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Even Education and Experience Has Its Limits: Closing the Wage Gap

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December 2014

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ABSTRACT

Even Education and Experience Has Its Limits: Closing the Wage Gap^{*}

Economic outcomes are compared for university graduates in Israel belonging to four different ethnic groups. A unique dataset is used that includes all individuals who graduated with a first degree from universities and colleges in Israel between the years 1995 and 2008 and which tracks them for up to 10 years from the year they graduated. The main finding is that education and experience appear to have a strong effect on earnings in the long run and that an ethnic group can improve its position relative to specific groups while it has no effects relative to other groups.

JEL Classification: J15, J24, J31

Keywords: wage differences, immigrants, discrimination

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1. Introduction

There are various explanations proposed for economic gaps between different segments of the population, particularly in a country with sizable minority groups. Among them is discrimination in the job market. For example, if a member of a minority group enters the job market with no experience or education, he may be subject to statistical discrimination when looking for a job and in the determination of his wage when he finds one. The resulting wage gaps between the various groups will be negatively correlated with level of education (see Neal and Johnson, 1996).¹ This is due to the fact that a higher level of education reduces the uncertainty of employers regarding the productivity of job candidates and in this way may lessen statistical discrimination (see Lang and Manove (2011) who present a signaling model to explain this phenomenon).² Therefore, education as a signal of productivity may play an important role in closing wage gaps between various groups in the economy.

Experience is another important factor in determining wage gaps in the economy. Experience enables a potential employer to more precisely evaluate the abilities of workers, rather than using membership in a particular minority group as a proxy. Thus, it may take longer for employers to recognize the individual skills of minority group members. However, education and experience may also have the reverse effect since at higher levels of experience and education employers have more degrees of freedom in determining wages. Thus, if workers are earning low or even minimum wage, it is harder for the employer to discriminate between them when setting wages. Lehmann (2013) finds that highly-educated and experienced workers have a greater chance of being employed but that they suffer from larger wage gaps than less-skilled and less-experienced workers.³

As mentioned, both education and experience may have important effects on wage gaps between various groups in the economy. We use data for Israel to test for this effect on wage differences between the majority and minority groups. The Israeli economy provides an

¹ Neal and Johnson (1996) find that after controlling for age and performance on the Armed Forces Qualifying Test (AFQT), the black-white earnings differential among young men is only about 7 percent and insignificant.

² They argue that when the AFQT score is controlled for, educated blacks earn noticeably less than whites with the same education and cognitive score.

³ Using a unique longitudinal survey that tracked 4,000 lawyers, Lehmann (2013) finds that compared to whites with similar credentials, blacks are more likely to be hired but are assigned to lower-level tasks and are less likely to be a partner seven years after entering the bar. Siniver (2011) finds that the wage gap between immigrant and native physicians is due to statistical, rather than taste-based discrimination.

ideal setting to test for this effect, for the following reasons: 1. Israel has four well-defined ethnic groups, which differ in size, years since migration and other characteristics. 2. A unique dataset exists for Israel which includes all individuals who graduated with a first degree from universities and colleges between the years 1995 and 2008. The database includes psychometric test scores (similar to the SAT), type and name of academic institution, field of study and occupation (note that immigration to Israel is not for the most part self-selected but rather is a result of push factors). In particular, the use of psychometric test scores enables us to control for an individual's abilities and thus more precisely to interpret the results.

The Israeli population

Immigrants currently represent over 15 percent of the Israeli labor force, one of the highest rates in the world. This provides a unique opportunity to study some of the unresolved questions related to return on experience and migration.

Israel's population can be divided into four main ethnic groups: native Jews, Jewish immigrants from the Former Soviet Union (FSU), Jewish immigrants from Ethiopia and Israeli Arabs. The population is distributed as follows: about 4,100,000 native Jews (53 percent of the total); about 1,587,000 Israeli Arabs (20.5 percent of the total); about 1,000,000 FSU immigrants (13 percent of the total); and about 140,000 Ethiopian immigrants (1.8 percent of the total). Native Jews, FSU immigrants and Ethiopian immigrants are similar in terms of culture, in that they are all Jews, while Israeli Arabs have their own separate culture. The immigrants from the FSU and from Ethiopia do not live in enclaves, as a result of the deliberate government policy of dispersing them throughout the country and thus preventing the formation of enclaves. The geographic distribution of these immigrants is thus very similar to that of the general population. In contrast, the Arabs do live in enclaves.⁴

We use a unique dataset that includes all individuals who graduated with a first degree from universities and colleges in Israel between the years 1995 and 2008. The sample includes 269,596 individuals: 226,285 native Jews (83.93 percent), 23,730 FSU immigrants

⁴ According to the Central Bureau of Statistics, Arabs tend to live in enclaves. The following cities have an almost entirely Arab population: Nazareth (75,000), Umm-Al-Fahm (50,000), Tayibe (30,000), Sakhnin (70,000), Tira (25,000), Kafr-Qasim (20,000) and Tamra (30,000).

(8.8 percent), 18,406 Israeli Arabs (6.83 percent) and 1175 Ethiopian immigrants (0.44 percent). As mentioned, cultural differences (such as customs and language), size of enclave and skin color can affect the wage gaps between the different groups and we will attempt to determine the effect of each.

Immigration to Israel is usually induced by political pressure in the country of origin. Thus, in 1989, the Soviet Union removed restrictions on immigrating to Israel, while the US restricted the possibility of Soviet immigrants receiving refugee status. The result was a major wave of immigration to Israel, which began in the fall of 1989. By 2000, about 800,000 immigrants had arrived, thus increasing the Israeli population by 14%.

Other related literature

Kohler (2012a, 2012b) found that in Switzerland ethnic groups that are culturally less similar to natives encounter greater economic discrimination. Epstein and Gang (2009) found that cultural differences affect both assimilation and economic outcomes. Most of the studies in Israel have focused on FSU immigrants, while ignoring Ethiopian immigrants who are black-skinned and thus differ from both FSU immigrants and native Jews in that respect. Researchers in the US, including Couch and Daly (2004), Smith and Welch (1977), Blau and Beller (1992) and Card and Krueger (1992), have found that the earnings of native whites are higher than those of native blacks.

Chiswick (1978) found that immigrants in the US earn less than natives in the period following their arrival.⁵ If the earnings gap persists over time, this is likely due to one of two reasons: (1) a persistent deficit in knowledge required to succeed in the labor market or (2) taste-based discrimination against immigrants in hiring, in the determination of wages, etc. Since Chiswick (1978), it has become widely recognized that the earnings of immigrants increase more rapidly than those of natives. Although there are a number of possible factors

⁵ He shows that: (1) They have less knowledge of the customs and language relevant for jobs in the US, less information about local job opportunities and less firm-specific training. (2) Employers are likely to have less information about the productivity of a job applicant, (i.e. it is more difficult for them to verify schooling and previous employment references). (3) Knowledge and skills are not perfectly mobile across countries. On the other hand, the gap will narrow with years in the US and the earnings of immigrants may eventually exceed those of natives, as a result of self-selection in migration (i.e. migration in response to economic incentives is more profitable for those with higher levels of skill and motivation). As a result of the aforementioned differences between immigrants and natives, it is difficult to empirically determine whether the gap in earnings between immigrants and natives is due to statistical or taste-based discrimination.

to explain this phenomenon, only two have been extensively studied: (1) fluency in the local language (see McManus, Gould and Welch (1983), Kossoudji (1988), Chiswick (1991), Dustmann (1994) and Carliner (2000)) and (2) the existence of enclaves. Tienda and Lii (1987) found that the earnings loss for Hispanic and Asian men living in ethnic enclaves is highest for college graduates and lowest for those lacking a high school education. Lazear (1999) and Card (1990) found that an enclave serves as a platform for networking, which increases the opportunities for employment. Thus, living in an enclave can improve earnings, especially for recent immigrants. Daneshvary and Schwer (1994), Dadoo and Baffour (2002) and Model (1991) found an earnings gap between black and non-black immigrants in favor of the latter.

One of the main factors determining an immigrant's degree of assimilation is age on arrival (see, for example, Friedberg (1992) and Bleakley and Chin (2010)).

In the Israeli context, Eckstein and Weiss (1998) found that the rate of growth in earnings increases with an immigrant's skill level. Berman, Lang and Siniver (2003) obtained similar results for FSU immigrants. Chiswick (1998), Chiswick and Reppeto (2001) and Friedberg (2000) also found that the earnings gap between FSU immigrants and native Jews narrows over time and Epstein and Hizler (2006) found that FSU immigrants who decided to settle in an ethnic enclave were more successfully absorbed.

Our study

A database was constructed in order to control for all variables that differ between immigrants and natives. The database includes all individuals who graduated with a first degree from universities in Israel during the period 1995-2008. As a result, immigrants in the sample are likely to have earning power characteristics that are similar to those of natives. Thus, FSU immigrants have similar levels of human capital to natives, they speak Hebrew fluently and because they have studied in Israel, Israeli employers have sufficient information to judge their productivity.

If it is found that natives earn more than immigrants and Arabs, this may be because employers have better information about the productivity of natives. However, over time the market recognizes the skills of immigrants and Arabs. If there is no taste-based discrimination against these groups, then after several years in the labor market they should be able to close the earnings gap with natives with similar psychometric test scores.

However, if the earnings gap persists, it is likely that taste-based discrimination against immigrants and/or Arabs does indeed exist.

The results obtained in this study show that on average native Jews attain the best economic outcomes, followed by FSU immigrants, Israeli Arabs and finally Ethiopian immigrants. While this result is not new (see Epstein and Siniver, 2012), the unique database used here makes it possible to improve the precision of the results. For example, while the above mentioned results hold for men, among women Ethiopian immigrants do better than Israeli Arabs. Even though native Jews initially have higher earnings, FSU immigrants have a higher return on experience and after two years in the labor market they overtake native Jews. Ethiopian immigrants who arrived before the age of 13 have a higher return on experience than Israeli Arabs and within four years after graduation are earning a higher wage than comparable Israeli Arabs. Thus, education combined with work experience can improve the position of Ethiopian immigrants relative to Israeli Arabs.

It is worth emphasizing that despite the use of psychometric test scores to control for the abilities of individuals wage gaps still exist, although they are smaller than in the estimation that does not include a measure of ability.

We also consider the effect of gender, age, age on arrival, choice of occupation and other characteristics on economic performance.

2. Description of the data

The database includes all individuals who graduated with a first degree from universities and colleges in Israel between the years 1995 and 2008. The data for each individual starts from the year of his graduation and ends in 2008. Thus, for example, an individual who graduated in 1995 will have data from 1995 until 2008.

The basic database was constructed from various sources within the Central Bureau of Statistics and merged; the data on academic degrees was obtained from the universities and colleges; the data on wages was obtained from the Income Tax Authority; and demographic information was obtained from the Population Registry.

The data includes the following information for each graduate and for each year following graduation:

1. Wage and employment data: average monthly wage, number of months worked, number of jobs held, the sector in which the highest monthly wage was earned and the average wage for all workers in the individual's place of employment.
2. Demographic information: gender, country of origin, father's country of origin, age, marital status, occurrence of a birth that year, number of children and place of residence.
3. Education: psychometric test scores, type and name of the academic institution, field of study and occupation, both for a first degree and for more advanced degrees.

The research population is limited to graduates who remained in Israel and are salaried employees (i.e. it excludes emigrants and the self-employed). The database consists of a panel, where the time variable is the number of years since graduation. The analysis is limited to no more than 10 years since graduation, which is imposed due to the low number of observations for Ethiopian immigrants. Thus, those who graduated in 1995, 1996, 1997 and 1998 are tracked for 10 years until 2005, 2006, 2007 and 2008, respectively. Those who graduated after 1998 are tracked until 2008. For example, an individual who graduated in 1999 is tracked for only 9 years (until 2008).

We also estimated the models for a period of 7 years after graduation and added a quadratic term to the 10-year model, but the results remained unchanged.

Table 1 presents the number of observations for each ethnic group. There are a total of 1,376,423 observations and a total of 237,256 individuals, resulting in an average of 5.8 observations per individual. It should be noted that the data for each individual is not necessarily continuous since only years with a positive salary are included.

< Place Table 1 here >

3. Empirical Analysis

We wish to empirically examine the development of wages over time for university graduates with a first degree. The population is divided into four groups: native Jews (who constitute the majority) and three minority groups – FSU immigrants, Israeli Arabs and Ethiopian immigrants. The database is restricted to individuals who obtained their degree in Israel.

In order to examine the earnings gaps between the various groups, we estimated the monthly wage (in logarithmic terms) using the following independent variables for each individual and each year: years since graduation, age, gender, country of origin, religion, age on arrival (for immigrants), family status, number of children, place of residence, number of months employed, industry, psychometric scores and information on the individual's education, including type of degree, year of graduation, institution where the degree was obtained, type of institution and field of study. All regressions are estimated using OLS. Our main focus is on the effect of years since graduation on earnings.

3.1 General analysis

Figure 1 presents the average wage over time (since graduation) for the four groups. As can be seen, native Jews earn the highest wage, with FSU immigrants close behind and Israeli Arabs and Ethiopian immigrants well behind them.

**Figure 1: Average monthly wage of each ethnic group by years since graduation
(raw data)**

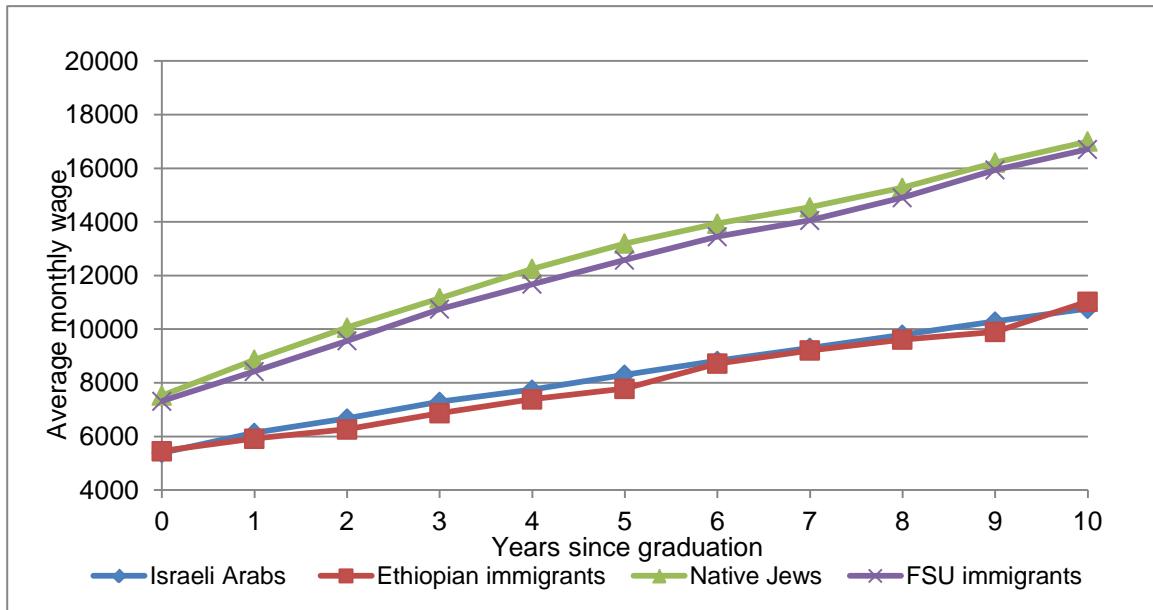
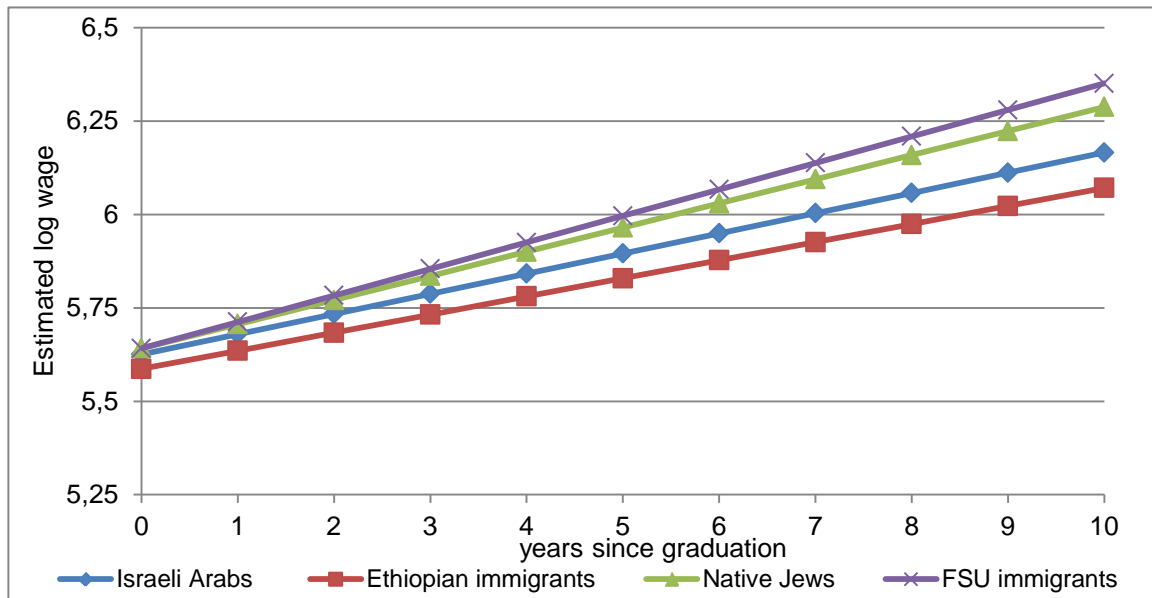


Table 2 (columns 1-3) and figures 2, 2a and 2b below present the estimated log wage for each ethnic group as a function of years since graduation, while controlling for: age, gender, number of children, marital status, psychometric score, geographic region, type of academic education (college vs. university, MA or BA and field of study), number of months worked each year, cumulative months of absence from the labor market since graduation, cumulative number of workplaces, economic sector and year.

< Place Table 2 here >

Figure 2: Estimated log wage by ethnic group and years since graduation



It was found that the coefficient for experience (i.e. years since graduation) is highest for FSU immigrants, followed by native Jews, Israeli Arabs and finally Ethiopian immigrants.

The intercept for Israeli Arabs is higher than that for Ethiopian immigrants and the difference is statistically significant. The slope is identical and therefore Ethiopian immigrants never close the gap. Meanwhile, the intercepts are the same for FSU immigrants and native Jews (the difference is not statistically significant). The slope for FSU immigrants is larger (the difference is statistically significant), which means that their earnings grow faster than those of native Jews. Thus, the wage function of Israeli Arabs is always above that of Ethiopian immigrants following graduation and Ethiopian immigrants never manage to close the gap (since they start at a lower wage and have the same rate of wage growth). FSU immigrants and native Jews have the same starting point on graduation but the wage of FSU immigrants grows faster than that of native Jews.

Figure 2a: Estimated log wage by ethnic group and years since graduation – Men only

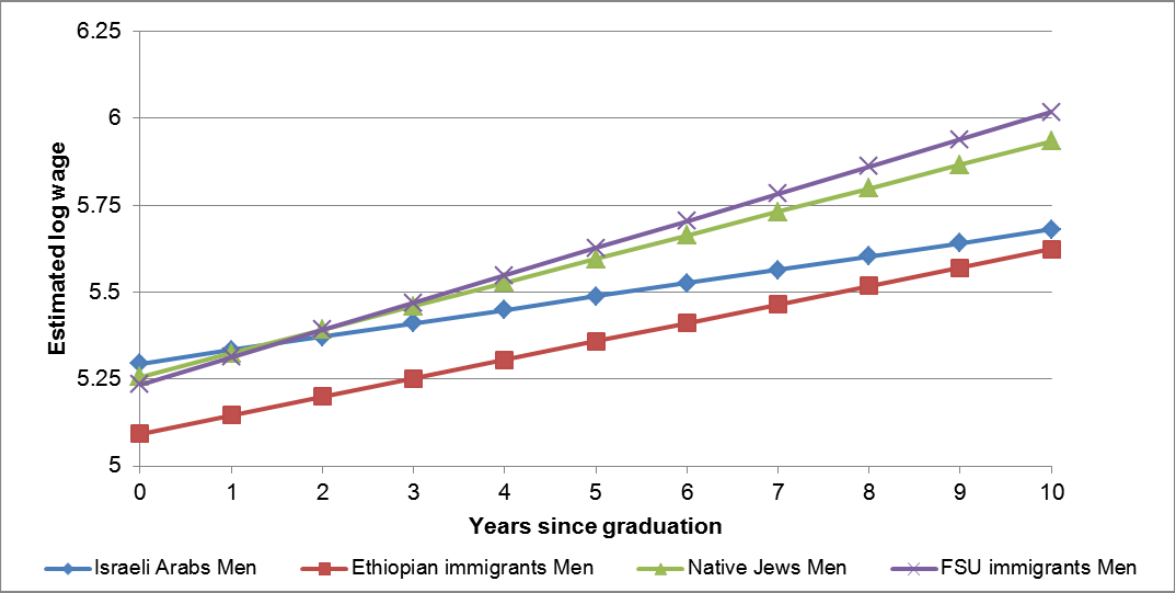
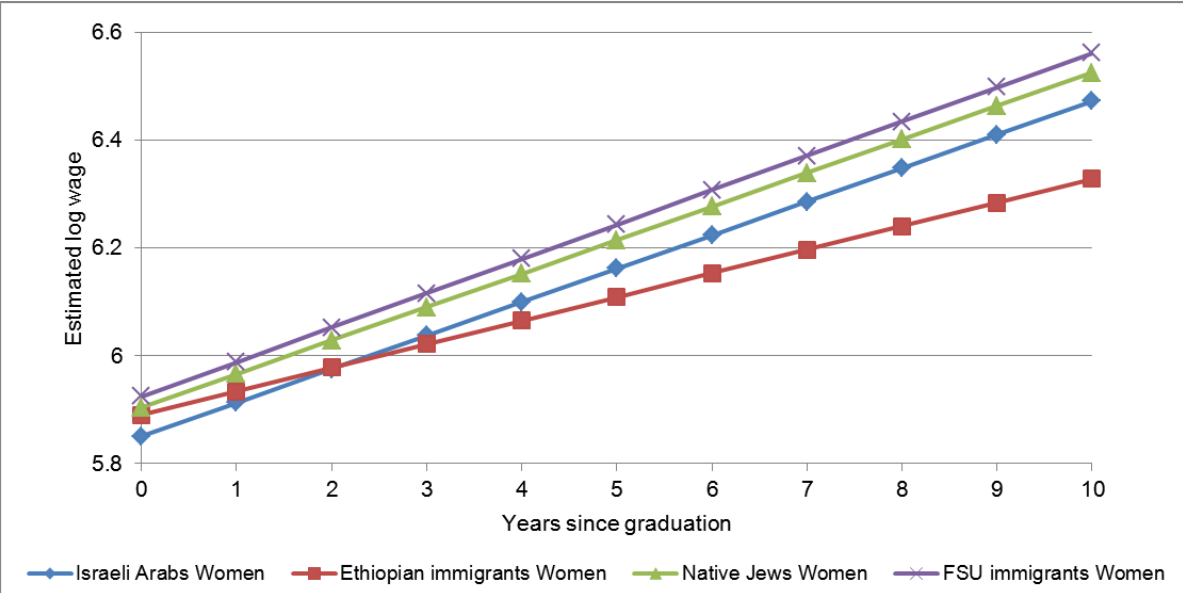


Figure 2b: Estimated log wage by ethnic group and years since graduation – Women only



In the case of men, FSU immigrants start lower than native Jews following graduation; however, the rate of growth in their wages is higher than that of native Jews and therefore the gap is closed after two years and following that the wage profile of FSU immigrants remains above that of native Jews.

The intercept for Israeli Arabs is higher than that for Ethiopian immigrants and the gap is statistically significant. Since the slope of the Ethiopian immigrants' wage function is larger than that of Israeli Arabs (the difference is statistically significant), the gap diminishes over time.

In the case of women, the intercept for Israeli Arabs is lower than that for Ethiopian immigrants and the difference is significant. The slope of the wage function for Israeli Arabs is larger than that for Ethiopian immigrants and again the difference is significant. Therefore, Israeli Arab women close the gap after two years and following that their wage remains above that of Ethiopian immigrant women.

The intercept for FSU immigrant women is above that for native Jewish women (the difference is statistically significant) and the slopes of their wage functions are equivalent (the difference is not statistically significant). Therefore, the wage function of FSU immigrant women remains above that of native Jewish women.

3.2 General analysis and psychometric score

In order to explain the difference in return on experience between the ethnic groups, we estimate the regression such that the return on experience can vary with psychometric test score and ethnic group. We were unable to test whether the ethnic groups perform differently on the psychometric exam because there were not enough Ethiopian immigrants with high psychometric scores.

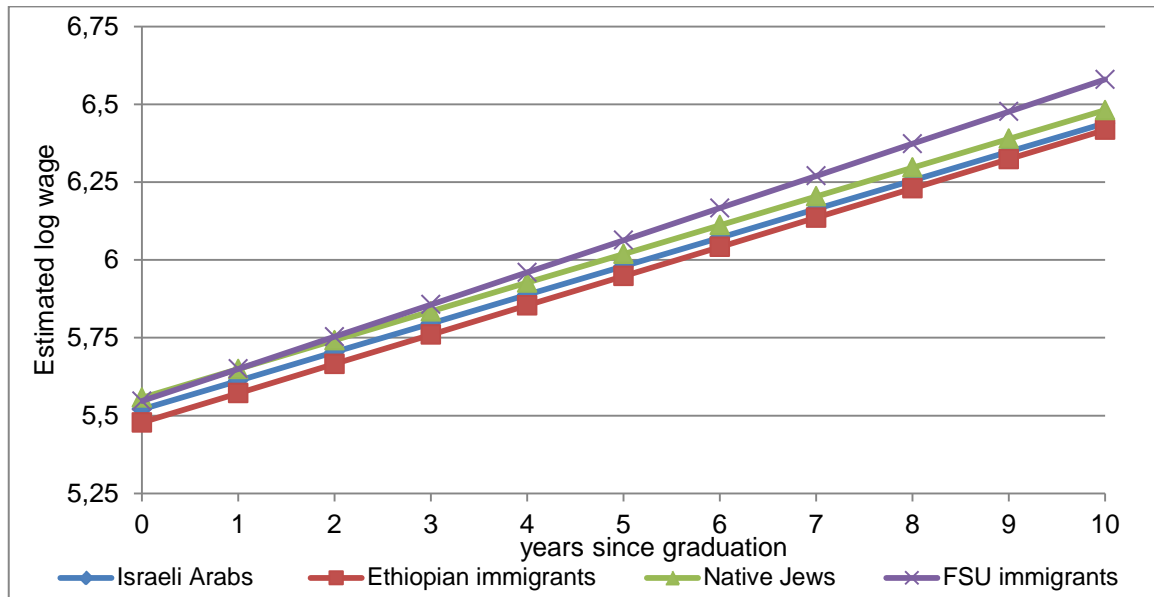
The following table presents the number of graduates in each ethnic group by psychometric score.

Psychometric score	Ethiopian immigrants		Israeli Arabs		Native Jews		FSU immigrants	
	Number of graduates	Percent	Number of graduates	Percent	Number of graduates	Percent	Number of graduates	Percent
0-500	855	92.4%	7261	50.7%	23272	13.9%	3931	21.9%
500--550	33	3.6%	2670	18.6%	23856	14.2%	3527	19.7%
550--600	21	2.3%	2103	14.7%	32032	19.1%	3853	21.5%
600-650	8	0.9%	1420	9.9%	35825	21.4%	3382	18.9%
650--700	6	0.6%	678	4.7%	32669	19.5%	2369	13.2%
+700	2	0.2%	194	1.4%	19935	11.9%	864	4.8%
All	925		14326		167589		17926	

Added to the regression was the interaction between the psychometric score and experience for all groups combined. The results show that the return on experience increases with the psychometric test score.

Table 2 (columns 4-6) and figures 2d, 2e and 2f below present the estimated log wage for each ethnic group as a function of years since graduation after controlling for all the variables mentioned above and allowing the return on experience to vary according to psychometric test score.

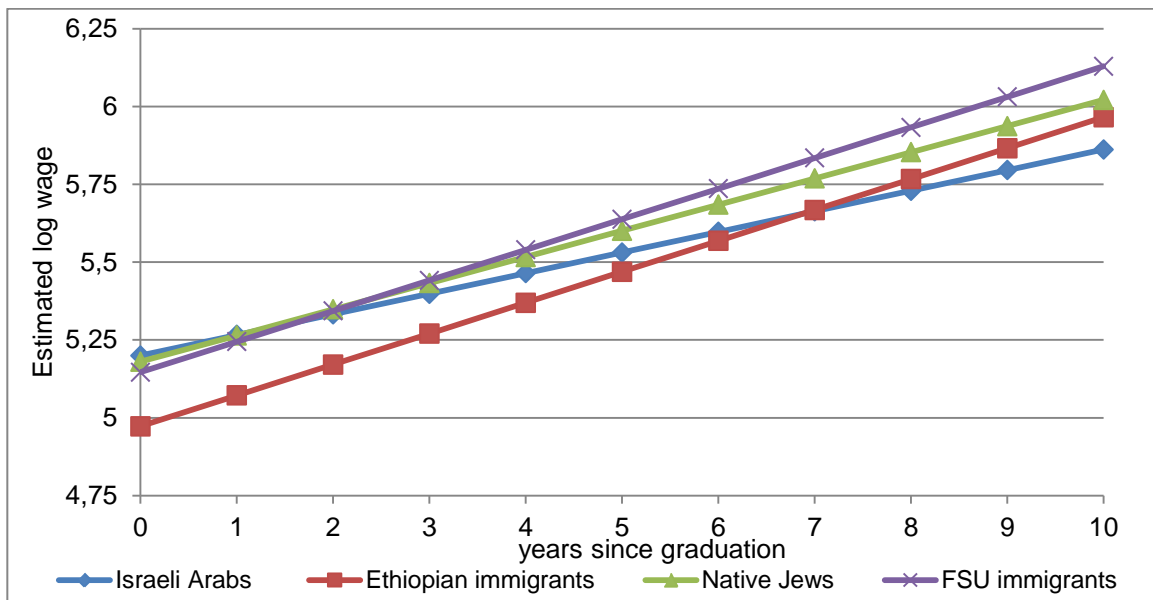
Figure 2d: Estimated log wage by ethnic group and years since graduation allowing for the return on experience to vary with psychometric score



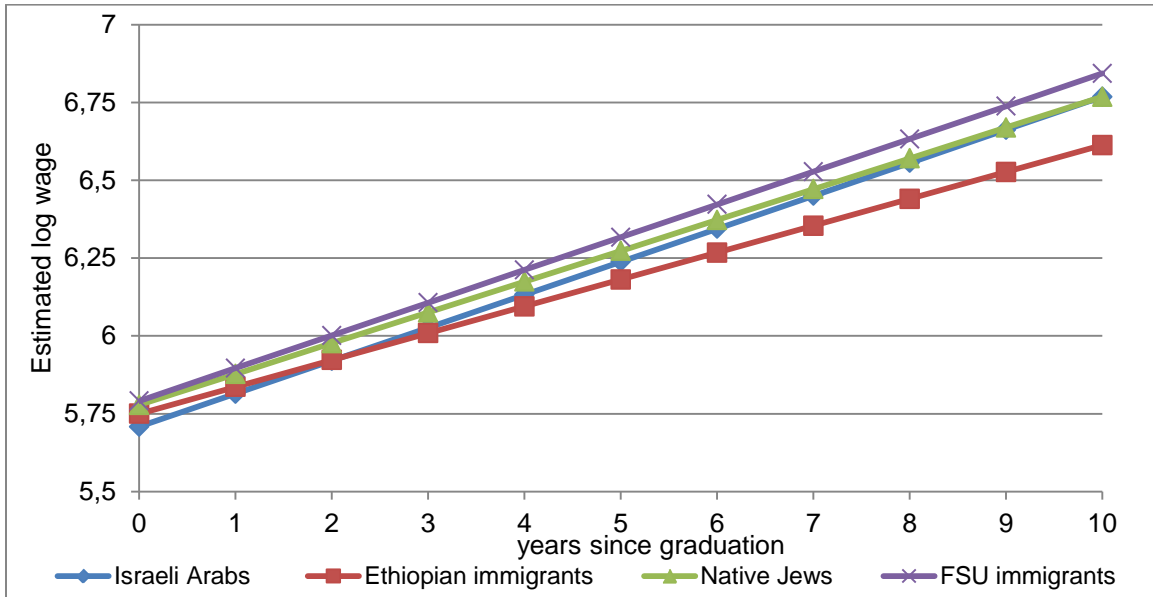
Different results were obtained once we allowed the return on experience to vary with psychometric score. Thus, although there was still an earnings gap between Israeli Arabs and

Ethiopian immigrants it was significantly reduced in size, and the earnings of both groups approached those of native Jews over time (in contrast to the earlier results in which the gap widened over time). On the other hand, the gap between FSU immigrants and native Jews became larger.

**Figure 2e: Estimated log wage by ethnic group and years since graduation
allowing for the return on experience to vary with psychometric score
Men only**



**Figure 2f: Estimated log wage by ethnic group and years since graduation
allowing the return on experience to vary with psychometric score
Women only**



In the case of men, when we allow the return on experience to vary by psychometric score we obtain different results. Ethiopian immigrants close the gap with Israeli Arabs and then overtake them after six years while the gap between Ethiopian immigrants and native Jews diminishes over time. The gap between Israeli Arab and native Jews grows over time but to a lesser degree. On the other hand, the gap between FSU immigrants and native Jews is now even larger.

In the case of women, when we allow the return on experience to vary with psychometric score we again obtain different results. Israeli Arabs close the gap with Ethiopian immigrants and overtake them after two years while the gap between the Israeli Arabs and native Jews diminishes over time. The gap between Ethiopian immigrants and native Jews grows over time but to a much lesser extent.

On the other hand, the gap between the FSU immigrant women and native Jewish women is now even larger.

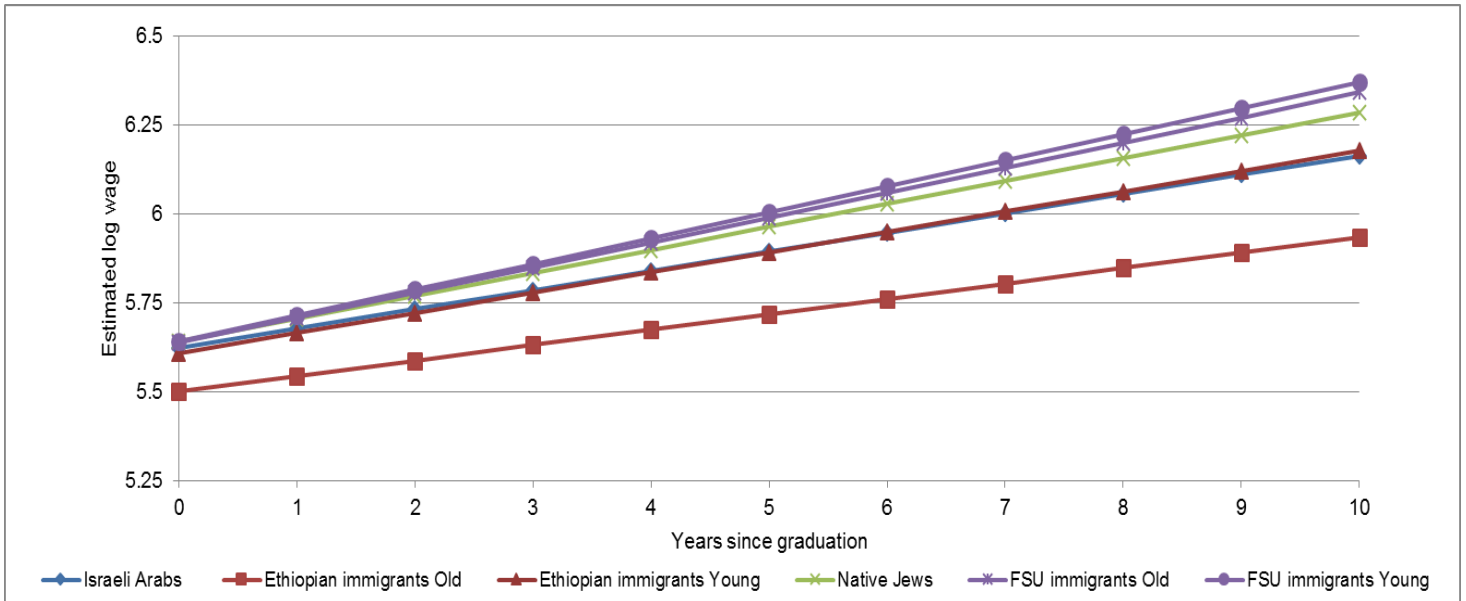
3.3 Age on arrival

We now consider the effect of age on arrival and set the age of 13 as the dividing point between “young” and “old” immigrants. In other words, those who arrived after the age of 13 are viewed as first generation while those who arrived before that are viewed as second generation.

Table 3 (columns 1-3) and figures 3, 3a and 3b present the estimated log wage for each ethnic group as a function of years since graduation while controlling for the following variables: age, gender, number of children, marital status, psychometric score, geographic region, type of academic education (college vs. university, MA or BA and field of study), number of months worked each year, cumulative months of absence from the labor market since graduation, cumulative number of workplaces, economic sector and year.

< Place Table 3 here >

Figure 3: Estimated log wage by ethnic group, age on arrival and years since graduation



The results show that the starting point of Israeli Arabs is significantly higher than that of Ethiopian immigrants who arrived after the age of 13; however, the difference in the rate of growth in wages due to accumulated years of experience is not significant and thus the gap between the two groups does not close over time and Israeli Arabs always earn more than Ethiopian immigrants who arrived after the age of 13. On the other hand, there is no significant difference between Israeli Arabs and Ethiopian immigrants who arrived in the country before the age of 13.

The results also show that there is no effect of age on arrival on the return on experience for FSU immigrants; thus, both groups (FSU immigrants who arrived after the age of 13 and FSU immigrants who arrived before the age 13) have a higher return on experience than native Jews.

Figure 3a: Estimated log wage by ethnic group, age on arrival and years since graduation – Men only

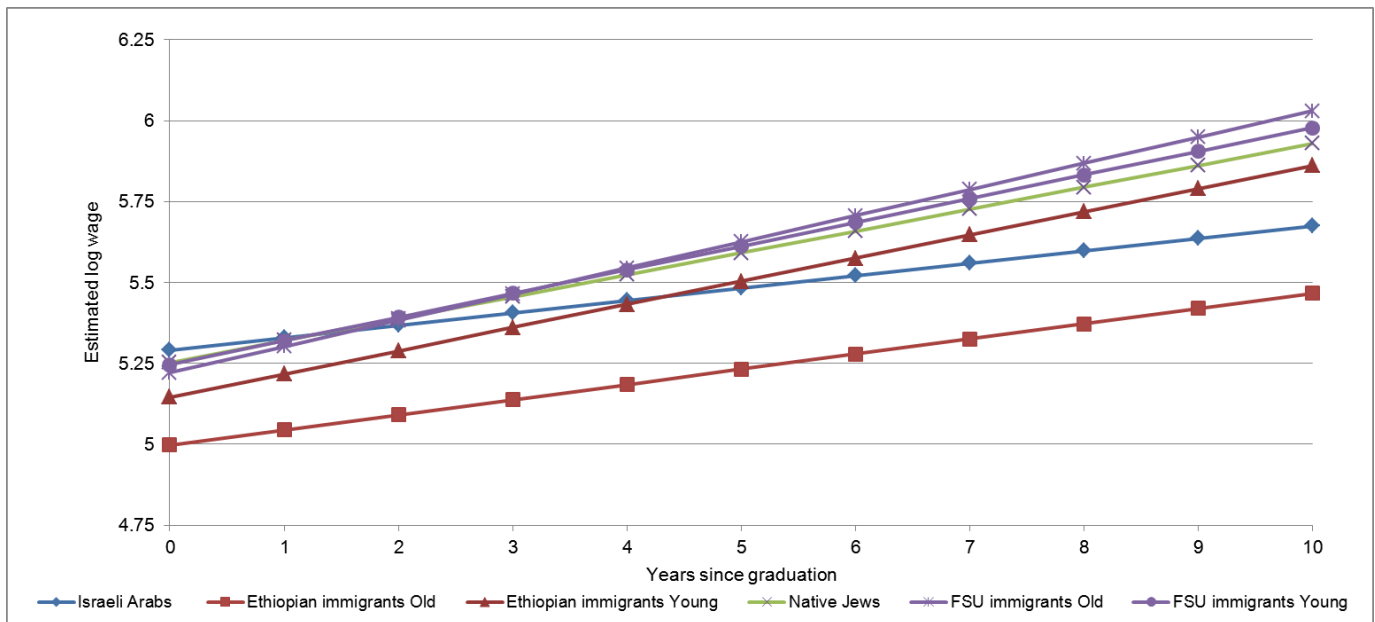
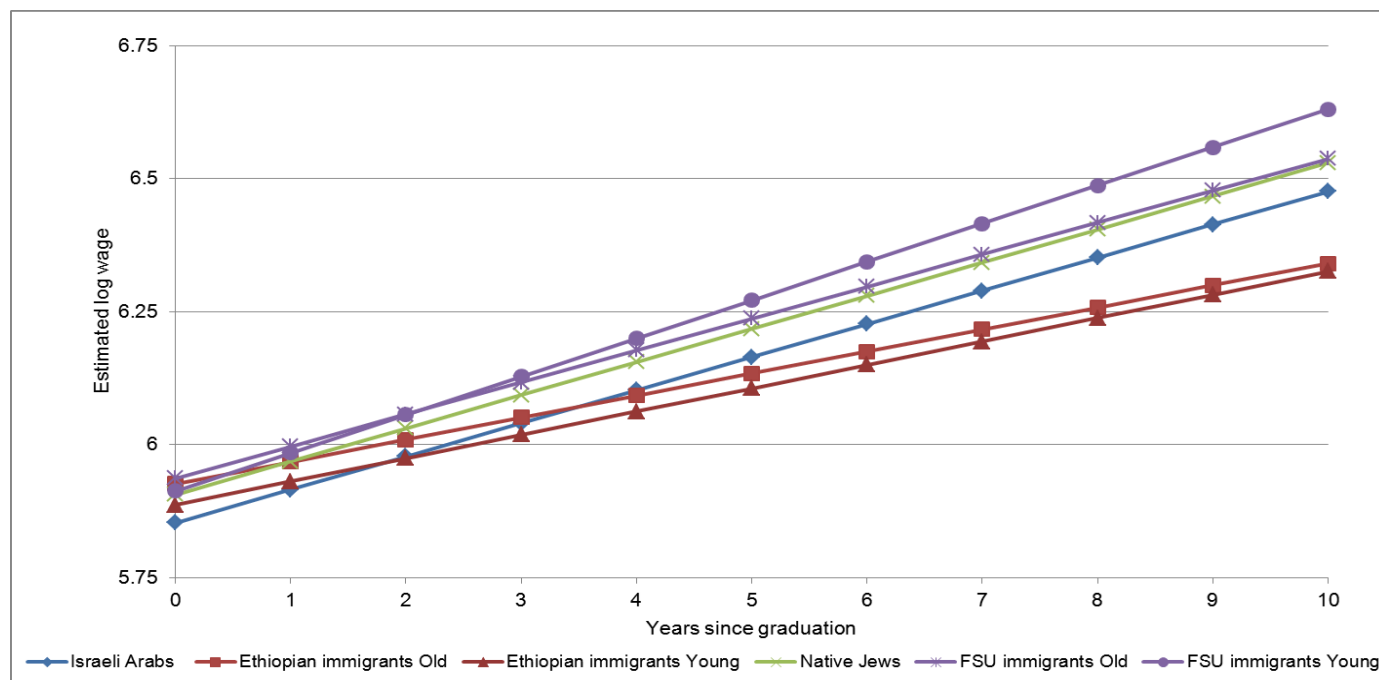


Figure 3b: Estimated log wage by ethnic group, age on arrival and years since graduation – Women only



The results for men indicate that the wage function for Israeli Arabs remains above that of Ethiopian immigrants who arrived after the age of 13 and that Ethiopian immigrants do not manage to close the gap (they start at a lower wage and the rate of growth in their wages is equivalent to that of Israeli Arabs).

Ethiopian immigrants who arrived before the age of 13 have a lower starting point than Israeli Arabs but the rate of growth in their wages is higher and therefore they overtake Israeli Arabs after four years.

FSU immigrants (whether they arrived before or after the age of 13) and native Jews have the same starting point but the rate of growth in the wage of FSU immigrants is higher than that of native Jews. The wage of FSU immigrants who arrived before the age of 13 grows faster than that of FSU immigrants who arrived after that age.

In the case of women, Israeli Arabs and Ethiopian immigrants (whether they arrived before or after the age of 13) have the same starting point on graduation; however, the rate of growth in the wage of Israeli Arabs is higher than that of Ethiopian immigrants and therefore

their wage is always higher. There is no difference in the rate of growth in wages according to age on arrival among Ethiopian immigrants and therefore their wage functions are virtually identical.

FSU immigrant women (whatever their age on arrival) and native Jewish women have the same starting point but the rate of growth in the wage of FSU immigrant women is higher and therefore they always earn more than native Jewish women.

Native Jewish women have a lower starting point than FSU immigrant women who arrived after the age of 13 but the rate of growth in their wages is higher and therefore they are able to close the gap within 6-7 years.

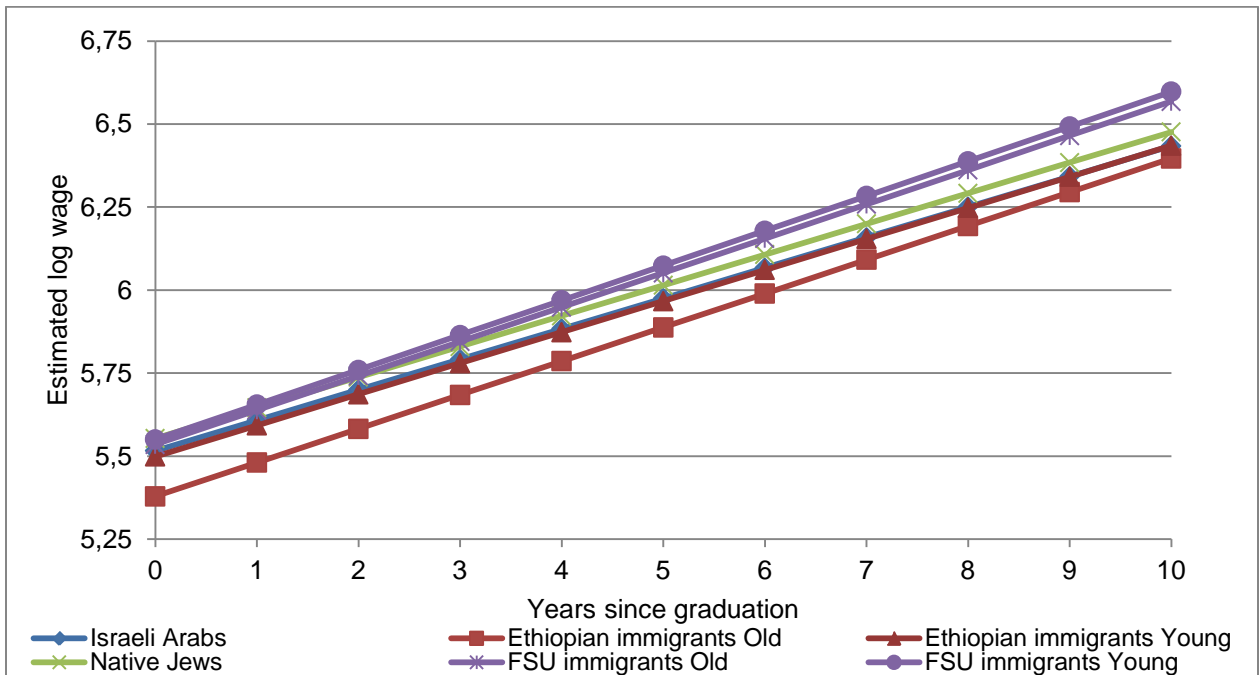
These results may be explained by the network effect. The three minority groups can be ranked with respect to their cultural similarity to the majority group, as follows (from most to least similar): FSU immigrants, Ethiopian immigrants and Israeli Arabs. They can also be ranked by size (from largest to smallest): Israeli Arabs (about 1,587,000 or 20.5 percent of the population), FSU immigrants (about 1,000,000 or 13 percent of the population) and Ethiopian immigrants (about 140,000 or about 1.8 percent of the population).

Thus, even though Israeli Arabs are least similar to the majority group in terms of culture, they are the largest minority group and have the potential to generate employment within their enclave. Native Jews can help members of their own group find jobs and thus generate higher earnings following graduation; however, over time FSU immigrants overtake them as the network effect decreases in importance and experience starts to play a greater role in determining wages. The explanation is similar for the comparison of Israeli Arabs to Ethiopian immigrants.

3.4 Age on arrival and psychometric score

Table 3 (columns 4-6) and figures 3c, 3d and 3e below present the estimated log wage for each ethnic group as a function of years since graduation after controlling for all the variables mentioned above and allowing the return on experience to vary with the psychometric test score.

Figure 3c: Estimated log wage by ethnic group, age on arrival and years since graduation allowing the return on experience to vary with psychometric score



When we allow return on experience to vary with psychometric score, we obtain different results. The gap between Israeli Arabs, young Ethiopian immigrants and old Ethiopian immigrants diminishes over time, and the wage of each group approaches that of native Jews (in contrast to the previous results according to which the gap widens). On the other hand, the gap between FSU immigrants and native Jews becomes even larger.

Figure 3d: Estimated log wage by ethnic group, age on arrival and years since graduation allowing the return on experience to vary with psychometric score - Men only

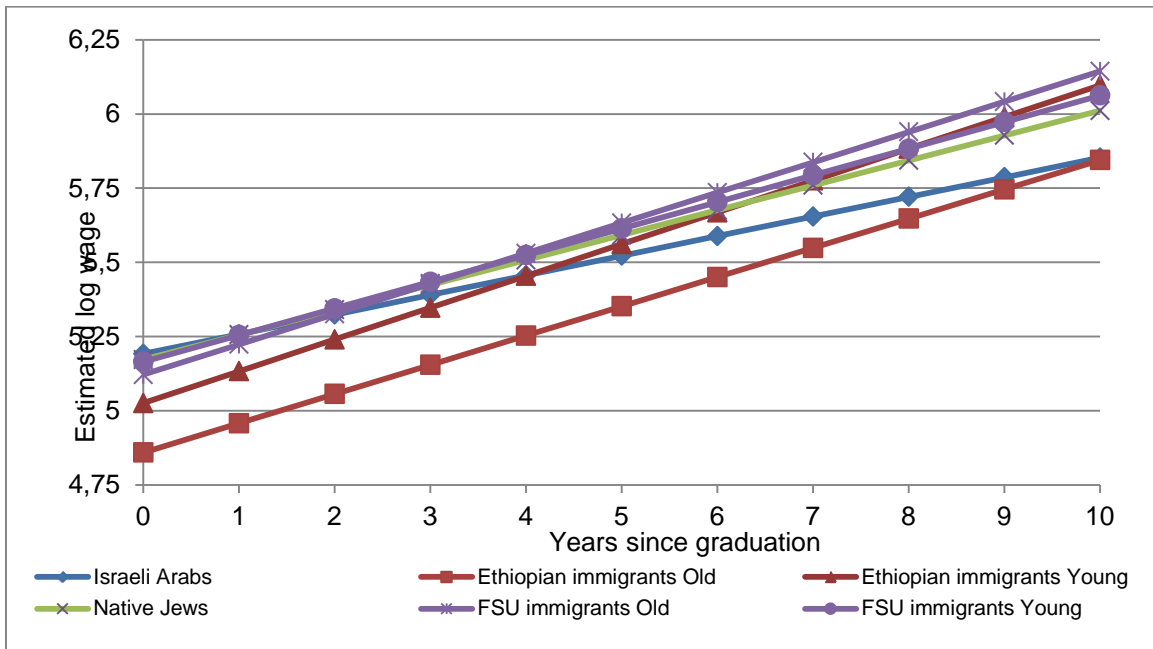
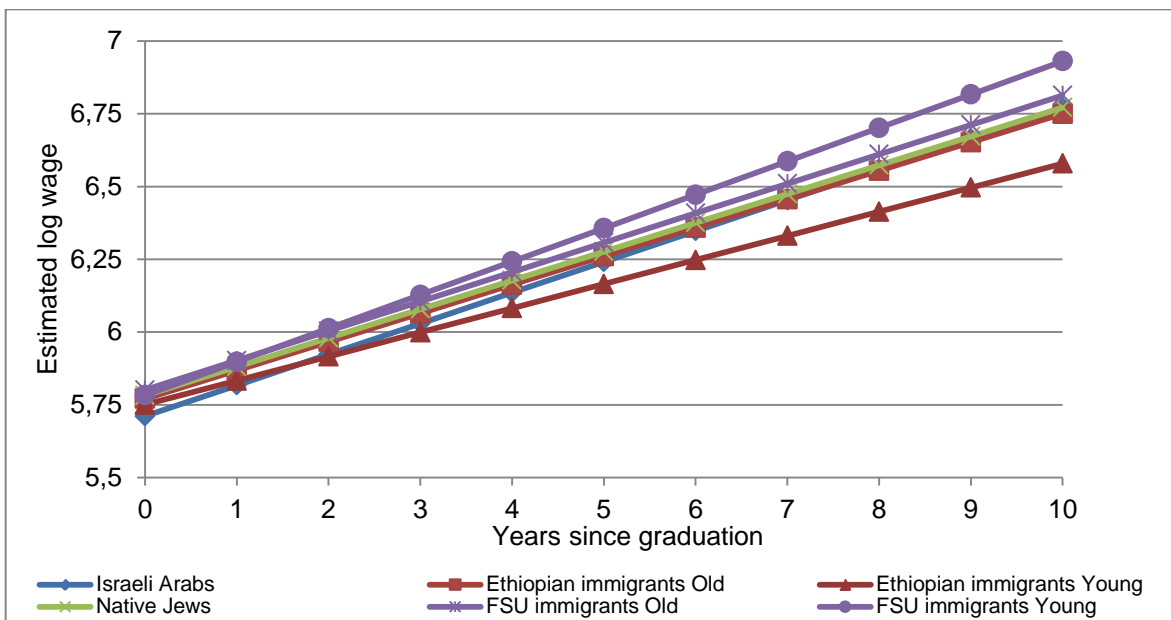


Figure 3e: Estimated log wage by ethnic group, age on arrival and years since graduation allowing the return on experience to vary with psychometric score - Women only



In the case of men, when we allow the return on experience to vary with psychometric score we obtain different results. Young Ethiopian immigrants close the gap with Israeli Arabs after four years and even overtake native Jews.

The gap between old Ethiopian immigrants and Israeli Arabs diminishes over time, while the gap between them and native Jews grows over time but to a lesser extent. On the other hand, the gap between FSU immigrants and native Jews remains almost unchanged. The gap between older and younger FSU immigrants grows over time.

Also in the case of women, when we allow the return on experience to vary with psychometric score we obtain different results. Israeli Arab women and older Ethiopian immigrant women close the gap with native Jews they are all bigger the younger Ethiopian immigrants women but less than the FSU immigrants. The gap between young and old FSU immigrants grows over time.

4. Conclusion

The economic outcomes of university and college graduates were compared for four different ethnic groups in Israel: native Jews, Jewish immigrants from the Former Soviet Union (FSU), Jewish immigrants from Ethiopia and Israeli Arabs. A unique dataset was used which includes all individuals who graduated with a first degree between the years 1995 and 2008 and which tracks the individuals for up to ten years from the year of graduation. .

Native Jews earn more than Ethiopian immigrants and Israeli Arabs even when controlling for psychometric test score, academic institution, field of study and occupation. Moreover, the earnings gap between natives on the one hand and Ethiopian immigrants and Israeli Arabs on the other persists over time.

On the aggregate level, native Jews and FSU immigrants have similar wage functions, as do Ethiopian immigrants and Israeli Arabs who both lag far behind native Jews and FSU immigrants.

The results support the conclusion that education has the power to narrow wage gaps between ethnic groups, but only to a certain extent. Thus, for example, Ethiopian immigrants overtake Israeli Arabs over time, but they remain far behind native Jews and FSU immigrants.

When we control for experience together with psychometric test scores, many of the gaps narrow, indicating that individual abilities together with experience and education can help to close wage gaps. However, not all the gaps disappear.

Note that we did not include an interaction term between the psychometric test scores and ethnicity. If we had, it may well be that the already small wage gaps would have been eliminated altogether, although it appears likely that some of the gap would have remained.

The results indicate that the difference in earnings between native Jews and Ethiopian immigrants and between native Jews and Israeli Arabs is real. The gaps do diminish with growth in experience and education and when we control for the ability of individuals; however, gaps still remain and they are likely due to taste-based discrimination.

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Tables

Table 1: Number of observations¹

	Number of years since graduation (BA)													
	0	1	2	3	4	5	6	7	8	9	10	11	12	13
All ethnic groups	237256	208636	183246	159325	137691	117856	98362	80862	64919	50420	37850	27114	16552	7584
Israeli Arabs	16293	14377	12407	10627	9022	7440	5997	4744	3647	2688	2009	1397	860	383
Ethiopian immigrants	1059	876	724	586	482	384	269	189	139	76	42	28	14	6
Old Ethiopian immigrants*	227	212	194	170	149	132	103	79	70	38	23	17	10	4
Young Ethiopian immigrants**	832	664	530	416	333	252	166	110	69	38	19	11	4	2
Native Jews	199286	175147	154014	134153	116155	99667	83432	68762	55464	43328	32506	23302	14247	6609
FSU immigrants	20618	18236	16101	13959	12032	10365	8664	7167	5669	4328	3293	2387	1431	586
Young FSU immigrants*	10340	9918	9408	8753	7935	7173	6205	5264	4212	3221	2441	1761	1045	409
Old FSU immigrants**	10278	8318	6693	5206	4097	3192	2459	1903	1457	1107	852	626	386	177

*Immigrants who arrived after the age of 13.

** Immigrants who arrived before the age of 13.

	Number of years since graduation (BA)													
	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Israeli Arab men	7682	6639	5636	4736	3950	3280	2648	2109	1651	1225	886	593	365	178
Israeli Arab women	8611	7738	6771	5891	5072	4160	3349	2635	1996	1463	1123	804	495	205
Ethiopian immigrant men	386	319	271	218	188	157	118	95	75	39	23	16	10	5
Ethiopian immigrant women	673	557	453	368	294	227	151	94	64	37	19	12	4	1
Native Jewish men	82815	71667	62989	54136	46300	39554	32725	26446	21084	16472	12356	8834	5464	2567
Native Jewish women	116471	103480	91025	80017	69855	60113	50707	42316	34380	26856	20150	14468	8783	4042
FSU immigrant men	8182	7155	6581	5694	4844	4159	3486	2902	2326	1841	1404	1055	634	245
FSU immigrant women	12436	11081	9520	8265	7188	6206	5178	4265	3343	2487	1889	1332	797	341

Note:

Includes only employed individuals.

Table 2: Estimation of log monthly wage function by OLS

		All ¹	Male ²	Female ³	All ⁴	Male ⁵	Female ⁶
		I	II	III	IV	V	VI
Intercept		5.641*** (0.017)	5.235*** (0.030)	5.925*** (0.022)	5.547*** (0.022)	5.146*** (0.037)	5.791*** (0.027)
Addition to Intercept	Israeli Arabs	-0.016*** (0.004)	0.06*** (0.007)	-0.074*** (0.006)	-0.027*** (0.005)	0.054*** (0.008)	-0.083*** (0.006)
	Ethiopian immigrants	-0.054*** (0.013)	-0.142*** (0.023)	-0.034** (0.017)	-0.069*** (0.014)	-0.174*** (0.025)	-0.041** (0.017)
	Native Jews	0.0003 (0.003)	0.022*** (0.005)	-0.021*** (0.004)	0.0104*** (0.003)	0.034*** (0.005)	-0.013*** (0.004)
	FSU immigrants	0	0	0	0	0	0
Slope	Israeli Arabs	0.054*** (0.0008)	0.0385*** (0.001)	0.062*** (0.001)	0.092*** (0.001)	0.066*** (0.002)	0.106*** (0.002)
	Ethiopian immigrants	0.048*** (0.004)	0.053*** (0.006)	0.044*** (0.005)	0.094*** (0.004)	0.099*** (0.007)	0.087*** (0.006)
	Native Jews	0.064*** (0.0003)	0.068*** (0.0005)	0.062*** (0.0004)	0.092*** (0.0008)	0.084*** (0.001)	0.099*** (0.001)
	FSU immigrants	0.070*** (0.0007)	0.078*** (0.001)	0.064*** (0.001)	0.103*** (0.001)	0.098*** (0.002)	0.105*** (0.002)
Interaction between years since graduation and psychometric score	0-500				-0.041*** (0.0009)	-0.034*** (0.001)	-0.044*** (0.001)
	500-550				-0.041*** (0.0009)	-0.029*** (0.001)	-0.047*** (0.001)
	550-600				-0.029*** (0.0008)	-0.018*** (0.001)	-0.038*** (0.001)
	600-650				-0.021*** (0.0008)	-0.009*** (0.001)	-0.029*** (0.001)
	650-700				-0.011*** (0.0008)	-0.006*** (0.001)	-0.018*** (0.001)
	700+				0	0	0

- All regressions control for: age, gender, number of children, marital status, psychometric score, geographic region, type of academic education (college vs. university, MA or BA and field of study), number of months worked each year, cumulative months of absence from the labor market since graduation, cumulative number of workplaces, economic sector and year.
 - Standard errors appear in parentheses. Levels of confidence: * significant at 10%; ** significant at 5%; *** significant at 1%.
1. All of the differences in the estimated intercept between the ethnic groups are significant except between native Jews and FSU immigrants. All the differences in the estimated slope between the ethnic groups are significant except between Israeli Arabs and Ethiopian immigrants.

2. In the case of men, all the differences in the estimated intercept and slope between ethnic groups are significant.
3. In the case of women, all the differences in the estimated intercept between the ethnic groups are significant except between Ethiopian immigrants and native Jews. All the differences in the estimated slope between the ethnic groups are significant except between Israeli Arabs on the one hand and native Jews and FSU immigrants on the other.
4. In the case of graduates with a psychometric score, all of the differences in the estimated intercept between the ethnic groups are significant. All the differences in the estimated slope between the ethnic groups are significant except between Israeli Arabs and Ethiopian immigrants on the one hand and native Jews on the other.
5. In the case of male graduates with a psychometric score, all the differences in the estimated intercept and slope between ethnic groups are significant except for the difference in estimated slope between Ethiopian immigrants and FSU immigrants.
6. In the case of female graduates with a psychometric score, all the differences in the estimated intercept between the ethnic groups are significant except between Ethiopian immigrants and native Jews. All the differences in the estimated slope between the ethnic groups are significant except between Israeli Arabs and FSU immigrants.
7. The differences between the wage functions of the various ethnic groups are presented in table 1 in the appendix.

Table 3: Estimation of log monthly wage by OLS for each ethnic group and gender by age on arrival and years since graduation

		All ¹	Male ²	Female ³	All ⁴	Male ⁵	Female ⁶
		I	II	III	IV	V	VI
Intercept		5.641*** (0.018)	5.246*** (0.031)	5.913*** (0.022)	5.551*** (0.022)	5.165*** (0.038)	5.7832*** (0.027)
Addition to Intercept	Israeli Arabs	-0.017*** (0.005)	0.045*** (0.009)	-0.060*** (0.007)	-0.034*** (0.006)	0.026*** (0.009)	-0.072*** (0.007)
	Old Ethiopian immigrants[*]	-0.140*** (0.027)	-0.249*** (0.035)	0.014 (0.041)	-0.172*** (0.029)	-0.306*** (0.039)	-0.0122 (0.046)
	Young Ethiopian immigrants^{**}	-0.033** (0.016)	-0.101*** (0.030)	-0.026 (0.019)	-0.052*** (0.017)	-0.139*** (0.032)	-0.0329* (0.019)
	Native Jews	-0.001 (0.004)	0.007 (0.007)	-0.006 (0.005)	0.003 (0.005)	0.007 (0.008)	-0.0016 (0.006)
	Old FSU immigrants[*]	-0.004 (0.006)	-0.025*** (0.009)	0.024*** (0.007)	-0.015** (0.006)	-0.044*** (0.01)	0.0181** (0.007)
	Young FSU immigrants^{**}	0	0	0	0	0	0
Slope	Israeli Arabs	0.054*** (0.001)	0.038*** (0.001)	0.062*** (0.001)	0.092*** (0.001)	0.066*** (0.002)	0.106*** (0.002)
	Old Ethiopian immigrants[*]	0.043*** (0.007)	0.047*** (0.008)	0.0041*** (0.011)	0.102*** (0.008)	0.099*** (0.009)	0.0979*** (0.012)
	Young Ethiopian immigrants^{**}	0.057*** (0.005)	0.072*** (0.009)	0.044*** (0.006)	0.094*** (0.005)	0.107*** (0.009)	0.0829*** (0.006)
	Native Jews	0.065*** (0.0003)	0.068*** (0.001)	0.062*** (0.0004)	0.092*** (0.0008)	0.084*** (0.001)	0.099*** (0.001)
	Old FSU immigrants[*]	0.070*** (0.001)	0.081*** (0.001)	0.060*** (0.001)	0.103*** (0.001)	0.102*** (0.002)	0.101*** (0.001)
	Young FSU immigrants^{**}	0.073*** (0.001)	0.073*** (0.002)	0.072*** (0.002)	0.105*** (0.001)	0.089*** (0.002)	0.115*** (0.002)
Interaction between years since graduation and psychometric score	0-500				-0.041*** (0.0009)	-0.034*** (0.001)	-0.044*** (0.001)
	500-550				-0.041*** (0.0009)	-0.029*** (0.001)	-0.047*** (0.001)
	550-600				-0.029*** (0.0008)	-0.018*** (0.001)	-0.038*** (0.001)
	600-650				-0.021*** (0.0008)	-0.009*** (0.001)	-0.029*** (0.001)
	650-700				-0.011*** (0.0008)	-0.006*** (0.001)	-0.018*** (0.001)
	700+				0	0	0

* Immigrants who arrived in Israel after the age of 13.

** Immigrants who arrived in Israel before the age of 13.

- All regressions control for: age, gender, number of children, marital status, psychometric score, geographic region, type of academic education (college vs. university, MA or BA and field of study), number of months worked each year, cumulative months of absence from the labor market since graduation, cumulative number of workplaces, economic sector and year.
- Standard errors appear in parentheses. Levels of confidence: * significant at 10%; ** significant at 5%; *** significant at 1%.

1. All the differences in the estimated intercept between the ethnic groups are significant except between native Jews and all FSU immigrants and between Israeli Arabs and young Ethiopian immigrants. All the differences in the estimated slope between the ethnic groups are significant except between Israeli Arabs and Ethiopian immigrants and between young Ethiopian immigrants and native Jews.
2. All the differences in the estimated intercept between ethnic groups are significant for men except between native Jews and young FSU immigrants. All the differences in the estimated slope between ethnic groups are significant for men except between Israeli Arabs and old Ethiopian immigrants and between young Ethiopian immigrants on the one hand and native Jews and all FSU immigrants on the other.
3. All the differences in the estimated intercept between ethnic groups are significant for women except between old Ethiopian immigrants on the one hand and native Jews and all FSU immigrants on the other, between young Ethiopian immigrants on the one hand and native Jews and young FSU immigrants on the other and between native Jews and young FSU immigrants. All the differences in the estimated slope between ethnic groups are significant for women except between Israeli Arabs on the one hand and native Jews and old FSU immigrants on the other and between old Ethiopian immigrants and young Ethiopian immigrants.
4. For graduates with a psychometric score, all the differences in the estimated intercept between the ethnic groups are significant except between native Jews and young FSU immigrants and between Israeli Arabs and young Ethiopian immigrants. None of the differences in the estimated slope between the ethnic groups are significant except between Israeli Arabs and all FSU immigrants, between young Ethiopian immigrants and all FSU immigrants and between native Jews and all FSU immigrants.
5. For male graduates with a psychometric score, all the differences in the estimated intercept between the ethnic groups are significant except between native Jews and young FSU immigrants. All the differences in the estimated slope between ethnic groups are significant except between old Ethiopian immigrants and young Ethiopian immigrants, native Jews and all FSU immigrants and between young Ethiopian immigrants and old FSU immigrants.
6. For female graduates with a psychometric score, all the differences in the estimated intercept between the ethnic groups are significant except between old Ethiopian immigrants and all other ethnic groups and between native Jews and young FSU immigrants. All the differences in the estimated slope between ethnic groups are significant except between old Ethiopian immigrants and all other ethnic groups
7. The differences between the wage functions of the various ethnic groups are presented in table 2 in the appendix.

Appendix

Table 1: Differences in the estimated intercept and coefficient of years since graduation between the ethnic groups and by gender

		All	Male	Female	All	Male	Female
		I	II	III	IV	V	VI
Differences in the intercept	Israeli Arabs in comparison to Ethiopian immigrants	0.038*** (0.014)	0.202*** (0.023)	-0.039** (0.017)	0.042*** (0.015)	0.227*** (0.025)	-0.042** (0.018)
	Israeli Arabs in comparison to native Jews	-0.016*** (0.004)	0.038*** (0.005)	-0.053*** (0.005)	-0.037*** (0.004)	0.019*** (0.006)	-0.070*** (0.005)
	Israeli Arabs in comparison to FSU immigrants	-0.016*** (0.004)	0.06*** (0.007)	-0.074*** (0.006)	-0.027*** (0.005)	0.054*** (0.008)	-0.083*** (0.006)
	Ethiopian immigrants in comparison to native Jews	-0.054*** (0.013)	-0.164*** (0.022)	-0.014 (0.016)	-0.079*** (0.014)	-0.208*** (0.025)	-0.026* (0.017)
	Ethiopian immigrants in comparison to FSU immigrants	-0.054*** (0.014)	-0.142*** (0.023)	-0.034** (0.017)	-0.069*** (0.014)	-0.174*** (0.025)	-0.041** (0.017)
	Native Jews in comparison to FSU immigrants	0.0003 (0.003)	0.022*** (0.005)	-0.021*** (0.004)	0.010*** (0.003)	0.034*** (0.005)	-0.013*** (0.004)
Differences in the effect of years since graduation	Israeli Arabs in comparison to Ethiopian immigrants	0.006 (0.004)	-0.015** (0.006)	0.018*** (0.005)	-0.002 (0.004)	-0.033*** (0.007)	0.019*** (0.005)
	Israeli Arabs in comparison to native Jews	-0.011*** (0.0008)	-0.029*** (0.001)	-0.0001 (0.001)	-0.0005 (0.0009)	-0.018*** (0.002)	0.007*** (0.001)
	Israeli Arabs in comparison to FSU immigrants	-0.017*** (0.001)	-0.039*** (0.002)	-0.002 (0.001)	-0.011*** (0.001)	-0.032*** (0.002)	0.0008 (0.001)
	Ethiopian immigrants in comparison to native Jews	-0.016*** (0.004)	-0.015** (0.006)	-0.018*** (0.005)	0.002 (0.004)	0.015** (0.007)	-0.013** (0.005)
	Ethiopian immigrants in comparison to FSU immigrants	-0.022*** (0.004)	-0.025*** (0.006)	-0.020*** (0.005)	-0.009** (0.004)	0.001 (0.007)	-0.019*** (0.005)
	Native Jews in comparison to FSU immigrants	-0.006*** (0.0007)	-0.011*** (0.001)	-0.002* (0.0009)	-0.011*** (0.0008)	-0.014*** (0.001)	-0.006*** (0.001)

- Standard errors appear in parentheses. Levels of confidence: * significant at 10%; ** significant at 5%; *** significant at 1%.
- Columns IV, V and VI - only graduates with a psychometric score.

Table 2: Differences in the estimated intercept and coefficient of years since graduation between the ethnic groups and genders and by age on arrival

		All	Male	Female	All	Male	Female
		I	II	III	IV	V	VI
Difference in the intercept	Israeli Arabs in comparison to old Ethiopian immigrants [*]	0.123*** 0.026	0.294*** (0.035)	-0.074* (0.041)	0.137*** (0.029)	0.332*** (0.039)	-0.059 (0.046)
	Israeli Arabs in comparison to young Ethiopian immigrants ^{**}	0.016 0.016	0.145*** (0.030)	-0.034* (0.018)	0.017 (0.016)	0.166*** (0.032)	-0.039** (0.019)
	Israelis Arabs in comparison to native Jews	-0.016*** 0.004	0.038*** (0.005)	-0.053*** (0.005)	-0.037*** (0.004)	0.019*** (0.006)	-0.070*** (0.005)
	Israeli Arabs in comparison to old FSU immigrants [*]	-0.014*** (0.005)	0.070*** (0.008)	-0.084*** (0.007)	-0.019*** (0.005)	0.07*** (0.008)	-0.090*** (0.007)
	Israeli Arabs in comparison to young FSU immigrants ^{**}	-0.017*** (0.005)	0.045*** (0.009)	-0.060*** (0.007)	-0.034*** (0.006)	0.026*** (0.009)	-0.072*** (0.007)
	Old Ethiopian immigrants [*] in comparison to young Ethiopian immigrants ^{**}	-0.107*** (0.030)	-0.149*** (0.045)	0.040 (0.045)	-0.120*** (0.034)	-0.167*** (0.049)	0.021 (0.049)
	Old Ethiopian immigrants [*] in comparison to native Jews	-0.139*** (0.026)	-0.256*** (0.035)	0.020 (0.041)	-0.174*** (0.029)	-0.313*** (0.039)	-0.011 (0.046)
	Old Ethiopian immigrants in comparison to old FSU immigrants [*]	-0.136*** (0.027)	-0.224*** (0.035)	-0.010 (0.041)	-0.156*** (0.029)	-0.262*** (0.039)	-0.030 (0.046)
	Old Ethiopian immigrants [*] in comparison to young FSU immigrants ^{**}	-0.140*** (0.027)	-0.249*** (0.035)	0.014 (0.041)	-0.172*** (0.029)	-0.306*** (0.039)	-0.012 (0.046)
	Young Ethiopian immigrants ^{**} in comparison to native Jews	-0.032** (0.015)	-0.107*** (0.029)	-0.020 (0.018)	-0.054*** (0.016)	-0.146*** (0.032)	-0.031* (0.018)
	Young Ethiopian immigrants ^{**} in comparison to old FSU immigrant [*]	-0.029* (0.016)	-0.076** (0.030)	-0.050*** (0.019)	-0.036** (0.017)	-0.096*** (0.032)	-0.051*** (0.019)
	Young Ethiopian immigrants in comparisons to young FSU immigrants ^{**}	-0.033** (0.016)	-0.101*** (0.030)	-0.026 (0.019)	-0.052*** (0.017)	-0.139*** (0.032)	-0.033* (0.019)
	Native Jews in comparison to old FSU immigrants [*]	0.003 (0.004)	0.032*** (0.006)	-0.030*** (0.005)	0.018*** (0.004)	0.050*** (0.006)	-0.019*** (0.005)
	Native Jews in comparison to young FSU immigrants ^{**}	-0.001 (0.004)	0.007 (0.007)	-0.006 (0.005)	0.003 (0.005)	0.007 (0.008)	-0.002 (0.006)
Old FSU immigrants [*] in comparison to young FSU immigrants ^{**}	-0.004 (0.006)	-0.025*** (0.009)	0.024*** (0.007)	-0.015** (0.006)	-0.042*** (0.01)	0.018** (0.007)	

* Immigrants who arrived in Israel after the age of 13.

** Immigrants who arrived in Israel before the age of 13.

Table 2 – continued

		All	Male	Female	All	Male	Female
		I	II	III	IV	V	VI
Difference in the effect of years since graduation	Israeli Arabs in comparison to old Ethiopian immigrants [*]	0.011 (0.007)	-0.009 (0.008)	0.021* (0.011)	-0.01 (0.008)	-0.032*** (0.009)	0.008 (0.012)
	Israeli Arabs in comparison to young Ethiopian immigrants ^{**}	-0.003 (0.005)	-0.033*** (0.009)	0.018*** (0.006)	-0.002 (0.005)	-0.041*** (0.009)	0.023*** (0.006)
	Israelis Arabs in comparison to native Jews	-0.011*** (0.001)	-0.029*** (0.001)	-0.0001 (0.001)	-0.0005 (0.0009)	-0.018*** (0.002)	0.007*** (0.001)
	Israeli Arabs in comparison to old FSU immigrants [*]	-0.016*** (0.001)	-0.042*** (0.002)	0.002 (0.002)	-0.012*** (0.001)	-0.036*** (0.002)	0.005*** (0.002)
	Israeli Arabs in comparison to young FSU immigrants ^{**}	-0.019*** (0.001)	-0.035*** (0.002)	-0.010*** (0.002)	-0.013*** (0.002)	-0.024*** (0.003)	-0.009*** (0.002)
	Old Ethiopian immigrants [*] in comparison to young Ethiopian immigrants ^{**}	-0.014* (0.008)	-0.025** (0.012)	-0.003 (0.012)	0.008 (0.009)	-0.009 (0.013)	0.015 (0.014)
	Old Ethiopian immigrants [*] in comparison to native Jews	-0.021*** (0.007)	-0.021** (0.008)	-0.021* (0.011)	0.009 (0.008)	0.015 (0.009)	-0.001 (0.012)
	Old Ethiopian immigrants [*] in comparison to old FSU immigrants [*]	-0.027*** (0.007)	-0.034*** (0.008)	-0.019* (0.011)	-0.002 (0.008)	-0.004 (0.009)	-0.003 (0.012)
	Old Ethiopian immigrants [*] in comparison to young FSU immigrants ^{**}	-0.030*** (0.007)	-0.026*** (0.008)	-0.030*** (0.011)	-0.003 (0.008)	0.009 (0.010)	-0.017 (0.012)
	Young Ethiopian immigrants ^{**} in comparison to native Jews	-0.008 (0.005)	0.004 (0.009)	-0.018*** (0.006)	0.001 (0.005)	0.023** (0.009)	-0.016*** (0.006)
	Young Ethiopian immigrants ^{**} in comparison to old FSU immigrant [*]	-0.014*** (0.005)	-0.009 (0.009)	-0.016*** (0.006)	-0.009* (0.005)	0.005 (0.009)	-0.018*** (0.006)
	Young Ethiopian immigrants in comparisons to young FSU immigrants ^{**}	-0.016*** (0.005)	-0.002 (0.009)	-0.028*** (0.006)	-0.011** (0.005)	0.017* (0.009)	-0.032*** (0.006)
	Native Jews in comparison to old FSU immigrants [*]	-0.006*** (0.001)	-0.013*** (0.001)	0.002** (0.001)	-0.011*** (0.0009)	-0.018*** (0.002)	-0.002* (0.001)
Native Jews in comparison to young FSU immigrants ^{**}	-0.008*** (0.001)	-0.006*** (0.002)	-0.010*** (0.002)	-0.012*** (0.001)	-0.006** (0.002)	-0.016*** (0.002)	
Old FSU immigrants [*] in comparison to young FSU immigrants ^{**}	-0.002* (0.002)	0.008*** (0.002)	-0.012*** (0.002)	-0.001 (0.002)	0.013*** (0.003)	-0.014*** (0.002)	

^{*} Immigrants who arrived in Israel after the age of 13.

^{**} Immigrants who arrived in Israel before the age of 13.

- Standard errors appear in parentheses. Levels of confidence: * significant at 10%; ** significant at 5%; *** significant at 1%.
- Columns IV, V and VI - only graduates with a psychometric score.