Human Capital Heterogeneity: University Choice and Wages

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Abstract

This paper analyzes the impact of post-secondary education on wages in Israel. The focus is on the impact of university choice on individual wages controlling for the degree acquired and the area of study. Although the raw data indicate that universities command a different return to education, the paper shows that this is due to the selection of more able individuals to particular universities and not to differences in the quality of education offered. The paper is based on a unique data set linking the 1995 census of population, the universities' records, and the Manufacturing and Crafts Survey.

1. Introduction

Mincer (1958) and Becker (1964) laid the analytical foundations for economic research into the relation between wages and the level of human capital. Mincer's model serves as the basis for many empirical studies estimating the rate of return on education and attempt to explain the reasons for wage differentials among workers.

In this paper, I use an integrated employer-employee cross-sectional data base of the Israeli manufacturing sector for the year 1995 to estimate the Mincerian wage regression and analyze the influence of human capital heterogeneity on wages. The paper identifies three dimensions of heterogeneity in post-secondary education that may affect individual wages – the university degree acquired, the university attended, and the area of study. Measuring education by the years of schooling, as it is commonly done, ignores the large variation in degrees acquired (BA, MA, Ph.d.) and areas of studies in the population. Estimation of the returns to different degrees and areas of study is one of the goals of this paper. In addition, universities may vary in the quality of education offered with a corresponding variation in wages. Thus, controlling for degree acquired and area of study may not suffice to capture the impact of education on wages.

In fact, the raw data clearly indicate that there are wage differences between different human capital allocations. In particular, controlling for degree and area of study, there are significant variations in wages across universities. These differences may reflect true quality differences in education or they may reflect the sorting of students across universities according to pre-university capabilities that are correlated with wages.

The paper deals with this selection bias in two complementary ways. First, I compare individuals with the same degree and area of study but that are working in the same plant. The underlying premise is that variation in unobserved abilities across workers hired by the same employer is "small". The second approach is to focus on engineering graduates only. The implicit assumption here is that the relationship between their pre-university abilities and university attended is weak.

The first approach requires linking the data on 1980-1995 university graduates with the 1995 household and population census long form and with the 1995

Manufacturing and Crafts Survey. This is the first time such a linkage between employers, employees and their education is done in Israel.

Controlling for unobserved abilities, in the manner described above, indicates that the differences in wages among university graduates observed in the raw data cannot be attributed to differences in education quality. Thus, the selection of the more able students to particular universities explains the differences in the relative return to education between universities that is not explained by the combination of degrees and areas of study.

The paper is structured as follows: In Section 2, I present the development of the higher education system in Israel during the 1980-1995 period. Section 3 describes the unique data base and presents statistical data about wage differentials between university graduates. Section 4 presents the empirical framework used for examining the research questions and the empirical results. Section 5 discusses different approaches to control for the selection problem and Section 6 presents the conclusions.

2. The Higher Education System in Israel

The higher education system in Israel has its beginnings even before the establishment of the State. In 1924 the Technion was established and, in 1925, The Hebrew University of Jerusalem (hereafter: The Hebrew University) was founded. In 1948, when the state of Israel was established, the number of students studying in these two institutions was only 1,635. The rise in the demand for higher education resulted in the opening of the Weitzman Institute in 1949 and of Bar-Ilan University and Tel-Aviv University in 1955 and 1956, respectively. The opening of these three universities allowed a major rise in the number of students, so that by 1960 there were already 9,275 students. The rise in the demand for higher education continued during the 1960s because the large number of individuals who immigrated during the 1950s was reaching the higher education age. As a result, two more universities were opened in the 1960s: Haifa University in 1963 and Ben-Gurion University in 1964. In the early seventies the government decided to establish an eighth university - The Open University – which opened in 1976[1]. By 1995 there were seven active universities in Israel granting bachelor, master, and doctorate degrees, as well as certificate studies.

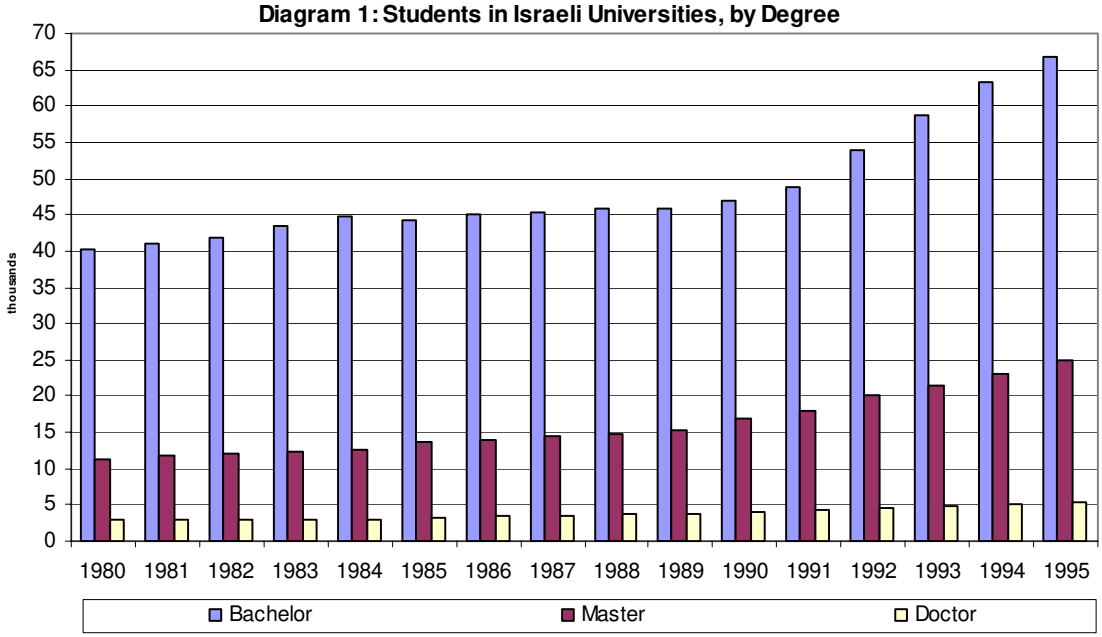
The higher education system in Israel experienced a rapid rise in the number of students since 1980. During the period 1980-1995 as a whole, the student population increased by 78 percent but the pace at which it grew was uneven (Diagram 1). During the 1980s the average growth rate in the number of students was about 2 percent a year, but increased to a yearly average of 7 percent during the 1990s. This drastic change in the growth rate of the number of students studying at Israeli universities coincides with the immigration wave from the former Soviet Union and their absorption in Israel. During the same period, 1980-1995, the universities opened new fields of study and substantially raised the number of students for advanced degrees (master and doctoral studies). As a result, during the first half of the nineties the growth rate of these degrees rose to 8 percent for master and 6 percent for doctoral studies, whereas during the 80s the growth

[1] The structure of studies at the Open University differs from the structure at the other 7 universities. Studies are not defined by units of time (years or semesters) but rather by the number of accumulated credits. Thus, the Open University does not require from its students to complete a uniform and prescribed program of study during a certain academic year.

rate of students studying for master and doctorate degrees was 5 and 3 percent, respectively[2].

The fast expansion in the number of students in the higher education system followed the expansion of the supply - of the number of universities, of the fields of study and of the offered degrees. Table 1 shows the number of university students by year and degree. There is substantial variation in the number of students across universities and also across the acquired degrees in each university. The number of students at Tel-Aviv University rose faster than in the other universities and, since the 1980s, it is the largest universities in terms of its student body. In 1995, the number of students at Tel-Aviv University was 25 percent larger than that at The Hebrew University, even though the latter was established 31 years before Tel Aviv.

Diagram 1: Students in Israeli Universities, by Degree



[2] It is interesting to note that the number of students studying for a master degree in business administration rose from about 2,000 in 1980 to about 4,800 students in 1995.

Table 1: Number of Students in Universities in 1995, by Degrees and Institutions

	1948/49	1959/60	1969/70	1979/80	1984/85	1989/90	1994/95
Total	**1,635**	**9,275**	**35,374**	**54,480**	**61,155**	**67,770**	**97,250**
Bachelor	1,549	28,348	28,053	40,250	44,355	46,960	66,750
Master	..	..	5,156	10,050	12,765	16,100	23,550
Doctor	86	927	1,346	2,930	3,215	3,910	5,430
Hebrew University							
Total	**957**	**6,752**	**12,588**	**13,570**	**14,385**	**16,780**	**20,300**
Bachelor	871	6,277	9,213	8,700	9,070	10,600	12,170
Master	. .	. .	2,119	3,130	3,840	4,630	5,930
Doctor	86	475	742	1,340	1,300	1,420	1,950
Technion - Israel Institute of Technology							
Total	**678**	**2,411**	**6,045**	**7,580**	**8,060**	**9,080**	**10,480**
Bachelor	676	1,971	4,066	5,400	6,000	6,600	7,540
Master	2	360	1,645	1,740	1,640	1,900	2,240
Doctor	-	80	334	350	360	520	650
Tel Aviv University							
Total	**-**	**616**	**7,958**	**14,380**	**18,020**	**19,270**	**26,030**
Bachelor	-	2,616	6,836	10,350	12,975	12,770	16,690
Master	-	. .	951	3,100	4,120	5,450	7,800
Doctor	-	-	. .	630	750	850	1,160
Bar Ilan University							
Total	**-**	**423**	**4,273**	**8,070**	**8,780**	**9,330**	**16,890**
Bachelor	-	423	3,925	6,750	6,800	6,780	12,610
Master	-	. .	272	1,010	1,550	1,940	3,110
Doctor	-	-	20	210	300	410	610
Haifa University							
Total	**-**	**-**	**2,794**	**6,140**	**6,330**	**6,780**	**12,440**
Bachelor	-	-	2,729	5,350	5,410	5,400	9,800
Master	-	-	-	480	715	1,130	2,320
Doctor	-	-	-	10	25	90	130
Ben-Gurion University of the Negev							
Total	**-**	**-**	**1,297**	**4,250**	**5,080**	**5,890**	**10,340**
Bachelor	-	-	1,284	3,700	4,100	4,810	7,940
Master	-	-	-	420	720	860	1,930
Doctor	-	-	-	70	160	170	380
Weizmann Institute of Science							
Total	**-**	**-**	**419**	**490**	**500**	**640**	**770**
Bachelor	-	-	-	-	-	-	-
Master	-	-	169	170	180	190	220
Doctor	-	-	250	320	320	450	550

3. Description of the Data

In order to examine the effect of educational heterogeneity on wages, the data used in this paper come from the merging of three large scale databases assembled by the Central Bureau of Statistics (CBS). The first database is a subset of the 1995 Census of Population and Housing long form (the 'B' level form), which was filled by approximately 20 percent of the population in Israel. The census includes demographic characteristics as well as earnings and employment attributes at the individual level. This study focuses on individuals employed by plants in the manufacturing sector - 56,000 individual observations - because we will later use information on the plants where the individuals are employed which is only available for manufacturing plants. The second database is from the National Insurance Institute ("Bituach-Leumi", hereafter: NII) register of employment[3]. The register contains detailed monthly information on the employment status and wages for each individual in the census. The third database has detailed information on university education. These data are collected by the CBS directly from all university registries comprising detailed information on 193,000 degree recipients that concluded their studies in one of the seven Israeli universities during the period of 1980-1995. The registry includes data on the acquired degree, field of study, the university and the year the degree was granted.

Table 2 summarizes the different sources of data and the variables supplied by each source. After merging the three sources of data we remain with a representative sample of 18,713 university graduates from the veteran (non-immigrant) Jewish population working in full-time jobs in 1995 in the manufacturing sector.[4]

[3] The data are collected from the 102 form filled by employers and it applies to Israeli employees only.

[4] The following individuals were not included in the final sample: individuals who were not Jewish, self-employed, living in cooperative localities ("Kibbutzim"), and those who worked part time during 1995. In addition, about 1,200 individuals were excluded due to missing wage data, and/or mismatching between the data on education from the Census of Population and the data from the universities.

Table 2: Sources of Data

Database	Description of the Data	Variables
1995 Household and population census, "B" form. Manufacturing.	Personal and demographic data. 20% of the individuals working in the manufacturing sector. 56,000 observations.	Age, Gender, Country of Birth, Parents Country of Birth, Religion, School years.
Degree Holders Registry	Records of degree holders from the 7 Israeli Universities, for the years 1980-1983, 1985-1995. 15,500 observations.	Degree, Year of receiving the degree, Academic Field, University.
1995 NII wage data (form #102)	Wage and employment data on all employees, as reported by the employer to the NII. 300,000 observations	Monthly wages, employment

3.1 Wages

Table 3 shows the average wage of full time workers in the manufacturing sector by area of study, university and degree. The average monthly wage was 10,419 NIS in 1995[5]. This sample average masks variations across universities, degrees and areas of study. The average wage of a Weizmann Institute graduate is significantly higher than average (12,102 NIS) while the average wage of a Haifa University graduate is much lower (7,471 NIS). Because university graduates are unequally distributed with respect to their area of study and degree, one might suspect that part of the wage gap across universities is due to differences in areas of study and degrees and not to differences in the quality of education.

In all universities, the average wage of master graduates was higher than that of bachelor graduates. The average wage of doctorate graduates, however, was lower than that of master graduates in 4 of the universities and marginally higher in The Hebrew University and the Technion. This surprising result may reflect the research orientation of doctorate graduates who tend to work in universities or other public sector jobs where wages are lower.[6]

[5] Wages are in 1995 nominal New Israeli Shekels.
[6] It may also reflect the small number of doctorate graduates in the sample.

Table 3: Monthly Average Wage by Area of Study, University and Degree.

		Arts & Humanities	Social Sciences [a]	Medical Sciences	Exact Sciences [b]	Engineering	Weighted Average
Hebrew							
	Bachelor	5,079	9,471	6,610	8,450		8,187
	Master	9,420	11,982	9,124	10,140		10,816
	Doctor	4,232			12,918		11,832
	Average	**5,648**	**10,400**	**7,410**	**9,310**		**9,161**
Technion							
	Bachelor			3,510	9,485	10,159	10,076
	Master			5,768	14,667	12,875	12,785
	Doctor				13,349	13,796	13,604
	Average			**5,316**	**11,010**	**10,627**	**10,617**
Tel Aviv							
	Bachelor	6,270	9,527	7,010	10,367	11,829	9,982
	Master	6,725	16,877	10,365	12,936	13,630	15,158
	Doctor	5,084			10,681	10,206	9,848
	Average	**6,320**	**13,188**	**7,849**	**10,931**	**12,245**	**11,730**
Bar Ilan							
	Bachelor	6,261	10,278		8,970		9,511
	Master	8,578	16,295		11,213		14,225
	Doctor				8,174		8,174
	Average	**7,188**	**12,044**		**9,231**		**10,733**
Haifa							
	Bachelor	5,193	8,002		7,545		7,246
	Master	7,221	12,023				10,308
	Doctor						
	Average	**5,404**	**8,317**		**7,545**		**7,471**
Ben-Gurion							
	Bachelor	7,344	6,475	5,232	9,674	9,347	8,703
	Master	3,228	7,775		10,669	16,722	14,813
	Doctor	13,664					13,664
	Average	**6,710**	**6,683**	**5,232**	**9,908**	**11,392**	**10,209**
Weizmann							
	Master				13,273		13,273
	Doctor				11,048		11,048
	Average				**12,102**		**12,102**
Average							
	Bachelor	5,812	8,960	6,244	9,266	10,265	9,226
	Master	7,405	15,386	8,109	11,798	14,504	13,763
	Doctor	4,800			11,347	13,445	11,413
	Average	**6,082**	**11,132**	**6,865**	**10,061**	**11,152**	**10,419**

Source: National Insurance Institute Data taken from the employer 102 forms. 3 months average wage.
a- include business management and law. **b** - Include nature sciences

Another noticeable variation in wages is across areas of study: the average wage of engineers (11,152 Nis) was the highest, while the average wages of Arts and Humanities graduates was the lowest (6,082 Nis), almost an 85 percent difference. This difference, although very high, may not be surprising given that we are comparing workers within the manufacturing sector.

3.2 Heterogeneity in Education

The universities offer many fields of studies, more than a hundred in total. To make the analysis manageable, the fields of study were grouped into five main areas according to the yearbook of the Central Statistics Bureau. The first area of study is Arts and Humanities (25 percent of the individuals in the sample) which include General Arts and Humanities, Languages, Education, Art, Music and Cinematography. The second area is Social Sciences (39 percent) which include General Social Sciences, Business Administration and Law. The third area is Medical Studies (8 percent) which include the paramedical careers. The fourth area is Exact Sciences (15 percent) including the Natural Sciences, Mathematics, Statistics, Physics and Biology. And the fifth area is Engineering (13 percent). The grouping of the fields of study into five areas enables the examination of area-specific premia to education without losing many degrees of freedom. As expected, the distribution of areas of study differs across universities. Table B-1 (in the appendix) shows the number of graduates in each area of study by university. The Weizmann Institute specializes in the area of Exact Sciences. The Technion specializes in the areas of Engineering, Exact Sciences and Medicine while that Haifa University and Ben Gurion University specialize in the areas of Social Sciences and Arts and Humanities. On the other hand, The Hebrew University and Tel-Aviv University – the two largest universities accounting for over half the graduates – have a balanced distribution of graduates across the five areas of study.

If we expect wages of Engineering graduates to be higher than that of Arts and Humanities or Social Sciences graduates then the average wages of Technion graduates would be higher than the average wages of Haifa University graduates because most of

the latter students graduated in Arts and Humanities or Social Sciences. This can potentially explain part of the wage gap across these two universities.

Table B-2 (in the appendix) shows that, overall, 68 percent of the graduates acquired a bachelor degree, 28 percent a master degree and only 4 percent acquired a doctoral degree. This distribution also varies across universities and may also explain some of the differences in the average wage across them. In the smaller universities (Technion, Haifa University and Ben Gurion University) the share of bachelor degree graduates is higher than the average share, while in the two largest universities (Hebrew University and Tel-Aviv University) the share of master and doctorate degree graduates is higher than average. This can reflect advantages to size in teaching advanced degrees. Another important issue that may affect average wages is that bachelor degrees are not granted by the Weizmann Institute, and that most of its graduating students acquired a doctorate degree.

3.3 Measuring Human Capital

The years of education are not always a good indicator of the human capital acquired in the form of formal education. Table 4 illustrates the distribution of actual years of education by degree. It can easily be seen that the reported number of overall years of education are higher than the number of formal years required for obtaining a degree[7].

The reported standard deviations (1.5-2 years) are quite high. If one treats these deviations as a classical error in variable problem then using the number of years of schooling in a wage regression can lead to downward biased estimates of the return to higher education. Table 4 further indicates that the estimated standard deviation is not constant among areas: in Arts and Humanities the standard deviation is much higher than in Social Sciences (for any degree) – perhaps because education in Arts and Humanities, much more than in Social Sciences, can also be seen as a consumption good. Consistent with this view, the lowest standard deviation is found in Engineering studies.

[7] 3 years for bachelor degree, with some exceptions like Engineering (4 years), Law (3.5 years), Accounting (4 years), and Medical sciences (6 years). The master degree takes additional 2 years (17 years in total), and a doctoral degree another 5 (21 years in total). The numbers are taken from the universities registries.

Table 4: Distribution of Actual Years of University Schooling by Area and Degree.

	Arts & Humanities	Social Sciences	Medicine	Exact Sciences	Engineering	Total
Bachelor						
Mean	16.06	15.86	16.29	15.71	16.26	15.97
S.d.	1.68	1.64	1.68	1.54	1.40	1.62
Master						
Mean	17.60	18.05	18.79	18.16	18.46	18.03
S.d.	2.04	1.78	1.77	1.85	1.75	1.91
Doctor						
Mean	20.20	20.51	21.03	20.58	21.21	20.60
S.d.	2.76	2.47	1.96	2.83	1.90	2.64

4. Empirical Framework and Results

Numerous empirical studies examine the impact that college choice has on wages. Berhman et al. (1996), using data on female twins, rejected models ignoring college choice and the quality of education. Dale and Krueger (1999) estimated the private return to a specific college and found that private unobserved ability has a strong impact on admissions. Arcidiacono (2003), in a recent paper, argues that there are significant differences in the premium to different majors. He also suggests controlling for the area of study (major) when estimating the college premium.

The paper contributes to this literature by estimating the returns to higher education (and the return to university choice) by analyzing three different dimensions of education: the university where the degree was acquired, the degree conferred to the individual and the area of study. The ideal variable that one would like to measure is the one that most accurately reflects the level of human capital acquired. The actual variable used in most wage regressions is the number of years of formal education acquired by the individual in the higher education system. Year of education is a poor proxy for acquired human capital since it ignores differences in the quality of instruction and differences in the area of study and degree acquired. This paper, therefore, can be viewed as an attempt to allow for some heterogeneity in the measurement of education in order to better reflect the different types of education that individuals acquire and, specially, to estimate the premiums to different areas of study (Arcidiacono, 2003).

Specifically, the standard wage equation assumes that log wages (y) is linearly related to education (e), and to a vector of individual characteristics (x)

$$E(y_i \mid x_i, e_i) = \alpha_i + x_i'\beta + \delta e_i \tag{1}$$

The individual's education may be proxied by two different methods:

$$e_i = \begin{cases} years\ of\ schooling \\ \\ e(u_i, d_i, a_i) \end{cases} \tag{2}$$

The standard method measures education by the number of formal years of schooling. In the method proposed here, e is proxied by three factors: the university (u) where individual i studied, the degree acquired (d), and his area of academic study (a). Using a linear approximation to the function $e(\cdot)$ we get:

$$e(u_i, d_i, a_i) = \gamma_u u_i + \gamma_d d_i + \gamma_a a_i . \tag{3}$$

Since the three factors are discrete, the education function (e) uses only dummy variables to measure the education level. Using (1) and (3) one can rewrite the expected compensation as:

$$E(y_i \mid x_i, u_i, d_i, a_i) = \alpha_i + x_i'\beta + \pi_u u_i + \pi_d d_i + \pi_a a_i \tag{4}$$

where $\pi_d = \delta\gamma_d$ is the return to degree d, $\pi_a = \delta\gamma_a$ is the return to area of study a, and $\pi_u = \delta\gamma_u$ is the return to studying at university u.

The linear formulation (4) implies that wage differences across fields are constant and do not depend on the university nor on the degree. This is a restricting assumption which will be tested empirically by adding interactions among the dummy variables for the universities, for the areas of study and for the degrees acquired.

In estimating the wage equation (4), six dummy variables for the universities, two dummies for the degrees acquired and four dummies for the areas of study were used. The reference group is an individual with a bachelor degree in Arts and Humanities from Tel-Aviv University. The vector x controls for gender, immigrants[8] and potential work experience. In addition, all the estimated models include eight dummies for the geographical district where the employee works and for the 2-digit economic branch (as reported in the census long form). These dummy variables control for geographic and industrial differences in wages due to differences in the cost of living, employment opportunities and industrial composition across districts and branches.

The main concern in estimating equation (4) is that the estimated dummy coefficients of the different education dimensions do not represent the causal impact of education on wages. This is particularly true for the university coefficients which may not only reflect the quality of the university but are also likely to pick up the sorting of students across universities according to unobserved (pre-university) abilities – wages are higher for graduates of "better" universities because their students are more capable. Nevertheless, I first examine if a significant effect of the university attended on wages exists – even if it is not casual - and later I will attempt to correct for the self selection bias by examining subsets of the data where the variation in unobserved ability across individuals is presumed to be smaller.

Equation (4) was estimated by OLS using heteroscedasticity-consistent standard errors clustered at the university level in order to account for university-specific random effects. Table 5 presents estimates of different variations of equation (4).

[8] A new immigrant is defined in this study as an individual who immigrated to Israel during the period 1989-1995 and attained an academic degree from one of the seven Israeli universities. This definition mostly captures immigrants from the former Soviet-Union

Table 5: Wage regressions – (individual data only)

Dependent variable: log average monthly wage

Variable	(1)	(2)	(3)	(4) [a]
Constant	3.66	4.20	4.31	4.23
	(28.64)	(34.65)	(34.59)	(40.00)
Experience	0.06	0.07	0.07	0.07
	(21.66)	(21.74)	(21.35)	(19.97)
Experience^2	0.00	0.00	0.00	0.00
	(29.22)	(21.74)	(22.55)	(19.46)
Gender (Women=1)	-0.11	-0.11	-0.12	-0.13
	(7.37)	(7.18)	(8.31)	(9.74)
New Immigrant	-0.26	-0.28	-0.27	-0.28
	(8.10)	(9.36)	(8.39)	(9.56)
Years of Schooling	0.04			
	(15.23)			
Master Degree		0.21	0.21	
		(8.80)	(8.68)	
Doctor Degree		0.27	0.32	
		(11.57)	(11.88)	
Hebrew University			-0.06	
			(5.83)	
Technion			-0.03	
			(1.22)	
Bar Ilan University			0.04	
			(5.23)	
Haifa University			0.05	
			(5.33)	
Ben-Gurion University			-0.01	
			(0.41)	
Wiezmann Institute			-0.09	
			(1.80)	
Social Sciences			-0.03	
			(0.82)	
Medical studies			-0.01	
			(0.27)	
Exact sciences			-0.07	
			(1.47)	
Engineering			-0.03	
			(0.47	
individual characteristics [b]	Yes	Yes	Yes	Yes
Obs.	18,713	18,713	18,713	18,713
Adjusted R^2	0.23	0.24	0.24	0.25

t-statistics in parentheses based on standard errors clustered by university. The baseline group is bachelors from Tel Aviv University in the area of Arts and Humanities. **a** - Includes full interactions between the degrees, the areas of study and the universities. Coefficient estimates not reported, while estimated returns to education are presented in Table 6. **b** - 7 dummy variables for geographical districts, 15 dummy variables for 1-digit economic branch (for details see "Standard Industrial Classification of All Economic Activities 1993", CBS technical publication No. 63), and 7 dummy variables for 1-digit occupations branch (for details see "The standard classification of occupations 1994", CBS technical publication No. 64).

In column (1) education is measured by the number of years of education. The estimated return to every year of formal education is 4.8 percent. It follows that the estimated return to a master degree (above the bachelor degree) is about 9.6 percent while the return to a doctoral degree (above the master degree) is an additional 12.8 percent.[9] In column (2) education is instead measured by the highest degree acquired. Now the estimates reveal a different story: the marginal return to a master degree is 21 percent while the marginal return to a doctorate degree is only 6 percent.

Column (3) allows the returns to higher education to differ, in addition, by university and area of study, and the baseline group is bachelors from Tel Aviv University in the area of Arts and Humanities. The marginal return to a doctorate degree increases to 11 percent which is more reasonable. The returns to education seem to vary significantly across universities as well as across areas of study[10]. The estimates indicate that averages wages of graduates from The Hebrew University are 6 percent lower than comparable graduates from Tel-Aviv University, while the wages of those graduating from Bar-Ilan and Haifa universities were about 4-5 percent higher. The latter result is quite surprising in light of the low wages for Haifa graduates shown in Table 3. The reason is that Haifa University has no engineering or doctoral graduates in the sample; controlling for the areas of study as well as for the degree received corrects this bias.

In column (4) I use a full set of 44 interactions between the education variables. The interactions among degree, area of study and university dummies allow for the marginal returns to a university degree to vary across areas of study, degree and university. These estimated returns are shown in Table 6 for bachelors (top panel) and masters (bottom panel). The estimated returns to a doctorate are not shown only because there are not enough Ph.D. graduates in the sample. The reference group in each area of study – the columns – is Tel-Aviv University, which has graduates in all areas. Thus, the entries are measuring the returns in each university relative to that at Tel-Aviv University.

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[9] Assuming 2.0 additional years of studying towards the master degree and 2.57 additional years towards the doctorate degree (see Table 4).

[10] The null hypothesis that the university coefficients are all zero is rejected with a p-value less than 1 percent. Similarly, the hypothesis that the areas of study coefficients are all zero, is also rejected with a p-value less than 1 percent.

This added flexibility changes some of the conclusions obtained from column (3). For example, the return to a BA in Arts and Humanities at The Hebrew University is 5 percent higher than at Tel-Aviv University, but the return to a BA in Social Sciences and in Exact Sciences is 8 and 14 percent lower, respectively, than at Tel-Aviv University. The results also indicate that the Technion graduates (bachelors and masters) are paid less than Tel-Aviv University and Ben-Gurion University graduates.

From Table 6 it is clear that the private "return to education" varies considerably across areas of studies, universities and degrees. In this sense, these results emphasize that education heterogeneity is important because economic returns depend on the specific type of education acquired.

Table 6: Return to Education (percent) by Degree, University, and Area of Study Relative to Tel-Aviv University Graduates[11]

Bachelor Degree	Arts & Humanities	Social Sciences	Medical studies	Exact Sciences	Engineering
Hebrew	5.5*	8.5*	4.5*	-13.7*	..
	(1.3)	(1.1)	(1.3)	(0. 6)	
Technion	..	..	-6.5	8.2*	-0.93*
			(7.6)	(3.1)	(2.0)
Bar-Ilan	18.1*	2.9*	..	8.7*	..
	(1.7)	(1.0)		(0. 8)	
Haifa	11.6*	0. 8	..	1.4	..
	(1.0)	(1.1)		(1.8)	
Ben-Gurion	12.5*	-4.0*	-12.2*	-0. 7	-0.48*
	(1.9)	(1.5)	(1.6)	(1.4)	(0.09)
Weizmann	..	..	..	-15*	..
				(3.0)	

Master Degree	Arts & Humanities	Social Sciences	Medical studies	Exact Sciences	Engineering
Hebrew	3.8*	-10.3*	2.7	-15.5*	..
	(1. 1)	(0. 7)	(1.2)	(0. 6)	
Technion	..	..	-9.5*	5.2	-12.3
			(2.4)	(4.4)	(5.2)
Bar-Ilan	5.5*	-9.8*	..	-4.0*	..
	(0. 8)	(0. 7)		(1.3)	
Haifa	15.0*	4.3*	..	2.1	..
	(1.2)	(1.4)		(2.4)	
Ben-Gurion	13.3*	-3.3	-11.4*	0. 1	-4.0
	(3.2)	(3.4)	(1.9)	(2.8)	(3.1)
Weizmann	..	..	..	-15.0*	..
				(3.0)	

* - significant at 5 percent. Standard errors in parentheses, clustered by university.

[11] Source: Model 4, Table 5. The relative return to education is calculated separately for every area of study, degree and university.

Another interesting finding refers to the wage gap between genders and between veteran Israelis and new immigrants. In all models in Table 5, the wages of women were found to be lower by 11-13 percent than that of men, and the wages of the average new immigrants were lower by 26-28 percent than that of veteran Israelis. Adding interaction variables to the elapsed time from the time of immigration to Israel showed that the differences between veteran Israelis and new immigrants disappear after 7 years from immigration.[12]

Arcidiacono (2003) argues that because there are large and significant premiums to some areas of study, differences in wages between men and women reflect differences in the distribution of gender among the various areas of study. In order to investigate this issue the wage equation was estimated separately for each of the five areas of study. Each regression includes dummy variables for the universities, for the degrees acquired and for the interaction between them. Table 7 shows the results. As before, the base group in each regression is Tel-Aviv University bachelors. Clearly, the gender premium depends on the area of study. In the Medical Sciences there is no difference between men and women, in the Exact-Sciences and Engineering the differences stands at 8-11 percent, while in the Social Sciences it is 20 percent. The results confirm that the return to education, by gender, varies between the areas of study. It appears that in areas where the selection is higher (as in Medicine) the gender wage-gap is lower[13].

Table 7 also reveals that the wage gap among new immigrants and veteran Israelis differ between the areas of study: there is no significant wage gap among engineering graduates but there is a large and significant difference in wages in all other areas of study, reaching 46 percent in Arts and Humanities. This finding is quite surprising because the immigrants in the sample graduated from Israeli universities. A possible explanation for this result is that wages also reflect pre-immigration accumulated human capital but do so with varying discounts. Apparently, the discount in engineering is close to zero, perhaps because technical skills are universal.

[12] Results not shown and are available upon request. For a better understanding of the usage of the interaction between the date of immigration and time, see Chiswick B. (1998, 2001)

[13] This could reflect the fact that physicians' employment conditions are the result of collective agreements and therefore no gender-based difference in wages is expected. It is not always clear whether wage differential are due to selection or collective bargaining.

Table 7: Gender and Immigrant Differences, by Area of Study

Dependent variable: log average monthly wage

Area of study	Art & Humanities	Social Sciences	Medical studies	Exact Sciences	Engineering
Constant	4.54	4.23	3.67	4.38	4.49
	(9.52)	(17.09)	(39.51)	(38.99)	(9.05)
Experience	0.04	0.08	0.06	0.09	0.09
	(8.30)	(24.00)	(4.99)	(25.10)	(9.77)
Experience^2	0.00	0.00	0.00	0.00	0.00
	(4.17)	(11.77)	-2.54	(31.55)	(6.72)
Women	-0.14	-0.15	-0.03	-0.06	-0.11
	(7.71)	(11.50)	(0.97)	(3.17)	(5.31)
New Immigrant	-0.46	-0.25	-0.28	-0.26	-0.10
	(11.34)	(6.80)	(5.71)	(5.56)	(1.11)
Master	0.19	0.31	0.17	-0.04	0.22
	(9.81)	(55.18)	(11.94)	(1.56)	(29.62)
Doctor	0.22	0.37	2.02	0.27	0.17
	(8.28)	(13.39)	(32.51)	(6.72)	(7.96)
Hebrew	0.02	-0.05	-0.04	-0.17	
	-0.77	(5.87)	(1.09)	(17.75)	
Technion			-0.25	0.03	-0.14
			(11.09)	(1.28)	(7.14)
Bar-Ilan	0.06	0.03		0.09	
	(2.11)	(5.50)		(5.25)	
Haifa	0.01	0.02		0.04	
	(0.53)	(1.63)		(1.96)	
Ben-Gurion	-0.01	-0.03	0.00	0.00	-0.08
	(0.47)	(1.46)	(0.06)	(0.25)	(6.90)
Weizmann				-0.11	
				(2.05)	
Individual characteristics [a]	Yes	Yes	Yes	Yes	Yes
Interaction variables [b]	Yes	Yes	Yes	Yes	Yes
Obs.	4,634	7,386	1,503	2,756	2,434
Adjusted R^2	0.21	0.28	0.09	0.27	0.29

t-statistics in parentheses based on standard errors clustered by university.

a – 7 dummy variables for geographical districts, 15 dummy variables for 1-digit economic branch (for details see "Standard Industrial Classification of All Economic Activities 1993", CBS technical publication No. 63), and 7 dummy variables for 1-disigt occupations branch (for details see "The standard classification of occupations 1994", CBS technical publication No. 64).

b – Includes full interactions between the degrees, the areas of study and the universities. Coefficient estimates not reported, while estimated returns to education are presented in Table 6. The baseline group is bachelors from Tel Aviv University in the area of Arts and Humanities.

5. Controlling for Self Selection

The differences in the economic return to attending a specific university reported in Table 6 may reflect the sorting of individuals across universities according to pre-university capabilities that are correlated with (future) wages. That is, these returns may reflect pre-university abilities and not necessarily differences in the quality of education across universities. In this section, I attempt to deal with this selection problem in two ways: by comparing individuals working in the same plant and by examining more closely the university effects among engineering graduates only. The underlying motivation is that the variation in unobserved abilities across workers is smaller if they are employed in the same plant, and similarly within engineering graduates.

5.1. Matching Workers to Plants

I matched the individual-level data to the plants where the individuals are employed. Comparing individuals within the same plant may control for selection under the assumption that the variation in unobserved abilities is smaller within the same plant. Employers invest resources in attempting to identify key unobserved traits of their prospective employees through formal and informal testing procedures (e.g., interviews, personality tests, etc.). The assumption then is that the employers have a preference for particular levels and types of abilities and prefer hiring university graduates with similar such characteristics. If within-plant comparisons of otherwise identical individuals provide evidence for the presence of university effects then it is likely that these effects are related to the quality of the education acquired at the university. Conversely, if the university effects reported in Table 5 disappear when comparing individuals employed by the same plant then we can conclude that these were driven by the sorting of students across universities according to wage-related unobserved characteristics.

In 1995, 9,913 industrial plants, employing five employees or more, were active in the manufacturing sector in Israel[14]. The number of employees in these plants was about 384,000 (598 plants employed over 100 employees). The Manufacturing and Crafts Survey (MCS) for 1995 sampled about 2,300 plants employing at least five workers.

[14] '1995 Manufacturing and Crafts Survey', page 18, Table A

Merging the plants from the MCS dataset with the data from the Census of Population and Housing used in the previous sections, results in a matched employer-employee sample covering 2,308 employees in 477 manufacturing plants. The integrated dataset is a representative sample of salaried Jewish employees who worked in manufacturing in 1995 and acquired an academic degree in one of the seven Israeli universities.

This employer-employee sample is very similar in its characteristics to the sample used in previous sections, and only the ratio of women was lower (30 percent instead of 33 percent in the entire sample). The distribution of degrees is very similar to that found in the general sample: 72 percent have a bachelor degree, 25 percent have a master degree and 3 percent have a doctorate degree. Data on the plants in the sample include the industry (grouped into 7 main groups), the number of employees in the plant, the raw output per employee and the ownership structure of the plant (private, government or cooperative – kibbutz or cooperative society – ownership), the wage bill, and data regarding the export ratio of the total plant output[15].

In order to compare individuals within plants I added dummy variables indicating the plant where the individual is employed. The relative return to education by university, area of study and degree estimated from this equation are shown in Table 8. The results indicate that the relative premium to attending a specific university in most cases are insignificant; the relative premium from Table 6 was significant in 15 out of 19 possible cases, however in Table 8 only 5 of the relative premium are significant. The only significant premium is for The Hebrew University, and for the Ben-Gurion University. For Ben-Gurion University, the return to education for Bachelors is 3 percent lower relatively to the baseline group – bachelors from the Tel-Aviv University – in the area of arts and humanities and the area of social sciences. In the other areas of study and other degrees there are no differences in the returns to education between the Ben-Gurion University and the Tel-Aviv University. For The Hebrew University the picture is not homogenous: the return to education for bachelors and masters in the area of Aarts and

[15] The distribution of employees between plants reveals that over half of the plants employ more than 100 employees. Most of the sampled plants are owned privately and only 12 percent of them are owned by cooperative societies or by the government. More than 50 percent of the employees in the sample are employed in large plants (a large plant is defined as employing over 300 employees) but these large plants represent only 21 percent of the plants in the sample. 28 percent of all employees in the sample are employed in government-owned plants, implying that the government plants are quite large (e.g., plants in the security industry).

Humanities and the area of Exact Sciences is negative relative to Tel-Aviv university, however it is positive (7 percent) in the area of medical sciences. One can conclude that using the plant characteristics in the wage regression improves the ability of the econometrician to control for unobserved ability, and as a result the relative return to education is insignificant for most of the universities and areas of study, except for Ben-Gurion University – which is lower in some areas – and for The Hebrew University – which is higher in the area of medical studies and lower in other areas.

Table 8: Return to Education (percents) by Degree, University, and Area of Study Relative to Tel-Aviv University graduates[16]

Bachelor Degree	Arts & Humanities	Social Sciences	Medical studies	Exact Sciences	Engineering
Hebrew	-4.5*	-0.7	7.2*	-1.8*	..
	(1.23)	(7.9)	(2.7)	(0.80)	
Technion	..	..	-0.2	-1.4	-0.2
			(4.2)	(0.9)	(0.5)
Bar-Ilan	-2.8	-0.6	..	-1.0	..
	(1.7)	(0.8)		(0.9)	
Haifa	-1.2	-1.0	..	-1.3	..
	(1.1)	(0.7)		(1.2)	
Ben-Gurion	-3.4*	-2.6*	-1.7	-1.4	-0.3
	(1.5)	(0.9)	(4.1)	(0.1)	(0.6)
Weizmann	..	..	..	-0.7	..
				(1.8)	

Master Degree	Arts & Humanities	Social Sciences	Medical studies	Exact Sciences	Engineering
Hebrew	-5.1*	-1.3	6.5*	-2.5*	..
	(1.47)	(0.8)	(2.7)	(0.9)	
Technion	..	..	-1.7	-2.9*	-1.2
			(4.1)	(1.1)	(0.9)
Bar-Ilan	-2.7	-0.5	..	-1.0	..
	(1.7)	(0.9)		(1.2)	
Haifa	-2.57	-2.3	..	-2.7	..
	(2.2)	(1.9)		(2.3)	
Ben-Gurion	-2.1	-1.3	-3.0	-0.1	0.9
	(1.)	(1.2)	(4.2)	(1.2)	(0.9)
Weizmann	..	..	..	-0.7	..
				(1.8)	

* - significant at 5 percents. Standard errors in parentheses, clustered by university.

[16] Source: appendix B-3: the wage regression using employer-employee sample with full interactions between the degrees, the areas of study and the universities. The relative return to education was calculated separately for every area of study, degree and university. Hence, it is possible to compare increment by university within each area of study but not between areas.

5.2. Engineering Studies

Another way of dealing the sorting problem is by using graduates of identical field of study, where the variation in unobserved abilities across workers is smaller. A good candidate for that is the area of engineering studies. Restricting the sample to that of engineers only would eliminate the selection bias that may be confounding the estimates in Table 6. The three universities offering such studies are Tel-Aviv University, the Technion and Ben-Gurion University[17]. From Table 3 one can see that the wages of engineers with a master degree are 41 percent higher than those with bachelor degree, and that the wages of those with a doctorate degree is about 7 percent lower than those with a master degree. Engineers with a degree from Tel-Aviv University earn the highest wages, while those from the Technion earned the lowest[18].

I estimated the wage regression on all engineering graduates, and on a subset of graduates from Mechanical Engineering, Electrical Engineering and Industrial Management Engineering – fields of study that are the same in all universities. This subset contains more than 60 percent of the entire population of engineers (1,105 observations out of 1,817 engineers). The model was estimated using the same individual characteristics appearing in Table 5 and interactions between the universities and the degrees. Appendix B-4 presents the estimate returns to education.

Previous results show that the return to education for Technion graduates is 9 percent lower than that of Tel-Aviv University graduates and 5 percent lower that of Ben-Gurion University graduates (Table 6). However, using the estimate for the sub-sample of engineers' only, the differences in the return to education across universities decrease. Moreover, when comparing within identical fields of study – Mechanical Engineering, Electrical Engineering and Industrial Management Engineering, there was no difference between the wage premiums among these three universities, except that the return to a master degree in engineering at the Ben-Gurion University is 2.5 percent higher than that of the Technion or Tel-Aviv University (Table 9). This result is important for

[17] The share of Technion graduates is 66 percent out of the engineers. The distribution of degrees is very similar to that in the overall sample: 79 percent have a bachelor degree, 17 percent have a master degree and an additional 4 percent have a doctorate degree. Tel-Aviv University graduates earn the highest wages, while those from the Technion earned the lowest (Table 3).

[18] Detailed distribution of engineers and wage according to the university and degree are presented in Appendix B (Tables B-6 and B-7).

understanding the role of the university on wages since it is based on the assumption that unobserved heterogeneity is lowest when comparing graduates from exactly the same area of study.

Table 9: Return to Education (%) for Engineers studies by Degree and University, Relative to Tel-Aviv University graduates[19]

Bachelor Degree	All Engineers	Mechanical, Electrical, and Industrial Engineers
Technion	-0.80*	-0.11
	(0.41)	(0.43)
Ben-Gurion	-0.79	-0.28
	(0.46)	(0.47)
Master Degree		
Technion	-1.33	0.26
	(0.78)	(1.00)
Ben-Gurion	1.75	2.51*
	(0.92)	(1.09)

* - significant at 5 percent. Standard errors in parentheses, clustered by university.

[19] Source: appendix B-4: the wage regression using engineers sub-sample with full interactions between the degrees, the areas of study and the universities. The relative return to education was calculated separately for every area of study, degree and university. Hence, it is possible to compare increment by university within each area of study but not between areas.

6. Concluding Remarks

The raw data clearly indicate that there are wage differences between different human capital allocations. In particular, there are variations in wages across degrees, areas of study, and universities. These differences may reflect true quality differences in education or they may reflect the sorting of students across universities according to pre-university capabilities that are correlated with wages.

I estimate the Mincerian wage regression and analyze the influence of human capital heterogeneity on wages. I identify three dimensions of heterogeneity in post-secondary education that may affect individual wages – the university degree acquired, the university attended, and the area of study. Estimation of the relative returns to education to different dimensions of education is one of the goals of this paper. In addition, universities may vary in the quality of education offered with a corresponding variation in wages. Thus, controlling for degree acquired and area of study may not suffice to capture the impact of education on wages.

Estimating the wage equation reveals that the private "return to education" varies considerably across areas of studies, universities and degrees: 15 out of the 19 cases were found to be significant. The results emphasize that education heterogeneity is important because economic returns depend on the specific type of education acquired.

A concern is that the university premiums reflect the sorting of students with different prior abilities to different universities. The paper deals with this selection problem in two complementary ways. First, I analyze within-plant wage differentials, i.e., I compare the wages of individuals with the same degree and area of study but from different universities that are working in the same plant. The second approach is to focus on engineering graduates only.

Comparing individuals within the same plant, using a matched sub-sample of employer-employee, indicates that the relative premium to attending a specific university in most cases is insignificant: only 5 of the relative premiums were significant. The only significant premium is for The Hebrew University, and for Ben-Gurion University. The model was estimated again for a subset of identical engineering graduates from the fields of Mechanical, Electrical, and Industrial Engineers. Here too there was no difference across universities in the wages received, except for the return to a master degree in

engineering at the Ben-Gurion University, which was higher when estimating the model for identical engineers.

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Appendix A - The Variables

Variable	Description	Remarks
br	Grouped economic branch	1- Food and beverages. 2 - Textiles and apparel. 3 - Wood, metal products, non-metallic mineral products, and mining. 4- Chemicals, plastic and rubber. 5- Machinery and equipment. 6- Electronics. 7 - Other (including security plants).
toar	Academic degree	1 - Bachelor degree 2 - Master degree (including diploma studies) 3- Doctorate degree
dfemale	Gender dummy variable	1 - Women 0 - Men
dole	New immigrant dummy variable. Defined by those who immigrated to Israel after 1988, and includes mainly the former soviet union immigrants.	1- New immigrant 0 - Israeli veteran
e	Number of employees	
limtotal	Total years of schooling	
exp	Potential experience	Age-15
exp2	Experience^2	
ocp	Grouped academic area of study	1 - Arts and humanities. 2 - Social sciences, law and business management. 3 - Medical studies 4 - Exact sciences and nature sciences. 5 - Engineering.
fyr	Year of obtaining the degree	
mahoz	District. taken from the CBS Technical Publication No.68 (Hebrew only).	1- Jerusalem. 2 - North. 3 - Haifa. 4 - Center. 5- Tel-Aviv. 6 - South. 7 - Judea, Samaria and Gaza.
newid	Plant code	
newtz	Individual ID.	
sector	ownership sector	1 - Private plants (LTD). 2 - Other private plants. 3 - Cooperatives. 4 - Government.
unv	university	1- Hebrew university. 2 - Technion institute of technology 3 - Tel-Aviv university. 4 - Bar-Ilan university. 5 - Haifa university 6 - Ben-Gurion university. 7 - Wiezman institute.
wage	3 months average wage.	

Appendix B - The Data

Table B-1: University graduates by university and area of study.

University \ Area	Arts & Humanities	Social Science	Medicine	Exact Sciences	Engineering	**Total**
Hebrew	**1,080**	**1,610**	**534**	**900**	**..**	**4,124**
Percent of University	26%	39%	13%	22%	0%	100%
Percent of field	23%	22%	36%	33%	0%	22%
Technion	**..**	**..**	**136**	**277**	**1,473**	**1,886**
Percent of University	0%	0%	7%	15%	78%	100%
Percent of field	0%	0%	9%	10%	61%	10%
Tel Aviv	**1,312**	**2,531**	**638**	**681**	**374**	**5,536**
Percent of University	24%	46%	12%	12%	7%	100%
Percent of field	28%	34%	42%	25%	15%	30%
Bar Ilan	**898**	**1,708**	**..**	**310**	**..**	**2,916**
Percent of University	31%	59%	0%	11%	0%	100%
Percent of field	19%	23%	0%	11%	0%	16%
Haifa	**954**	**1,080**	**..**	**229**	**..**	**2,263**
Percent of University	42%	48%	0%	10%	0%	100%
Percent of field	21%	15%	0%	8%	0%	12%
Ben Gurion	**390**	**457**	**195**	**236**	**587**	**1,865**
Percent of University	21%	25%	10%	13%	31%	100%
Percent of field	8%	6%	13%	9%	24%	10%
Weizmann	**..**	**..**	**..**	**123**	**..**	**123**
Percent of University	0%	0%	0%	100%	0%	100%
Percent of field	0%	0%	0%	1%	0%	1%
Total	**4,634**	**7,386**	**1,503**	**2,756**	**2,434**	**18,713**
Percent of field	25%	39%	8%	15%	13%	100%

Table B-2: University graduates by university and Degree.

University \ Degree	Bachelor	Master[20]	Doctor	Total
Hebrew	**2,490**	**1,420**	**214**	**4,124**
Percent of University	60%	34%	5%	100%
Percent of field	20%	27%	30%	22%
Technion	**1,335**	**437**	**114**	**1,886**
Percent of University	71%	23%	6%	100%
Percent of field	10%	8%	16%	10%
Tel Aviv	**3,651**	**1,706**	**179**	**5,536**
Percent of University	66%	31%	3%	100%
Percent of field	29%	32%	25%	30%
Bar Ilan	**2,126**	**715**	**75**	**2,916**
Percent of University	73%	25%	0%	100%
Percent of field	17%	14%	0%	16%
Haifa	**1,702**	**551**	**10**	**2,263**
Percent of University	75%	24%	0%	100%
Percent of field	13%	10%	0%	12%
Ben Gurion	**1,424**	**421**	**20**	**1,865**
Percent of University	76%	23%	1%	100%
Percent of field	11%	8%	3%	10%
Weizmann	..	33	90	123
Percent of University	0	27%	73%	100%
Percent of field	0	1%	13%	1%
Total	**12,728**	**5,283**	**702**	**18,713**
Percent of field	68%	28%	4%	100%

[20] Including graduate Studies for diploma

Table B-3: wage regression for (employer-employee sample)

Dependent variable: log average monthly wage

Variable	(1)	(2)	(3)
Constant	4.722	4.642	5.68
	(100.86)	(51.37)	(36.62)
Experience	0.102	0.099	0.087
	(7.68)	(10.22)	(8.71)
Experience^2	-0.004	-0.004	-0.003
	(4.32)	(5.56)	(4.53)
Gender (Women=1)	-0.235	-0.179	-0.137
	(5.05)	(3.99)	(2.67)
New Immigrant	-0.255	-0.226	-0.222
	(3.90)	(5.13)	(3.98)
Master Degree	-0.191	-0.117	-0.081
	(1.88)	(0.74)	(0.40)
Doctor Degree	-0.225	-0.095	-0.275
	(11.48)	(2.55)	-1.06
Hebrew University	-0.298	-0.411	-0.502
	(27.09)	(25.81)	(10.89)
Technion	0.136	-0.109	-0.116
	(1.32)	(2.93)	(2.37)
Bar Ilan University	-0.049	0.038	-0.168
	(1.93)	(0.85)	(4.12)
Haifa University	-0.05	-0.077	-0.126
	(3.22)	(2.10)	(2.51)
Ben-Gurion University	-0.139	-0.279	-0.333
	(11.00)	(9.83)	(6.93)
Wiezmann Institute	-0.194	-0.016	-0.04
	(12.23)	(0.56)	(1.03)
Social Sciences	0.06	-0.02	-0.138
	(1.81)	(0.57)	(2.05)
Medical studies	-0.364	-0.453	-0.552
	(21.15)	(8.29)	(3.89)
Exact sciences	0.229	0.047	-0.062
	(6.98)	(1.38)	(1.11)
Engineering	0.1	-0.102	-0.213
	(2.38)	(1.89)	(3.30)
Plant characteristics [a]	No	Yes	Yes
Plant fixed effects [b]	No	No	Yes
Obs.	2,308	2,064	2,064
Adjusted R^2	0.29	0.34	0.5

t-statistics in parentheses based on standard errors clustered by university.

a - 7 dummy variables for geographical districts, 7 dummy variables economic branch, 3 dummy variables for ownership, the number of employees, and the productivity-per-employee.

b – 476 dummy variables for the plants.

Table B-4: wage regression for (engineers only)

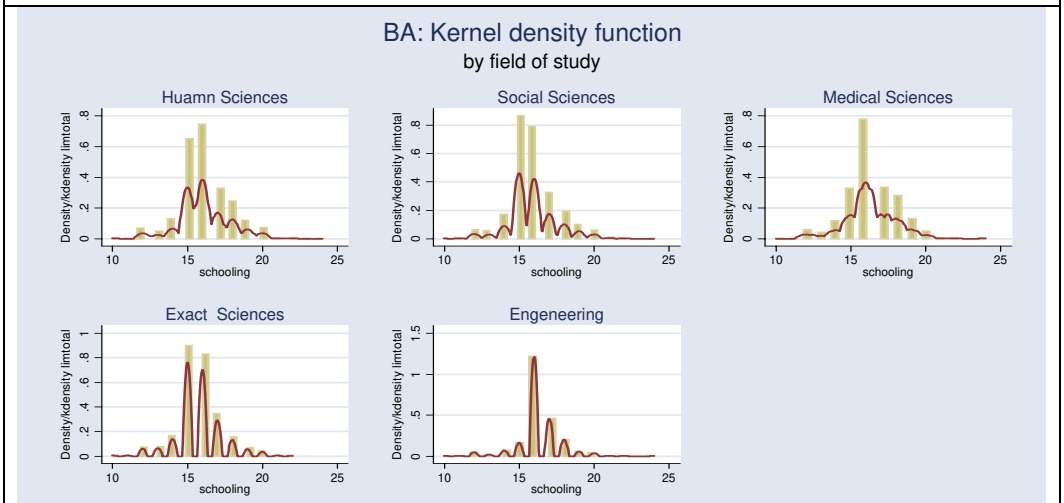
Dependent variable: log average monthly wage

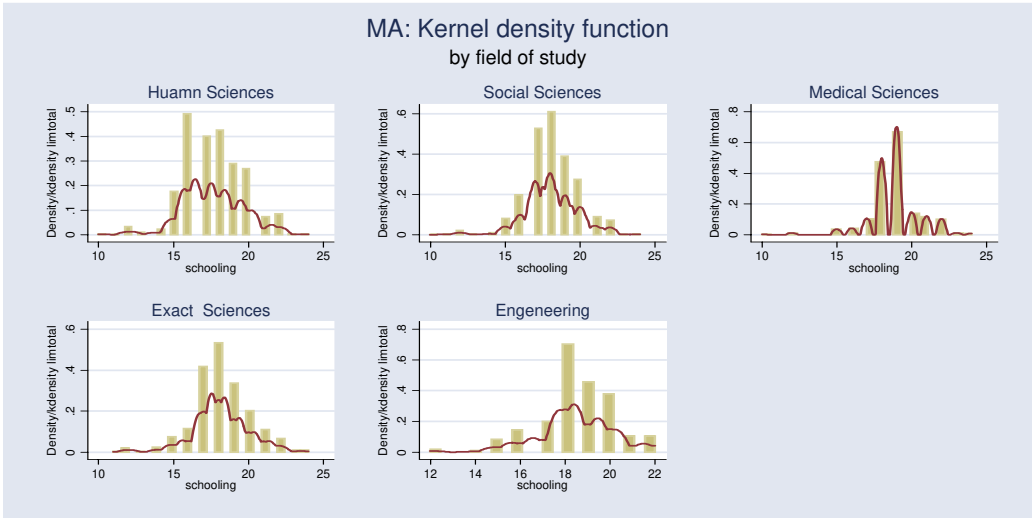
	All Engineers	Mechanical, Electrical, and Industrial Engineers
Constant	3.912	3.615
	(16.74)	(7.59)
Experience	0.12	0.1
	(9.91)	(6.41)
Experience^2	-0.005	-0.004
	(6.28)	(3.97)
Women	-0.113	-0.081
	(3.60)	(1.68)
New Immigrant	-0.159	-0.456
	(1.40)	(2.37)
Master	0.297	0.253
	(3.79)	(2.71)
Doctor	0.345	0.636
	(1.97)	(2.69)
Technion	-0.08	-0.011
	(1.95)	(0.26)
Ben-Gurion	-0.079	-0.028
	(1.70)	(0.60)
Technion* Master	-0.053	0.038
	(0.61)	(0.36)
Technion * Doctor	0.18	-0.161
	(0.97)	(0.61)
Ben-Gurion * Master	0.254	0.28
	(2.50)	(2.39)
Ben-Gurion * Doctor	-0.37	-1.365
	(1.45)	(3.37)
Electrical Engineering		0.186
		(5.23)
Industrial Engineering		0.072
		(1.76)
Individual characteristics [a]	Yes	Yes
Obs.	1,817	1,105
R^2	0.27	0.29

t-statistics in parentheses based on standard errors clustered by university.

a - Includes full interactions between the degrees, the areas of study and the universities, 7 dummy variables for geographical districts, 15 dummy variables for 1-digit economic branch (for details see "Standard Industrial Classification of All Economic Activities 1993", CBS technical publication No. 63), and 7 dummy variables for 1-digit occupations branch (for details see "The standard classification of occupations 1994", CBS technical publication No. 64).

Diagram: kernel density functions for the total number of years of university schooling by degree and area of study





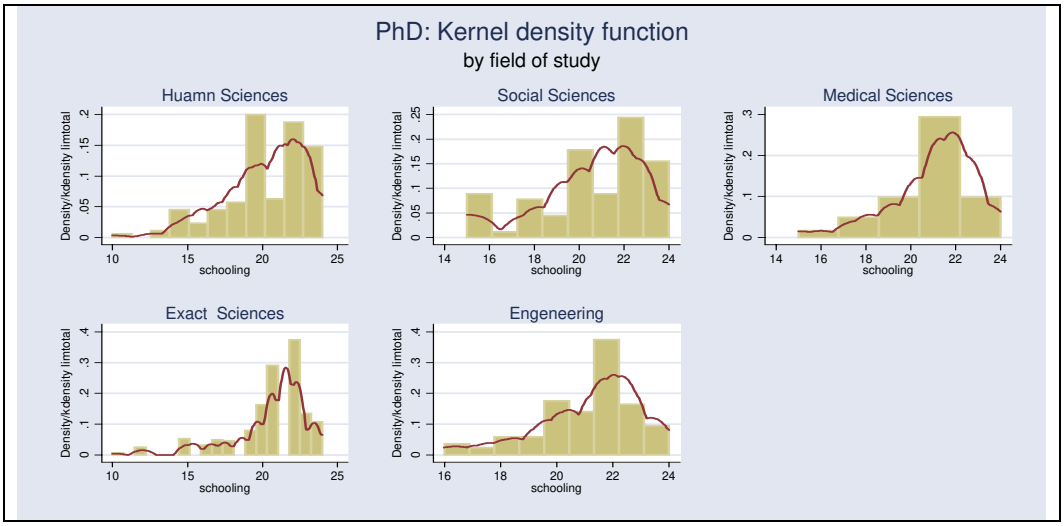
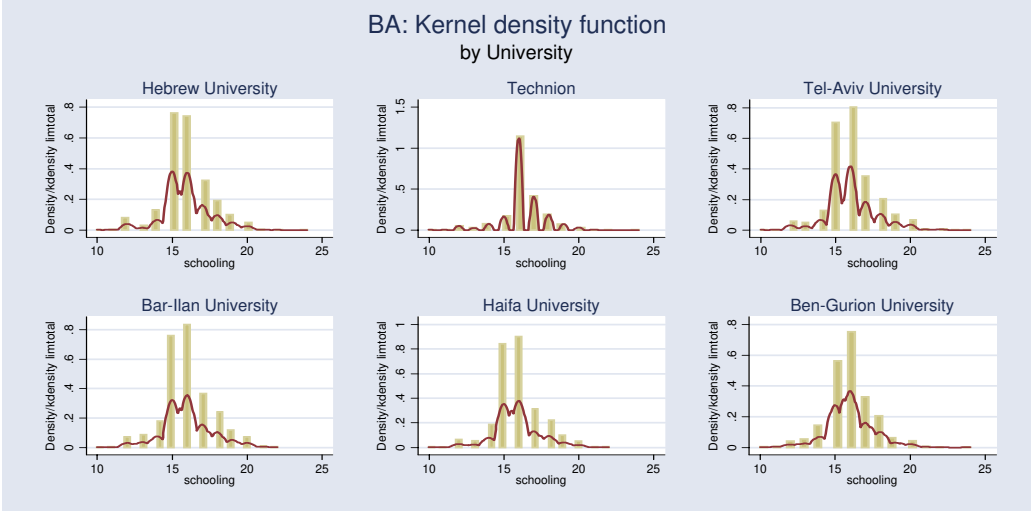
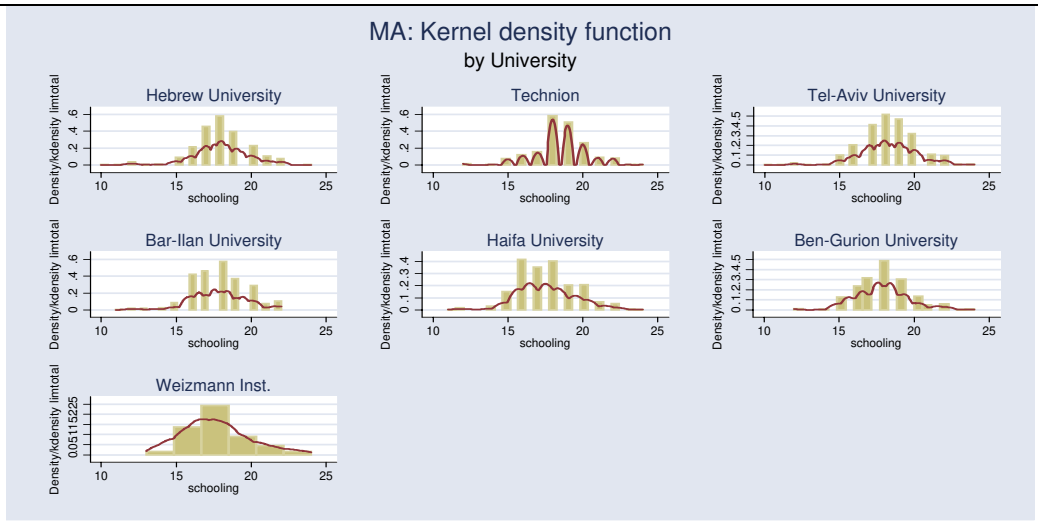
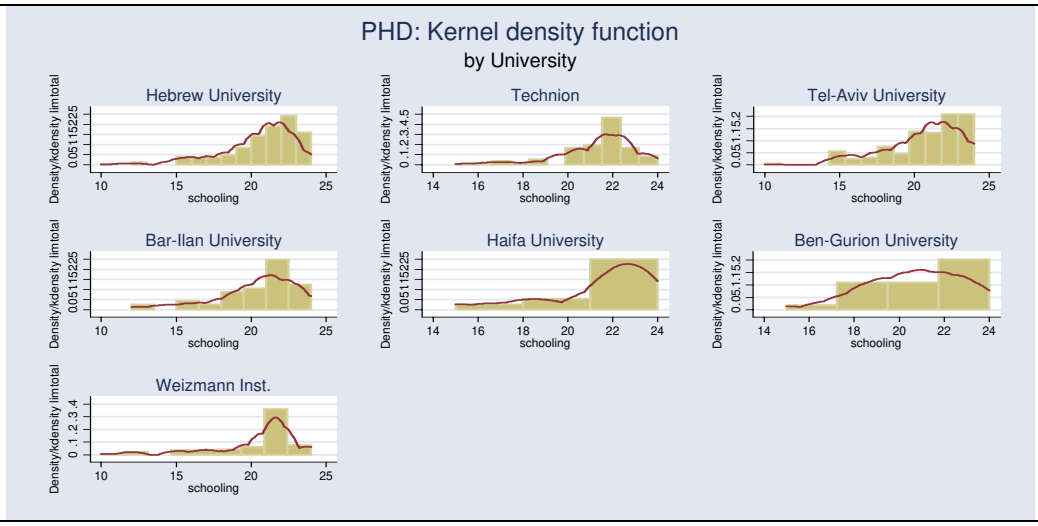


Diagram: kernel density functions for the total number of years of university schooling by degree and university




MA: Kernel density function
by University
Hebrew University
Technion
Tel-Aviv University
Bar-Ilan University
Haifa University
Ben-Gurion University
Weizmann Inst.
Density/kdensity lmtotal
schooling


PHD: Kernel density function
by University
Hebrew University
Technion
Tel-Aviv University
Bar-Ilan University
Haifa University
Ben-Gurion University
Weizmann Inst.
Density/kdensity lmtotal
schooling