ISET WORKING PAPER SERIES

WP 011-08 SEPTEMBER 2008

Wage Differentials in Israel: Endowments, Occupational Segregation, Discrimination, and Selectivity

Muhammad Asali

The International School of Economics at Tbilisi State University (ISET) is supported by BP, the Government of Georgia, the Norwegian Ministry of Foreign Affairs, Higher Education Support Program of the Open Society Institute, the Swedish International Development Agency and the World Bank.

International School of Economics at Tbilisi State University
16 Zandukeli Street, Tbilisi 0108, Georgia
www.iset.ge e-mail: publications@iset.ge

Wage Differentials in Israel: Endowments, Occupational Segregation, Discrimination, and Selectivity

Muhammad Asali*

July 23, 2008

Abstract

I use a panel of cross sections income data between 1991 and 2003 to measure wage differentials between Israeli-Arab and Jewish workers in Israel. The wage gap discovered is decomposed into components corresponding to human capital, occupational segregation, selectivity, and a residual, which may reflect discrimination. The unadjusted hourly wage gap between Arab and Jewish workers almost doubled from 40% in 1991 to 77% in 1999. By 2003, however, it had declined to 56%. The study shows large fluctuations in the wage gap. Human capital differences explain a major part of the wage gap, but its contribution is susceptible to the non-discriminatory norm adopted. Occupational segregation accounts for about a third of the wage gap. Because sudden changes in the underlying characteristics of the populations are not likely—these were actually slightly converging over the study period—large part of the changes in the wage gap are likely to be due to labor market discrimination.

*This study benefitted from helpful discussions with Michael Beenstock, Joseph Zeira, Lena Edlund, and Till von Wachter. Thanks must also go to seminar participants at Columbia University and an anonymous referee for helpful comments. I thank the Israel Social Sciences Data Center, at the Hebrew University of Jerusalem, for providing the main data. The generous financial support from the Falk Institute for Economic Research in Israel is gratefully acknowledged. All remaining errors are mine.

1 Introduction

Israel is a multicultural, multiethnic society. Its population brings together Western and Eastern Jews, foreign- and locally-born citizens, and Arabs from a range of Muslim, Christian, and Druze religious and ethnic backgrounds.[1] Israeli Arab citizens constitute about 20% of the total population;[2] yet despite extensive studies of ethnic wage disparities in Israel (e.g., Neuman and Silber (1996), Neuman and Oaxaca (1998), and Neuman and Oaxaca (2004b)), very little attention has been paid specifically to the characteristics of this group as workforce participants.

The literature on the Jewish-Arab wage differentials is very narrow. The main findings of this literature are that Jewish-Arab wage gaps are very large, and the major part of this gap is not explained by differences in individual human capital characteristics. Previous research also provides evidence as to the large differences in the occupational distribution between Jews and Arabs—Arab workers are over-represented in blue-collar jobs, but under-represented in academic, management, and professional jobs (see Levanon and Raviv (2007) and references therein). Most of these studies, however, base their inference on a single, or a very few, cross section datasets (such as the census of 1995).

The objective of this chapter is to measure and document the evolution of wage gaps

[1] Arabs, or Israeli Arabs, mentioned here are citizens and residents of Israel. They are native-born, live, and work in Israel, have Israeli citizenship, and share the same national institutions with the Jewish citizens. Palestinians, living in the West Bank and Gaza Strip, are not the subject of this chapter.

[2] Israel's total population (excluding the Gaza Strip and West Bank) was estimated at around 5 million in the early 1990s and has steadily increased since then. In 2003 the estimated population was 6.7 million. See the Statistical Abstract of Israel, Central Bureau of Statistics (2005).

between Arabs and Jews in the Israeli labor market in the years 1991–2003, aiming to describe and evaluate the different mechanisms that may be driving these gaps. It also provides a method of measuring occupational segregation using standard wage decomposition procedures. The study disaggregates observed wage gaps into different components such as human capital differences, occupational segregation, and a residual component that may reflect labor-market discrimination within occupations. It also corrects for self selection into employment.

In addition to recording the Jewish-Arab wage gap in gross terms, this study also analyzes patterns of change between the different wage gap components between 1991 and 2003. I find that the Jewish-Arab hourly wage gap hovered at around 40% (of Arab hourly wage) in the years 1991–1994, peaking at 64% in 1999. Since then the hourly wage gap has decreased, falling to 43% by the end of 2003.[3] The unexplained component of the gap, resulting from different returns to human capital characteristics, accounted for 10%–20% of the overall wage gap in the beginning of the period but increased vastly during the late 1990s to account for more than 60% of the gap. Occupational segregation explained 30%–40% of the overall wage gap over the entire period.

The large fluctuations in the wage gap found in this study suggest that a large part of the changes in the wage gap are likely to be the result of labor market discrimination, because sudden changes in the wage gap are not likely to result from sudden changes in the

[3]The figures, when recent Jewish immigrants are excluded from the samples, are 45% for 1991-1994, 77% in 1999, and 56% in 2003.

underlying characteristics of the populations. In fact, many of the key (observable) human capital characteristics of Arab and Jewish workers were converging in the study period.

The chapter is organized as follows: the next section describes the methodology used to measure wage gaps and their decompositions. Section 3 features a detailed description of the study data. The main results of the study are in turn reported in section 4. Section 5 concludes.

2 Methodology

2.1 Basic Methodology

I use Oaxaca-Blinder decomposition [Oaxaca (1973) and Blinder (1973)] in its general form [see Neumark (1988) and Oaxaca and Ransom (1988, 1994)], to analyze wage gaps between Jewish and Arab workers in Israel. The method breaks wage gaps down into, first, a component representing differentials in human capital, and second into a component representing the effect of discrimination. Let $\ln(w_{ij}) = X'_{ij}\beta_j + \varepsilon_{ij}$ represent the wage equation for individual i. The decomposition is then:

$$G = \overline{\ln W_J} - \overline{\ln W_A} = \underbrace{\left(\bar{X}_J - \bar{X}_A\right)' \hat{\beta}^*}_{Q} + \underbrace{\left[\bar{X}'_J\left(\hat{\beta}_J - \hat{\beta}^*\right) + \bar{X}'_A\left(\hat{\beta}^* - \hat{\beta}_A\right)\right]}_{D} \qquad (1)$$

where W_{ij} is the hourly wage of individual i of ethnic group j ($j = J, A$), X_{ij} is a vector of worker characteristics, A and J subscripts stand for Arabs and Jews, and upper-bars signify averages of the different variables (over individuals, $i = 1, 2, ..., N$). The regressors vector, X_{ij}, includes years of schooling, experience, experience squared, a marital status category (single, married, widowed, separated, and divorced), wave of immigration (relevant to Jewish citizens only), occupational dummies, and industrial dummies.[4] $\hat{\beta}^*$ is the estimate of the nondiscriminatory wage coefficients, and G is the gross (geometric) wage gap.[5] The first term in equation 1, Q, represents the human capital component of the overall wage gap, and D, the sum of the second and third terms, represents the discriminatory (or unexplained) component. The nondiscriminatory wage coefficient, $\hat{\beta}^*$, can be estimated using the sample of Jewish workers ($\hat{\beta}_J$), the sample of Arab workers ($\hat{\beta}_A$), or the pooled sample of Jewish and Arab workers ($\hat{\beta}_P$).

In this chapter I carry out the estimation under the assumption that $\hat{\beta}^* = \hat{\beta}_A$ or that $\hat{\beta}^* = \hat{\beta}_J$.[6] In doing so, I analyze the effects of two different "experiments." First, the "enrichment experiment (EE)," that is, when Arabs are hypothetically assigned the average Jewish Human Capital (HC) characteristics—maintaining the Arab returns to those characteristics ($\hat{\beta}^* = \hat{\beta}_A$). Second, the "civil rights experiment (CRE)," when Arabs are assumed to have

[4] The Income Surveys do not provide a direct measure of labor market experience. Consequently, I use potential experience, defined as: $Experience = Age - Schooling - 5$. Moreover, using "type of locality" and "large city" identifiers in the wage equations has virtually no effect on the results.

[5] This is the *approximate* geometric wage gap. See Appendix A for a description of the different measures of gross wage gaps.

[6] The $\hat{\beta}^* = \hat{\beta}_P$ variation of the nondiscriminatory wage coefficients is analyzed in the working version of this chapter (Asali (2006)).

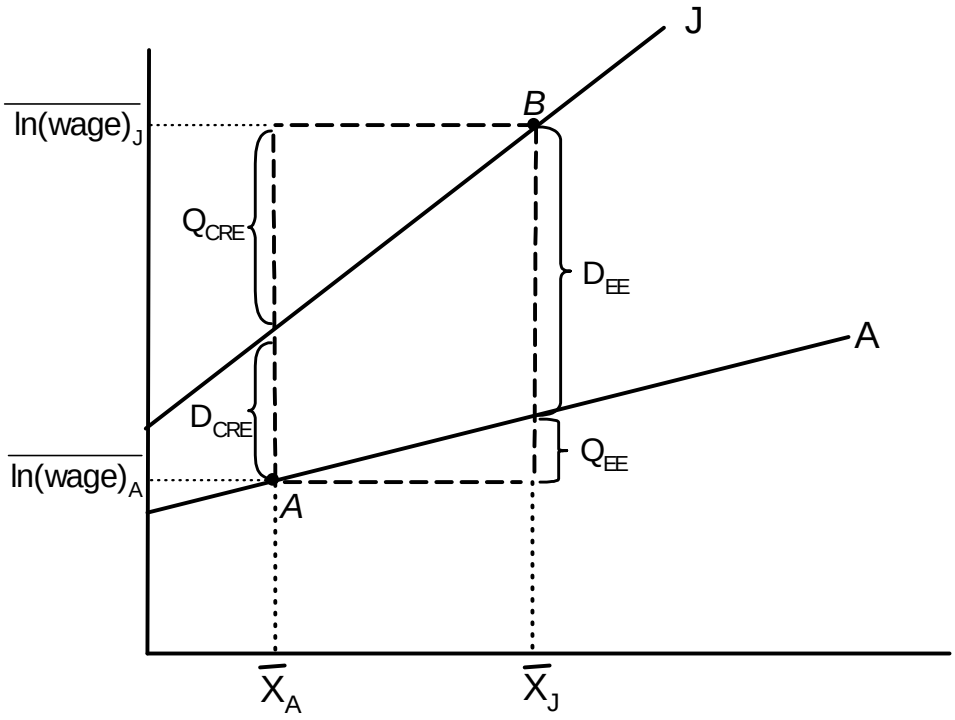

Figure 1: Civil Rights and Enrichment Experiments

the Jewish returns to HC, while maintaining their current average levels of HC ($\hat{\beta}^* = \hat{\beta}_J$). Figure 1 depicts these theoretical experiments for one ingredient of human capital—for the sake of the example, assume X to stand for years of schooling.

Point A in the graph is the current average wage and schooling for Arabs; point B shows the current average wage and schooling for Jewish workers. As the graph is drawn, namely, Jewish workers have higher returns to schooling, it is shown that the unexplained part of the wage gap will be greater under the enrichment experiment than the civil rights experiment. That is, if Arabs experience an immediate enhancement in their human capital component ($\bar{X}_A$), to reach the average level of that of their Jewish counterparts ($\bar{X}_J$), the total wage

gap will be reduced by only a small fraction of Q_{EE}, while a great portion of the gap, D_{EE}, will be attributed to unexplained differences in the returns to schooling.

2.2 Occupational Segregation

For the dataset in question, the average income varies widely across occupations (as well as across ethnic groups). Therefore, even in the absence of unexplained wage gaps within occupations, wage differences could still exist pertaining to different distributions of Arab and Jewish workers across employment sectors. While controlling for occupational and industrial affiliation in the wage regressions would eliminate inter-occupational wage gaps, it would also have the effect of *underestimating* the discriminatory component of the overall wage gap, to the extent that occupational segregation itself derives from discrimination. This could be through different barriers to entry offered to representatives of the two groups. To show this, let C_i^A $\left(C_i^J\right)$ be the proportion of Arabs (Jews) employed in occupation i, and W_i^A $\left(W_i^J\right)$ the mean (log) hourly-wage of an Arab (Jewish) worker in occupation i $(i = 1, 2, ..., I)$. It then follows that: $\bar{W}^j = \sum_i C_i^j W_i^j$ for $j = A, J$ and

$$G = \sum_{i=1}^{I} \left(C_i^J W_i^J - C_i^A W_i^A\right) \tag{2}$$

The above illustration indicates the possibility that including occupational dummies in the wage regressions may result in underestimating the discriminatory component of the

overall wage gap, in the sense that the added variables would disguise labor market discrimination as a human capital component.

Oaxaca decomposition does not account for group differences in group members' occupational distribution. Different methods were suggested to measure the occupational segregation component of the wage gap. For example, Brown *et al.* (1980) and Miller (1987) use a multinomial logit model to estimate the distribution of one group across occupations, and compare this with the observed distribution of the other group. Neuman and Silber (1996), alternatively, estimate the occupational segregation component by comparing each group's share in a certain occupation with the share of that occupation in the total employed labor force, and sum the differences over all occupations. These estimates, however, measure the real rather than the nominal occupational segregation. That is, they look at the employment distribution rather than its effect on wage differentials.

I use a variation of the original Oaxaca decomposition to directly measure the occupational (and industrial) segregation component of the wage gap. This method is preferred for its simplicity, and because it does not assume any functional form of the distribution of occupations. I include a set of occupational dummies in the wage equations, and modify the Oaxaca decomposition by dissociating the part explained by those dummies from the human capital component. Let the estimated wage equation be $\overline{\ln W_j} = \bar{X}_j'\hat{\beta}_j + \overline{C}_j'\hat{\gamma}_j$,where $\overline{C}_j$ is a vector of average occupational dummies for the group $j = A, J$. Defining the matrix

$Z_j' := [X_j', C_j']$ and the parameters vector $\hat{\delta} := [\hat{\beta}', \hat{\gamma}']'$ I arrive at the following decomposition:

$$G = \underbrace{\left(\bar{X}_J - \bar{X}_A\right)' \hat{\beta}^*}_{Q} + \underbrace{\left[\bar{Z}_J' \left(\hat{\delta}_J - \hat{\delta}^*\right) + \bar{Z}_A' \left(\hat{\delta}^* - \hat{\delta}_A\right)\right]}_{D} + \underbrace{\left(\overline{C}_J - \overline{C}_A\right)' \hat{\gamma}^*}_{S} \tag{3}$$

Equation 3 accommodates the effect that different occupational distributions have on wage gaps. Q is the within-occupation human capital component. D is the unexplained component. The last term, S, representing differences in the occupational distribution weighted by a nondiscriminatory norm (hereafter $\hat{\gamma}_J$ or $\hat{\gamma}_A$), takes its place as the occupational segregation component.[7]

Although estimating the individual contributions of sets of dummy variables to the *unexplained* component of the wage gap may produce arbitrary results, since those depend on the dropped category, it is still true that the overall decomposition and estimated separate contributions of dummy variables to the *explained* component are consistent and invariant to any choice of the dropped category (Oaxaca and Ransom (1999)). This fact makes possible the isolation of the occupational distribution effect from the human capital component.

It has been noted that occupational segregation can be the result of labor market discrimination.[8] While labor market segregation can reflect barriers to entry into well-paying

[7] C in this study includes single-digit occupational and industrial dummies—to represent about 15 industries and 10 occupations. Although double-digit occupational and industrial dummies are available in the income surveys it is very difficult to make them comparable over the years—that is before and after 1995, when the occupational and industrial classifications were revised. The S component will, therefore, represent both the occupational and industrial segregation, but, for simplicity, will be referred to as the "occupational segregation" component.

[8] As noted by Neuman and Silber (1996) (p.651, n.3), occupational segregation represents another dimension of labor market discrimination. Segregation and barriers to entrance based solely on ethnic affiliation,

jobs, it can exist more neutrally as a manifestation of different preferences. I do not further decompose the occupational segregation component into self-selection and discrimination, and this should be viewed as a compound effect.

2.3 Selectivity

Self-selection into employment has been proved potentially to bias the wage regression coefficients (see Heckman (1979) for more details). A consistent estimation of wage regressions is needed to get consistent wage gap decomposition. Neuman and Oaxaca (2004a) introduced different methods for incorporating this correction into the Oaxaca decomposition. The authors suggest different selectivity-corrected decompositions; however, each of these yields different results, and their method does not help in choosing the 'correct' one, as acknowledged by the authors.[9]

Following Reimers (1983) I calculated the selectivity effect as a whole and the corrected gross wage gap, then decomposed this to a human capital component, an unexplained (or discriminatory) component, and an occupational and industrial segregation component. The

other things being equal, should be viewed as discriminatory.

Neumark (1988) expresses the same concern in other words:

> The question of whether industry or occupation dummy variables should be included in regressions to estimate wage discrimination hinges on the extent to which the distribution of men and women across industries and occupations is itself a result of discrimination. p. 291.

[9] "None of what has been presented here authoritatively identifies the 'correct' decomposition... The choice of which selectivity corrected decomposition to use is largely judgmental because it inevitably reflects value judgments about what constitutes labor market inequity." Neuman and Oaxaca (2004a), p. 8.

decomposition in equation 3 is generalized as follows:

$$G = \underbrace{\left(\bar{X}_J - \bar{X}_A\right)' \hat{\beta}^*}_{Q} + \underbrace{\left[\bar{Z}'_J \left(\hat{\delta}_J - \hat{\delta}^*\right) + \bar{Z}'_A \left(\hat{\delta}^* - \hat{\delta}_A\right)\right]}_{D} + \underbrace{\left(\overline{C}_J - \overline{C}_A\right)' \hat{\gamma}^*}_{S} + \underbrace{\left(\hat{\theta}_J \hat{\lambda}_J - \hat{\theta}_A \hat{\lambda}_A\right)}_{Selection} \quad (4)$$

where Q, D, and S are the familiar components as defined in the previous subsections. The last term measures the selectivity effect, where $\hat{\theta}$ is the coefficient of the Inverse Mills Ratio ($\hat{\lambda}$) in the modified wage equations. See Neuman and Oaxaca (2004a) for discussion of selectivity-corrected wage decomposition and the relevant terminology.

The selectivity corrected wage equations are estimated using the Heckman two-steps procedure.[10] The explanatory variables in the selection equation are: schooling, dummy variables for schooling categories, capturing the 'sheepskin effect,' such as high school dropouts, high school graduates, some college, college graduates, and beyond college education, age, age squared, marital status, and years since first marriage (with a zero value for unmarried).[11] This innovative variable, arguably, affects participants' decision to join the labor market, as more years since marriage may lower the reservation wage. The willingness to work increases at each wage level. That is, a greater number of years since first marriage, other things equal, may affect (increase) the probability of joining the labor market, without affecting the worker's wage.

[10] In the working version of this chapter, maximum likelihood estimation is used in addition to the Heckman two-steps procedure (Asali (2006)).

[11] Data for the years 1996–2003 include only an interval variable of year of marriage. For these periods I impute values for the variable 'years since first marriage,' using the midpoint of each interval.

3 Data

Data are drawn from the yearly income surveys conducted by the Central Bureau of Statistics in Israel for the years 1990–2003. Income surveys are based on questionnaires conducted at the household and individual levels and cover information on demographic, personal, and labor market characteristics. The samples include Jewish and non-Jewish respondents living exclusively in Israel—residents of the West Bank or the Gaza Strip are not included in the survey. Hence, all respondents in the income survey, both Arabs and Jews, are residents and citizens of Israel.

To identify whether the individual is an Arab or Jewish I use the "religion" variable from the income survey. This variable, however, is not detailed enough to identify individuals who are neither Arab nor Jewish (e.g., non-Arab Christians). In the years 1991–2000 the religion variable included two categories: Jews versus non-Jews (i.e., Arabs and "others"). In the years 2001–2004 the two categories identified by the religion variable were non-Arabs (i.e., Jews and "others") versus Arabs. "Others" might refer to non-Arab Christians, people with no religion classification, or people who simply did not report their religion. In either case this group is very small and is not likely to have any effect on the study results.[12]

[12]In the Labor Force surveys, where the "religion" variable is more accurate—it reports whether the individual is Jewish, Muslim, Christian, Druze, or "Other"—I found that, within the samples of employed men, "others" constituted about 0.1%–1.5% of the observations in each year of 1991–2004. Yet this is not a perfect identifier of non-Arab, non-Jewish individuals—as a "Christian" can be non-Arab. Nonetheless, Table 2.1, pp. 85–86, of the Statistical Abstract of Israel 2007, shows that "others"—in this case referring to people who are neither Arab nor Jewish—constituted about 1.5%–4.2% of the population in the years 1995–2004.

I limit the analysis to salaried, prime-aged (25–65), male workers.[13] Worker's hourly wage is calculated by dividing monthly income by the product of hours worked per week and working weeks per month. I deal with outliers, in terms of hourly wage, by dropping observations below the 1st and above the 99th percentile of the log hourly wage distribution for each year. This procedure is more robust and meaningful than dropping observations on a given (New Israeli Shekel, NIS) cutoff point, since the analyses involve different years over which the currency value is not comparable. Moreover, this procedure circumvents the problem of an a priori imposed NIS cutoff point by accommodating changes in the wage distribution over period years (Chandra (2000)).

Israel remains an immigrant society in the sense that incomers constitute a large portion of its population. To take into consideration this fact's potential effect on the results, therefore, in subsequent analyses I control for the period of immigration—which is an important determinant of wages due to assimilation effects.[14] Finally, it is important to emphasize that sampling weights provided in the data are always used in the analyses, unless otherwise is clearly stated. Using sample weights is not only useful for the within-year analyses, but it makes inference based on different cross sections (years) more comparable.[15]

[13] Data on income from self-employment are available only for recent years, and only partially; thus, the main income variable used in the study is the income from salaried work.

[14] In the working version of this study I deal with the issue of immigration by excluding recent arrivals from the analyses (Asali (2006)). While not a perfect approach, it is still insightful and suggestive, and I will allude to its potential and actual results in subsequent analyses.

[15] This is especially true for 1995, when the income survey was extended to include Arabs in smaller urban localities (with 2,000–10,000 inhabitants). And for 1997, when the income survey size was doubled thanks to using the "Survey of Family Expenditures" as another source of income data. Sample weights, provided in the data by the CBS, accommodate these changes and make the data years more comparable.

4 Results

Table 1 reports the averages of the relevant variables in the working samples, for each investigated year. Sample weights are used to calculate variable averages in the table. As mentioned before, I restrict the samples to employed men aged 25–65. The table reports the average hourly wage, in New Israeli Shekels (NIS) of 2000. The hourly wage gap was increasing in the 1990s to record a maximum of 64% in 1999. The gross gap started then declining until the end of the period, but remained above its starting level, by about 8%.

It is clear from the table that Jewish workers are highly educated, as compared to their Arab counterparts. The difference in average schooling was about 3 schooling years in the beginning of the period, but converged to less than 2.5 years by the end of the period.

Table 1: Sample Means by Ethnic Group

	% Employment		Income		Schooling		Age		% Married		Hours Worked	
Year	Arab	Jew	Arab	Jew	Arab	Jew	Arab	Jew	Arab	Jew	Arab	Jew
1991	59.4	65.8	26.0	35.1	9.6	12.7	35.4	41.1	80.3	88.3	44.6	46.6
1992	61.0	65.2	26.7	37.1	9.7	12.7	37.7	41.6	87.5	89.5	45.2	47.1
1993	53.5	67.0	24.7	34.6	10.0	12.9	35.6	41.2	87.4	88.4	45.3	47.2
1994	58.5	67.1	26.8	36.0	10.6	13.1	36.2	41.1	86.3	87.4	45.3	47.5
1995	63.2	69.4	29.0	40.4	10.4	13.2	36.8	41.1	85.9	86.1	44.5	48.0
1996	63.6	67.5	26.3	38.2	10.5	13.2	36.8	41.1	82.2	85.2	45.6	47.7
1997	60.8	65.3	27.5	40.5	10.7	13.4	36.9	41.1	85.9	85.9	45.8	47.9
1998	61.2	63.3	28.2	42.5	11.0	13.6	36.9	41.1	87.0	86.1	45.2	47.6
1999	61.4	67.6	26.5	43.4	11.1	13.7	36.7	41.2	84.7	86.1	45.6	47.9
2000	59.6	67.7	28.2	44.6	11.4	13.6	36.6	41.0	84.2	84.2	46.6	48.1
2001	57.0	65.4	31.5	47.3	11.8	13.8	36.7	41.1	85.0	85.0	46.1	47.8
2002	51.7	64.7	30.9	44.9	11.4	13.8	36.5	41.1	84.3	83.5	44.5	47.3
2003	51.7	65.2	30.4	43.6	11.5	13.8	36.5	40.9	82.6	82.0	44.6	47.1

NOTE.— *Employment* is approximated by the portion of workers with positive income, in the income survey samples. The sample includes salaried (with positive income), prime-aged (25–65), male workers. *Income* is the real hourly-wage, in NIS of 2000. *Married* is non-single, i.e., currently, or was ever, married. Reported results are weighted using sample weights in the data.

Jewish workers are older and more experienced than Arab workers, but the difference in average age converged from 5.5 years in the beginning of the period to about 4.5 years by 2003. Percentage of ever-married Jewish workers was higher in the beginning of the period, to converge to that of Arabs by the end of the period. As to weekly working hours, those were about 2 hours higher for Jewish workers, and the difference was stable over the study period.

Tables 2–6 document the main findings of the study. They present the overall wage gap decompositions, according to the techniques discussed earlier, and under different assumptions. All the estimates in those tables are significant at the 5% significance level.[16]

Table 2 reports results from the benchmark wage gap decomposition. The gross wage gap $(\ln(W_J) - \ln(W_A))$ is decomposed into a human capital component, Q, and an unexplained component, D. The variables included in the underlying regressions are found in the notes to the table, and main coefficients of these regressions are found in Table 7 and Table 8. The increasing wage gap of the 1990s, and the peak at 1999, are clear from this table as well.

The explanatory power of human capital differences, when using the Arab wage structure as the nondiscriminatory norm, was declining from 1994 (80% of the gross gap) to 2000 (40%), to increase up to 60% in 2003. In contrast, human capital differences explained only about 28% of the gross gap, when Jewish wage structure is used as the nondiscriminatory norm. This result is not surprising, given the fact that we include the period of immigra-

[16] Basic wage regressions, on which Tables 2 and 3 are based, are reported in the appendix to this chapter, in Tables 7, 8, 9, and 10.

tion to Israel as an explanatory variable in the wage equations. First, all Arabs are born in Israel—so, for them, all the dummies of different periods of immigration will be zero. Second, it is a well-documented fact that immigrants, at different stages of the assimilation period, get lower wages than natives. These two facts combined mean that the human capital component in the wage gap will be lower when we use the Jewish wage structure (with negative coefficients for immigration periods) rather than the Arab wage structure (with zero immigration coefficients) as the nondiscriminatory norm.[17]

The table also suggests that the unexplained part of the wage gap was increasing in the 1990s, and its portion from the total gap was large and increasing as well (for example 80% of the gross gap when β_J is used, and increasing from 20% to 60% when β_A is used). Figure 2, based on the above table, shows these results clearly.

Figure 3 is the mirror image of the previous figure (Figure 2). This figures makes it clear that the contribution of the human capital component to the wage gap, in absolute terms, is relatively stable over the whole period. Also, the figure shows this to be true regardless of the nondiscriminatory norm assumed (β_J or β_A).

Table 3 reports results of the wage gap decomposition, accounting for the occupational

[17] One specification in the working version of this chapter excludes immigrants arriving in the last twenty years altogether from the analyses. The estimation from this "reduced sample" lends support to the argument brought here in that wage gaps are immensely higher in the reduced sample than in the full sample (Asali (2006)). Levanon and Raviv (2007) also find that the wage gap between Jewish workers and each of Christian, Muslim, or Druze Arab workers is higher when "new immigrants" are excluded from the sample (ibid. Table 4). Moreover, I found that, if we do not control for the immigration period in the wage equations, Q and D estimated for the Arab and Jewish wage structures are very similar.

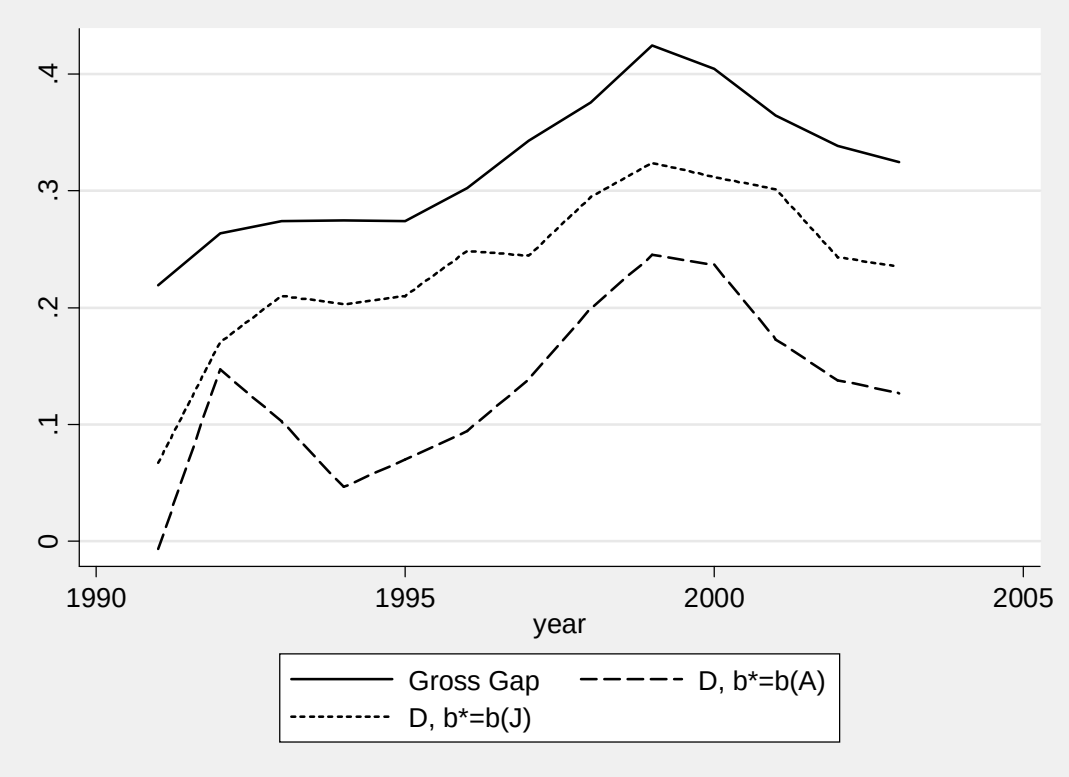

Figure 2: Gross Wage Gap and Unexplained Gap ($\beta^* = \beta_J, \beta_A$)

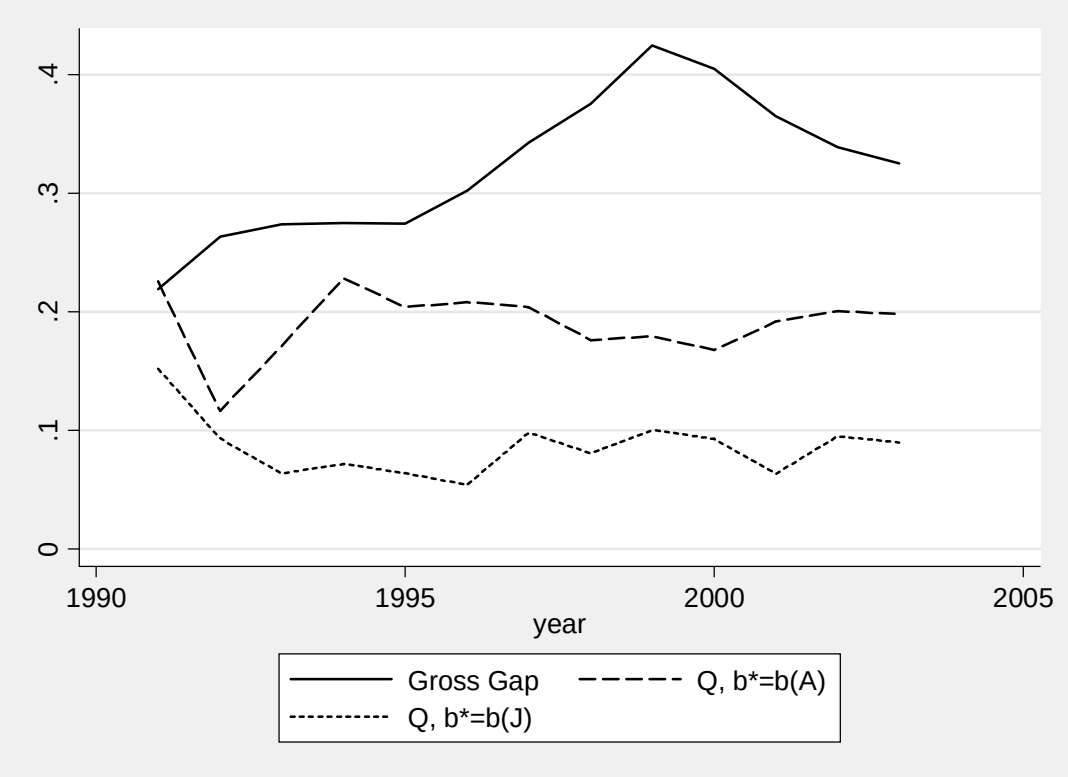

Figure 3: Gross Wage Gap and the Human Capital Component (Q), $\beta^* = \beta_J, \beta_A$

segregation component.[18] Occupational segregation refers to different distributions of Arab and Jewish workers over occupations and industries, nominally evaluated using the nondiscriminatory norm.

Occupational segregation, as evident from Table 3, absorbs on average more than 60% (75%) of the estimated human capital component of the wage gap, when $\hat{\beta}_A$ ($\hat{\beta}_J$) is used as the nondiscriminatory norm. Occupational segregation contributed a great deal to the wage gap. Using the Jewish wage structure, this was estimated at about 35% of the total gap for most of the time—at least after 1993. Using the Arab wage structure, however, the contribution of occupational segregation was not stable; this was declining from 1994 to 1998 and increasing thereafter. Nonetheless, on average, it explained about 37% of the total wage gap.

If Jewish workers are concentrated in high-premia jobs and Arab workers face barriers to entry to these jobs then, when controlling for occupational and industrial affiliation, the unexplained gap should decrease more when the Jewish wage structure (β_J) is used rather than the Arab wage structure. This is especially true if the returns to human capital characteristics, within occupation and industry groups, are higher for Jewish workers—a fact which is supported by comparing wage regression coefficients from Tables 9 and 10. The verifiable implication of this assumption is confirmed in Figures 4 and 5, where, controlling

[18]The gross gap is ought to be identical to that from Table 2; the slight differences, however, are due to the fact that information about occupational and industrial affiliation is not always available for all workers, resulting in a slightly smaller sample than before.

Table 2: Basic Wage Gap Decomposition

		$\beta^* = \beta_A$		$\beta^* = \beta_J$	
Year	Gross Gap	Q	D	Q	D
1991	0.2190	0.2257	-0.0067	0.1519	0.0671
1992	0.2634	0.1165	0.1470	0.0933	0.1702
1993	0.2739	0.1713	0.1026	0.0638	0.2101
1994	0.2747	0.2282	0.0465	0.0718	0.2029
1995	0.2740	0.2040	0.0700	0.0640	0.2100
1996	0.3023	0.2081	0.0943	0.0540	0.2484
1997	0.3427	0.2039	0.1388	0.0982	0.2445
1998	0.3754	0.1762	0.1992	0.0808	0.2946
1999	0.4242	0.1793	0.2450	0.1003	0.3239
2000	0.4047	0.1679	0.2367	0.0928	0.3119
2001	0.3647	0.1918	0.1728	0.0634	0.3013
2002	0.3385	0.2006	0.1379	0.0951	0.2433
2003	0.3248	0.1979	0.1268	0.0898	0.2349

NOTE.— Gross gap refers to $ln(1+G)$ (or $lnW_J - lnW_A$), Q refers to the human capital component of the wage gap, D refers to the unexplained component of the wage gap. Results are based on wage equations which include as regressors: schooling, experience, experience squared, marital status, and period of immigration.

Table 3: Extended Wage Gap Decomposition

		$\beta^* = \beta_A$			$\beta^* = \beta_J$		
Year	Gross Gap	Q	D	S	Q	D	S
1991	0.2188	0.0893	0.0390	0.0904	0.0775	0.0089	0.1323
1992	0.2609	0.0346	0.1220	0.1043	0.0311	0.0993	0.1305
1993	0.2754	0.0756	0.0927	0.1072	-0.0022	0.1679	0.1097
1994	0.2735	0.0189	0.0542	0.2004	0.0190	0.1410	0.1136
1995	0.2734	0.0973	0.0517	0.1243	-0.0148	0.1781	0.1100
1996	0.3008	0.0773	0.0837	0.1397	-0.0062	0.2068	0.1002
1997	0.3399	0.0649	0.1460	0.1290	0.0352	0.1968	0.1079
1998	0.3753	0.0972	0.2258	0.0523	0.0220	0.2339	0.1193
1999	0.4243	0.0929	0.2138	0.1176	0.0434	0.2448	0.1362
2000	0.4048	0.0537	0.2140	0.1372	0.0481	0.2207	0.1361
2001	0.3524	0.0406	0.1923	0.1195	0.0158	0.2295	0.1071
2002	0.3356	0.0909	0.1314	0.1133	0.0302	0.1809	0.1245
2003	0.3196	0.1140	0.1240	0.0816	0.0243	0.1826	0.1127

NOTE.— Gross gap refers to $ln(1+G)$ (or $lnW_J - lnW_A$), Q refers to the human capital component of the wage gap, D refers to the unexplained component, and S refers to the occupational and industrial Segregation component. Results are based on wage equations which include as regressors: schooling, experience, experience squared, marital status, period of immigration, occupation fixed effects, and industry fixed effects. Figures of "gross gap" are slightly different from previous tables, because we lose observations for which there is no information about occupational or industrial affiliation.

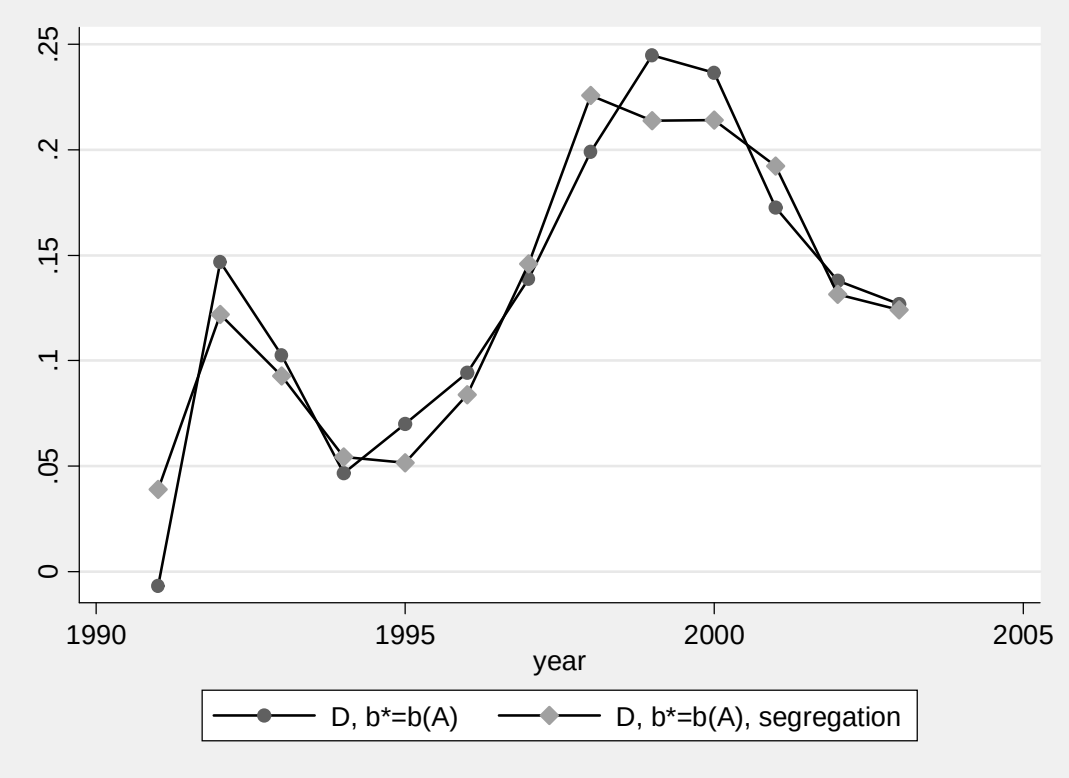

Figure 4: Unexplained Wage Gap, With and Without Occupations, $\beta^* = \beta^A$

for occupation and industry, the unexplained gap is virtually unchanged when β_A is used, but is diminished when β_J is used instead. (These figures are based on Tables 2 and 3.)

The unexplained wage gap might be an underestimate of the labor market discrimination. This is true in so far as occupational segregation, a component which explains about a third of the total gap, may well represent a form of labor market discrimination, manifested in barriers to entry for higher-paying professions.

Over the study period we observe a slow but steady convergence in some of the important productivity-related variables, such as schooling, age, experience, and marital status. The

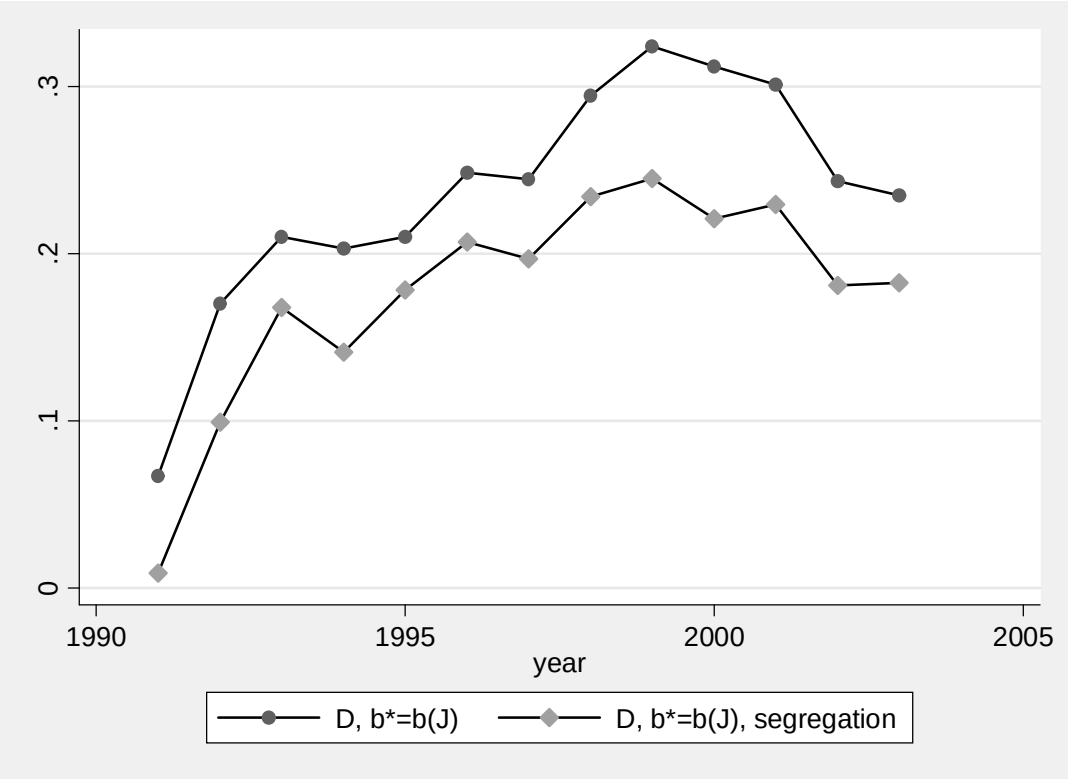

Figure 5: Unexplained Wage Gap, With and Without Occupations, $\beta^* = \beta^J$

schooling gap between the groups declined from 3.1 in 1991 to 2.3 in 2003; the difference in the average age of the workers declined from 5.5 in 1991 to 4.5 in 2003; and the difference in the marriage rate among workers declined from 8% (with a greater portion of Jews married) to -0.6% (with a greater portion of Arabs married). This convergence did not lead, however, to a steady and clear decline of Q, the human capital component of the wage gap. This is possible due to the nature of the year-to-year comparisons that we outline, where the change in a specific component of the gap is not predictive since the gross change is composed of "price" (coefficients) and "quantity" changes in observable and unobservable characteristics (Juhn *et al.* (1993)).

Singling out the part of the wage gap explained by schooling and experience, Table 4 reports the portion of the gross gap contributed by these two human capital components. Although the human capital component, as a whole, explains an unsteady, and not always large, portion of the wage gap, especially under the "civil rights" experiment ($\beta^* = \beta_J$),[19] Table 4 shows that eliminating schooling and experience differences alone can eliminate a great part of the total wage gap. Under the "enrichment experiment" this can be eliminating the whole gap in 1991, 76% of it in 1995, 44% in 1999, and 58% in 2003. Very close figures, albeit a slightly smaller, are attained under the "civil rights experiment," namely 98% of the gross gap in 1991, 69% in 1995, 46% in 1999, and 54% in 2003.[20]

[19] In the specification that controls for occupational segregation, the human capital component, Q, explains about 0%–10% of the gross wage gap, G, when β_J is used, and 10%–30% of G when β_A is used.

[20] Table 4 is based on wage equations *without* occupation and industry fixed effects. A similar table, but controlling for occupation and industry, is found in the appendix to this chapter (Table 11).

Table 4: Contribution of Schooling and Experience to the Wage Gap

	1991		1995		1999		2003	
G	0.2190	100%	0.2740	100%	0.4242	100%	0.3248	100%
$\beta^* = \beta_A$:								
Schooling	0.1916		0.1926		0.1663		0.1639	
Experience	0.0361		0.0160		0.0215		0.0243	
Total	0.2277	104.0%	0.2086	76.1%	0.1878	44.3%	0.1882	57.9%
$\beta^* = \beta_J$:								
Schooling	0.1863		0.1753		0.1853		0.1676	
Experience	0.0279		0.0140		0.0102		0.0061	
Total	0.2142	97.8%	0.1893	69.1%	0.1955	46.1%	0.1737	53.5%

NOTE.— Results are based on wage equations without occupation and industry fixed effects. G is the gross wage gap. "Schooling" and "experience" signify the wage gap contributed by Jewish-Arab differences in these variables.

The table reveals a striking fact. Just bridging the Jewish-Arab schooling gap can eliminate more than 50% of the observed wage gap. Closing the experience gap only adds to this figure. These are straightforward policy tools—through providing and enhancing employment and schooling opportunities—which can be implemented immediately and have a direct and observable effect. Notwithstanding, a large portion (20%–60% when $\beta^* = \beta_A$, and 50%–70% when $\beta^* = \beta_J$) of the gross wage gap is still unexplained neither by human capital differences, nor by occupational segregation. Assuming that any unobservable wage-relevant variables vary only to a negligible degree between consecutive years, then we would be bound to attribute any change in the unexplained wage gap between years to labor market discrimination. The fact that during the years of converging characteristics the wage gap was *increasing,* and vice versa, supports this claim.

Table 5: Basic Selectivity-Corrected Wage Gap Decomposition

		$\beta^* = \beta_A$		$\beta^* = \beta_J$		
Year	Gross Gap	Q	D	Q	D	Selection
1991	0.2190	0.232	0.225	0.156	0.301	-0.238
1992	0.2634	0.127	0.413	0.105	0.434	-0.276
1993	0.2739	0.167	0.533	0.046	0.654	-0.426
1994	0.2747	0.216	0.677	0.056	0.836	-0.618
1995	0.274	0.189	0.339	0.049	0.479	-0.254
1996	0.3023	0.214	1.009	0.030	1.193	-0.921
1997	0.3427	0.219	0.874	0.099	0.994	-0.750
1998	0.3754	0.214	1.162	0.073	1.303	-1.001
1999	0.4242	0.183	0.695	0.084	0.794	-0.454
2000	0.4047	0.161	0.220	0.090	0.290	0.024
2001	0.3647	0.196	0.742	0.051	0.887	-0.573
2002	0.3385	0.259	0.735	0.088	0.905	-0.655
2003	0.3248	0.196	-0.051	0.079	0.065	0.181

NOTE.— Gross gap refers to $ln(1+G)$ (or $lnW_J - lnW_A$), Q refers to the human capital component of the wage gap, D refers to the unexplained component of the wage gap. Selection refers to the term $\hat{\theta}_J\hat{\lambda}_J - \hat{\theta}_A\hat{\lambda}_A$, estimating the component of the wage gap attributed to self-selection into employment; see text for details. Results are based on wage equations which include as regressors: schooling, experience, experience squared, marital status, period of immigration, and the Inverse Mills Ratio. Selection is estimated using the two-steps Heckman procedure, where the selection equation includes schooling, high school dropout, high school graduate, some college, college graduate, beyond college education, age, squared age, immigration period, marital status, and years since first marriage.

4.1 Selectivity Corrected Wage Gap Decomposition

Table 5 reports selectivity-corrected decomposition results. The decomposition is performed according to equation (4), where the selection equation includes, among other wage-related variables, dummies for high-school dropout, high-school graduate, some college, college graduate, after college schooling; age, age squared, and the number of years since the first marriage (zero for never married).

The Heckman selection procedure depends on the functional form assumed, and the identification variables for labor market participation. Therefore, the evidence presented

Table 6: Extended Selectivity-Corrected Wage Gap Decomposition

		$\beta^* = \beta_A$			$\beta^* = \beta_J$			
Year	Gross Gap	Q	D	S	Q	D	S	Selection
1991	0.2188	0.114	0.036	0.085	0.084	0.035	0.116	-0.016
1992	0.2609	0.042	0.232	0.110	0.039	0.215	0.129	-0.123
1993	0.2754	0.080	0.316	0.096	-0.014	0.419	0.087	-0.216
1994	0.2735	-0.001	0.240	0.185	0.003	0.321	0.100	-0.151
1995	0.2734	0.078	0.250	0.126	-0.028	0.384	0.098	-0.181
1996	0.3008	0.083	0.481	0.105	-0.021	0.612	0.078	-0.368
1997	0.3399	0.070	0.397	0.132	0.037	0.451	0.112	-0.259
1998	0.3753	0.081	0.428	0.076	0.020	0.447	0.117	-0.210
1999	0.4243	0.094	0.390	0.122	0.030	0.448	0.129	-0.182
2000	0.4048	0.047	0.152	0.126	0.043	0.143	0.140	0.080
2001	0.3524	0.037	0.340	0.117	0.018	0.369	0.107	-0.142
2002	0.3356	0.111	0.230	0.120	0.024	0.310	0.126	-0.125
2003	0.3196	0.125	0.018	0.079	0.016	0.101	0.105	0.098

NOTE.— Gross gap refers to $ln(1+G)$ (or $lnW_J - lnW_A$), Q refers to the human capital component of the wage gap, D refers to the unexplained component of the wage gap, and S refers to occupational and industrial Segregation. Selection refers to the term $\hat{\theta}_J\hat{\lambda}_J - \hat{\theta}_A\hat{\lambda}_A$, estimating the component of the wage gap attributed to self-selection into employment; see text for details. Results are based on wage equations which include as regressors: schooling, experience, experience squared, marital status, period of immigration, occupation fixed effects, industry fixed effects, and the Inverse Mills Ratio. Selection is estimated using the two-steps Heckman procedure, where the selection equation includes schooling, high school dropout, high school graduate, some college, college graduate, beyond college education, age, squared age, immigration period, marital status, and years since first marriage.

here shall be taken as suggestive and by no means authoritative. That said, the table shows a generally negative selection component. A negative 'selectivity effect' suggests that Arabs are more positively, or less negatively, selected into the labor market than Jews. Thus, accounting for the selectivity effect, if negative, will yield higher unexplained wage gaps—which is also evident from the table below. Table 6 shows similar evidence, when reporting the occupational segregation component.

The tables show, in general, that Arabs are positively self-selected into employment, or at least to a greater tune than their Jewish counterparts. Therefore, for the same human capital and occupational distribution differences—whose effects are very similar to those

derived earlier, without selectivity correction—a higher portion of the wage gap will be unexplained. This may suggest that the uncorrected wage decomposition might underestimate the unexplained, or discriminatory, wage gap.

Unlike the volatile selection measures from Table 5, Table 6 shows that the *change* in the selection of workforce does not seem likely to be a major concern in measuring the gaps. The Arab-Jewish ratio of observable human capital components was stable, and at times converging, in the study period (see Table 1). This also shows that there are no major changes in the selection of workforce. The Arab-Jewish ratio in the variable "years since first marriage," for married workers, ranged between 0.8–0.9 with a slightly downward sloping trend (see Figure 6). Along this dimension, the Arab positive self-selection seems to be very slightly increasing.

4.2 Quality of Schooling

In previous analyses I assumed that human capital variables are comparable. Schooling is an important example where this may not be the case. That is, given the segregated schooling system in Israel—each of Arabs and Jews have their own schools, despite all being bound to the Ministry of Education—it may be persuasively claimed that the quality of schooling is better in the well-endowed Jewish sector.

Since, in the income datasets at hand, there is no information about the type of schools attended or school quality I address this concern by restricting my samples to individuals

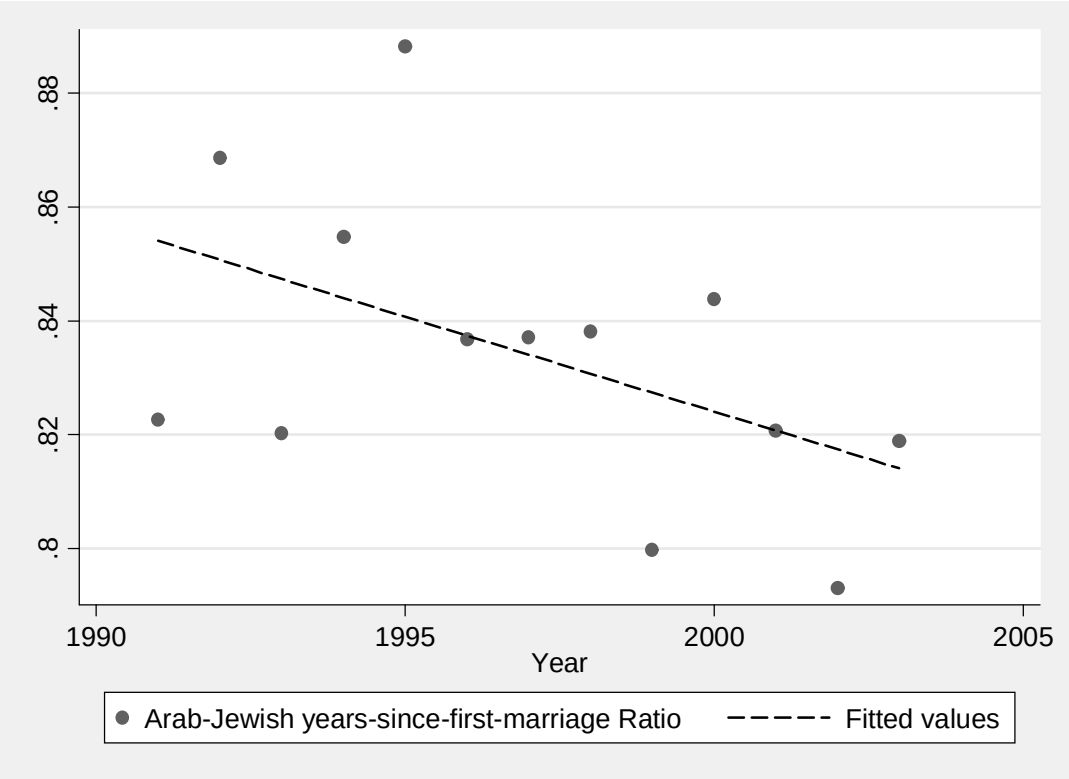

Figure 6: Arab-Jewish years-since-first-marriage Ratio, Married Workers

with some college education or above (and, alternatively, with college degree or above). The notion behind this exercise is simple. If school quality is lower in the Arab sector, then any wage gap between Jewish and Arab workers with the same years of schooling will be mistakenly attributed to labor market discrimination (or unexplained gap), other things being equal. This means that the unexplained gap (D) will be *overestimated*. If that is true, then once we restrict the sample to some college/college graduates or above—where the higher schooling system is identical, as Arabs and Jews attend the very same universities and colleges—the portion of the unexplained gap from the total wage gap should be lower than that in the unrestricted sample.

I find no evidence of the sort. In fact, I find that, in the highly educated restricted sample, the portion of the unexplained gap from the total gap is *higher* than that from the unrestricted sample, almost in each year. This is true whether the Arab or the Jewish wage structure is used as the nondiscriminatory wage norm (i.e., whether $\beta^* = \beta_A$ or $\beta^* = \beta_J$); also it is true whether the sample is restricted to 13 years of schooling and above or to 15 years of schooling (college degree) or above. Figure 7 shows the results for the different samples and using $\beta^* = \beta_A$. This preliminary evidence suggests that the quality of schooling is not at stake, and therefore my previous decompositions are robust to this concern.[21]

The above illustration does not imply that early-age gaps, in school quality and other

[21] In the working version of this study I also show evidence that the unexplained wage gap increased with education (Asali (2006)). Levanon and Raviv (2007) also show that the unexplained gap increases with education—for all religions in Israel—regardless of occupational controls.

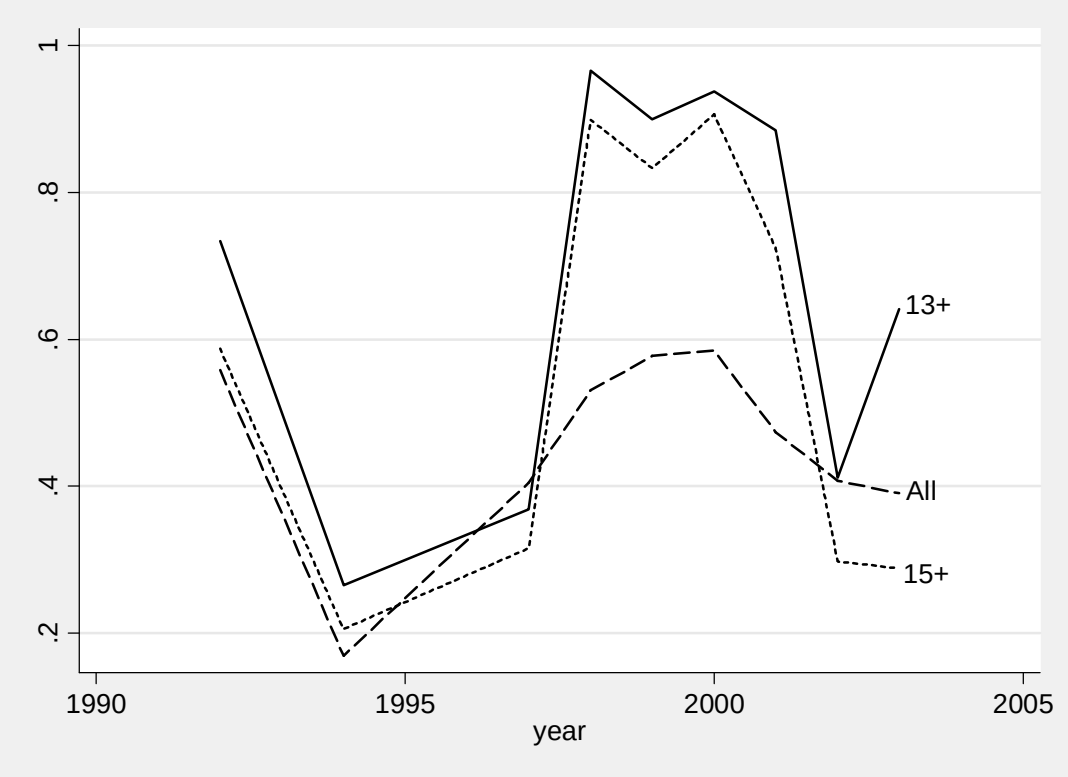

Figure 7: Portion of the Unexplained Gap from the Gross Gap, by Years of Schooling. $\beta^* = \beta_A$

skills, are not carried into the future. In fact, ample evidence in the literature shows that gaps at early ages are not only carried into the labor market but are even exacerbated in the future (Carneiro *et al.* (2005)). Neither does this exercise imply that college graduates are perfectly homogenous. Rather, in limiting the sample to workers who attend the very same educational institution, and thus experience literally the same school quality, this exercise shows that the unexplained wage gap—which potentially may be the result of unmeasured human capital differences such as school quality—is not decreased. This result, while not eliminating the concern about the effect of school quality, suggests that school quality is not likely to be the major factor driving the gaps, and thus is not a major concern in measuring and decomposing these gaps.

4.3 Wage Distribution

It is interesting to know who was driving the increase in the wage gap during the 1990s. Is it skilled Jewish workers (i.e., at the top of the wage distribution) who gain more, or unskilled Arab workers at the bottom of the distribution who lose more. Figure 8 tells a striking story. The figure plots the change in the average log real wage (which is approximated by the percentage change in real wage) between the years 1991 and 1999, by percentile. The positive slope of the data points means that the inequality *within* group has increased during this period: real wages of higher income individuals increased more than individuals at the bottom of the distribution.

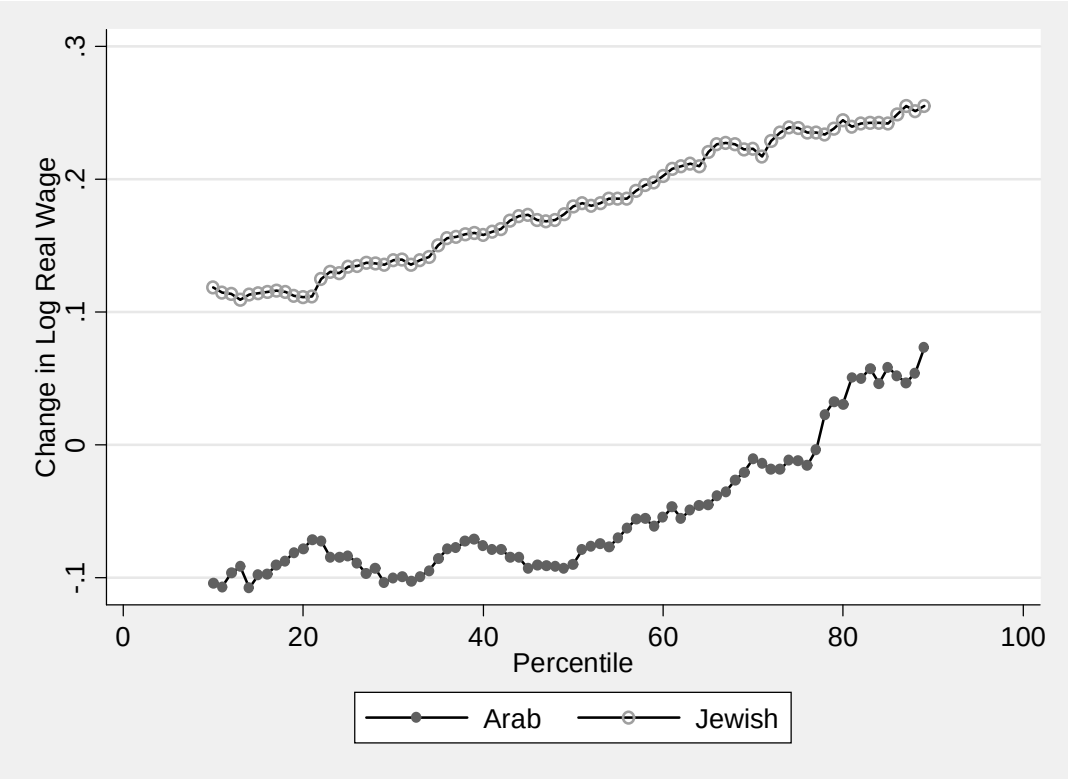

Figure 8: Change in Log Real Wage by Percentile, 1991–1999

The striking fact about the figure, beside that at each percentile in the distribution, the Jewish wages increase by a higher percentage than the Arab wages, is that about 80% of the Arab workers have a *lower* wage in 1999 than in 1991. The previously shown increase in the wage gap is actually experienced by individuals from the whole distribution.

The fastest growing industry in Israel, after 1995, was the high-tech industry. Since almost all of the high-tech firms in Israel are Jewish owned, it is unlikely that Arabs benefit from this boom (Levanon and Raviv (2007)). Therefore, what may have been happening in Israel in the late 1990s can be described as "skill-biased technical change." However, it seems that Arabs missed the opportunity, mainly due to barriers to entry to these firms which were fiercely pushing the economy ahead. Figure 9 shows that highly educated Jews benefited more than the low educated Jews, and higher skill workers (higher in the distribution) gained more than low-skilled ones.

There are not enough highly-educated Arab observations in the sample in 1991 to draw statistical inference. However, using all available data, Figure 10 shows that, while about 80% of the Arab workers experienced a loss in wages, the skilled ones benefited more (or were harmed less). The striking result in the graph is that highly educated Arabs not only did not benefit from the technological boom of the 1990s as their Jewish counterparts, but were harmed even more than the low-educated Arabs. This is suggestive as to the effect of the high-tech boom of the 1990s. Arabs being excluded from the lucrative top jobs, Jewish workers—concentrated in those jobs—were the ones to reap the fruits of the boom.

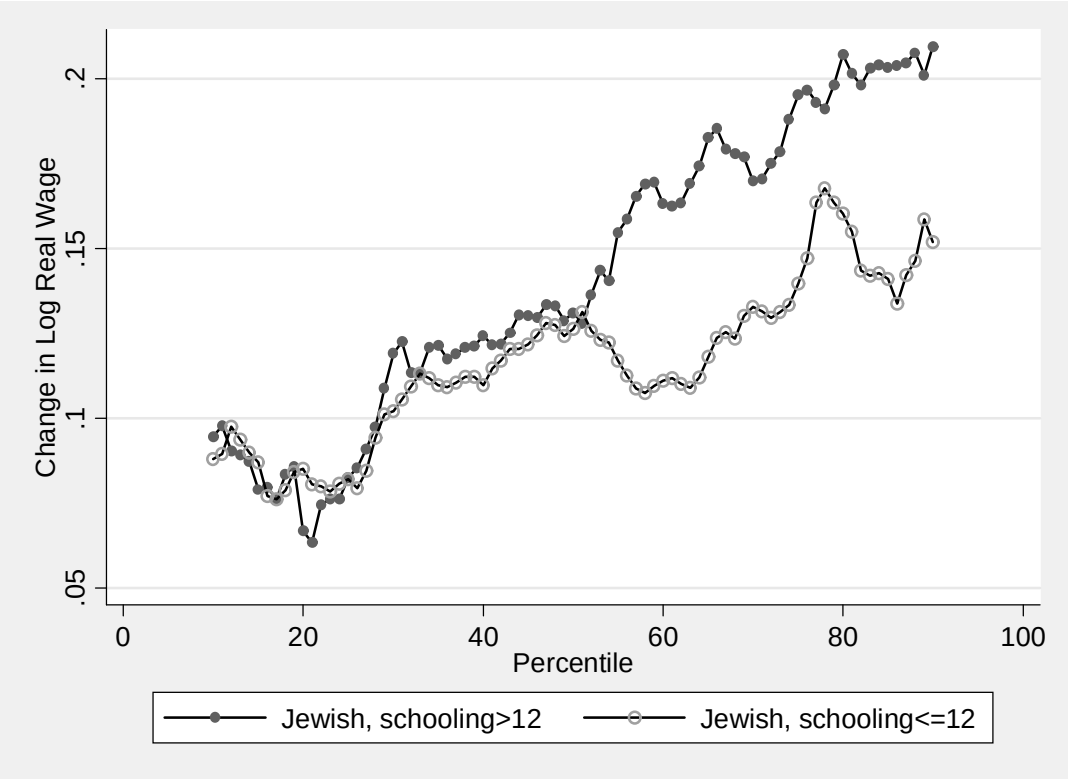

Figure 9: Change in Log Real Wage by Percentile and Education, Jews, 1991–1999

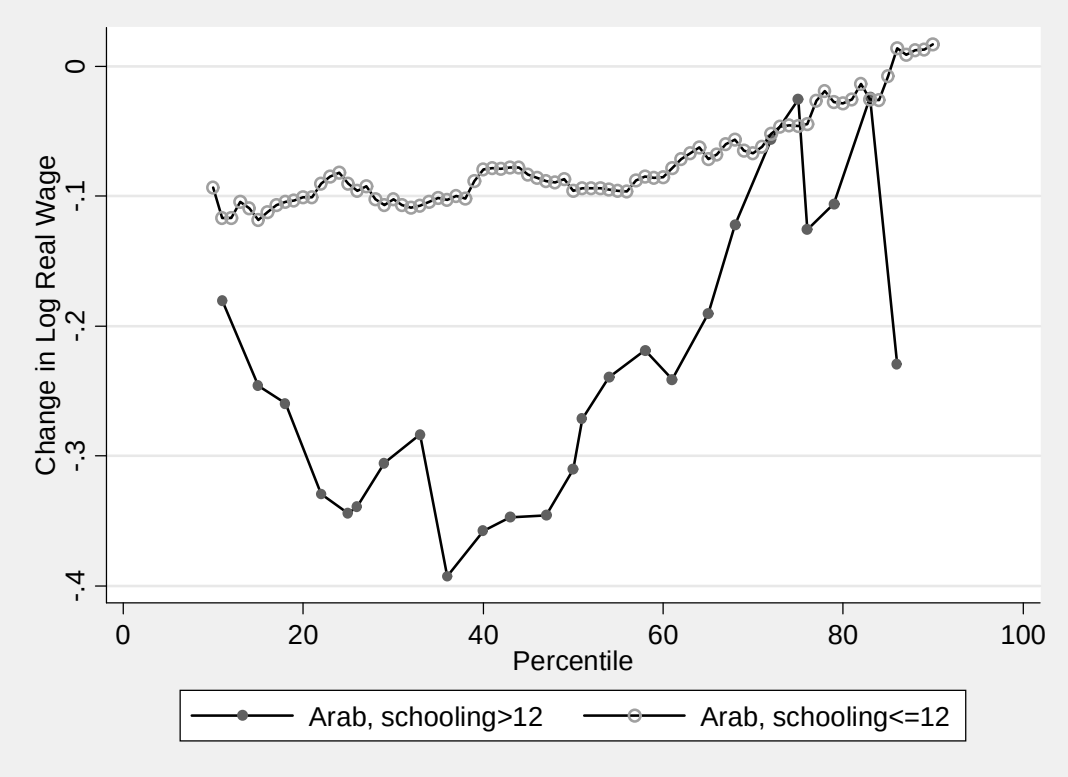

Figure 10: Change in Log Real Wage by Percentile and Education, Arabs, 1991–1999

5 Concluding Remarks

This study measures and documents the Jewish-Arab wage differential, and its evolution, in the Israeli labor market in the years 1991–2003. Many reasons can be adduced in explanation of wage differentials in the labor market. More so for Israel whose economy is subject to so great a variety of pressures. Israel has experienced rapid and large-scale changes in the composition of its workforce over the 1990s. The large influx of foreign workers, the Oslo peace process, massive inward migration, and the breakout of the second Intifada, while events in the political sphere, have all had their impact on the country's economy, precipitating shifts in the wage gap and its constituent parts as analyzed. This study sought to illuminate this gap in terms of productivity-related differentials, on the one hand, and labor market segregation and, possibly, discrimination, on the other.

That the Jewish-Arab wage gap reached an alarming pitch is beyond question. It is likewise impossible to maintain anything other than that the immense *observed* labor market wage gap is an indication of the existence of some labor market friction or failure (whether segregation, disintegration, or discrimination). The appropriate way to measure this discrimination is, however, a matter of controversy. In this study, I used standard decomposition methods, with occupational distribution and selectivity correction introduced, to measure the human capital, occupational segregation, and a residual component that may reflect labor market discrimination.

I find that the Jewish-Arab hourly wage gap hovered at around 40% (of Arab hourly

wage) in the years 1991–1994, peaking at 64% in 1999. Since then the hourly wage gap has decreased, falling to 43% by the end of 2003. The unexplained component of the gap, resulting from different returns to human capital ingredients, accounted for 10%–20% of the overall wage gap in the beginning of the period but increased vastly during the late 1990s to explain more than 60% of the gap. Occupational segregation explained 30%–40% of the overall wage gap over the entire period. The sum of the occupational segregation component and the unexplained component explains most of the observed gap, however it is difficult to discern the part of this sum which obtains due to pure labor market discrimination.

One main policy implication is that bridging the schooling gap can eliminate about one- to two-thirds of the wage gap—despite the "human capital" component being smaller than that in some cases; this is because there are other factors in the human capital which have negative effect on the wage, such as being unmarried, new immigrant, and the like which reduces the share of this component as a whole. Moreover, breaching barriers to entry—which can also be related to the schooling gap—to different lucrative industries can eliminate more than third of the total wage gap. This is also about breaking the vicious circle, where Arabs choose to underinvest in education as long as they are not allowed into high-paying, skilled jobs.

Arabs are found to be more positively, or less negatively, selected into employment. This finding implies that the estimate of the unexplained gap is understated. In other words, had there been no Arab positive selection, the *observed* wage gap would have been higher.

Moreover, the study shows that there are large fluctuations in the wage gap. Because sudden changes in the wage gap are not likely to result from sudden changes in the underlying characteristics of the populations, and in fact many of the key (observable) characteristics were converging in the study period, this result suggests that a large part of the levels and changes in the wage gap are likely to be due to labor market discrimination.

A A Note on the Gross Wage Gap G

Note that, since G values in this study are very large (can reach 0.42), the approximation used in the discrimination literature, namely, that $\ln(1+G) = G$, is not very accurate in this case. Also, note that, since G is defined as $G = \overline{\ln W_J} - \overline{\ln W_A}$, it is representing the *geometric* wage differential, and not the simple arithmetic one—to which I allude when describing the observable wage gaps; since, $\overline{\ln W_J} - \overline{\ln W_A} = \ln\left(\prod_{i=1}^{N_J} W_{Ji}\right)^{1/N_J} - \ln\left(\prod_{i=1}^{N_A} W_{Ai}\right)^{1/N_A} = \ln\left(\widetilde{W_J}\right) - \ln\left(\widetilde{W_A}\right) = \ln(1+g) \approx g$, where $\tilde{W}$ is the geometric average of hourly wage, and g is the geometric wage gap.

For example, take the year 2003. In this year the average hourly wage for Jews and Arabs is $\bar{W}_J = 43.6$ and $\bar{W}_A = 30.4$. Therefore, the wage gap is 43.4% ($43.6/30.4 - 1 = 0.434$). The corresponding geometric average hourly wage is $\tilde{W}_J = 36.6$ and $\tilde{W}_A = 26.4$, therefore the geometric wage gap (g) is 38.6%. Tables in the main text show that $G = 0.3248$, which is way below $g = .386$. (Or $\tilde{g} = \exp(.3248) - 1 = 0.384$).

B Underlying Wage Regressions

Table 7: Basic Wage Regressions, Arab Workers

Variable	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Schooling	0.061	0.038	0.054	0.081	0.070	0.067	0.072	0.062	0.064	0.071	0.084	0.078	0.069
	(.0011)	(.0014)	(.0013)	(.0013)	(.0008)	(.0008)	(.0006)	(.0008)	(.0007)	(.0008)	(.0008)	(.0008)	(.0007)
Experience	0.044	0.048	0.050	0.035	0.009	0.018	0.015	0.037	0.018	0.009	0.018	0.011	0.013
	(.0013)	(.0018)	(.0019)	(.0018)	(.0011)	(.0010)	(.0007)	(.0009)	(.0009)	(.0011)	(.0011)	(.0011)	(.0011)
Exp^2 ($\times 100$)	$-.056$	$-.067$	$-.070$	$-.044$	0.002	$-.010$	$-.007$	$-.050$	$-.011$	0.002	$-.008$	0.005	$-.001$
	(.0023)	(.0031)	(.0036)	(.0034)	(.0019)	(.0017)	(.0013)	(.0015)	(.0017)	(.0021)	(.0022)	(.0019)	(.0022)
Intercept	2.011	2.147	1.888	1.825	2.331	2.162	2.148	2.014	2.157	2.224	2.012	2.174	2.257
Occupation	No	No	No	No	No	No	No	No	No	No	No	No	No
Industry	No	No	No	No	No	No	No	No	No	No	No	No	No
R^2	0.351	0.137	0.211	0.308	0.273	0.252	0.257	0.181	0.241	0.235	0.302	0.280	0.248

NOTE.— Dependent variable is the logarithm of hourly wage. Explanatory variables are: schooling, experience, squared experience, and marital status (married, single, widowed, separated, divorced). Standard errors are in parentheses. Sample weights are used to estimate these models.

Table 8: Basic Wage Regressions, Jewish Workers

Variable	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Schooling	0.060	0.062	0.053	0.062	0.064	0.062	0.067	0.066	0.071	0.077	0.079	0.075	0.071
	(.0004)	(.0004)	(.0004)	(.0004)	(.0004)	(.0004)	(.0003)	(.0004)	(.0003)	(.0004)	(.0004)	(.0004)	(.0004)
Experience	0.038	0.032	0.035	0.036	0.036	0.028	0.030	0.032	0.035	0.023	0.021	0.025	0.024
	(.0005)	(.0005)	(.0005)	(.0005)	(.0005)	(.0005)	(.0003)	(.0005)	(.0005)	(.0005)	(.0005)	(.0005)	(.0005)
Exp^2 ($\times 100$)	$-.051$	$-.041$	$-.049$	$-.052$	$-.051$	$-.038$	$-.042$	$-.048$	$-.053$	$-.030$	$-.030$	$-.034$	$-.038$
	(.0008)	(.0009)	(.0009)	(.0008)	(.0009)	(.0009)	(.0006)	(.0009)	(.0009)	(.0009)	(.0009)	(.0009)	(.0009)
Intercept	2.204	2.31	2.342	2.242	2.335	2.431	2.349	2.373	2.271	2.346	2.424	2.375	2.428
Occupation	No	No	No	No	No	No	No	No	No	No	No	No	No
Industry	No	No	No	No	No	No	No	No	No	No	No	No	No
R^2	0.278	0.286	0.291	0.308	0.286	0.291	0.295	0.284	0.300	0.285	0.300	0.285	0.266

NOTE.— Dependent variable is the logarithm of hourly wage. Explanatory variables are: schooling, experience, squared experience, marital status, and period of immigration. Standard errors are in parentheses. Models are estimated using sample weights.

Table 9: Extended Wage Regressions, Arab Workers

Variable	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Schooling	0.022	0.013	0.023	0.006	0.033	0.023	0.022	0.032	0.031	0.020	0.021	0.035	0.038
	(.0013)	(.0018)	(.0015)	(.0014)	(.0009)	(.0009)	(.0007)	(.0009)	(.0008)	(.0008)	(.0012)	(.0011)	(.0010)
Experience	0.040	0.048	0.043	0.028	0.004	0.015	0.015	0.023	0.021	0.010	0.015	0.011	0.012
	(.0011)	(.0019)	(.0018)	(.0015)	(.0010)	(.0009)	(.0006)	(.0008)	(.0008)	(.0009)	(.0013)	(.0010)	(.0011)
Exp^2 ($\times 100$)	$-.055$	$-.071$	$-.063$	$-.050$	0.004	$-.015$	$-.017$	$-.031$	$-.024$	$-.010$	$-.020$	$-.003$	$-.006$
	(.0020)	(.0032)	(.0034)	(.0027)	(.0017)	(.0016)	(.0011)	(.0014)	(.0015)	(.0018)	(.0025)	(.0019)	(.0021)
Intercept	3.09	2.935	2.128	3.777	3.128	2.581	3.109	2.505	3.511	3.795	3.542	2.917	2.639
Occupation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.57	0.239	0.37	0.632	0.427	0.445	0.451	0.389	0.396	0.472	0.461	0.363	0.329

NOTE.— Dependent variable is the logarithm of hourly wage. Explanatory variables are: schooling, experience, squared experience, marital status (married, single, widowed, separated, divorced), occupation fixed effects, and industry fixed effects. Sample weights are used in the estimation. Standard errors are in parentheses.

Table 10: Extended Wage Regressions, Jewish Workers

Variable	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Schooling	0.034	0.037	0.026	0.035	0.028	0.032	0.036	0.036	0.041	0.044	0.046	0.036	0.033
	(.0004)	(.0005)	(.0004)	(.0004)	(.0004)	(.0004)	(.0003)	(.0004)	(.0004)	(.0004)	(.0006)	(.0004)	(.0004)
Experience	0.031	0.029	0.033	0.033	0.035	0.025	0.029	0.031	0.031	0.025	0.019	0.026	0.026
	(.0005)	(.0005)	(.0005)	(.0004)	(.0005)	(.0005)	(.0003)	(.0004)	(.0004)	(.0004)	(.0006)	(.0004)	(.0004)
Exp^2 ($\times 100$)	$-.042$	$-.038$	$-.046$	$-.047$	$-.050$	$-.034$	$-.041$	$-.046$	$-.046$	$-.033$	$-.026$	$-.035$	$-.041$
	(.0008)	(.0009)	(.0008)	(.0008)	(.0008)	(.0009)	(.0006)	(.0008)	(.0008)	(.0008)	(.0012)	(.0009)	(.0009)
Intercept	2.707	2.682	3.045	2.764	3.195	3.089	2.981	2.966	3.399	2.847	2.939	3.197	3.038
Occupation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.382	0.369	0.39	0.392	0.397	0.384	0.4	0.398	0.413	0.401	0.411	0.411	0.377

NOTE.— Dependent variable is the logarithm of hourly wage. Explanatory variables are: schooling, experience, squared experience, marital status, period of immigration, occupation fixed effects, and industry fixed effects. Standard errors are in parentheses. Sample weights are used in the estimation.

C Schooling and Experience Contribution to the Wage Gap

Table 11: Contribution of Schooling and Experience to the Wage Gap, within Occupations

	1991		1995		1999		2003	
G	0.2188	100%	0.2734	100%	0.4243	100%	0.3196	100%
$\beta^* = \beta_A$:								
Schooling	0.0678		0.0898		0.0800		0.0902	
Experience	0.0255		0.0095		0.0135		0.0186	
Total	0.0933	42.6%	0.0993	36.3%	0.0936	22.1%	0.1089	34.1%
$\beta^* = \beta_J$:								
Schooling	0.1052		0.0762		0.1061		0.0798	
Experience	0.0223		0.0122		0.0097		0.0077	
Total	0.1275	58.3%	0.0884	32.3%	0.1158	27.3%	0.0875	27.4%

NOTE.— Results are based on wage equations *with* occupation and industry fixed effects. G is the gross wage gap. "Schooling" and "experience" signify the wage gap contributed by Jewish-Arab differences in these variables.

References

Asali, Muhammad. 2006. "Why Do Arabs Earn Less Than Jews in Israel?," *The Maurice Falk Institute for Economic Research in Israel, Discussion Papers Series*, **06.03**, 1–56.

Blinder, Alan S. 1973. "Wage Discrimination: Reduced Form and Structural Estimates," *Journal of Human Resources*, **8**(4), 436–455.

Brown, Randall S., Moon, Marilyn, and Zoloth, Barbara S. 1980. "Incorporating Occupational Attainment in Studies of Male-Female Earnings Differentials," *Journal of Human Resources*, **15**(1), 3–28.

Carneiro, Pedro, Heckman, James J., and Masterov, Dimitriy V. 2005. "Labor Market Discrimination and Racial Differences in Premarket Factors," *Journal of Law and Economics*, **48**(1), 1–39.

Central Bureau of Statistics, Israel. 2005. *Statistical Abstract of Israel*. Jerusalem: Cenral Bureau of Statistics.

Central Bureau of Statistics, Israel. Multiple years. *Income Survey (Households and Individuals)*. Hebrew University of Jerusalem: Israel Social Sciences Data Center.

Chandra, Amitabh. 2000. "Labor-Market Dropouts and the Racial Wage Gap: 1940-1990," *The American Economic Review*, **90**(2), 333–338.

Heckman, James J. 1979. "Sample Selection Bias as a Specification Error," *Econometrica*, **47**(1), 153–162.

Juhn, Chinhui, Murphy, Kevin M., and Pierce, Brooks. 1993. "Wage Inequality and the Rise in Returns to Skill," *The Journal of Political Economy*, **101**(3), 410–442.

Levanon, Gad, and Raviv, Yaron. 2007. "Decomposing Wage Gaps between Ethnic Groups: The Case of Israel," *Southern Economic Journal*, **73**(4), 1066–1087.

Miller, Paul W. 1987. "The Wage Effect of the Occupational Segregation of Women in Britain," *The Economic Journal*, **97**(388), 885–896.

Neuman, Shoshana, and Oaxaca, Ronald L. 1998. "Estimating Labour Market Discrimination with Selectivity Corrected WageEquations: Methodological Considerations and an Illustration from Israel," *Center for Economic Policy Research*, **1915**(June), 1–23.

Neuman, Shoshana, and Oaxaca, Ronald L. 2004a. "Wage Decompositions with Selectivity-Corrected Wage Equations: A Methodological Note," *Journal of Economic Inequality*, **2**(apr), 3–10.

Neuman, Shoshana, and Oaxaca, Ronald L. 2004b. "Wage Differentials in the 1990s in Israel: Endowments, Discrimination, andSelectivity," *CEPR Discussion Paper*, **4709**(Oct.), 1–26.

Neuman, Shoshana, and Silber, Jacques G. 1996. "Wage Discrimination Across Ethnic Groups: Evidence from Israel," *Economic Inquiry*, **34**(4), 648–661.

Neumark, David. 1988. "Employers' Discriminatory Behavior and the Estimation of Wage Discrimination," *The Journal of Human Resources*, **23**(3), 279–295.

Oaxaca, Ronald. 1973. "Male-Female Wage Differentials in Urban Labor Markets," *International Economic Review*, **14**(3), 693–709.

Oaxaca, Ronald L., and Ransom, Michael R. 1988. "Searching for the Effect of Unionism on the Wages of Union and NonunionWorkers," *Journal of Labor Research*, **9**(2), 139–148.

Oaxaca, Ronald L., and Ransom, Michael R. 1994. "On Discrimination and the Decomposition of Wage Differentials," *Journal of Econometrics*, **61**(1), 5–21.

Oaxaca, Ronald L., and Ransom, Michael R. 1999. "Identification in Detailed Wage Decompositions," *Review of Economics and Statistics*, **81**(1), 154–157.

Reimers, Cordelia W. 1983. "Labor Market Discrimination Against Hispanic and Black Men," *The Review of Economics and Statistics*, **65**(4), 570–579.