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Estimating Immigrants' Occupational Choice and Occupational Wages with Selectivity Bias

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Abstract

This paper analyzes occupational wage differentials between immigrants and the native-born in Norway. The paper first compares the occupational distributions of immigrants and the native-born in the Norwegian labor market, and rejects the null hypothesis that they are similar. Next, it decomposes the overall wage gap into intra- and inter-occupational wage effects respectively. The evidence indicates that wage differences between immigrants and the native-born occur *across* rather than within occupations. The results also show that a large portion of the overall wage gap still remains even after adjusting for observed worker and job characteristics. Finally, there is no evidence of selectivity bias in the wage equations.

JEL classification: J14, J24, J61

Key Words: Immigrant, Occupation, Wages

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I. Introduction

Do Norwegian immigrants receive lower or higher wages than comparably equipped native-born Norwegians? If so, what role does the occupational distribution play in explaining the wage gap between immigrants and the native-born population? In other words, given comparable human capital attributes, does the occupational segmentation of the immigrants adversely affect their wages? One popular view is that immigrants regardless of skills, are employed in less-skilled and least paid occupations. For this reason, average wages would be lower for immigrants than for the native-born. If this is the case, then a policy removing the barriers to occupational mobility would appear appropriate. An alternative view is that immigrants earn less because they have less skills or human capital than the native-born cohorts. The aim of this paper is to test these competing views recognizing the impact of potential selectivity bias on the wage-equation estimates.

There are *a prior* reasons to believe that occupational differences may play a major role in creating a wage gap between immigrants and the native-born in the Norwegian labor market. First, the prevailing macroeconomic conditions in the labor market may have differential effects on the relative earnings of immigrants and the native-born. For example, a high rate of unemployment in the country will lead to job rationing, particularly in the high-skilled sectors of the labor market. For this reason, employers may raise hiring standards. For example, employers may set a higher level of Norwegian language proficiency as a precondition for hiring immigrants, and this will make it more difficult for most immigrants to gain access to high-paying jobs.

Second, hiring is an investment under uncertainty (Spence, 1973). Therefore, given less information about skills (e.g., education, experience) acquired abroad, employers may be less certain of the productivity of immigrants. For this reason, they may not hire immigrants to better-paid jobs. This will depend on the type of jobs for which immigrants are applying. If the jobs being sought require the employer to invest in specific on-the-job-training for its workers, then as implied in Oi (1962), employers may adopt hiring policies that favor the native-born since they

possess "characteristics" associated with long-term employment. In other words, potential employers may consider the expected labor turnover rate to be higher for immigrants than for the native-born who otherwise have similar observable characteristics.[1]

Third, immigrants may face non-economic barriers that will prevent them from obtaining better-paid jobs. For example, some employers may have an aversion towards immigrants and will avoid hiring them. However, as implied in Becker's (1971) theory of employer discrimination, there may be other employers who will be indifferent, or even prefer immigrant workers. This implies that the equilibrium difference between native-born and immigrant wages would be related to the distribution of tastes for discrimination across employers and to the relative proportions of native-born and immigrant workers.

Finally, there can be path dependence in the choice of occupations between immigrant cohorts. That is, earlier immigrant cohorts may provide information on prevailing conditions (*e.g.*, differential hiring policies) in the labor market to recent immigrant arrivals from the same country of origin. Recent immigrants will incorporate such information in their decisions about job choices. Consequently, recent immigrants, in particular those from Third World countries, will self-select into jobs in which immigrants are over-represented. These are often the less-skilled and lowest-paid jobs.

While some of the factors discussed above (*e.g.*, the economic condition and path-dependence factors) may be difficult to measure due to the lack of appropriate longitudinal data, others can be measured in this cross-sectional study. For example, the uncertainty factor and discrimination effects are interrelated and will be the focus of this paper. As a prelude to analyzing the wage differentials between immigrants and the native-born, the paper first analyzes the occupational choice of immigrants and the native-born. Based on the assumption of equal preferences and tastes, It predicts the occupational distribution of immigrants that would exist if

[1] Stated differently, employers may rationally rely on group differences when it is difficult and

they faced the same structure (*i.e.*, the set of regression coefficients) determining occupational distribution of the native-born.[2] Given the assumption of equal preferences, if both groups also have the same measured skills, then the predicted occupational distribution of immigrants would be different from that of the native-born only when the returns to skills differ for the two groups.

The paper would estimate separate wage equations for immigrants and the native-born by incorporating information from the occupation equations. It will also decompose the overall wage gap between immigrants and the native-born into a portion that can be ascribed wage differences which appear *within* given occupations, and the portion of wage differentials due to occupational differences. The next section discusses the econometric model, while section III gives a description of the data. Section IV presents the empirical results. Section V provides a measure of occupational differences. Section VI decomposes the immigrant–native-born wage gap into intra- and inter-occupational wage differences. Finally, the paper concludes with a discussion of the findings.

II. The Econometric Model

As mentioned in the introduction, the same unobserved factors, such as motivation, innate ability etc. that affect an individual's choice of occupation may also affect his wages. For this reason, estimating individual wage equations using the OLS estimator would yield biased and inconsistent estimates. This argument favors the use of a two-stage estimation technique. In this paper, the generalized sample selection model by Lee (1983) is used.

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costly to determine the qualifications and likelihood of turnover for specific job candidates.

[2] The assumption of equal preferences was made to simplify the analysis. It should, however, be noted that predicting the "non-discriminatory" occupational distribution by giving the native-born coefficients to immigrant skills may not be an appropriate method to use, if the tastes and preferences differ significantly for immigrants and the native-born.

In this type of model, it is assumed that there are *M* mutually exclusive occupational categories in the labor market indexed by the subscript *j*. As implied in Freeman (1971), wages are a function of the rate at which abilities are rewarded and of the person's ability endowment so that the wage, w_{ij} in this model can be considered as individual and occupation specific. Suppose that an individual *i* chooses a particular occupational category *j*, his expected wage can be defined as:

$$\ln W_{ij} = X_{ij}\beta_j + u_{ij}, \qquad \mathrm{u_{ij}} \sim N(O, \sigma_j^2), \tag{1}$$

$$i = 1,2,\ldots\ldots..,N$$

$$j = 1,2,\ldots\ldots.,M$$

where *X* is a vector of individual *i*'s socioeconomic characteristics, which include factors such as school and age (experience), which may affect the individual's choice of a particular occupation *j*. β_j is a vector of unknown but estimable parameters.

Further, it is assumed that an individual's choice of occupation is an outcome of an optimization process. More precisely, an individual is assumed to select the occupation that yields the highest level of utility. This optimization process is captured by an index function

$$O_{ij}^{*} = Z_i\gamma_j + \eta_{ij}, \tag{2}$$

where Z_i is a vector of exogenous variables, η_{ij} is a vector of residual error terms that capture unobserved variations in tastes and errors in the optimization, and γ_j are the preference parameters. In practice, O_{ij}^{*} is not observed. What we observe is an occupational indicator function

$$O_i = j \text{ iff } O_{ij}^* \geq \max O_{im}^*, \qquad j = 1, \ldots\ldots, M, j \neq m. \tag{3}$$

Let

$$\varepsilon_{ij} = \max O_{im}^* - \eta_{ij}, \qquad j = 1, \ldots\ldots, M, m \neq j, \tag{4}$$

where ε_{ij} is the residual for each individual and occupational category. By substituting for O_{ij}^* from (2) and O_{im} from (4) into (3) and rearranging, the indicator function can be rewritten as

$$O_i = j \text{ iff } \varepsilon_{ij} < Z_i \gamma_j . \tag{5}$$

Assuming that the disturbance terms, $\eta_{ij} s$ of the utility function in Eq. (2) are independently and identically distributed with the *Type I* extreme value distribution with cumulative distribution functions given by

$$F(\eta_{ij} < x) = \exp[-\exp(-x)], \tag{6}$$

Maddala (1983) shows that the model implies the multinomial logit estimating equation

$$\Pr(\varepsilon_{ij} < Z_i \gamma_j) \equiv \Pr(O_j = j) = \frac{\exp(Z_i' \gamma_j)}{\sum_{j=1}^{M} \exp(Z_i' \gamma_j)}, \tag{7}$$

where Pr (.) is the probability that an individual *i* will choose occupational category *j*. Z_i is a vector of personal and labor market characteristics, and γ are preference parameters. The wage equation conditional on occupational category *j* being chosen can be written as

$$\ln W_{ij} = X_{ij}\beta_j + \theta_j \hat{\lambda}_j + u_{ij} \qquad \text{j} = 1,2,3 \tag{8}$$

where $\theta_j = \sigma_j \rho_j$ and $\hat{\lambda}_j = \dfrac{\phi\left\{\Phi^{-1}\left[F_j(Z_i\gamma_j)\right]\right\}}{F(Z_i\gamma_j)}$, u_{ij} is an error term. Consistent estimates of β_j and θ_j are then obtained by OLS regression of lnWage on X_{ij} and $\hat{\lambda}_j$. The standard errors are corrected using the heteroskedasticity-consistent procedure outlined in White (1980). Appendix A1 provides a detailed description of the model and the estimation procedure.

III. Data and Descriptive Statistics

The data used in this analysis come from the 1990 Population Census of Norway Data Bank (FTDB). FTDB is an 8.33% sample drawn from the central register. The register was created by joining files from the 1960, 1970, 1980 and 1990 population censuses respectively. Overall, the register contains information on 5.6 million individuals aged 16 years and above. For the purpose of this study, information on all the 9080 immigrants in FTDB was used. In addition, a sample of 9080 native-born individuals was randomly drawn to match the immigrant sample. Individuals included in this analysis are those aged 18-65 who earned positive incomes (*i.e.*, labor income including social security benefits) and are neither self-employed nor students. Self-employed workers were eliminated from the analysis because their income includes both property and labor income. Similarly, students are excluded from the analysis since they may choose lower-paying jobs, perhaps in return for more flexible working hours. Variables with missing observations were also dropped from the analysis. The final observations include 2923 native-born individuals and 2400 immigrants for whom the relevant data are complete or estimable.

The census data do not report the individual's period of immigration. However, the "personal identification" variable in the data provides information on the individual's participation in the various population censuses. According to Norwegian law, only individuals who are

registered as residents in Norway for at least six months prior to each census can participate in the population census. Using this eligibility condition, four cohort-specific dummy variables were constructed for immigrants. For example, immigrants in the pre-1960 cohort reported participation in the 1960 Census. Similarly, immigrants in the 1960-69 cohort reported participation in the 1970 Census, while those in the 1970-79 cohort reported participation in the 1980 Census. Finally, immigrants in the 1980-89 cohort reported participation in the 1990 Census.

Descriptive Statistics

Table 1 presents variable and data description, while Table 2 reports the sample means of selected variables used in the analysis. As Table 2 shows, average wages vary across occupations in the Norwegian labor market. For example, the wage offer in the professional category is higher than in any other occupational category. Similarly, in the service category, where immigrants dominate, the average wage is lower than in any other occupational category. The native-born wage in the professional category is about 7.3% higher than the immigrant wage in the same category. Similarly, native-born wages are about 19.7% and 11.6% higher than immigrant wages in the clerical and service categories respectively. Given these occupational wage differentials, the next step is to determine the sources of these differentials; more precisely, to ascertain whether the observed wage gap within given occupations is a result of differences in skills between immigrants and the native-born, assuming there is equal premium for equal skills in each occupation, or whether immigrants have similar productive skills to the native-born but receive lower premium for their skills.

Table 3 shows the distribution of immigrants and the native-born by highest level of education in given occupational categories. The data in the upper panel of Table 3 shows that within each educational level below college graduate (*i.e.*, less than 13 years of schooling), a greater percentage of the native-born than immigrants occupy the better paid professional and

clerical occupations, and a greater percentage of immigrants than the native-born occupy the lower-paying service occupations. At the post-secondary school level (*i.e.*, more than 12 years of schooling) however, a greater percentage of immigrants than the native-born occupy both the better-paid and lowest-paid occupations. For example, 2% of immigrants with post-secondary education occupy service occupations compared to only 0.4% of the native-born.

The second panel of Table 3 breaks down the immigrant sample into arrival cohorts. This is to control for years of residence in Norway. A greater percentage of highly educated immigrants in the 1970-79 and 1980-89 cohorts occupy better paid professional and clerical occupations than the native-born. On the other hand, a greater percentage of less-educated recent arrivals occupy both low-paid and high-paid occupations than the native-born. For the comparison between the native-born and earlier arrival cohorts, the situation is a bit different. The native-born in all educational categories occupy better-paid occupations than immigrants who arrived in the period 1960-69 or earlier.

The forgoing analysis suggests *a priori* that the relatively weaker wage position of immigrants within given occupations may not be a result of differences in educational attainments, but may be due to differences in the returns to education. Of course, individual wages are determined by many observable characteristics other than education. For example, age (a proxy for work experience) is an important determinant of individual wages. As Table 2 indicates, immigrants tend to be younger on the average than the native-born in each of the occupational categories.

IV. Empirical Results

Following the procedure outlined in section II, equations (7) and (8) were estimated separately for immigrants and the native-born respectively. In the logistic equation, the dependent variable is

assigned the value of one if an individual's occupation is in equations professional, clerical and service categories; otherwise, it is assigned a value zero.[3] Table 4 presents the results from the logistic regression. The coefficients for craft and operative occupations are normalized to zero. Thus, the estimated coefficients reflect the likelihood that an individual will be in a given occupation relative to this base. For example, education makes it more likely for the native-born to be in professional or clerical categories relative to the base category. Similarly, education makes it more likely for immigrants to be in the professional occupations relative to the base category.

The age variable may be considered as capturing the effects of aging on an individual's choice of occupation. The results show that as a native-born individual grows older he or she is more likely to be in one of the three categories relative to the base category. For immigrants, the age variable is an important determinant of choice of professional category. The significantly positive effect of age on the occupational choice in this paper is contrary to the findings in Gyourko and Tracy (1988). They argue that age should be included in the vector of regressors in the logistic specification only if there is a systematic movement of individuals between labor markets (occupations in our case) as they grow older. To test this hypothesis, I estimated the multinomial logit model *with* and *without* the age variable. The likelihood ratio test (LR) conducted on the two model specifications rejected the null hypothesis that age has no significant effect on the individual occupational choice at 5 percent significance level ($\chi^2 = 64.2$).

In both the native-born and immigrant samples, women are less likely than men to be in craft and operative occupations (base) relative to the other categories. A possible explanation is that craft/operative occupations are physically demanding and may be less attractive to women.

[3] This paper uses a four-digit occupational classification. This broadly defined occupational category was dictated by the need to have a significant number of observations in all the relevant groups. A finer classification would lead to a reduction in the number of observations, in particular estimating cells, and would produce unreliable results.

The native-born working part time are more likely than full-time workers to be in the service category relative to the base. Similarly, immigrants working part time are less likely than full-time workers to be in operatives relative to the remaining categories. Other aspects of the job apart from earnings may also determine an individual's choice of occupation. For example, certain employers may provide their new workers with accommodation, while others may assist them to secure accommodation. These facilities may vary according to geographical locations. For example, in the southern part of the country where demand for housing is high, this benefit may influence an individual's choice of occupation more than in the northern region where there is less demand for housing. To capture this effect, a proxy variable, "fringe," which is set to one if an individual rented his or her apartment through the workplace, and its interaction with a set of geographical locations dummies were included in the choice equation.[4] The results show that immigrants who rented apartments through the workplace are more likely to be in the operative category relative to other occupations, and are also more likely to be in the northern part than in the southern part of Norway.[5]

A set of country of origin dummies was included in the immigrants' logistic equation to capture two effects on the individual occupational outcomes: (1) Differences in preferences over jobs among immigrants. (2) Barriers to entry (or differential access) into particular occupations by a particular ethnic group. Immigrants from other Nordic countries (Denmark, Finland, Iceland and Sweden) are used as the base group, such that the likelihood of a non-Nordic immigrant being in a particular occupational category is compared to the base group *i.e.*, Nordic immigrants. The results show that immigrants from advanced countries are less likely than Nordic immigrants to be

[4] The identification of the model requires obtaining appropriate instruments that determine occupational choice but that do not directly affect individual wages. In this analysis, the variables, Nchild and Fringe are used as instruments in the logistic equation. As to how good these instruments are remains an empirical question.

[5] Caution must be exercised in interpreting the "fringe variable" due to the small sample size.

in the operative (base) category relative to all other categories.[6] Third World immigrants are less likely than Nordic immigrants to be in better paid professional and clerical categories, but are more likely to be in the low-paying service category relative to the base category, *i.e.*, operatives and crafts. Number of children has a positive influence on a native-born's choice of professional and service occupations.

The cohort-specific dummies were also introduced into the immigrants' logistic equation to control for the effect of period of immigration to Norway on the occupational outcomes of immigrants.[7] The base cohort is those arriving prior to 1960. The results show that the 1980-89 arrival cohort is more likely than the pre-1960 cohort to be in the professional category relative to the base category. This is consistent with the data analysis in section III. Given that the coefficient of the advanced country dummy is positive and statistically significant, and the coefficient of the Third World dummy is negatively significant, it is reasonable to assume that the professionals in the 1980-89 cohort are more likely to originate from the other advanced countries than from the Third World.

Wage Determination across Occupations

Table 5 presents the estimates from the wage equation (8). The dependent variable is the natural logarithm of wages. Columns 1-3 show the results for the native-born while those for immigrants are reported in Columns 4-6. The results show that almost all the estimated coefficients that attain statistical significance are of the expected sign. For example, the level of education has a positive effect on immigrant and native-born wages in most of the occupational categories. To facilitate comparison, the calculated wage premiums for levels of education across occupational categories

[6] The term "advanced countries" used here refers to advanced countries other than Nordic countries.

[7] Immigrants arriving in Norway during the period 1980-1989 will face a different job situation (because of the effect of a prolonged recession) in the labor market than those arriving prior to 1960. Again this "entry effect" can best be measured using appropriate longitudinal data.

are presented in Table 6. The result strongly suggests that individuals with higher education (*i.e.*, more than 12 years of schooling) receive higher wage premiums than those with lower education (12 years or less of schooling) in almost all the occupational categories. For example, an average native-born person with 17 years or more of schooling receives wage premiums ranging from 36.9% to 70.0% across occupations, while for immigrants the reward is similarly high, about 19.2% in the professional category and 90.2% in clerical occupations. The only exception is the service category where there is no significant return to immigrants' education.

Age is used as a proxy for actual work experience.[8] All else being equal, the quadratic relationship between age and wages is statistically significant for both immigrants and the native-born. However, the marginal effects of age on wages differ for immigrants and the native-born within given occupations. For example, the marginal effects range from 0.28% to 0.37% for the native-born across occupations, evaluated at the sample means. Similarly for immigrants, the marginal effects are 1.24%, 0.05% and 0.94% across occupations.[9] The differences in the marginal effects of aging may be due to the fact that immigrants are younger on the average than the native-born across occupations. According to human capital theory, the younger the individual the higher the marginal effect of aging on wages.

The results show that men in both immigrant and native-born samples receive higher wages on average than do women across occupations. Variation in wages across geographical locations in the country manifests itself in this study. For example, wages are higher for native-

[8] Potential experience (measured as Age *minus* Years of schooling *minus* Age at school start) was not used in this analysis because of the presence of women in both immigrant and native-born samples. Given the discontinuity in women's labor supply profile, potential labor market experience will overstate the actual labor market experience for women.

[9] For instance, the marginal effect of age on native-born wages in the professional occupation is given as $\partial \ln Wage / \partial Age = 0.0366 - 0.0008 Age$. The wage-maximizing value of age can be calculated as $\beta_1 / 2\beta_2$. For example, the calculated peak years for the native-born are 45.75 years, 45 years and 46.5 years in professional, clerical and service categories respectively. Similarly, for immigrants, the peak years are 55.25 years, 38.31 years and 43.66 years in professional, clerical and service categories respectively.

born workers attached to clerical and service occupations in the southern part than in other parts of the country. Similarly, wages are higher for immigrants in the professional category working in the western part than in the southern part of the country. This may reflect the effect of the oil and gas industry in the western part of the country. Those in the north are generally at an earnings disadvantage relative to those in the south. Living in the south may be more expensive than in the north and higher wages in the south may simply reflect higher reservation wages.

The set of country-specific dummies in the wage equations for immigrants may be seen as capturing the effects of heterogeneity in skills and ethnicity on immigrant wages across occupations. It is well known that skills (*e.g.* education) from Third World countries cannot be easily transferred into the Norwegian labor market compared to similar skills from the other advanced countries.[10] As expected, Third World immigrants receive wages about 23% lower than Nordic immigrants (base group) in the professional category. On the other hand, Third World immigrants receive wages about 22.5% higher than their Nordic counterparts in service occupations.[11]

Furthermore, the set of cohort-specific dummies captures the impact of "period of immigration" on immigrant wages. The *a priori* expectation is that recent arrival cohorts lack human capital, for example, language skills, specific to the Norwegian labor market and will therefore earn lower wages than earlier cohort across occupations. To capture the assimilation effect, the entry wage of the pre-1960 cohort was used as the basis of comparison. The results show that entry wages of subsequent arrival cohorts are lower than that of the pre-1960 cohort in each occupational category. For example, the 1960-69 cohort receives wages about 17.5% lower

[10] Borjas (1990) argues that less-developed countries tend to have relatively unequal earnings distribution. For this reason, immigrants from less-developed countries would be negatively self selected with regard to productive skills. For those from the advanced countries, the reverse is the case.

[11] Although, it is difficult to know from the data how risky service occupations are, they are generally considered to be menial, undesirable etc., perhaps from the point of view of an average

than the base cohort in the professional category. Similarly, in the clerical category, the 1960-69 cohort receives wages about 33.2% lower than the base cohort, that is, pre-1960. Furthermore, the 1970-79 cohort receives wages about 36.0% lower while the 1980-89 cohort receives wages about 63.2% lower than the pre-1960 cohort (base). The wage deficits of the 1970-79 and the 1980-89 cohorts are about 28.6% and 30.7% in the service category. These estimates accord nicely with the findings in the previous studies on immigrants' earnings assimilation in Norway (see, *e.g.* Hayfron 1998).

More important is the relationship between the job selection processes and wage determination. This relationship is captured by the inclusion of *lambda* which was estimated from the logistic equation (7), as a regressor in both the immigrant and native-born wage equations (8). As implied by Dolton, Makepeace and Klaauw (1989), though the asymptotic properties of *t*-statistics associated with the selectivity correction terms ($\hat{\lambda}$) are not known, they may be used to ascertain whether the allocation of workers to given occupational categories is random. The results show that this is the case, as all the coefficients on the selectivity correction terms are statistically insignificant, indicating that there is no sample selection bias in the wage equations for immigrants and the native-born.

V. Occupation Analysis

As mentioned earlier, the aim of this paper is to estimate how much of the observed wage gap between immigrants and the native-born is due to wage differences across occupations, (*i.e.*, inter-occupational wage component), and how much is due to wage differences within given occupations (*i.e.*, intra-occupational wage component). This aim can be achieved by first

native-born person. In this case, a higher wage premium for Third World immigrants in service occupation may imply a kind of "compensating differential."

ascertaining whether there is a significant difference in the observed distributions of immigrants and the native-born across occupations in the Norwegian labor market. One popular measure of occupational differences is the Index of Dissimilarity.

The Index of Dissimilarity, sometimes also called Index of Segregation (D) can be calculated as:

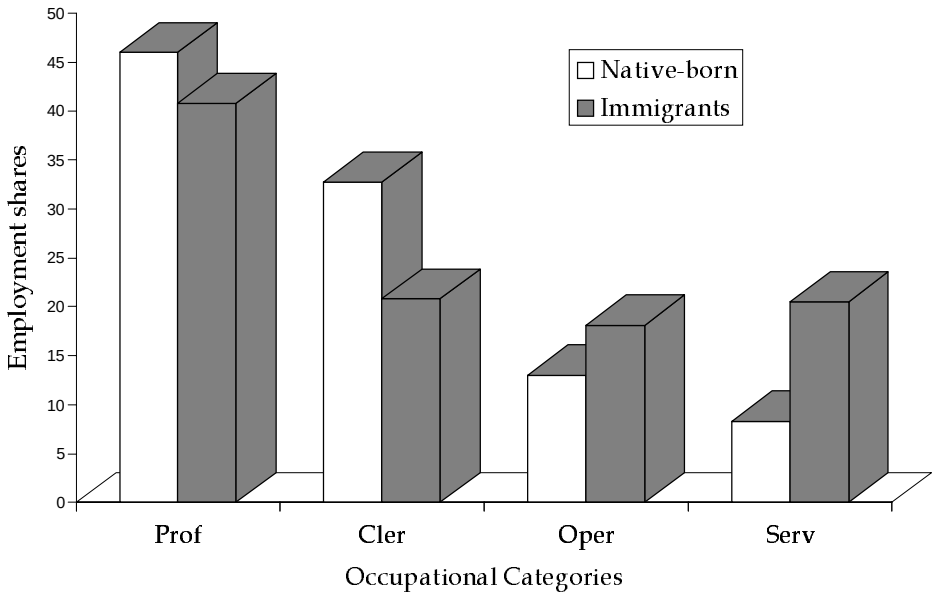
$$D = (\tfrac{1}{2})\sum_{j=1}^{k}\left| f_j^{\,N} - f_j^{\,I} \right|, \tag{9}$$

where $f_j^{\,N} = \frac{N_j}{N}$ and $f_j^{\,I} = \frac{I_j}{I}$ are the sample proportions of the native-born and immigrants in occupational category *j* respectively. N_j is the number of the native-born employed in occupational category *j*, *N* is the total number of employed native-born, and I_j and *I* are the comparable measures for immigrants. The index varies between 0 and 100. If the occupational distributions are identical, the index *D* is equal to zero, that is, there is no evidence of occupational differences between immigrants and the native-born in the Norwegian labor market. If there is no overlap in immigrant and native-born occupational distributions, the index is 100, or immigrants and the native-born are distributed differently across occupations in the labor market.

Table 7 reports a number of indexes of dissimilarity. The first index was calculated using actual sample proportions of immigrants and the native-born in professional, clerical and service occupations. The results indicate that about 17.1% of either, or a combination of, the native-born and immigrants will have to shift jobs for the occupational distributions to be identical. A chi-square test of the null hypothesis that the native-born and immigrants have identical occupational distributions was rejected at 99% level of confidence $(\chi^2 = 22{,}820)$. Given the rejection of the null hypothesis, it is interesting to investigate in which occupations immigrants and the native-

born are concentrated. As Figure 1 shows, immigrants are not only under-represented in the white-collar (for the most part highest-paid) professional and clerical occupations, but they are also over-represented in the low-paying service occupations.

Figure 1. Occupational Distribution of Immigrants and Native-born in Norway.
Percent

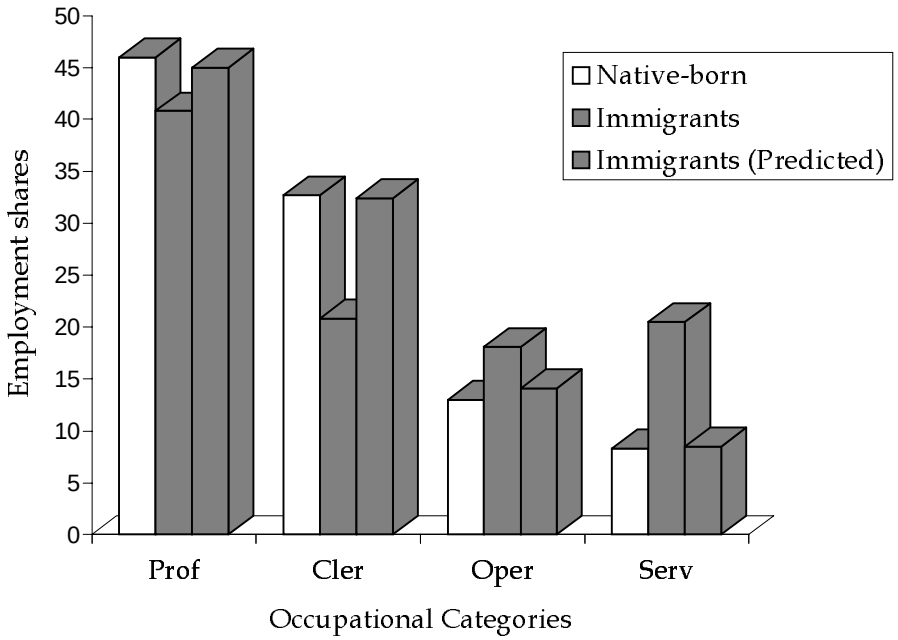


Source: Population and Housing Census of Norway. 1990

To investigate the source(s) of the occupational differences, the estimated native-born coefficients from the multinomial logit model and the mean characteristics of immigrants were used to simulate an occupational distribution for immigrants. This "hypothetical" distribution is the one that would be observed if immigrants were allocated to jobs in the same way as the native-born in the labor market.[12] A comparison of the index of dissimilarity, D*, based on the observed distribution of the native-born and the predicted occupational distribution of immigrants also

shows a substantial decrease in the first index by about 92.4% to 1.3%. Moreover, the null hypothesis that the predicted immigrant distribution and observed native-born occupational distributions are identical could not be rejected at 99% confidence level ($\chi^2 = 0.030$). A further confirmation of the uneven occupational distributions between immigrants and the native-born was obtained by comparing the predicted immigrant distribution with the observed immigrant distribution. Again the null hypothesis that these two occupational distributions are similar was rejected at 99% confidence level ($\chi^2 = 13.926$).

Figure 2. Actual and Predicted Occupational Distribution of Immigrants and Native-born in Norway



Source: Population and Housing Census of Norway. 1990

[12] See, appendix A2 for the approach used to simulate "hypothetical" occupational distribution for immigrants.

Figure 2 provides a clearer picture of the differences in the observed and predicted distributions of the native-born and immigrants across occupations in the Norwegian labor market. For example, Figure 2 shows that the predicted distribution of immigrants is quite similar to the observed native-born distribution across occupations, but different from the observed distribution of immigrants across occupations.

To summarize, both measures of occupational differences, *i.e.*, the indexes of dissimilarity and the descriptive overview of occupational distributions, holding education and year of immigration constant, support the hypothesis that discrimination or differences in unmeasured characteristics (or both) may be the sources of the occupational differences between immigrants and the native-born in the Norwegian labor market.[13] For example, the data predicted 8.5% of immigrants to be in service occupations, but we actually observed 20.5%. Given similar characteristics, tastes and preferences as the native-born, this would imply that the skills of 58.1% of immigrants observed in service occupations are underutilized since they have a higher comparative advantage in better-paid professional and clerical occupations in the labor market.

VI. The Wage Decomposition

The analysis from the previous section provided evidence that immigrants and the native-born have significantly different occupational distributions. Apart from this, the analysis in section II, also indicated that wages differ both *across* and *within* given occupations for immigrants and the native-born. Given these differences, the next step is to ascertain which one of the two occupational wage differentials is important in explaining the overall wage gap between immigrants and the native-born in the Norwegian labor market. To examine the relative contribution of occupational differences to the observed wage gap, the sample proportions of

immigrants and the native-born in occupational category *j*, f_j^N *and* f_j^I are used as weights in the decomposition of the overall native-born–immigrant wage gap using (9)

$$\overline{\ln W_j^N} - \overline{\ln W_j^I} = \sum_{j=1}^{3} (f_j^N \overline{W}_j^N - f_j^I W_j^I), \tag{9}$$

where $\overline{W}_j^N$ and $\overline{W}_j^I$ are sample means of log wages of the native-born and immigrants in occupational category *j*. The results from this decomposition exercise indicate that the overall mean wage gap (in log) is about 0.0949. This implies that immigrants on the average receive wages about 9.5% lower than the native-born.

Since the interest is to estimate the portion of the wage gap that is attributable to occupational differences, equation (9) is decomposed further into the intra- and inter-occupational components respectively (see, appendix A3). The intra-occupational component depends on differences between native-born and immigrant wages within occupations, whereas the size of the inter-occupational component depends on differences between native-born and immigrants occupational distributions. As Table 8 shows, inter-occupational wage differences explain almost the entire wage gap between immigrants and the native-born in the Norwegian labor market. Furthermore, a greater part of the inter-occupational wage gap (about 79.6%) is unexplained, or attributable to what is known in the literature as wage effect of occupational segregation. Overall, 24.5% of the aggregate wage differential is explained by differences in skill characteristics, while the remaining 75.5% cannot be ascribed different skill characteristics.

Given a lack of previous research in Norway (and probably elsewhere) that uses a similar approach to analyze the immigrant–native-born wage gap, there is little against which to compare

[13] However, this must be interpreted with caution, since differences in taste and preferences not

these results. Where direct comparisons can be made however, these results are not consistent with previous research for male-female wage differentials (see, *e.g.* Brown 1980; Miller 1987; Reilly 1991; Kidd and Shannon 1994). These studies concluded that most of the wage differences between males and females occur within rather than across broad occupational categories. The differences in the findings may be due to differences in the categorization of occupations and the type of variables included in the choice equation. For example, if age is excluded from the logistic regression, the main conclusion of this paper becomes comparable with the conclusions of the previous studies.

VII. Summary of Results and Conclusions

In this paper, the relative contribution of occupational differences to the observed wage differentials between immigrants and the native-born was analyzed. This was first done by examining the occupational distributions of immigrants and the native-born. Initial analysis indicated that the occupational distributions differ significantly for immigrants and the native-born in the Norwegian labor market. Immigrants, particularly recent immigrants from Third World countries (61%), were found to be heavily concentrated in service occupations where there is a substantial wage disadvantage. The native-born, on the other hand, were found to be over-represented in higher-paying professional and clerical occupations respectively. Applying the estimated coefficients from the native-born logistic equation to immigrant skills, a "hypothetical" occupational distribution was predicted for immigrants. The predicted distribution was found to be identical to the actual distribution of the native-born, thus suggesting that differences in the return to skills rather than differences in the observable skills may be the source of the occupational differences between these two groups.

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well captured by the model may overestimate that part attributable to discrimination.

The next step was to examine the effect of occupational differences on the observed wage gap between immigrants and the native-born. Using the sample proportions of immigrants and the native-born in various occupational categories as weights, the overall wage gap (in log) of 9.5% was decomposed into intra- and inter-occupational components respectively. The results show that differences in wages across occupational categories are the major sources of the overall wage gap between immigrants and the native-born. A possible explanation is that the over-representation of immigrants in lower-paying service occupations holds down the overall mean wage of the immigrant population. A further decomposition of the wage gap into a portion attributable to differences in endowments (explained), and a portion due to differences in the coefficients (unexplained), indicated that 24.5% of the wage gap is explained, while 75.5% of the occupational wage differentials still remains even after controlling for the observed worker and job characteristics.

Finally, the results show no evidence of occupational selectivity bias in the wage equations for immigrants and the native-born. Therefore, the assumption that immigrants will select themselves into certain (for the most part low skilled, lowest-paid) occupations in the Norwegian labor market because of past discrimination cannot be supported.

Appendix A1

To obtain equation (8), assume that the expected wage, given that individual *i* chooses occupational category *j* can be expressed as:

$$E(\ln W_{ij}) = X_{ij}\beta_j + E(u_{ij}|O_j = j) = X_{ij}\beta_j + E(u_{ij}|\varepsilon_{ij} < Z_i\gamma_j), \qquad (10)$$

where X is a vector of individual *i's* socioeconomic characteristics and u_{ij} is the error term. Assuming that u_{ij} and ε_{ij} follow a bivariate normal distribution, a selectivity bias correction can be

performed. To transform the ε_{ij} into standard normal random variables, let $F_j(x) \equiv \Pr(\varepsilon_{ij} < x)$. Thus, it follows from Lee (1983) that the transformed residual is given by

$$\varepsilon_{ij}^{*} \equiv \Phi^{-1}[F_j(x)], \tag{11}$$

where Φ is the cumulative distribution function for a standard normal variable. Similarly,

$$\varepsilon_{ij} < Z_i\gamma_j \text{ iff } \varepsilon_{ij}^{*} < \Phi^{-1}[F_j(Z_i\gamma_j)]. \tag{12}$$

Substituting from (12) into (10), a wage equation conditional upon occupational category *j* being chosen can be derived as:

$$E(\ln W_{ij} | O_i = j) = X_{ij}\beta_j + E\left\{u_{ij} | \varepsilon_{ij}^{*} < \Phi^{-1}[F_j(Z_i\gamma_j)]\right\}. \tag{13}$$

This wage equation can be rewritten as:

$$\ln W_{ij} = X_{ij}\beta_j - \sigma_j\rho_j \frac{\phi\left\{\Phi^{-1}[F_j(Z_i\gamma_j)]\right\}}{F_j(Z_j\gamma_j)} + \bar{\xi}_j, \tag{14}$$

where, $E(\bar{\xi}_j | O_j = j) = 0$, ϕ is the standard normal density function, σ_j is the standard deviation of the disturbance term ε_j and ρ_j is the correlation coefficient between u_{ij} and ε_{ij}^{*}. The conditional variance of $\bar{\xi}$ is derived in Trost and Lee (1984).

Estimating W_{ij} in (14) by OLS would lead to biased and inconsistent estimates of β_j, if $\rho_j \neq 0$. That is, a selection bias would result if the unobservables that affect occupational choice are correlated with the unobservables that affect wages. A solution to this problem is to estimate equation (14) using the two-stage approach suggested by Lee (1983). This model is a generalization of Heckman's (1980) sample selection model. In the first stage, equation (7), which predicts an individual's propensity to choose a particular occupation, is estimated using a multinomial logit model.[14] In the second stage, the estimated coefficients $\hat{\gamma}_j$, (j = 1, 2, 3) from (7) are entered as another variable into the OLS regression model, equation (8) that predicts wages for individuals who choose a particular occupation.

Appendix A2

To investigate the sources of occupational differences between immigrants and the native-born, a "hypothetical" occupational distribution for immigrants was predicted using equation (15) (see, *e.g.* Gabriel, Williams and Schmitz, 1990),

$$\ln\left(\frac{P_{ij}}{P_{im}}\right) = \overline{Z}_j^I \hat{\gamma}_j^N , \tag{15}$$

where, $\hat{\gamma}_j^N$ represent the estimated coefficients from the native-born choice equation (7), and $\overline{Z}_j^I$ represent the average levels of observable characteristics of immigrants. The "occupational probability density function" is generated for each immigrant worker using (16)

[14] The multinomial logit model is considerably less difficult and computationally cheaper to estimate. Other models, such as the unordered probit model, become relatively intractable with the addition of occupational categories. Similarly, the ordered probit model requires a sequential ranking which may involve arbitrary judgments.

$$P_j^I = \frac{e^{\bar{Z}_j^I \hat{\gamma}_j^N}}{\sum_{j=1}^{M} e^{\bar{Z}_j^I \gamma_j^N}}. \qquad (16)$$

The predicted proportion of immigrants in occupational category *j* is obtained by summing up (16) across all immigrants,

$$f_j^* = \sum_I (P_i^I), \qquad (17)$$

where the term, f_j^* shows the "hypothetical" occupational distribution of immigrants that would be observed if their skills were evaluated in the same way as the native-born in the Norwegian labor market. Using (17) and the actual occupational distribution for the native-born, the second index of dissimilarity can be defined as:

$$D^* = (\tfrac{1}{2}) \sum_{j=1}^{4} \left| f_j^N - f_j^* \right|. \qquad (18)$$

*D** is then compared with *D*. Recall that *D* was calculated using the actual sample proportions of immigrants and the native-born in occupation *j*. If the value of *D** is less than or equal to that of *D*, this may be an indication that discrimination or some unobserved characteristics may be the source of the differences in occupational distributions between immigrants and the native-born in the Norwegian labor market. The intuition behind this analysis (although not explicitly stated in the literature) is rather straightforward. If it is the difference in the coefficients and not the personal characteristics (implicitly assumed to be equal) that cause occupational distributions to differ for immigrants and the native-born, then applying native-born coefficients for immigrants

should lead to a simulation of occupational distribution for immigrants that is identical to the native-born distribution. This seems to be the case in this study, as the data failed to reject the null hypothesis that the simulated distribution for immigrants and actual distribution of the native-born are identical. Finally, the explained portion of the occupational differentials can be calculated as *D*/D*. For example, 0.007 / 0.147 = 0.048, implying that about 4.8% of the immigrant–native-born occupational differentials is explained by human capital and other productivity-enhancing characteristics, while 95.2% is unexplained.

Appendix A3

VI. The Wage Decomposition

Very briefly, using the definition that OLS estimates go through the sample means, the logarithmic wage gap can be decomposed in the following manner :

$$\overline{\ln W_j^N} - \overline{\ln W_j^I} = \sum_{j=1}^{3} f_j^I (\overline{W}_j^N - W_j^I) \quad + \quad \sum_{j=1}^{3} \overline{W}_j^N (f_j^N - f_j^I).$$

$$\underbrace{\textit{Intra}-\textit{occupational}\ \text{Effect}} \qquad \underbrace{\textit{Inter}-\textit{occupational Effect}}$$

$$= \sum_{j=1}^{3} f_j^I \hat{\beta}_j^N \Delta\overline{X}_j + \sum_{j=1}^{3} f_j^I \Delta\hat{\beta}_j \overline{X}_j^I + \sum_{j=1}^{3} \overline{W}_j^N (f_j^N - f_j^*) + \sum_{j=1}^{3} \overline{W}_j^N (f_j^* - f_j^I). \qquad (19)$$

Explained *Unexplained* *Expl. Allocation* *Segregation*

Where $\overline{W}_j^N$ and $\overline{W}_j^I$ are sample means of log wages of the native-born and immigrants in occupational category *j*. $\hat{\beta}_j^N$ and $\hat{\beta}_j^I$ are the estimated coefficients from the wage equations (8) for the native-born and immigrants respectively. ΔX_j represents the differential mean skill

characteristics (*e.g.* education, age etc.) assumed to determine the individual wages in occupational category *j*. Finally, f_j^N, f_j^I *and* f_j^* are the actual and predicted sample portions of the native-born and immigrants in occupational category *j*, used as weights in the wage decomposition in order to appropriate a "nondiscriminatory" wage structure.

The first and second terms of (19) represent the intra-occupational and inter-occupational (wage) components of the wage gap, the first being accounted for by differences in wages within given occupations, and the second, owing to differences in the distribution of immigrants and the native-born across occupations. The intra-occupational component can be further disaggregated to examine the portion of the wage gap due to differences in wage-related attributes (*i.e.*, explained portion), and the portion attributable to differences in the returns to skills (*i.e.*, unexplained portion). Similarly, the third and fourth terms (line 2) represent the portion of inter-occupational wage component which is attributable to the "explained" allocation of workers to given occupational categories, and the portion attributable to occupational segregation. The results from this decomposition exercise are reported in Table 8.

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Table 1

Variable And Data Description

Variable	Description
Ln Wage	Natural logarithm of hourly earnings
Schooling	Years of completed schooling
Education	
<12 Years	Reference
12 Years	One if 12 years of schooling; zero otherwise
14 Years	One if 13-14 years of schooling; zero otherwise
16 Years	One if 15-16 years of schooling; zero otherwise
17 + Years	One if greater than 16 years of schooling; zero otherwise
Age	1990 *minus* year of birth
Agesq	Age - Squared
Male	One if male; zero otherwise
Mar	One if married; zero otherwise
Nchild	Number of children
Part-Time	One if worked part-time in the census year; zero otherwise
Area of Residence	
South	Reference
West	One if resides in Western part of Norway; zero otherwise
North	One if resides in Northern part of Norway; zero otherwise
Fringe	One if rented apartment through job; zero otherwise
Country of Birth	
Nordic	Reference
Advanced	One if immigrant originates in Other advanced country (Australia, Canada, Europe except Nordic, Japan, New Zealand, United States); zero otherwise
Third World	One if immigrant originates in Third World country (Africa, Asia, Middle East and South America); zero otherwise
Year of Immigration	
1980-1989	One if immigrated between 1980 and 1989; zero otherwise
1970-1979	One if immigrated between 1970 and 1979; zero otherwise
1960-1969	One if immigrated between 1960 and 1969; zero otherwise
< 1960	Reference

Table 2

Summary Statistics in Immigrant and Native-born Samples

	Mean and Standard Deviation					
	Prof	Cler	Serv	Prof	Cler	Serv
	Native-born			Immigrants		
LnWage	4.86	4.60	4.53	4.79	4.43	4.42
Wage (NoK)	129.02	99.48	92.76	120.30	83.93	83.10
Education						
<12 Years	.0000	.0000	.0000	.0000	.0000	.0000
12 Years	.1642	.2911	.1898	.1095	.2729	.2398
	(.3706)	(.4545)	(.3928)	(.3124)	(.4460)	(.4274)
14 Years	.2479	.0750	.0305	.1695	.0988	.0711
	(.4320)	(.2636)	(.1723)	(.3754)	(.2988)	(.2573)
16 Years	.2181	.0220	.0102	.2358	.0894	.0630
	(.4131)	(.1467)	(.1005)	(.4247)	(.2856)	(.2432)
17+ Years	.1194	.0026	.0034	.2242	.03294	.0244
	(.3244)	(.0508)	(.0582)	(.4173)	(.1787)	(.1544)
Age	42.3	41.3	42.7	39.7	38.1	35.8
	(9.9)	(11.370)	(12.0)	(9.1)	(10.8)	(9.8)
Agesq	1887.8	1838.3	1966.3	1663.6	1573.0	1374.8
	(869.6)	(971.5)	(1052.5)	(773.8)	(894.9)	(786.0)
Male	.4668	.3312	.2814	.4905	.3741	.4431
	(.4991)	(.4709)	(.4504)	(.5002)	(.4845)	(.4973)
Mar	.9046	..8435	.8678	.8684	.8776	.8862
	(.2938)	(.3636)	(.3393)	(.3382)	(.3281)	(.3179)
Part-Time	.2380	.3402	.5051	.2600	.3318	.3781
	(.4260)	(.4741)	(.5008)	(.4389)	(.4714)	(.4854)
Area of Residence						
South	.0000	.0000	.0000	.0000	.0000	.0000
West	.3764	.3739	.4146	.2747	.2471	.1972
	(.4847)	(.4841)	(.4933)	(.4466)	(.4318)	(.3982)
North	.0912	.0802	.1085	.0610	.0518	.0508
	(.2880)	(.2718)	(.3115)	(.2395)	(.2218)	(.2198)
Fringe	.0370	.0116	.0070	.1040	.0310	.0550
	(.1900)	(.1070)	(.0820)	(.3060)	(.1720)	(.2280)
Country of Birth						
Nordic				.0000	.0000	.0000
Advanced				.4663	.4188	.2703
				(.4991)	(.4939)	(.4446)
Third World				.1432	.1788	.4858
				(.3504)	(.3837)	(.5003)
Year of Immigration						
1980-1989				.4905	.4259	.6138
				(.5002)	(.4951)	(.4874)
1970-1979				.3074	.2541	.2297
				(.4616)	(.4359)	(.4210)
1960-1969				.1337	.2329	.1016
				(.3405)	(.4232)	(.3025)
< 1960				.0000	.0000	.0000
Sample Size	1206	773	295	950	425	492

Table 3

Distribution of Immigrants and Native-born by Level of Education across Occupational Categories. Percent

	Prof		Cler		Craft		Serv		
	≤12yrs	> 12yrs	≤12yrs	> 12yrs	≤12yrs	> 12yrs	≤12yrs	> 12yrs	N
Native-born	17.1	24.2	23.8	2.6	21.7	0.5	9.6	0.4	2923
Immigrants	17.0	27.9	12.9	3.7	19.9	1.2	15.3	2.0	2405
Cohort									
1980-89	13.6	25.3	10.1	4.4	19.7	2.3	18.7	5.4	1195
1970-79	17.0	27.9	12.9	3.7	19.9	1.2	15.3	2.0	652
1960-69	12.9	22.8	25.6	2.5	21.9	0.3	13.8	0.3	356
< 1960	18.8	19.4	19.4	2.4	24.1	0	15.9	0	170

Table 4

Multinomial Logit Model (Reference Category = Craft/Operative)

	Native-born			Immigrants		
	Prof	Cler	Serv	Prof	Cler	Serv
Intercept	-9.9675	-2.5914	-1.5787	-4.5900	-.4350	.4752
	(16.737)	(4.592)	(2.029)	(8.715)	(.772)	(.849)
Education	.8214	.3315	.0827	.3682	.1173	.0318
	(20.541)	(8.321)	(1.464)	(16.727)	(4.806)	(1.410)
Age	.0544	.0233	.0298	.0351	-.0034	.0022
	(7.587)	(3.351)	(3.262)	(4.409)	(.394)	(.266)
Male	-2.7489	-2.6954	-2.4847	-1.8029	-2.1154	-2.0462
	(16.108)	(16.751)	(12.365)	(11.186)	(12.293)	(12.241)
Mar	.4762	.0140	.0244	.2724	.5282	.3172
	(2.246)	(.072)	(.095)	(1.384)	(2.335)	(1.433)
Part-Time	.1240	.2773	.9236	.3671	.5615	.7698
	(.632)	(1.490)	(4.389)	(2.121)	(3.079)	(4.481)
Nchild	.2793	.0844	.1547	.0774	-.1012	-.0563
	(3.954)	(1.212)	(1.699)	(1.386)	(1.582)	(.981)
Area of Residence						
West	-.0428	-.3289	.2132	-.0085	-.1229	-.5077
	(.150)	(1.194)	(.651)	(.039)	(.490)	(2.300)
North	1.0480	.2909	.7053	-.3537	-1.1795	-1.0767
	(2.085)	(.581)	(1.244)	(.875)	(2.081)	(2.285)
Fringe	-.1216	-.1561	-.3738	.0620	.0727	-.6975
	(.574)	(.787)	(1.453)	(.376)	(.399)	(4.009)
Fringe*West	-.0811	.1243	-.3553	-.0720	-.0110	.1871
	(.253)	(.401)	(.941)	(.246)	(.033)	(.569)
Fringe*North	-.4448	.0024	-.0061	.0847	1.3502	1.6466
	(.781)	(.004)	(.009)	(.141)	(1.856)	(2.489)
Country of Origin						
Advanced				.1501	.3516	.4799
				(.952)	(1.954)	(2.534)
Third World				-.9276	-.5969	.5729
				(4.821)	(2.767)	(2.840)
Year of Immigration						
1980-1989				.6234	.0491	.1923
				(2.229)	(.160)	(.591)
1970-1979				.4895	-.0201	-.0762
				(1.785)	(.066)	(.235)
1960-1969				-.2166	-.0116	-.3493
				(.763)	(.038)	(1.036)
Sample Size	2923			2400		
Logl. (Max)	-2839.116			-2590.1		
Logl. (Restr.)	-3749.082			-3197.9		
Corr. pred. (%)	57.92			53.25		
ρ	24.27			19.01		
$\chi^2_{33/48}$	1819.9			1215.6		

Notes.– Dependent Variable = 1 if Professional/Administrative/Technical. Dependent Variable = 1 if Clerical/Sales/Transport, Post & Telecommunications. Dependent Variable = 1 if Service.

Asymptotic *t*-statistics are in parentheses. ρ is McFadden - R^2 calculated as $1 - \frac{\log l.(\max imum)}{\log l(restricted)}$.

Table 5

Wage Equations Corrected For Selectivity Bias (Dependent Variable = *Ln* Wage)

	Native-born			Immigrants		
	Prof	Cler	Serv	Prof	Cler	Serv
Intercept	3.5209	3.5426	3.6420	3.6929	2.8579	3.6754
	(13.004)	(10.072)	(8.025)	(7.508)	(5.610)	(8.500)
Education						
12 Years	.0263	.1493	.0344	.1163	.2274	-.1019
	(0.574)	(2.622)	(.368)	(1.518)	(2.565)	(1.031)
14 Years	.1914	.2285	.1043	.1071	.3107	-.0029
	(4.538)	(2.910)	(.830)	(1.690)	(2.512)	(.019)
16 Years	.1768	.1745	.2497	.0685	.4018	-.1219
	(3.711)	(1.026)	(1.726)	(1.003)	(2.951)	(.771)
17+ Years	.3141	.4721	.5245	.1754	.6431	-.0125
	(5.931	(5.650)	(2.837)	(2.518)	(2.821)	(.191)
Age	.0366	.0450	.0372	.0442	.0996	.0524
	(3.717)	(3.298)	(2.312)	(2.413)	(3.679)	(2.749)
Agesq	-.0004	-.0005	-.0004	-.0004	-.0013	-.0006
	(3.350)	(3.085)	(2.166)	(1.674)	(3.735)	(2.509)
Male	.2352	.1962	.2846	.1765	.1793	.1116
	(7.799)	(2.862)	(2.776)	(3.782)	(1.844)	(1.446)
Mar	.0993	.0186	-.0039	.0200	-.0550	-.0294
	(2.414)	(.280)	(.036)	(.372)	(.480)	(.295)
Part-Time	-.0262	-.0587	.0062	-.0870	.0124	-.1088
	(.744)	(1.381)	(.101)	(1.671)	(.139)	(1.412)
Area of Residence						
West	-.0278	-.0740	-.1299	.1623	-.0983	-.0361
	(1.172)	(2.068)	(2.327)	(3.298)	(1.102)	(.468)
North	-.0459	-.2216	.0330	-.1708	-.4427	-.1008
	(1.111)	(2.523)	(.355)	(2.119)	(2.138)	(.569)
Country of Origin						
Advanced				.0051	.0597	.1521
				(.114)	(.717)	(1.752)
Third World				-.2336	-.1340	.2255
				(3.046)	(1.091)	(2.560)
Year of Immigration						
1980-1989				.0277	-.6318	-.3074
				(.338)	(3.711)	(2.205)
1970-1979				-.0219	-.3601	-.2859
				(.290)	(2.102)	(2.184)
1960-1969				-.1746	-.3324	-.1831
				(2.049)	(2.114)	(1.450)
Selectivity	.1667	-.0203	.0128	-.1830	.1070	-.1235
	(1.366)	(.149)	(.057)	(1.073)	(.326)	(1.033)
Sample Size	1206	773	293	950	425	492
R-sq	.2059	.1175	.1479	.1399	.1449	.0589
Adjusted R-sq	.1979	.1036	.1116	.1242	.1092	.0251
F[*k, N-k*]	25.78	8.44	4.08	8.92	4.06	1.74

Notes:–The figures in parentheses are the corresponding heteroskedasticity-consistent t-statistics, computed as the ratios of the coefficient estimates to the square roots of the respective diagonal elements of White's (1980) heteroskedasticity-consistent estimate of the *OLS* coefficient covariance matrix.

Table 6

Gross Wage Premium for Levels of Education. Percent

	Native-born			Immigrants		
	Prof	Cler	Serv	Prof	Cler	Serv
Educational Level						
12 Years	2.66	16.10*	3.50	12.33	25.53*	-9.69
14 Years	21.09*	25.67*	10.99	11.30	36.44*	-0.29
16 Years	19.34*	19.06*	28.36*	7.09	49.45*	-11.48
17+ Years	36.90*	60.34*	68.96*	19.17	90.24*	-1.24

Notes: The reference group is primary school education (< 12 years). The wage premium for 17+ years of schooling is defined as $R = (\frac{W_{17+} - W_{<12}}{W_{<12}})100$, where the *w's* are wages for individuals with 17 years or more schooling and the base group. The percent differential *R* is calculated as $\hat{R} = [e^{(\beta_{17+})} - 1]100$, as suggested by Halvorsen and Palmquist (1980) for semi-logarithmic equations. β_{17+} is the estimated coefficient of the dummy variable for 17 years or more schooling in the wage equation.

* Denotes statistically significant at 5% level of significance.

Table 7
Actual and Predicted Occupational Distributions of
Immigrants and Native-born. Percent

	Actual		Predicted (Logit)
	Native-born	Immigrant	Immigrant
Prof	46.0	40.8	45.0
Cler	32.7	20.8	32.4
Oper	13.0	18.1	14.1
Serv	8.3	20.5	8.5

Index of Dissimilarity [a]	*D*
Actual Native-born and Actual Immigrant	.147
Actual Native-born and Predicted Immigrant	.007
Actual Immigrant and Predicted Immigrant	.139

Chi-Square Goodness of Fit Statistics			*Critical Values*
Actual Native-born and Actual Immigrant	22.820*	>	$\alpha_{3,0.01} = 11.345$
Actual Native-born and Predicted Immigrant	0.030	<	$\alpha_{3,0.01} = 11.345$
Actual Immigrant and Predicted Immigrant	23.926*	>	$\alpha_{3,0.01} = 11.345$

Notes: —The predicted occupational distribution was calculated using the coefficients from the logit regression for native-born and the mean values of immigrant skills reported in Table 2. See, Eqs. (14) and (15).
* Denotes significant at 99 % level of confidence.
[a] The calculated index of dissimilarity does not include the sample proportions in the base category (Operatives/Crafts).

Table 8

Decomposition of Wage Differentials between Immigrants and Native-born

Differences in Natural Logarithm of Wages			0.0958
Due To			
Intra-Occupational Effect		-0.1562	
Explained	-0.0281		
Unexplained	-0.1281		
Inter-Occupational Effect		0.2520	
Explained Alloc.	0.0515		
Segregation	0.2005		
Total Explained = 0.0235 (24.5%); Total Unexplained = 0.0723 (75.5%)			

Source: Tables 5 and 6

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