THE WAGE EFFECT OF THE OCCUPATIONAL SEGREGATION: THE CASE OF UKRAINE

by

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Abstract

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The aim of the thesis is to study the main characteristics of the labor market of Ukraine, namely, to estimate the gender wage differential and, what is more important, to explain why individuals are remunerated differently. Two methods of the wage gap decomposition are utilized for this purpose. First, with a help of standard Oaxaca decomposition the justifiable (explained by differences in endowments) and unjustifiable (unexplained) parts are estimated. Second, the wage differential is decomposed into intra- and inter-occupational parts of the gap in order to estimate the impact of the occupational segregation on the individuals' wages. For estimation two data sets are used: Household Survey performed in 1996 by Kyiv International Institute of Sociology, and Survey performed in 2002 by Institute of Sociology of the National Academy of Sciences. The estimated gender wage differential is 17,92% and 30,17% based on analysis of 1996 and 2002 data sets respectively; the 44% (58%) of the gap can not be explained by differences in human capital level of individuals. The intra-occupational differential dominates inter-occupational in the case of both data sets. Moreover, the finding of the paper is that the fact that men and women are allocated differently across occupations tends to raise the female earnings ceteris paribus.

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GLOSSARY

Affirmative actions are actions of a state in order to seek out minorities and women to staff the vacancies of federal contractors.

Gender gap is a systematic difference in the labor market outcomes (the percentage of men and women in the labor market, the types of occupations they choose, and the difference in the average incomes they receive) that men and women achieve.

Occupational segregation is an unequal allocation of different social groups across occupations.

Wage differential is an average difference in the remuneration of different social groups.

INTRODUCTION

During the last 12 years Ukraine has been experiencing a fundamental transformation of its economic system toward a market economy. The labor market reform is one of the systematic reforms, the realization of which takes usually more time to be observed. Reforming of the labor market often follows first reform stages (e.g. macro liberalization, stabilization, privatization etc.). Although the necessity in reforming of labor market appears when most of the reforms have already been done, formulating an adequate labor market policy is important challenge faced by policy makers. Such policy should take in account the changes in the social and economic position of the different social groups.

Ukrainian legislation as most of other countries' legislation states equal rights of different ethic, national, gender, and age groups in the economic, political, social, and cultural spheres of life. The concept of equal rights includes equality of the outcomes individuals can receive on labor market. However, the implementation of the law might not be perfect. Therefore, it is useful to study the position of one group in comparison to the position of another one, e.g. women comparing to men, in the social, political, and economic structure of society. Investigating the gender wage gap, its reasons and consequences, is important since any inequality the reason of which is discrimination creates distortion in economy and has a direct effect on efficiency and growth (Becker, 1957).

Gender wage differential as well as one of its reasons occupational segregation is persistent in every country, at all levels of economic development and under all political systems. Although the ruinous impact of wage discrimination and occupational segregation on an economy's labor market is obvious, the latter is more serious since it is the major source of labor market rigidity, and hence economic inefficiency. As excluding one social group from particular occupations

increases labor market inflexibility, it evidently reduces an economy's ability to adjust, which is especially important in transition economies.

There are many studies of the gender wage gap and occupation segregation, and several studies of wage effect of occupational segregation of one group, which combine effects of mentioned phenomena, on Western labor markets; some relevant researches have been done for transitional countries but no similar research has been done for Ukraine.

Studying the transition effect on the labor market is not only very critical but also more challenging because such research has to take into account the particularities of economies in transition, i.e. its' preceding economic history.

The issue of gender wage differential in Ukraine is interesting to study since Ukraine has different story to tell. The difference is in our historical background. For almost a century we had been experiencing a policy of equalization. It was declared the equity of all people of different social groups, ethic groups, gender. Although women were engage in traditional 'male' jobs, they were not involved in prestigious positions.

During the transition period Ukrainian labor market is changing. Although the market now is more competitive and transparent, evidences of different treatment of individuals from different social groups are observed. The most obvious treatment inequality is different distribution of male and female workers across occupations. Such allocation may be a consequence of efficient market reallocation of human resources as well as a consequence of prejudicial hiring. Ukrainian employers still prefer to hire males on managerial position; males are more likely to be promoted.

An occupational segregation leads to general gender differences in earnings and, moreover, an occupational discrimination can be

observed through wage differential. The reason is that differences in earnings are likely to be observed and displayed in data, while prejudicial hiring decisions are often hidden and covert. So if wage differential is observed one of the reasons for that might be not only the difference in observed factors that affect payment but also the discrimination in wages and in occupations.

The empirical studies and statistical reviews suggest that in no region of the world women are equal to men in legal, social, economic rights. In industrial countries, women in the wage sector earn on average of 77 percent of what men earn; in developing countries, they earn 73 percent (Worldbank, 2002). The Worldbank gender statistics shows that in Ukraine women represent 48 (49) percent of paid employment in 1995 (2000); and earn 72 percent of male wage in non-agriculture and 98 percent in agriculture (Worldbank, 2002).

The purpose of the paper is to determine whether the gender wage differential is observed on Ukrainian labor market, whether individuals segregated on it and to estimate the impact of the occupational segregation (if it exists) on the remuneration of workers.

This paper is organized as follows. In Chapter 1 theoretical models of wage differential and labor market discrimination are overviewed and empirical methods and evidences are presented. Chapter 2 concerns the conceptual concept of wage gap decomposition; and theoretical model of wage discrimination discussed in more details. Methodology is presented in Chapter 3; empirical results and implications are in Chapter 4.

Chapter 1

LITERATURE REVIEW

In the review of literature I will first discuss the researches on the sources of gender differences in labor market outcomes and then consider different methods of detection of the wage discrimination and estimation the impact of occupational segregation of female workers on their wages.

The fact that female workers on average earn less than male workers prevails all over the world. But what accounts for the differences in earnings? The observable factors, such as education, job experience, hours worked, explain about 50 % of the gap. Surprisingly, only 10 to 30% of the difference in earnings can be explained by the different occupations of men and women. The remainder is due to differences within occupations and can not be explained by observable factors. This residual part may in fact be explained by individual self-selection or due to discrimination[1]. (Goldin, 2000)

1.1 The reasons and sources of the difference in wages: an overview of theories

There exist a number of theories that explains group differences in wages, occupations, and employment patterns as a consequence of preference and skill differences rather than discrimination (Altonji and Blank, 1999). Theory of *differences in preferences* claims that people have different preferences for market versus non-market job or for leisure and for the particular types of work (manual versus office work, work in the non-profit versus the private sector). The

[1]The source: http://www.econlib.org/library/Enc/GenderGap.html

distribution of preferences for particular job characteristics and the value of the job in the employer's point of view will determine the wage distribution as well as the occupational distribution of particular groups. As one of the source of such differences in preferences this theory mentions the pre-market discrimination in child-rearing practice or in educational system. The second theory in this class is *comparative advantage theory*, which emphasizes the role of differences in comparative advantages across the individuals. In competitive economy differences in comparative advantage will influence the allocation of time across occupations and between market and non-market work. (Altonji and Blank, 1999). Closely related to comparative advantage theory are group differences in human capital investments. *Human capital theory*, which was developed by a number of scientists such as Polachek and Mincer (1974), Polachek (1981), explains gender discrimination based on the accumulation and quality of human capital. The expected return to skills acquired through education and training depends on expected labor force participation and\or on expected salary, e.g. rational female worker may invest in the skills that do not depreciate very fast if one drops out of the labor force for a while. Thus, the return to human capital investment is higher for persons who expect to work full-time most of their adult lives. The differences in social expectations about gender roles and pre-market discrimination may explain the differences in investment in human capital and, consequently, the differences in labor market outcomes.

Now I proceed with the review of the main theories that explains gender difference in labor market outcomes as labor market discrimination.

Economists define discrimination in the labor market as the unequal[2] treatment of the same productive characteristics and efforts depending on what the demographic or gender groups the individuals belong to. Discrimination can take

[2] By "unequal" it's usually meant that persons receive different wages or face different demand for their services.

forms of unequal remuneration and employment segregation. The first form is called wage discrimination and it occurs if individuals with identical education, experience and background receive different wages at the same jobs because of their gender, ethnicity, or race. The second form is occupational segregation that means that women are precluded from being employed on certain jobs or levels.

A classic paper of Becker (1957) frames the problem in terms of *prejudicial tastes* and modeled prejudice as a 'taste' for discrimination. Becker distinguished between employer, employee and consumer discrimination depending on who is the initiator of labor market discrimination. *Employer discrimination* theory predicts that employers with high tastes for discrimination would not hire or hire very small number of individuals from discriminated group of employees, while employer with low prejudicial tastes would hire those individuals, pay them less and receive high profit. Over time, competitive market will eliminate discriminating firms. The basic idea of *employee discrimination* is that some member of the majority group are prejudiced against minority[3] group and do not like to work with the minority group members, resulting in occupational segregation rather than in wage discrimination. In the model of *consumer discrimination* prejudicial consumers get less utility if they buy a good from minority group member than from the member of the majority group. Consequently, they will purchase from member of minority group only if the price of the good is reduced. As a result, labor market outcomes for minority group members will decrease. The developers of the mentioned theories noted that the impact of taste-based wage discrimination is reduced if segregation is costless. A natural development of such theories is to introduce the costly search into models (Altonji and Blank, 1999).

[3] By minority group we mean a group that suffers discrimination.

The pioneering paper of Phelps (1971) identifies *statistical prejudgment* as another source of discrimination. There are two main strands to the statistical discrimination literature. The first investigates how prior beliefs about productivity of group members can influence hiring and pay decisions. The second concerns the consequences of group differences in the precision of the information that employers have about person productivity. (Altonji and Blanc, 1999). The basic idea of Phelps' and the further studies is that firms have limited information about the skills of applicants. In such situation employers tend to use easily observed characteristics such as gender or ethic group to 'statistically discriminate' among workers if these characteristics are correlated with performance. So statistical prejudgment means that employers attribute to the members of certain group of employees qualities they think the member of this group possesses. Statistical models demonstrate that treating the two groups of workers differently may be the rational response of firms to the uncertainty about individual's productivity. In this case persistent wage differentials may arise between workers with the same productivity who belong to different, identifiable groups, even in competitive market. As was noted by Lundberg and Startz (1983) in competitive market with perfect information, the absence of discrimination is guaranteed. The only systematic differences in the quality of information available about the two groups of workers will cause rational employers to set different wage schedules. Lundberg and Startz (1983) improve the classical model of statistical discrimination by examining the effect of prohibiting group-specific treatment of workers on both net social product and the distribution of income. They showed that a competitive equilibrium under the certain types of imperfect information could be improved by enforcing equal wage schedules for the different groups of workers. The authors showed that the gain of the advantageous group from discrimination, increase in the relative wage of this group, and it is lower than the gain of the disadvantageous group if statistical discrimination is eliminated. Lundberg (1991) makes the point that preventing

firms from using group specific equations to estimate the productivity of an individual will reduce the accuracy of their estimates of productivity. If output depends on the quality of the match between the job and the worker, then the reduced accuracy may result in an efficiency loss. The author points out that an outcome-based policy such as affirmative actions may be preferable to an 'equal treatment' policy because the latter is hard to enforce given heterogeneity of workers.

Another well-developed branch of literature (e.g. Barth et al, 1999) concentrates on non-competitive theories of discrimination, i.e. monopsony explanation of discrimination, which claims that if an employer has a monopsony power it would pay lower wage for the group of employees with lower labor supply elasticity. However, modern labor economists do not give this theory much credit; they note that this model does not leave much to the understanding of the gender wage gap. Most studies of developed countries' labor markets have not found the empirical evidence for the monopsony approach. But there are some researchers that claim the adequacy of the theory. Barth and Dale-Olsen (1999) apply a model of monopsony in labor market to gender differences. They argue that monopsonic discrimination may be a substantial factor behind the overall gender wage gap. Using matched employer-employee data from Norway, they investigate the wage structure within and between establishments, and present evidence that the establishments' excess turnover of employees is sensitive to the wage premium of men, but not to the wage premium of women. The estimated differential is about 24%, 20% depending on what is included in a regression as independent variables. Including details about industry, economy sector and region lowers the wage gap. Then studying within and between estimates of male/female wage gap Barth and Dale-Olsen (1999) found that going from a male-dominated to a female-dominated occupation depress wages by 8% ceteris

paribus. Moreover, they showed that male turnover is more wage elastic than female turnover.

Chase (2000) explores the feasibility of monopsony as an economic structure supportive the discrimination during transition, using Latvia's ethnic Russians as a case study. Measuring employment concentration and earnings differences across regions, monopsony appears prevalent in this country. Earnings decomposition show that though Russians are paid more than Latvians on average, given their human capital characteristic, they suffer wage discrimination from 5,5 to 7,3%. In addition, comparing with Latvians to Russians the likelihood that the Russians will be unemployed is higher, though Russians are less likely to register for unemployment. Chase (2000) also found a significant negative coefficient on male dummy in probit estimation of probability of participating in the labor force of Latvia.

1.2 Estimation of the impact of discrimination on wages: theories and empirical methods.

Many researchers take the "unexplained wage gap" – the difference in wages after controlling for a number of personal and job characteristics – in the classical wage regression as an evidence of discrimination. While the presence of unexplained differences in male\female wages is consistent with the presence of discrimination, it does not provide a very direct test of hypothesis. As Altonji and Blank (1999) noted, if discrimination is affecting the human capital investments and personal choices that individuals make or if it is affecting job choice, then 'unexplained gap' will understate discrimination, because some of the control variables themselves reflect the impact of discrimination. On the other hand, the specifications in many of these wage regressions are limited and researches typically have only very crude proxies to measure skills and abilities or experience. If there are omitted human capital variables, then the 'unexplained gap' will

overstate the impact of discrimination, since it will reflect both the impact of omitted and unmeasured productivity variables as well as any effect of discrimination.

Although there are several better methods of finding a direct evidence of discrimination such as audit studies, sex blind hiring, direct estimation of marginal product, and test for statistical discrimination developed by Altonji and Pierret (1997), all of them crucially depend on data availability. Unfortunately, such data are not available for Ukrainian labor market.

It is a common practice to decompose the wage differential; such methods decompose the wage differential on the part that can be explained by productivity differences and part that cannot be explained by such differences. The first decomposition method was developed by Oaxaca and Ransom (1994). This methodology decomposes the wage differential on two components: a productivity differential and a discriminative term, which cannot be explained by differences in productivity. Usually, the discriminative term becomes smaller as the number of explanatory variables in the wage equation increases. Developing Oaxaca decomposition one may try different payment structure as a competitive (faire, non-discriminative) one, e.g. male wage structure, female, or a weighted average of two structures in order to compare them and identify unexplained component. Oaxaca and Ransom (1994) used US Current population Survey, 1988 to illustrate their methodology. They found 35% male/female gross logarithmic wage differential, the discriminative component is nearly 32% (26 %) if female (male) wage structure is considered as competitive one, male productivity advantage is estimated to be 2% (7%).

Other methods of decomposing wage changes are Junh, Murfy, and Pierce's approach and Card and Lemieux's multidimensional skill model (Altonji and Pierret, 1997).

Estimating the wage determination equation one always has to remember about the problem of a selection bias, because individuals decide themselves whether to enter the labor force or not. Most researches, therefore, use a two-stage Heckman procedure to estimate the wage determination model. The correction for the selection bias is standard but usually if it is performed the decomposition of the Inverse Mills Ratio is not including in the stage of the wage gap decomposition.

Later Oaxaca and Neuman (2001) made a serious research on decomposing wage differential; they emphasize that the Heckian lambda (Inverse Mills Ratio) has to be also decomposed. They provide four different types of decomposing and noted that results crucially depend on choice of the decomposition type. The general empirical findings of Oaxaca and Neuman (2001) are: gender logarithmic wage differential is estimated to be 0.2567; unexplained component is 0.1730 or 67% using data on Israel.

There is a branch of literature that investigates labor market discrimination particularly in transition economies. Jollife (2002) used separate wage regressions estimates for males and females and Oaxaca method to show that men's wages are 24% higher than women's wages and 82% of this differential is due to difference in how men and women are rewarded for the same characteristics.

Paternostro and Sahn (1999) using Oaxaca decomposition technique studied wage determination and gender discrimination in Romania. They had found a total log wage differential of 0.244 in urban areas and of 0.598 in rural ones, which implies that the average male hourly wage is 27% higher than female one in urban areas and 82% in rural areas.

There exist many researches that study the different allocation of female and male workers, i.e. occupational segregation. Many empirical methods are developed in order to estimate the effect of such segregation on the labor market outcomes of segregated groups. One of the studies is Miller's paper (1987).

Miller (1987) was one of the first who studies the combined effect of wage discrimination and occupational segregation, i.e. the impact of occupational segregation of women on their wages in Britain. He merges two models: the gender wage distribution with the behavioral model of occupational attainment. Using the General Household Survey of Britain Miller (1987) found 39% wage gap, 14% of which is attributed to discrimination. As the author is concentrated mostly on the wage effect of occupational segregation of female workers he studied the inter-occupational and the intra-occupational components of the wage differential and estimated the explained and unexplained parts of these two components. Miller (1987) found that 23% of gap is due to productivity-related variables, 13% derives from non-participation factors, and 34% is unexplained. What's more interesting, Miller's results show that the fact that comparable male and female workers are allocated differently across occupations tends to raise female earnings and occupational segregation makes only minor contribution to the wage gap.

The fundamental theoretical framework of occupational segregation, however, was not documented until the hierarchical theory of occupational discrimination by Baldwin et al (1993) was developed. Under assumption of declining exponential distribution of female across supervisory and managerial positions and employee discrimination (male workers distaste to be supervised by women) the author showed that the number of female managers are smaller than male one, female managers are paid less if they supervise male workers, and in the equilibrium female managers supervise only female workers.

As a result of the research we want to determine whether there is an empirical evidence of different remuneration of men and women, and estimate wage effect of occupational segregation of female workers and find its reasons.

Chapter 2

WAGE GAP DECOMPOSITION: CONCEPTUAL FRAMEWORK

The conceptual framework of wage decomposition was developed by Oaxaca (1973), and then improved by Oaxaca and Ransom (1994) and others researchers. The authors of the latter paper propose new alternative model of discrimination and focus on the methods of estimation of the wage structure that would prevail in the absence of any unequal treatment. The choice of fair wage structure is an important stage of estimation because the values of explained and unexplained components crucially depend on what wage structure is chosen as a fair one. (Oaxaca and Ransom, 1994).

Let's refer to the female workers as to a disadvantageous group, the group that suffers from unequal treatment. Denoting as W_m and W_f the wages of males and females respectively, the gross wage differential (G_{mf}) can be defined as

$$G_{mf} = \frac{W_m}{W_f} - 1 \qquad (1)$$

In competitive market with absence of discrimination the wage differential would reflect differences in productivity (Q_{mf}):

$$Q_{mf} = \frac{W_m^c}{W_f^c} - 1 \qquad (2)$$

Here ^{c} denotes the absence of discrimination.

Then the market discrimination coefficient (D_{mf}) is defined as the proportional difference between $G_{mf}+1$ and $Q_{mf}+1$:

$$D_{mf} = \frac{W_m / W_f - W^c_m / W^c_f}{W^c_m / W^c_f} \quad (3)$$

From equations (1)-(3) the following logarithmic decomposition of the gross wage differential is

$$\ln(G_{mf} + 1) = \ln(D_{mf} + 1) + \ln(Q_{mf} + 1) \quad (4)$$

The equation (4) is a basic equation of the wage gap decomposition. Oaxaca and Ransom (1994) noted that the coefficient D_{mf} reflects unexplained component of the wage differential but reveals only the relative effect of labor market discrimination. D_{mf} does not snow what part of the gap is an overpayment (advantage) of male workers and what part can be attributed to the underpayment (disadvantage) of female workers. So, the wage gap can be further decomposed to separate overpayment and underpayment components:

$$\begin{aligned} \ln(D_{mf} = 1) &= \ln(W_m / W_f) - \ln(W^c_m / W^c_f) = \\ &= \ln(W_m / W^c_m) + \ln(W^c_f / W_f) = \\ &= \ln(\delta_{mc} + 1) + \ln(\delta_{cf} + 1) \end{aligned} \quad (5)$$

here $\delta_{mc} = (W_m / W^c_m) - 1$ and

$\delta_{cf} = W^c_f / W_f$,

δ_{mc} – is a difference between males current wage and the wage men would receive if they were treated equally to women; δ_{cf} – in turn, is a difference of the wage females were received in the absence of discrimination and actual wage of women.

Substituting (4) into (5) more informative decomposition of the wage gap:

$$\ln(G_{mf} + 1) = \ln(\delta_{mc} + 1) + \ln(\delta_{cf} + 1) + \ln(Q_{mf} + 1) \quad (6)$$

The decomposition can be estimated in the following way

$$\ln(G_{mf}+1) = X'_m(\hat{\beta}_m - \hat{\beta}^*) + X'_f(\hat{\beta}^* - \hat{\beta}_f) + (X'_m - X'_f)\hat{\beta}^* \quad (7)$$

$\hat{\beta}^*$ here is an estimated non-discriminative wage structure. The first term of the equation (7) is an estimated wage advantage of male workers, the second term – female disadvantage, and the third term is the estimated productivity difference.

Some assumptions about the non-discriminative wage structure have to be made in order to estimate and decompose the wage differential (Oaxaca and Ransom, 1994).

A reasonable representation of the estimated fair wage structure is given by

$\hat{\beta}^* = \Omega\hat{\beta}_m + (\mathrm{I} - \Omega)\hat{\beta}_f$, where Ω is a weighted matrix. So assumption about $\hat{\beta}^*$ reduces to the assumption about Ω. The paper of Oaxaca and Ransom (1994) concentrates on the choice of $\hat{\beta}^*$ and compares the decompositions based on different fair wage structure.

Earlier, Oaxaca (1973) proposed the adoption of either the actual make structure (Ω=1) or the actual female wage structure (Ω=0), however, the fair structure should somewhere 'between' the male and female structures.

Later, Oaxaca and ransom (1994) argues that some guidance for the choice of non-discrimination wage structure can be provided by the theory of discrimination. Oaxaca and Ransom (1994) argue: 'The model of Becker (1971) suggests that employer with taste for discrimination is willing to trade reduced profit for fewer minority (disadvantageous) employees. So the way worker (minority and non-minority) enter into production and utility functions have implications for how to interpret the resulting wage differentials'.

Then authors illustrate this statement on simple model of discrimination. Assuming that all firms are identical and competitive, and have discrimination tastes; all workers are identical then producers maximize the utility function (rather than profit) of the form:

$U=R(\pi,M,F)$,

π is a profit, M – the number of nonminority (male) workers, F- the number of minority (female) workers. The profit then is

$\pi=f(M+F)-W_mM - W_fF$,

applying first order conditions:

$f' - W_f=d_f$ and $f'-W_m=d_m$

or $W_f=f'-d_f$ and $W_m=f'-d_m$,

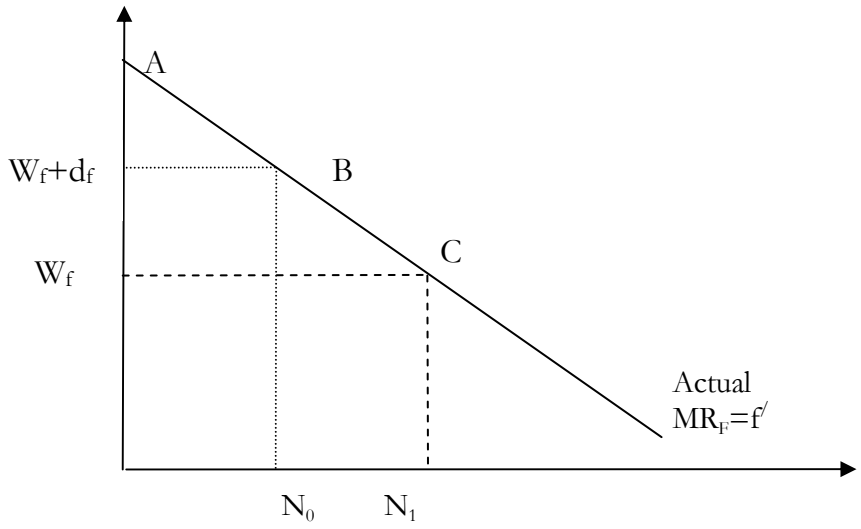
where $d_i = - R_i/R_\pi$ is the Beckerian discrimination coefficient. If d_i is positive, this indicates that the ith group loose from discrimination, whilst a negative d_i indicates that the group benefits from favoritism. If d_i is equal to zero then workers of ith group are paid the wage equal to their marginal product. The results shows if the actual productivity of women is devaluated by employers, female workers have to agree to work for lower wages than male workers to compete for jobs.

The graphic representation of this is on Figure 1. From the figure it can be seen that a discriminatory employer faced with a market wage rate of W_f for women will hire N_0, for a point where $f' = W_f+d_f$. Profit–maximizing employers, however, will hire N_1, where marginal product of female labor $f' = W_f$. The non-discriminatory employers hire women until the point where their marginal

product equal their wage, whilst discriminatory employers hire less number of female workers and lose profit in order to indulge their prejudices.

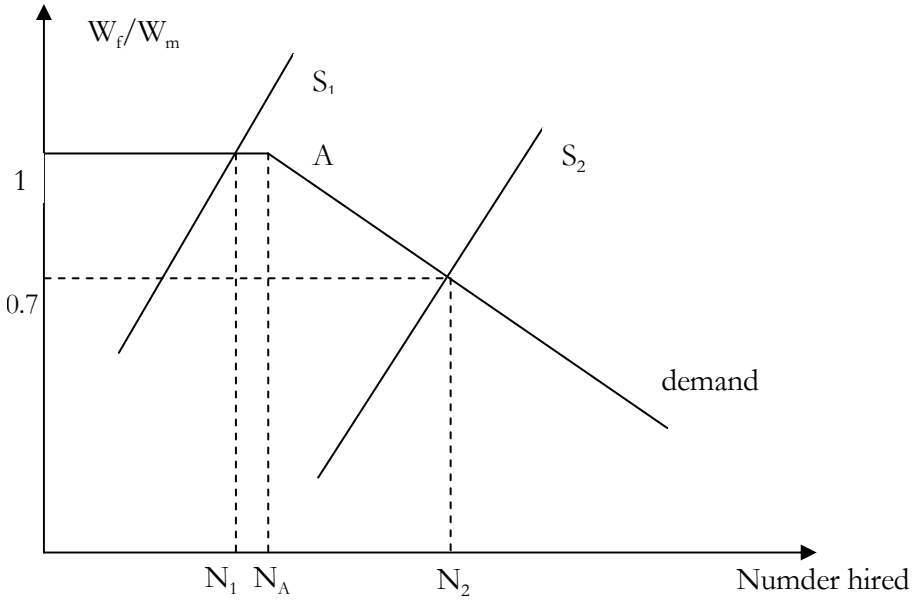
One of the implication of the theory deals with the gap in wages of male and female workers, gap between W_m and W_f. The determinants of the gap can be better illustrated by extend the analysis from one firm to the market labor demand for female workers. (Ehrenberg, 2000). In Figure 2, the market demand

Figure 1. Equilibrium employment of women in discriminatory firms



curve for women is express in terms of their wage relative to the wage of men. Here we assume that there are a number of nondiscriminatory employers, who hire N_a women at a unity relative wage ($W_f=W_m$). For those employers with taste foe discrimination the wage of females has to be lower than the wage of males to induce them to hire women. Thus the market demand curve for female workers is bending downward at point A. So if the supply of female workers is small (S_1), then they are hired by nondiscriminatory employers and there is no wage differential (relative wage is equal to one), if the number of females seeking for a

Figure 2. Market demand for women as a function of relative wage



job is relatively large (S_2), then some discriminatory employers also hire female workers, as a result, the relative wage decreases to 0.7.

Since workers are identical by assumption the wage differential is $W_m - W_f = d_m - d_f$. Unfortunately, the marginal productivity of labor (f') can not be measurable that is why d_i components can not be identified.

More general model allows for heterogeneity of workers, i.e.

$$\pi = f(M_1 + F_1, \ldots\ldots, M_n + F_n) - \sum_i B_i W_{mi} - \sum_i B_i W_{fi}$$

The utility of the employer an be generalized to

$U = R(\pi, M_1, F_1, \ldots\ldots, M_n, F_n)$

In this case, employers care about the composition of each type of labor. As Oaxaca and Ransom (1994) showed if the utility function is homogeneous of

degree zero within each type of labor, e.g. the employer only cares about the proportion of females within each type of labor, the non-discriminatory wage for each type of labor is a weighted average of each gender group's wage. The non-discriminatory wage structure, then, proposed to be estimated from the pooled sample of males and females. That is:

$\hat{\beta}^* = (X'X)^{-1}(X'Y)$, where X is the observation matrix of independent variables and Y is a vector of the natural logarithms of wages.

So for the purpose of the thesis the wage differential will be decomposed according to the above theoretical framework, using different fair wage structure, namely male, female wage, and the wage structure from the pooled sample.

Chapter 3

METHODOLOGY

The empirical part of studying the wage effect of the occupational segregation of women in Ukraine is based on the model proposed by Miller (1987). The model merges the other well-known model of the gender wage distribution with the behavioral model of occupational attainment. The former model allows to estimate the unexplained by individual characteristics part of the gender wage gap by using one of the decomposition methods. The latter model studies the occupational segregation of particular group.

The estimation procedure will be as follows. First, the gender wage gap is estimated and then decomposed into two parts: the part attributed to the differences in human capital characteristics, and the unexplained component. The decomposition will be done on the basis of different assumptions about fair wage structure. First, we assume that female wage is a wage that would prevail in the absence of discrimination; second, the male wage is assumed to de a fair wage structure; and third, the wage structure estimated from pooled sample of men and women is assumed to be fair one. Following Oaxaca and Ransom (1994), we believe that the third wage structure is an appropriate fair wage structure, and the decomposition based on the assumption of this wage structure as fair one is a basic decomposition.

A two-equation model of wage determination and occupational employment among individuals is used in order to estimate the wage equation and decompose the wage gap:

$$LnY_i = X_i{}^{/}\beta_1 + u_i,$$
$$L_i = H_i^{/}\gamma_1 + e_i,$$

where Y_i is the market wage, X_i is a vector of human capital variables that determine the market wages, , L_i is a binary variable associated with being employed, H_i, is a vector of determinants of occupational choice, β_1 and γ_1 are the associated parameter vectors, and e_i and u_i are i.i.d error terms. The error terms are supposed to be correlated, formally

$\begin{pmatrix} e_i \\ u_i \end{pmatrix}$ are $NID\left\{\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{12} & 1 \end{pmatrix}\right\}$, $\sigma^2{}_2$ – is normalized to 1.

Then, following Heckman two-stage procedure, the expected wage can be expressed as

$$E\,(Y_i \mid L_i > 0) = X^{/}{}_i\beta_1 + E\,(u_{1i} \mid e_{1i} > -H^{/}{}_i\gamma_1) = X^{/}{}_i\beta_1 + \theta_i\lambda_i,$$

where λ_{1i} is an Inverse Mill's Ratio, $\lambda_{1i} = \dfrac{\phi\left(H_i'\gamma_1\right)}{\Phi\left(X_i'\beta_1\right)}$, here $\varphi(.)$ is density function of normal distribution and $\Phi(.)$ is cumulative density function of normal distribution,

and $\theta_i = \rho_{12}\sigma_1$, $\rho_2 = \dfrac{\sigma_2}{\sigma_1}$ is a correlation coefficient of e_i and u_i.

Then the wage determination equation can be presented as

$$E\,(Y_i \mid L_i > 0) = X^{/}{}_i\beta_1 + \theta_1\lambda_i + \varepsilon_i$$

Decomposition is based on the Oaxaca method (1973) of decomposing the gender wage gap:

$$\ln(G_{mf}+1) = X'_m(\hat{\beta}_m - \hat{\beta}^*) + X'_f(\hat{\beta}^* - \hat{\beta}_f) + (X'_m - X'_f)\hat{\beta}^* \ , \quad (2)$$

$\hat{\beta}^*$ here is an estimated non-discriminative wage structure. The first term of the equation (2) is an estimated wage advantage of male workers, the second term – female disadvantage, and the third term is the estimated productivity difference. We will calculate the wage gap decomposition using tree different wage structures: female, male, wage structures, and the wage estimated from pooled sample. The reasoning is in the second chapter.

Second, the model of occupational segregation on the basis of gender is estimated. The possible models to estimate the different occupational attainments are multiple probit, multiple logit, ordered probit, and others. Miller (1987) argues that the ordered probit model is preferred over other models since it explicitly allows to make statements about vertical mobility of workers. This model estimates a probability that an individual will be employed on the several occupational categories. The occupations are ranked by average wage paid on each occupation in order to use the ordered model.

Third, the gender wage gap is decomposed into intra-occupational and inter-occupational wage components as was proposed by Miller (1987). Both components can be further analyzed as a sum of explained (or justifiable) and unexplained (unjustifiable) parts. The value of unexplained components may be considered as an indicator of discrimination. This modified methodology allows us to see what part of wage gap is due to segregation of women from some, often higher-paid, occupations.

$$\ln \overline{W}^m - \ln \overline{W}^f = \sum_j \boldsymbol{P}_j^f (\hat{\beta}_j^m \overline{X}_j^m - \hat{\beta}_j^f \overline{X}_j^f) + \sum_j \hat{\beta}_j^m \overline{X}_j^m (P_j^m - P_j^f) \ , (3)$$

the first term is an intra-occupational, the second – inter-occupational components,

and P^m_j, P^f_j are the proportions of males, females in the *j*th occupation.

The two components of equation (3) can be re-arranged in the following way

$$\sum_j P_j^f(\hat{\beta}_j^m \overline{X}_j^m - \hat{\beta}_j^f \overline{X}_j^f) = \sum_j P_j^f \hat{\beta}_j^m (\overline{X}_j^m - \overline{X}_j^f) + \sum_j P_j^f (\hat{\beta}_j^m - \hat{\beta}_j^f) \overline{X}_j^f$$

$$\sum_j \hat{\beta}_j^m \overline{X}_j^m (P_j^m - P_j^f) = \sum_j \hat{\beta}_j^m \vec{X}_j^m (P_j^m - \hat{P}_j^f) + \sum_j \hat{\beta}_j^m \overline{X}_j^m (\hat{P}_j^f - P_j^f)$$

where $\hat{P}^f{}_j$ is the simulated distribution across occupations of the female workforce. The distribution $\hat{P}^f{}_j$ (the proportion of female workers on the j position) would prevail on the market if female's human capital were rewarded as male's ones. Combining the coefficients from male attainment model with female data derives the proportion.

In the next chapters the described methodology is utilized for estimation the gender wage gap that is observed on Ukrainian labor market and calculation what part of the gap can be explained by occupational segregation.

Chapter 4

EMPIRICAL PART

3.1 DATA DESCRIPTION

For the estimation procedure we will use two sets of data. The first data set is taken from the household and individual survey performed in 1996 by Kyiv International Institute of Sociology (KIIS). The survey questionnaires are based on the standards of the Living Standards Measurement Survey (LSMS) that are being conducted by World Bank starting from 1980 in different countries (mostly in developing countries). It provides the characteristics of 2314 men and 2189 women, from all administrative regions of Ukraine.

The observations on 1069 women and 1033 men are used for this study (1996). The observations on pensioners, pupils, and college and universities students are dropped from the initial data set. The observations for those individuals who are younger than 17 and older than 65 were also excluded from the sample in order to concentrate the research on working age adults, since the purpose of the paper is to study whether a discrimination among adult individuals who work for wage exists. Also the observations with unrealistic numbers, such as negative education level, negative social payments.

There are several problems with the data. First, there are some employed individuals who do not reveal the wage or the wage is extremely small (about 100-300, 400 thousand krb[4]. The one reasonable explanation is the problem of wage arrears in 1996. An existence of wage arrears definitely influences the revealed

[4] The exchange rate in 1996 was $1=196 thousand krb

wage amount. Therefore, a dummy variable that describes whether individual was experienced arrears should be included in the wage equation. The problem of wage arrears introduces additional complication in to the estimation procedure, i.e. the wage differential may be not due to earnings discrimination but because of arrears discrimination.

The descriptive statistics of the main attributes of male s and females is shown in the Appendices 1 and 2 respectively. As it can be seen from the tables men and women have very similar level of human capital. Females have slightly more number of education years, and less years of job experience. As theory and empirical studies predict that the participation rate of women differs (it is smaller) from the men's one. The only significant difference that reveals from the tables is the difference in the average wages. The average wages are calculated in the sample that includes both employed and unemployed individuals. Therefore, the difference is that great. Instead, the difference in average wages of employed individuals should be considered.

The second set of data is the survey performed by Institute of Sociology (IS) of the National Academy of Sciences in 2002. For the purpose of the research observations on 453 females and on 439 males is considered. The observations on school and college students, pensioners and disabled were excluded from the sample. The descriptive statistics of the main human capital variables of men and women is presented in Appendices 3 and 4 respectively. The level of attributes of women and men have similar pattern. Most of the men and women are employed, however, women have lower participation rate; men have slightly less years of education, higher level of computer literacy, usually manage more subordinates. Similar to the descriptive statistics of 1996 data, in 2002 men on average have higher earnings comparing to women's.

The data from IS differs from the data from KIIS, fortunately, the surveys' questions about economic status and material situation of individuals are similar. The wages in the IS data are measured in Hryvnya whilst they are in thousands of Karbovanets in the KIIS data, but as the study is concentrated on the relative earnings of men and women, this is not a problem. The IS questionnaire do not include the information on wage arrears, so the arrears issue can not be compared, but in the 2002 data the number of individuals who were employed but did not reveal the wage is significantly smaller than in the 1996 data. So it can be concluded that the problem of wage arrears is less severe.

3.2 HECKMAN TWO-STAGE PROCEDURE ESTIMATION

A probit equation of labor force participation of women and men are estimated separately. The equation is specified as follows. The probability of being employed is expected to be influenced by age, age squared, the variable that indicates whether a person has children younger than 15 years, years of education, marital status, region type (city, settlement or village, village as a base), and region of residence (Kyiv, centre, west, east, north and south of Ukraine, west is a base).

The estimation results for female and male workers are shown in Table 1 for the 1996 data and in Appendix 5 for 2002 data. The results, in general, are as expected, and consistent with theory. In the regressions' results, a positive (negative) sign means that the variable increases (decreases) the probability of being employed.

We first will discuss the result of estimation based on 1996 data. The coefficients on the variables age, city and settlement region type (as compared to village) are positive and significantly differ from zero. The city of Kyiv has a positive sign, and its coefficient is significant in female regressions, which is as expected. In male's regression, however, the coefficient on Kyiv is not significant. Age squared

Table 1. Probit participation model of women and men, 1996.

Dependent variable is a binary variable that equals one if an individual is employed, (z-statistics are in the parentheses)

	Females		**Males**	
Independent variables	Model 1	Model 2	Model 1	Model 2
Age	0.123*** (3.859)	0.134*** (4.228)	0.057** (2.067)	0.068** (2.414)
Age^2	-0.001*** (-2.956)	-0.001*** (-3.306)	-0.001* (-1.788)	-0.001** (-2.135)
Children	-0.197** (-2.011)	-0.190** (-1.975)	-0.040 (-0.357)	-0.046 (-0.415)
Married	-0.244** (-2.163)	-0.355*** (-3.404)	0.365*** (2.586)	0.331** (2.402)
Years of Education	0.026* (1.713)	0.0247 (1.639)	-0.023 (-1.439)	-0.024 (-1.503)
Region type				
Settlement	0.329** (2.492)	0.302** (2.369)	0.236 (1.490)	0.226 (1.541)
City	0.391*** (4.047)	0.456*** (5.028)	0.309*** (2.869)	0.362** (3.589)
Village				
Region				
Centre	-0.167 (-1.264)		-0.347 (-2.439)	
South	-0.085 (-0.703)		0.046 (0.292)	
North	-0.283* (-1.737)		-0.172 (-1.015)	
East	-0.074 (-0.626)		0.113 (0.864)	
Kyiv	1.277*** (3.770)		0.416 (1.550)	
West				
Constant	-2.371*** (-4.714)	-2.530*** (-5.140)	-0.493 (-1.031)	-0.687 (-1.406)
Log likelihood	-622.5165	-635.0238	-502.0849	-509.7161
McFadden R-squared	0.109633	0.090578	0.055133	0.040772
Obs with Dep=0	386		218	
Obs with Dep=1	683		811	
Total obs	1069		1029	

*** significant at 1% ** significant at 5% * significant at 10 %

has negative sign denoting diminishing marginal return on age also in both regressions.

Having children and being married have significant negative coefficients in female participation equation whilst in the male equation the coefficient on being married is positive and significant, and having children has insignificant influence on the probability of being employed. These differences are reasonable and can be explained by the different social roles of men and women and (or) by the fact that married women may have financial support from their spouses. The different signs and significance of regional variables coefficients might be due to different gender participation (and unemployment) rates in the regions.

Having estimated the participation probit model using the 2002 data, we can see that the probability of being employed is positively influenced by number of education years both for males and females. The age of males has significant positive impact of the probability to have a job, while there is no similar dependence in subsample of females. As theory predicts female participation decreases if a woman has children, however, having children has no influence on participation of men. The city and settlement region types positively influence the participation of both men and women.

Having estimated the participation equation as a first step in Heckman procedure, the correlation between error terms is checked (ρ_{12} is significantly different from zero), hence, the Inverse Mills Ratio can be calculated, and then the wage equations are estimated. Among all relevant variables that determine the individual's wage are experience, experience squared (experience is calculated as a difference between age and years of education minus six years), years of education, region type (village is a base), tenure, region (west is a base), field of work (forestry as a base), an occupation (manual including workers of 1-2 grade, 3-4 grade, and 5 grade; office employees with special education and without it,

professional, military, and agricultural worker) with an agricultural worker as a base category, the variables that indicates whether a person has wage arrears experience and whether he or she has subordinates, and an Inverse Mills Ratio.

All mentioned variables are included in the wage regression using 1996 sample. In the wage regression of 2002 these variables are also included, except the variables on tenure, wage arrears and field of work (there are no such information in 2002 questionnaire). Another difference between the two wage regressions is a difference in the occupational categories. Due to the difference in the data sets we distinguish four occupational categories in the 2002 sample. These are manual workers (w_1), qualified workers (w_2), professionals (w_3), and managers, technical specialists (w_4). The manual workers do not included into the 2002 wage regression and it used as a base category. The basis for making such a distinction is the type of job and average wage that is earned on each occupation. However, as we have information on the level of computer literacy in 2002 data, we include a dummy variable on computer literacy in the wage regression, (the variable is equal 1-if individual can work with computer, 0-otherwise), as we suppose that the level of computer literacy influence the wage of employees.

Including occupational categories in the wage equation decreases the wage gap and its unexplained part, as many researches claims (Miller, 1987, Baldwin, 1993). Moreover, if occupations are in the wage regression it is possible to estimate part of the wage gap that can be explained by occupational segregation. This is the reason of including the categories into regression.

In the Table 2 the results of the estimation of the wage equation of women and men from 1996 data set are represented. The results are consistent with theoretical model and its interpretation is as follows. As it can be seen from the results the wage increases with experience and decreases with experience squared for females indicating that a return on experience is diminishing. In contrast, men

do not have significant positive return on experience. The reason may be in different valuation of male work by employers, a job experience, hence, means less for male workers.

Table 2. Wage equation of women and men, 1996

(t-statistics are in the parentheses)

Logarithm of wage is a dependent variable

	Women		**Men**	
Independent variable	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Inverse Mills Ratio	-0,109	-0,593	-3,600*	-3,660*
	(-0,099)	(-0,539)	(-1,897)	(-1,933)
Experience	0,022	0,012	-0,002	0,001
	(1,443)	(0,858)	(-0,146)	(0,099)
Experience^2	-0,0006**	-0,0004	-0,0001	-0,0002
	(-2,065)	(-1,617)	(-0,523)	(-0,826)
Years of education	-0,019	0,027	0,032*	0,024*
	(-1,116)	(1,623)	(1,928)	(1,711)
Tenure	0,007	0,009**	0,002	0,004
	(1,514)	(2,085)	(0,496)	(0,923)
Arrears	-0,409***	-0,392***	-0,468***	-0,463***
	(-5,552)	(-5,307)	(-6,287)	(-6,367)
Subordinates	0,153*	0,229***	0,386***	0,358***
	(1,700)	(2,625)	(3,799)	(3,840)
Region type				
Settlement	0,232*	0,173	-0,085	-0,084
	(1,669)	(1,246)	(-0,677)	(-0,685)
City	0,201	0,187	-0,191	-0,168
	(1,635)	(1,530)	(-1,713)	(-1,516)
Village				
Region				
Centre	0,052	0,101	0,197	0,201
	(0,384)	(0,797)	(1,365)	(1,398)
South	-0,083	-0,063	0,058	0,056
	(-0,954)	(-0,689)	(0,560)	(0,551)
North	0,018	0,068	0,101	0,107
	(0,116)	(0,415)	(0,756)	(0,792)
East	0,065	0,097	0,087	0,095
	(0,675)	(1,015)	(0,832)	(0,920)
Kyiv	0,182	0,156	0,378*	0,413**
	(1,034)	(0,894)	(1,862)	(2,051)
West				
Field of occupation				
Construction	0,577***	0,540***	0,366***	0,373**
	(2,778)	(2,819)	(2,239)	(2,290)

Education	0,087	0,120	0,856***	0,868***
	(0,740)	(1,025)	(3,684)	(3,793)
Finance	0,226	0,376**	0,906	0,831
	(1,117)	(2,151)	(1,543)	(1,502)
Health care	0,287**	0,275**	0,521***	0,561***
	(2,265)	(2,163)	(3,052)	(3,386)
Industry	0,207*	0,143	0,480***	0,501***
	(1,703)	(0,781)	(4,417)	(4,831)
Municipal	-0,159	-0,288*	0,235	0,291*
	(-1,019)	(-1,813)	(1,234)	(1,691)
Other field	0,071	0,065	0,456*	0,548***
	(0,374)	(0,326)	(2,694)	(3,529)
State organizations	0,009	-0,007	0,001	0,087
	(0,062)	(-0,044)	(0,005)	(0,463)
Trade	0,171	0,082	0,476***	0,469***
	(1,595)	(0,781)	(2,716)	(2,646)
Transport	0,275	0,180	0,335***	0,346***
	(1,534)	(1,012)	(2,759)	(2,889)
Forestry				
Occupation				
Worker of 1-2 grade	-0,238		0,0007	
	(-1,295)		(0,004)	
Worker 3-4 grade	-0,182		-0,045	
	(-0,872)		(-0,291)	
Worker 5 grade	-0,045		0,222	
	(-0,188)		(1,417)	
Office employee without special education	-0,171		0,030	
	(-0,963)		(0,165)	
Office employee with special education	0,050		0,198	
	(0,277)		(1,245)	
Military servicemen	1,038**		0,315	
	(2,524)		(1,316)	
Professional	0,435**		-0,077	
	(2,008)		(-0,425)	
Agricultural worker				
Constant	8,735***	8,512***	9,868***	9,972***
	(11,055)	(10,734)	(11,15)	(11,447)
R-squared	0,2133	0,1809	0,2245	0,210434
Prob(F-statistic)	0,0000	0,0000	0,0000	0,0000

*** significant at 1% ** significant at 5% * significant at 10 %

Surprisingly, the return on education is much higher for male workers. The return of education for males is positive and significant whilst for female it is negative (but insignificant). As a result, men have more incentives to invest in the

education since they can expect higher earnings. The earnings of both men and women increase with a tenure, and with a fact that individual has subordinates. Wage arrears, as was expected, decreases the wage (at least the wage that individual received in the previous to survey month). Women in cities and settlements receive higher wages than in villages; the earnings of men, however, do not significantly depend on the residence type. The wages in different regions of the country do not significantly differ, Kyiv is an exception – men in Kyiv earn more. An influence of the field of occupation is not so straightforward; it has different direction and magnitude for men and women. The reason for such difference is an unequal proportion of men and women occupied in different fields of economy. Another peculiarity of gender difference in earnings is that female professional and military workers ceteris paribus are paid higher wage than manual ones, as for male workers there is no such clear dependence.

Using the 2002 data we found that wage tends to increase with a number of education years, the wage is higher in the city of Kiyv, and on managerial positions for both male and female employees (sees Appendix 6). As it can be seen from the appendix women in the North earn significantly lower wage, and men in the East of Ukraine earns more. We can explain this by the regional specialization, i.e. in the highly industrial East men might have comparative advantage working on certain occupations, and therefore they received higher wages. Both women and men receive higher wages if they worked as a managers or technical employees. Men, moreover, have significant positive influence on wages the fact that men work as a qualified workers.

Inverse Mills Ratio is inversely related to the probability of being employed by its construction. Therefore negative sign of IMR indicates that individuals who have higher probability of being employed earn more. From the results (2000) we see IMR coefficient is higher for female workers, which means lower probability for women to be employed.

For the purpose of the wags gap decomposition we estimate the wage regressions using pooled sample of men and women for both 1996 and 2002 data. (see Appendices 7 and 8).

3.3 WAGE GAP DECOMPOSITION

The value of mean wage (in logarithm) is calculated using the coefficients of the wage regressions with occupational categories as additional independent variables, and mean values of variables included in the model, i.e. $\overline{LnW}^{i} = \overline{X}_i' \hat{\beta}_i$. Then the wage differential is decomposed into two parts: explained by difference in attributes and unexplained one (see Table 3 an 4 for the two samples results).

The calculated wage gap in 1996 is 0,1975; this implies that on average women earnings amount to 82,07% of the average earnings of men[5].

Table 3. The wage differential and its decomposition (1996).

Fair wage structure	Ln (G_{mf}+1)=0,1975				G_{mf}=0,2123 Wage gap=17,92 %			
	Ln (D_{mf}+1)		Ln (Q_{mf}+1)		D_{mf}	δ_{mo}	δ_{of}	Q_{mf}
	unexplained	%	explained	%				
Male	0,0509	25,77	0,1465	74,23	0,0522	0,0000	0,0522	0,1578
	due to occupational segregation		0,0215					
Female	0,1582	80,09	0,0393	19,91	0,1974	0,1974	0,0000	0,0174
	due to occupational segregation		0,0193					
Pooled	0,0869	44,00	0,1106	56,00	0,0908	0,0556	0,0333	0,1169
	due to occupational segregation		0,0327					

According to the calculations if a wage structure estimated from the pooled sample of males and females is a fair wage structure 56% of the wage gap can be explained by the male/female differences in human capital, that is this part of the

[5] $\ln(1/0,8207) = 0,1975$

gap is due to the fact that women on average have lower level of human capital. 44% of the wage gap, however, can not be explained by the variables included in the regression, it is just due to difference in remuneration or due to gender difference in unobservable characteristics. 21% of the gap is male advantage (overpayment), 16% is female disadvantage (underpayment) if the fair wage structure is estimated from the pooled regression of men and women. We also found that if female wage is assumed to be a fair wage then the unexplained part of the gap is significantly increases (from 44% to 80%), but if male wage is a fair one then the unexplained component declines. This illustrates the importance of the assumption about fair wage structure. We believe that the wage structure estimated from the pooled sample is an appropriate choice (Oaxaca and Ransom, 1994).

As occupational categories are in the wage regression it is possible to estimate part of the wage gap that can be explained by occupational segregation. 10,37 % of the gap can be attributed to difference in occupational attainments, this part has also both justifiable and unjustifiable components.

However, such approach to estimation the effect of wage segregation has serious limitations (Baldwin, 1993). In fact, it still impossible to estimate what part of the wage effect of different occupational distributions is justifiable (due to endowments), and what part is unjustifiable.

Similarly, the wage gap is estimated and then decomposed using another (2002) dataset. Here the estimated wage gap (in logarithm) is 0,3592 and, consequently, women earn on average 30% less than men according to data on year 2002 (see Table 4). Only 42% of the gap is explained by differences in attributes of men and women (assuming 'pooled' wage structure as a fair one), 15% of the gap is due to occupational segregation.

Table 4. The wage differential and its decomposition (2002).

Fair wage structure	Ln (G_{mf}+1)=0,3592				G_{mf}=0,4318 Wage gap=30,17 %			
	Ln (D_{mf}+1)		Ln (Q_{mf}+1)		D_{mf}	δ_{mo}	δ_{of}	Q_{mf}
	unexplained	%	explained	%				
Male	0,1644	45,76	0,1948	54,24	0,1787	0,0000	0,1787	0,1578
	due to occupational segregation		0,0127					
Female	0,3084	85,85	0,0508	14,15	0,3613	0,3613	0,0000	0,0174
	due to occupational segregation		0,0786					
Pooled	0,2068	57,58	0,1524	42,42	0,2197	0,1066	0,1112	0,1646
	due to occupational segregation		0,0593					

The difference in the estimated wage gaps is significant (it increased by 12%). Although the two data sets are different and we can not make any sound and empirically robust conclusions, we still can outline the tendency or a tendency direction of the labor market changes in Ukraine. The increase in the gender wage gap indicates the rising overall inequality in Ukrainian society during the period of transition. The difference in wages now is greater in all level of economic system, consequently, the gap between high earnings and low earnings increases significantly.

It is important to compare the findings of the paper to the findings of the similar papers done for other countries. The table in the Appendix 16 summarizes the empirical results of the gender wage gap studying. In Ukraine in 1996 the wage gap was very similar to the gap observed in other transition countries. We believe that the reason of such similarity is in common features in historical background. However, the wage gap in Ukraine in mentioned period is much smaller than the gap in wages of Western countries.

The wage gap observed in 2002 in Ukraine is closer to the gap observed in the Western countries. Here we can conclude that competitive market transformation

leads to important changes in income distribution. This tendency has reasonable grounds. From the period of total equalization (often unjustifiable since society members are, in fact, heterogeneous, and should be rewarded differently according to the personal accomplishments and capabilities) Ukraine moves toward market economy, and remuneration of employees directly depends on the productivity of employees. However, the issue of discrimination (mostly in occupation) still should be considered. The number of females employed on highly paid managerial positions is still lower than the number of males on similar positions, women are underrepresented in politics. So the issue of the occupational segregation is considered and its effect on wages is estimated in the next chapter.

3.3 ESTIMATION OF THE OCCUPATIONAL ATTAINMENT MODEL

The first step of studying the occupational distribution of men and women is to calculate the actual proportion of men and women occupied in each of eight occupational categories (1996). The calculation results are in the Appendix 9. As we can see the distribution of men and women across occupations are different, moreover, the average wages received by women are smaller than the wage paid for men even on the same occupation. The results are not so surprising, the greatest proportion of men is occupied as worker of 5th grade (the blue-color worker with the highest qualification); most women however are on positions of office employees with special education required. The distribution of male and female workers across manual occupations is opposite (Appendices 10 and 11)

In 2002 we distinguish only four categories: manual workers, qualified workers, professionals and managers. Again most women and men are employed on different positions. Most males employed as professionals whilst the most women are on positions of office employee (appendices 12 and 13)

Second, the model of occupational attainment is estimated using ordered probit model. The dependent variable is a variable that describes individual's occupation, the occupations are ordered in accordance with the mean wages paid on these occupations. The occupational attainment depends on the years of education, experience, experience squared, marital status, the 'children' variable, region type, region, field of occupation, and subordinates. The estimation results are in the Appendices 14 and 15 (1996 and 2002 data sets respectively).

The model of the occupational attainment is used for further simulations and decomposition of the wage gap on the intra- and inter-occupational parts. In the Tables 5 and 6 the simulations results are presented. From the tables we see the actual proportions of men and women employed on each eight (four) occupations for 1996 (2002).

Table 5. Proportion of males and females on different occupations (1996)

	Manual			Office employee		Professional	Military	Farmer
	Actual distribution							
Men	0,103	0,199	0,228	0,070	0,135	0,142	0,033	0,090
Women	0,134	0,076	0,036	0,166	0,293	0,227	0,003	0,065
	Simulated distribution							
P^f_f	0.126	0,155	0,329	0,018	0,179	0,132	0,031	0,029

Then we simulated the proportion of females that they would have if their characteristics were rewarded similar to the male's one. As we can see the simulated distributions are closer to the male distribution across occupations.

Table 6. Proportion of males and females on different occupations (2002)

	Manual workers	Qualified workers	Professionals	Managers, technical specialists
	Actual distribution across the occupations			
P_m	0,1660	0,1120	0,4730	0,2490
P_f	0,1230	0,4230	0,2710	0,1830
	Simulated distributions			
P_f^I	0,1207	0,1207	0,6868	0,0718

Next step is to calculate the wage effect of the occupational segregation. For this purpose the wage equation within each occupational category are estimated. Then using the formula of the decomposition presented in the Chapter 3 the wage gap is decomposed on intra- and inter-occupational components. The results of calculations based on the two samples, i.e. 1996 and 2002, are shown in the tables 7 and 8 respectively.

Table 7. Decomposition of gender wage gap, including decomposition of a segregation part (1996)

Intra-occupational (within)		0,1548
Explained by difference in endowments	0,0738	
Unexplained	0,0810	
Inter-occupational (between)		0,0406
Explained by difference in endowments	0,0663	
Unexplained	-0,0257	
Total explained	**0,1401**	
Total unexplained	**0,0553**	
	0,1954	0,1954

We should not expect that the results of estimation to be identical to the results of Oaxaca decomposition, since the estimation of the former decomposition includes the estimation of the wage equations within each occupation, as a result, the wage regression coefficients not identical but similar to the coefficients from polled regressions.

The results reveal that the within-occupational differences in wages dominate the between-occupational divergence in the case of both data sets. From the result tables we see that we can explain 72% (38%) of the 1996 (2002) wage gap. The explained parts are greater than the explained parts estimated using Oaxaca decomposition, since the now we explicitly accounts for the impact of the occupational segregation.

Table 8. Decomposition of gender wage gap, including decomposition of a segregation part (2002)

Intra-occupational (within)		0,3578
Explained by difference in endowments	0,1022	
Unexplained	0,2556	
Inter-occupational (between)		0,0360
Explained by difference in endowments	0,0479	
Unexplained	-0,0119	
Total explained	**0,1502**	
Total unexplained	**0,2437**	
	0,3938	0,3938

After the decomposition of the inter-occupational into the explained and unexplained parts we found that the unexplained part is negative using both data sets. In other words, it is beneficial for women to be employed on different positions than men since this fact tends to decrease the wage gap.

We found that the fact that men and women are allocated differently across occupations tends to raise the female earnings ceteris paribus. The important implication if this is that the anti-discrimination legislation should be directed more at promoting equal remuneration within occupation rather than at promoting more equal distribution of men and women across the various occupations.

CONCLUSIONS

In the research paper we study the peculiarities of the labor market of Ukraine, in particular, the differences in wages that male and female workers earn and the difference in occupations on which male and female workers are employed. The study is based on Oaxaca conceptual framework of the wage gap decomposition. The model allows estimating empirically the impact of the divergence in human capital level of men and women on the gender earnings gap, as well as the impact of immeasurable and unobservable differences that influence the payments. The latter is usually associated with unequal treatment of men and women on the labor market or with discrimination. This approach estimates the explained and unexplained parts of the wage gap. When using the decomposition, it is important to choose the wage structure to which the actual wage is compared. The actual wage structure associates with unfair one since the wage gap under actual wage structure is not explained by differences in attributes that influence the pay amount.

Following the methodology we estimated the wage gap and we decomposed it assuming that the wage structure estimated from pooled sample is a wage structure that would prevail in the absence of discrimination. The important challenge is to estimate the impact of the occupational segregation on the wage of employees, since it directly influences the earnings of individuals. Hence, after standard decomposition of the wage gap we performed another method of decomposition, and estimated within and between-occupational pay differences, using the method of Miller (1987). The advantage of the method is that the explained and unexplained components of both intra (within) and inter (between) occupational parts of the wage gap can de estimated. That is we are able to

estimate the impact of unequal treatment (discrimination) on the choice of the occupation and on the wages of employees.

We found the wage gap of 0,1975 in 1996, that is on average women earn 82,07% of the average earnings of men. 56% of the wage gap can be explained by the male/female differences in human capital, that is this part of the gap is due to the fact that women on average have lower level of human capital. 44% of the wage gap, however, is attributed to the difference in remuneration or to gender difference in unobservable characteristics. 10,37 % of the gap can be attributed to difference in occupational attainments.

In 2002 the estimated wage gap is 0,3592 and, consequently, women earn on average 30% less than men. Only 42% of the gap is explained by differences in attributes of men and women, 15% of the gap can be explained by differences in occupations of men and women.

After the decomposing the wage gap into intra- and inter-occupational components we found that it is beneficial for women to be employed on different positions than men.

The important finding of the paper is that the gender wage gap increased by 12% from 1996 to 2002. Although the two data sets are different and we can not make empirically robust conclusions, we still can outline the tendency of the labor market changes in Ukraine. The increase in the gender wage gap reflects the rising overall inequality in Ukrainian society during the period of transition. The difference in wages now is greater in all level of economic system, consequently, the gap between high wages and low wages increased significantly.

Comparing our findings to the results of other studies, we see that in Ukraine in 1996 the wage gap was very similar to the gap observed in other transition countries. We believe that the reason of such similarity is in common features in

historical background. However, the wage gap in Ukraine in mentioned period is much smaller than the gap in wages of Western countries.

The wage gap observed in 2002 in Ukraine is closer to the gap observed in the Western countries. Here we can conclude that competitive market transformation leads to important changes in income distribution. This tendency has reasonable grounds. From the period of total equalization (often unjustifiable since society members are, in fact, heterogeneous, and should be rewarded differently according to the personal accomplishments and capabilities) Ukraine moves toward market economy, and remuneration of employees directly depends on their productivity. Although both women and men have wider range of choices and more opportunities in the competitive economy than in former centrally planed economy, the rise in overall inequality brings new features into Ukrainian labor market.

During transition period the number of women on more prestigious and responsible posts increased, however, the issue of discrimination (mostly in occupation) still should be considered. The number of females employed on highly paid managerial positions is still lower than the number of males on similar positions, women are underrepresented in politics.

Another important finding of the paper is that the fact that men and women are allocated differently across occupations tends to raise the female earnings ceteris paribus. The important implication if this is that the anti-discrimination legislation should be directed more at promoting equal remuneration within occupation rather than at promoting more equal distribution of men and women across the various occupations.

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A P P E N D I C E S

APPENDIX 1. DESCRIPTIVE STATISTICS OF THE HUMAN CAPITAL VARIABLES OF WOMEN (1996)

	Age	Children	Married	Employed	Years of education	Experience	*Wage*[1]
Mean	35.85	0.66	0.74	0.64	11.65	18.20	*6192.50*
Median	36.00	1.00	1.00	1.00	12.00	18.00	3750.00
Maximum	54.00	1.00	1.00	1.00	19.00	44.00	128000
Minimum	16.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	1069	1069	1067	1069	1069	1069	1069

1 the wage is measured in thousands of krb.

APPENDIX 2. DESCRIPTIVE STATISTICS OF THE HUMAN CAPITAL VARIABLES OF MEN (1996)

	Age	Children	Married	Employed	Years of education	Experience	Wage[1]
Mean	36.68	0.64	0.80	0.79	11.23	19.50	*11017.87*
Median	36.00	1.00	1.00	1.00	11.00	18.50	6600.0
Maximum	59.00	1.00	1.00	1.00	19.00	50.00	422401
Minimum	16.00	0.00	0.00	0.00	0.00	0.00	0.00
Std. Dev.	11.17	0.48	0.40	0.41	3.03	11.68	21439.30
Observations	1033	1033	1030		1033	1033	1033

[1] the wage is measured in thousands of krb.

APPENDIX 3. DESCRIPTIVE STATISTICS OF THE HUMAN CAPITAL VARIABLES OF MEN (2002)

	Age	Married	Children	Experience	Years_educ	Computer	employed	ln_wage[1]	subordinates
Mean	37.54	0.71	0.39	19.56	11.98	0.25	0.85	5.55	0.11
Median	38.00	1.00	0.00	19.50	11.50	0.00	1.00	5.52	0.00
Maximum	55.00	1.00	1.00	45.00	19.50	1.00	1.00	7.60	1.00
Minimum	18.00	0.00	0.00	0.000	4.00	0.00	0.00	2.30	0.00
Std. Dev.	10.24	0.45	0.48	10.64	2.54	0.43	0.35	0.64	0.31
Observations	420	420	420	420	420	420	420	393	420

[1] the wage is in hryvnas

APPENDIX 4. DESCRIPTIVE STATISTICS OF THE HUMAN CAPITAL VARIABLES OF WOMEN (2002)

	Age	Married	Children	Experience	Years_educ	Computer	subordinates	ln_wage	Employed

Mean	38.10	0.66	0.45	19.99	12.12	0.23	0.086	5.10	0.77
Median	38.00	1.00	0.00	20.50	11.50	0.00	0.00	5.07	1.00
Maximum	60.00	1.00	1.00	42.00	19.50	1.00	1.00	6.90	1.00
Minimum	18.00	0.00	0.00	0.00	0.00	0.00	0.00	1.79	0.00
Std. Dev.	10.34	0.47	0.49	10.93	2.53	0.42	0.28	0.63	0.41
Observations	451	451	451	451	451	450	451	426	451

APPENDIX 5. PROBIT PARTICIPATION MODEL OF WOMEN AND MEN, 2002.

Dependent variable is a binary variable that equals one if an individual is employed, (z-statistics are in the parentheses)

Variable	Males	Females
Age	0.022**	7.99E-05
	(2.565)	(0.010)
Years_educ	0.114***	0.054**
	(3.551)	(2.045)
Children	-0.058	-0.307**
	(-0.348)	(-2.021)
Married	0.035	0.230
	(0.178)	(1.567)
Region		
Centre	0.265	-0.118
	(1.045)	(-0.541)
South	0.218	0.073
	(0.879)	(0.359)
North	-0.020	-0.083
	(-0.065)	(-0.255)
East	0.181	-0.208
	(0.815)	(-0.747)
Kyiv	-0.016	0.158
	(-0.045)	(0.742)
West		
Region type		
City	0.367*	0.210
	(1.722)	(1.110)
Settlement	0.342*	0.291*
	(1.710	(1.716)
Village		
Constant	-1.482***	-0.093
	(-2.993)	(-0.197)
Log likelihood	-161.9236	-232.7031
Mcfadden r-squared	0.087949	0.034845
Obs with dep=1	63	102
Obs with dep=0	357	349
Total # of observations	420	451

*** significant at 1% **significant at 5% *significant at 10 %

APPENDIX 6. WAGE EQUATION OF WOMEN AND MEN, 2002
(t-statistics are in the parentheses)
Logarithm of wage is a dependent variable

	Females		**Males**	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistis
Imills	-1.677	-1.343	-3.170**	-2.396
Experience	0.010	1.310	0.006	0.609
Experience^2	-0.0002	-1.006	-0.0003	-1.422
Children	0.120**	1.984	-0.075	-1.335
Years_educ	0.027**	2.071	0.040**	1.981
Subordinates	0.118	0.958	0.304***	3.520
Computer	-0.004**	-2.427	0.087	1.305
Region				
Center	0.025	0.349	0.009	0.106
East	0.038	0.600	0.291***	3.639
Kyiv	0.275**	2.338	0.528***	4.607
North	-0.213**	-1.882	-0.083	-0.795
South	-0.013	-0.179	0.085	0.966
West				
Occupation				
w_3	0.055	0.644	0.247***	3.613
w_4	0.163*	1.766	0.404***	4.593
w_2	0.031	0.388	-0.003	-0.030
Constant	5.461***	8.837	6.829***	8.889
r-squared	0.560717		0.440545	
log likelihood	-181.4390		-272.9925	

*** significant at 1% ** significant at 5% * significant at 10 %

APPENDIX 7. WAGE EQUATION, 1996 POOLED SAMPLE
(t-statistics are in the parentheses)
Logarithm of wage is a dependent variable

Variable	**Coefficient**	**t-Statistic**
Imills	-1.827***	-4.393
Experience	-0.0008	-0.134
Experience^2	-0.0001	-0.965
Years_Educ	0.017*	1.896
Tenure	-0.0009	-0.370
Arrears	-0.270***	-6.773
Subordinates	0.193***	3.883
Region type		
Settl	-0.132*	-1.927
City	-0.089	-1.633
Village (base)		
Region		
Center	0.181***	2.739

South	0.059	1.151
North	0.219***	3.096
East	0.138***	2.669
Kyiv	0.015	0.185
West		
Field of occupation		
Construction	0.330***	3.338
Education	0.179**	2.296
Finance	0.410*	1.960
Health_Care	0.287***	3.816
Industry	0.228***	3.814
Municipal	-0.035	-0.377
Other_Field	0.015	0.162
State	0.059	0.719
Trade	0.116*	1.684
Transport	0.242***	3.162
Forestry		
Occupations		
Worker of 1-2 grade	-0.165*	-1.929
Worker of 3-4 grade	-0.118	-1.331
Worker of 5 grade	0.067	0.733
Office employee without special education	-0.202**	-2.219
Office employee with special education	-1.93E-05	-0.0002
Military servicemen	0.401**	2.601
Professional	0.0251	0.244
Farmer		
Constant	9.610***	37.138
R-squred	0.547607	

*** significant at 1% **significant at 5% *significant at 10 %

APPENDIX 8. WAGE EQUATION, 1996 POOLED SAMPLE
(t-statistics are in the parentheses)
Logarithm of wage is a dependent variable

Variable	**Coefficient**	**t-Statistic**
Imills	-3.280***	-4.870
Experience	-0.003	-0.597
Experience^2	-5.77E-05	-0.350
Children	0.015	0.348
Years_Educ	-0.006	-0.603
Subordinates	0.163**	2.248
Computer	-0.003	-1.440
Region		
Center	-0.003	-0.059
East	0.144***	2.896

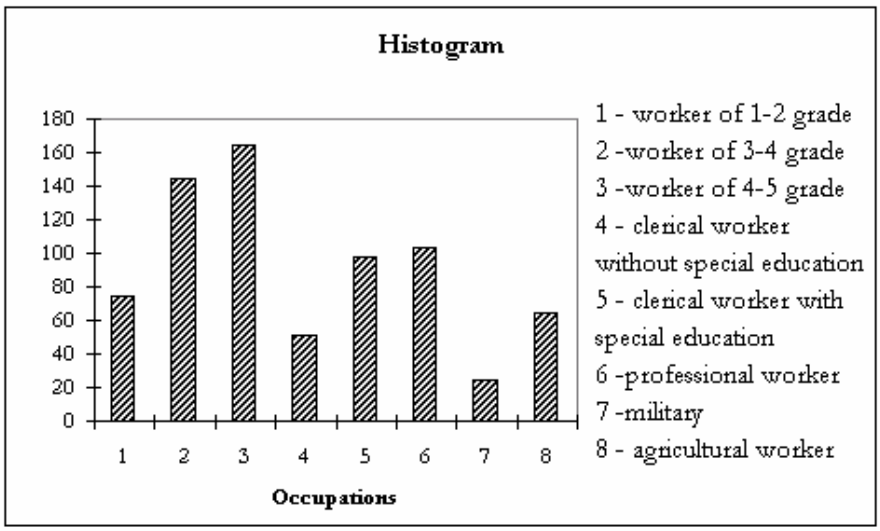
Kyiv	0.356***	4.421
North	-0.099	-1.302
South	0.002	0.042
West		
Occupation		
W_3	0.180***	2.939
W_4	0.277***	3.804
W_2	-0.012	-0.204
C	6.542***	18.12
R-Squared	0.478576	

*** significant at 1% **significant at 5% *significant at 10 %

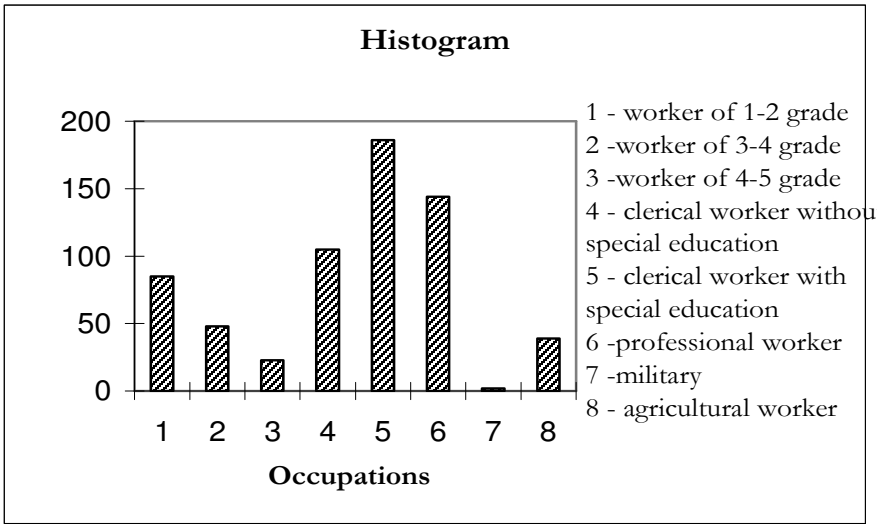
APPENDIX 9. THE OCCUPATIONAL ATTAINMENT DISTRIBUTIONS OF MEN AND WOMEN, AND AN AVERAGE WAGES ON EACH OCCUPATION.

Occupational category	**Total sample**		**Males**		**Females**	
	Proportion %	Average wage	Proportion %	Average wage	Proportion %	Average wage
Manual worker	**36,2**	**10338,45**	**53,0**		**24,6**	
Worker/1-2 grade	10,8	9171,16	10,3	11217,00	13,4	7365,72
Worker/3-4 grade	12,8	9104,53	19,9	9565,27	7,6	7722,31
Worker/5 grade	12,6	12592,05	22,8	13047,35	3,6	9325,00
Office employee	**29,4**	**11426,63**	**20,5**		**45,9**	
Clerk, without SSE	10,5	8966,11	7,0	12144,63	16,6	7422,25
Clerk, with SSE	18,9	12778,08	13,5	17711,01	29,3	10179,01
Professional worker	**16,5**	**15260,52**	**14,2**		**22,7**	
Specialist with HE	16,0	15278,52	13,8	18393,02	22,1	13053,88
Creative professional	0,5	14643,28	0,4	23000,66	0,6	8375,25
Military serviceman	**1,7**	**13783,46**	**3,3**	**13577,87**	**0,3**	**16250,5**
Farmer	**16,2**	**5844,66**	**9,0**	**5773,43**	**6,5**	**5961,56**
	100		100		100	
Number of observations	1356		724		632	

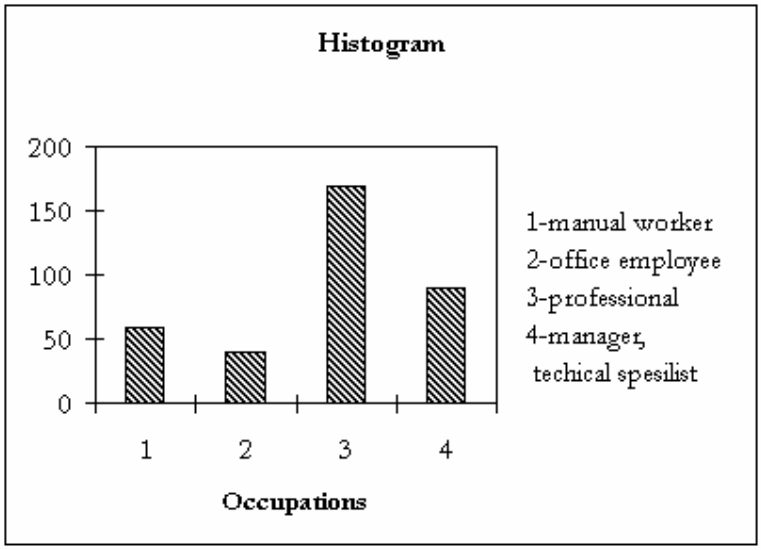
APPENDIX 10. OCCUPATIONAL ATTAINMENT DISTRIBUTION OF MALES (1996)



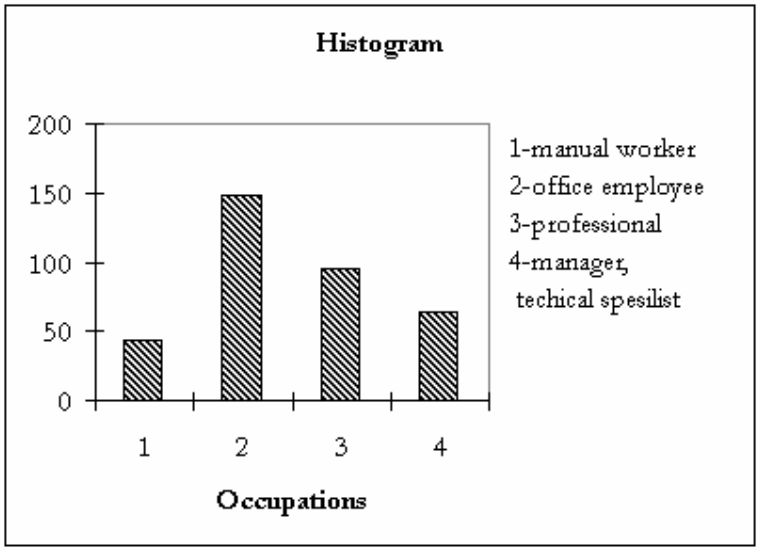
APPENDIX 11. OCCUPATIONAL ATTAINMENT DISTRIBUTION OF FEMALES (1996)



APPENDIX 12. OCCUPATIONAL DISTRIBUTIONS OF MALES (2002)



APPENDIX 13. OCCUPATIONAL DISTRIBUTIONS OF FEMALES (2002)



APPENDIX 14. OCCUPATIONAL ATTAINMENT MODEL (1996)

	Males		**Females**	
	Coefficient	z-Statistic	Coefficient	z-Statistic
Years_Educ	0.217***	12.022	0.325***	14.975
Experience	-0.005	-0.410	-0.050***	-2.674
Experience^2	0.000	1.346	0.001**	2.449
Tenure	0.036**	2.412	0.067***	3.618
Tenure^2	-0.0008*	-1.723	-0.002***	-3.333
Subordinates	0.578***	5.214	0.463***	3.756
Children	0.213**	2.386	-0.007	-0.069
City	0.211**	1.960	-0.021	-0.200
Settl	0.310**	2.256	0.242**	2.060
Center	-0.053	-0.376	0.263*	1.699
East	0.146	1.257	-0.037	-0.221
Kyiv	0.323	1.635	0.099	0.776
North	0.045	0.281	-0.031	-0.162
South	-0.034	-0.274	0.240	1.148
Constr	0.645***	3.725	-0.036	-0.269
Education	1.348***	5.211	0.542*	1.648
Finance	1.125	1.633	0.831***	4.852
Health_Care	0.740**	2.497	1.731***	3.444
Industry	0.500***	4.032	0.462**	2.803
Municipal	0.496**	2.079	0.435**	2.987
Other_Field	0.864***	4.344	0.079	0.348
State	1.343***	5.568	0.221	0.839
Trade	0.323	1.605	0.466	1.588
Transport	0.459***	3.282	0.160	1.043
Limit_1:C(25)	2.008***	7.610	2.199***	7.047
Limit_2:C(26)	2.382***	9.041	3.181***	10.128
Limit_3:C(27)	3.117***	11.721	3.476***	11.041
Limit_4:C(28)	3.444***	12.831	3.973***	12.508
Limit_5:C(29)	4.266***	15.363	4.110***	12.881
Limit_6:C(30)	4.996***	17.159	5.525***	15.898
Limit_7:C(31)	5.243***	17.602	5.550***	15.932
Akaike Info Criterion	3.387626		2.856888	

*** significant at 1% ** significant at 5% * significant at 10 %

APPENDIX 15. OCCUPATIONAL ATTAINMENT MODEL (2002)

	Males		**Females**	
	Coefficient	z-Statistic	Coefficient	z-Statistic
Years_Educ	0.120***	4.557	0.059***	2.579
Experience	0.005	0.247	0.008	0.436
Experience_Sq	9.29E-05	0.165	-0.000	-0.677
Children	-0.089	-0.685	-0.108	-0.839
Computer	0.320**	2.242	0.002	0.205
Married	0.194	1.320	0.298**	2.573
St_City	0.737***	4.503	0.339**	2.273
St_Setl	0.620***	4.028	0.506***	3.500
Subordinates	0.865***	4.355	0.886***	4.687
R_Center	-0.227	-1.235	-0.205	-1.163
R_East	-0.282*	-1.701	-0.039	-0.255
R_Kyiv	-0.676**	-2.592	0.047	0.189
R_North	-0.283	-1.199	-0.320	-1.428
R_South	-0.104	-0.582	0.114	0.699
Limit_1:C(15)	1.539***	4.204	0.701***	1.987
Limit_2:C(16)	1.847***	5.024	1.615***	4.541
Limit_3:C(17)	3.136***	8.273	2.369***	6.553
Akaike Info Criterion	2.326163			2.589393
Log Likelihood	-471.4943			-566.9080

APPENDIX 16. THE COMPARATIVE ANALYSIS OF THE FINDINGS.

	Wage gap	wage ratio	unexplained	segregation
US, 1988 (Oaxaca, 1994)	35%	0,65	32%	____
US, insurance industry (Baldwin, 1999)	Standard	0,55	60%	18,7%
	Gamma model		25%	37,8%
Israel, (Oaxaca, 2001)	23%	0,77	67%	___
Norway (Barth, 1999)	24%-20%	_____	____	
Great Britain (Miller, 1987)	39%	0,61	34%	
Bulgaria (Jollife, 2002)	20%	0,80	82%	
Romania (Paternostro, 1999)	22%	0,78	____	
Ukraine, 1996	18%	0,82	44%	10%
Ukraine, 2002	30%	0,70	58%	15%