

What is the true effect of students' employment on the duration of studies?

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Abstract

We examine the effect of the first-degree students' employment on the prolongation of their studies. When employing a popular instrumental variable, the regional unemployment rate, we find a negative impact of students' employment on duration of studies. Then, adding a predetermined IV—the individual's employment prior to the beginning of academic studies—turns the estimate positive. Furthermore, we find that the relationship between the extent of students' employment and duration of their studies depends on their age: among the younger students (aged 22–26), the extent of employment has no effect on the duration of studies, while among the older students the effect is positive and statistically significant.

Keywords: earnings, undergraduate studies, instrumental variable

JEL codes: I21, J22.

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1. Introduction

Employment is common among first-degree students who come from diverse socioeconomic backgrounds and pursue various majors (academic disciplines). It has considerable implications for the students' economic situation and, of course, on access to the higher-education system and their patterns of study.

Quite a few studies have examined empirically the effects of employment during academic study on the duration of study and the likelihood of dropping out, and have drawn clashing conclusions. Brunello and Winter-Ember (2003) found that employment of students in Europe had no significant effect on the duration of study. Ehrenberg and Sherman (1987), in contrast, found that employment of male students during the semester prolonged their degree studies and raised their dropout rates, and that the employment of first-degree students at the higher-education institution itself enhanced the likelihood of the students' pursuing advanced degrees.

The main problem in investigating the effect of employment on the duration of study and the likelihood of dropping out is the endogeneity of the students' employment, resulting from the positive correlation between unobserved personal characteristics that enhance their integration in the labor market and those that contribute to their scholastic success, e.g., motivation, social connections, non-cognitive ability, and so on. The most recent studies in this field (Ruhm, 1997; Light, 2001; Hakkinen, 2006) use an instrumental variable (IV), the regional unemployment rate during the term of studies, that correlates negatively with the extent of students' employment and does not correlate with the unobserved factors that affect the duration of study. This instrumental variable, however, being constant for all students in a given region, does not solve the problem of individual heterogeneity in employment and scholastic achievements.

Accordingly, this study attempts to add to the fractious literature about the effect of employment on duration of study and solves the individual heterogeneity problem by means of a predetermined IV: employment of the individual before the beginning of academic studies. That turns over the sign obtained by the use of a regional unemployment rate IV.

Unlike previous studies in this field, which were based on survey data, this study bases itself on a rich dataset constructed from administrative files and records – of candidates, students, and recipients of bachelor’s degrees – information about the earnings of all students and the duration of their employment, and socioeconomic traits of students and their parents.

The presentation is as follows: Section 2 describes the data, Section 3 presents descriptive statistics, Section 4 outlines the econometric model, Section 5 gives the estimates, and the last section concludes.

2. The Data

The study is based on administrative records of first-degree students at higher-education institutions in Israel – six universities and 16 academic colleges (not including teachers’ colleges) – who began their studies in the 1999/2000 academic year. New students were defined as those who had not engaged in degree studies in the previous year (1998/99) at higher-education institutions. The study focuses on new students because students who began their studies in previous years may show different patterns of studies and employment, e.g., due to credits accumulated in prior studies. The research population is composed of 29,395 students.

Information was gathered about each student’s preferences for institutions and fields of study at the time of enrollment and the progression of studies: the identity of

the institution and the subjects studied and completed, if any, by the 2005/06 school year. Thus, we follow the 1999/2000 cohort over a six-year period.

Data on scholastic abilities, measured by the psychometric examination that is required for enrollment in academic studies, were linked for 24,960 students.¹ The following demographic data were culled from the administrative register of residents: sex, date of birth, ethnic origin (Jew/Arab), country of birth and date of immigration, marital status, number of children, locality of residence, and identity of student's parents.

Information about students' and parents' employment and earnings was obtained from the matched employee–employer database for the years 1999–2005, which includes, among other things, number of months worked, annual gross earnings, and tenure of employment with employer. Importantly, the matched employee–employer database offers no information about hours worked and occupation; this information is also unavailable from other administrative sources. Since the earnings data originate from the income-tax records, our measures of employment and earnings may underestimate the real scope of employment, especially given the anecdotal evidence of students who “moonlight” as waiters, babysitters, tutors, etc.

¹ The psychometric exam results for 15 percent of the students were unavailable to us. Some students were admitted to academic institutions on the basis of matriculation-exam scores only; others were tested before 1995, the first year in which psychometric-exam results were available for research. The psychometric exam is composed of three parts: verbal thinking, quantitative thinking, and English. The scores on each segment are arrayed on a scale of 50–150. The weighted average weights each of the first two tests at 40 percent and the English exam at 20 percent. Thus, the scale of weighted scores used in the study ranges from 250 to 750. The Israeli psychometric examination is functionally similar to the American SAT.

3. Descriptive Statistics

The proportion of first-degree students who began to attend Israel's higher-education institutions in the 1999/2000 academic year and earned their degrees by the 2005/06 academic year stood at 79% (Table 1). The average duration of study was 3.7 years and 69% of students who earned a bachelor's degree did so within a period of time that did not exceed the standard number of years. In the humanities, fewer than half of the students completed their studies on time and low rates were also frequent among students of mathematics, statistics, and computer science. In contrast, some 90% of students of law and paramedical professions finished their studies on time. Only 66% of students in the humanities earned their first degrees within six years; similar rates were encountered in mathematics, statistics, and computer science, due to the high dropout rates of computer-science students at academic colleges. By the same token, high proportions of students of medicine and paramedical occupations earned their first degrees within six years. On average, 15% of first-degree recipients in the research population progressed to advanced-degree studies in the succeeding academic year. The share of continuing students declined steadily as first-degree studies were prolonged, evidently because the prompt completion of studies attests to strong scholastic abilities. A large variance was found among majors in the rates of advancement to higher studies: from a single-digit rate in law, business administration, engineering, and architecture, to 43% in natural sciences, biology, and agriculture, and 47% in medicine.

The number of months worked per year by first-degree students increased in the course of the years in all majors. Fewer months per year were worked in disciplines that entail heavy class loads, such as medicine, natural sciences, and engineering, than in others (Figure 1).

The average rate of employment² climbed from 52% in 2000 to 64% in 2002.³ The dynamics of the monthly employment rate in 1999–2004 are shown in Figure 2. In 1999, shortly before the beginning of study, the employment rate of students who switched employers during the studies stood at 40%–50%. The employment rate fell by 10–20 percentage points at the beginning of first-year studies but rebounded significantly during summer recess. The employment rate climbed steadily in subsequent years of study and edged upward during summer recesses.

The employment rate of students who did not switch employers during studies was much higher (by 30–40 percentage points) than among other students. Their employment rate increased slightly over the years. Notably, among degree recipients in 2004, the employment rate actually declined after the end of studies because many law graduates (who study for four years) stopped working at that time in order to prepare for their bar exams.

² The work load was represented by the proportion of employee-wage months in the course of the year out of twelve months.

³ The Euro-Student Survey 2003 embraced thousands of students (classified as ISCED-97 5A/5B) in several European countries and included, among other things, questions about students' employment and wage patterns in the course of the academic year. The average employment rate of first-degree students in countries in which the average standard duration of study is 5–6 years was 53% in 2003, and among those aged 24–27 it was 62%. In countries where the standard duration of degree studies resembles the Israeli norm (Ireland and the UK), the average rate in 2003 was 64% overall and 77% among those aged 24–27. For details, see *Eurostudent Report 2005*. The average employment rate of first-degree students in Israel during the academic year in 2000–2004 was 57% overall and 66% among those aged 24–27.

The average monthly earnings of first-degree students advanced steadily over the years, from NIS 3,100 in 2000 to around NIS 4,000 in 2002 (Figure 3).⁴ In 2003, and more emphatically in 2004, in years succeeding the standard term for the completion of studies, earnings rose considerably due to employment in occupations more closely associated with the field of study and because some students had completed their degrees and found work in their chosen occupations. The earnings of students who did not switch employers were much higher than those of other students and climbed in the course of their studies. Obviously, these students held regular jobs when they began their studies, in contrast to those who held temporary jobs, mostly in the secondary labor market. The earnings of students who did not switch employers and studied for four years surpassed those of counterparts who studied for three years. The main reason evidently has to do with the relatively well-paying fields of study that the former chose (e.g., paramedical professions, law, and accounting).

The 2006 Household Expenditure Survey⁵ shows the occupations that occur frequently among first-degree students aged 20–29: associate professional and technicians, agents, sales workers, and service workers, and clerical workers (Table 2). Students are less likely than first-degree holders to engage in academic professions. Compared with age counterparts who neither pursue nor possess an academic degree, students are less frequently found among “blue-collar” workers in agriculture, industry, and construction. This occupational structure supposedly

⁴ The NIS/USD exchange rate was NIS 4.077 in 2000 and NIS 4.738 in 2002; the national average wage was NIS 5,846 and NIS 6,534 in the respective years.

⁵ The survey population is a representative sample of the population of Israel, including residents of dormitories at higher-education institutions. For details, see

http://www.cbs.gov.il/www/publications/expenditure_survey04/pdf/e_intro.pdf

originates in the need for flexible and/or abridged work hours that are tailored to class load.⁶

4. Econometric Model

To examine the correlation of employment during study and patterns of study, one has to contend with unobserved heterogeneity in the traits of those who choose to work and the others, traits that correspond both to the decision to work and the likelihood of scholastic success, conditional on the field of studies.

Let us assume that Y_i , duration of study of individual i (in a given academic discipline), follows the model:

$$(1) \quad Y_i = \alpha X_i + \beta W_i + \varepsilon_i$$

where X_i represents an array of exogenous controlling variables (sex, age, ethnic origin, scholastic ability, etc.), and W_i denotes the extent of employment during the studies (measured by months of work or earnings). Stochastic error term $\varepsilon_i = \eta_i + u_i$, where η_i denotes unobserved personal traits correlated with academic success, and u_i is a “white noise” error term.

Equation (2) represents the extent of work during the studies:

$$(2) \quad W_i = \gamma X_i + \delta Z_i + \omega_i$$

where Z_i is an array of variables associated with employment but not with duration of studies (e.g., regional unemployment rate and parents’ income), and $\omega_i = \theta_i + v_i$,

⁶ The survey also indicates that first-degree students worked on average around 30 hours per week: about one-fourth worked fewer than 20 hours and 40 percent worked 40 hours or more.

where θ_i denotes unobserved personal traits affecting labor supply, and v_i is a “white noise” error term. It is assumed that $\text{cov}(u_i, v_i) = 0$.

The unobserved-heterogeneity problem originates in a positive correlation between θ_i and η_i , which makes the employment variable in Equation (1) endogenous.

Following the literature (e.g., Ehrenberg and Sherman, 1987), we employ a two-stage least-squares estimation: having estimated the model of the extent of work (Equation 2) at the first stage, we insert its expected value into Equation (1) at the second stage. Endogeneity of students' work, however, requires pursuing the IV approach. Ruhm (1997), Light (2001), and Hakkinen (2006) use the regional unemployment rate during years in college as an instrument for working when learning. This IV is not perfect because it creates variation between the regions—not between the students; therefore, it does not solve the (intra-regional) unobserved heterogeneity problem. To deal with this problem, we add an individual-level IV: a predetermined variable, employment in 1999, the year before the beginning of academic studies. This IV reflects the individual's propensity to work and should not be correlated with the duration of first-degree studies, unless there is an inter-temporal substitution between work prior to and during the studies. In Appendix A, we show that our individual-level instrument is valid.

We examine the effect of employment during the study on the deviation of duration of studies until receipt of first degree (within the six years of our follow-up period) from the standard duration of academic programme, by means of three econometric models: OLS estimation of Equation (1); two-stage least-squares (TSLS) estimation with the regional unemployment rate IV; and TSLS with two instruments: regional unemployment rate and individual's employment in the year preceding the

beginning of academic studies. The regional unemployment rate is calculated for six regions as the annual unemployment rate among Jews aged 21 to 30, with 12 to 14 years of schooling, separately for men and women.

We also estimate a binary discrete-selection model (logit) to investigate the effect of employment on additional outcome variables: the likelihood of earning a first degree within the standard number of years, the likelihood of earning a first degree within six years of the beginning of study, and the likelihood of a degree recipient's advancing immediately to higher studies.

5. Estimation Results

Table 3 shows the estimates of the controlling variables in the OLS and TSLS models. The estimates obtained by use of the OLS model for all students (Column A) indicate that the duration of studies is longer for young people, Arabs (relative to Jews), recent immigrants, singles, and those with few children. Stratton, O'Toole and Wetzel (2004), investigating the issue in the United States, found that the propensity of male students to study part-time in their first year of college (it being reasonable to assume that this will prolong their degree studies) actually increased with age because these students were more likely to be married and have children. The clash between the foregoing findings about the effect of age, marital status, and number of children may originate in differences in the composition of the student populations, since Israeli students are usually older than their North American and European counterparts due to the mandatory military service. Therefore, we estimate the model for students aged 22–26 at the beginning of their studies, who account for two-thirds of the research population (Column B). For this group, we find no statistically significant effect of

age and number of children and the effect of students' being married loses about one-third of its intensity, as compared with Column A.

Table 3 also shows that students who are not admitted to their most preferred department, those who switch majors and schools, and those who pursue a double major tend to prolong their studies beyond the standard number of years.

Scholastic abilities were found to correlate positively with duration of study. The reason for this counterintuitive finding may be that talented students tend to invest much more in their studies, evidently because they are interested in going on to advanced studies – a tendency that may extend the duration of their first-degree studies. Students' grades, which might have served as a "mediating variable" between scholastic abilities and duration of studies, were not available to us. We speculate that if there was a control for grades, scholastic abilities would be negatively correlated with duration of studies. Dummy variables for scholastic disciplines are compatible with the ranking of duration of studies by majors, as shown in Table 1.

Columns C and D in Table 3 show the estimates of Stage 1 of the two-stage estimation, with two IVs as explained above, in regard to employment in 2000 (Year 1) for all students and for those aged 22–26, respectively. The propensity to work during studies was found to be weaker among Arabs than among Jews and to weaken as the number of children rises. No difference was found between males and females and between married and single students. It seems that the more affluent a student's parents are, the more the student earns (elasticity 0.05), other factors being equal.

Students who remained with one employer throughout their studies worked more than the others did, as Figure 2 shows. The regional unemployment rate has a dampening effect on employment, as expected. Earnings in the year preceding the beginning of academic studies correlate positively with earnings in Year 1.

Tables 4 and 5 present estimates of the effect of employment, measured in terms of months of work during the year (Table 4) or (log) annual earnings (Table 5), on the deviation of duration of degree studies from standard years among the student population at large. Tables 6 and 7 present corresponding estimates for students aged 22–26.

The comparison of the OLS model with the TSLS model including the IV of regional unemployment rate (Table 4, columns A and B) shows that in the first three years of studies, employment has a statistically significant *negative* effect on the deviation of duration of degree studies from standard years. Thus, an increase in the number of months worked during studies *abbreviates* the duration of studies, contrary to the conventional wisdom. The two models offer different results in regard to the fourth year of studies (among students whose studies should last four years, e.g., in law, pharmacy, and engineering). The findings recur in Table 5, which uses (log) annual earnings as a measure of employment instead of months worked.

In contrast, in the TSLS model with two IVs – regional unemployment rate and extent of individual’s employment shortly before the beginning of academic studies (Column C) – employment was found to have a *positive* and non-significant effect on the duration of studies except in the first year of study, in which the estimate was 0.10 significant. In Table 5, in which (log) annual earnings is the indicator of employment instead of months worked, a statistically significant positive effect was found for employment in the first three years of studies. Thus, the use of the IV of months worked / earnings in the year preceding the beginning of academic studies reverses the sign of the effect of employment during the first-degree studies on the prolongation of study.

When we limited the student population to those aged 22–26 in their first year of studies, who constitute around two-thirds of the research population, and measured the extent of employment in terms of number of months worked (Table 6), the results were qualitatively similar to those obtained for the entire student population (Table 4), with the exception of a statistically significant positive estimate in Model C for Year 4. However, when we used annual earnings (Table 7), we did not find in Model C any statistically significant effect in years 1–3 on the duration of studies, in a contrast to the findings in Table 5, whereas in Year 4 the earnings of students aged 22–26 were found to prolong studies. By implication, for young students (those aged 22–26), who presumably are more inclined than older students to hold temporary and part-time jobs that are better suited to their class load, employment during studies was not a factor that postponed the earning of a degree.

When we examined the likelihood of completing the first degree within the standard number of years in the logit model (Column A of Table 8), we found that the signs of the estimates of the socio-demographic variables were consistent with those in Table 3 (for students aged 22–26). The effect of employment during studies on the likelihood of completing the degree program on time turned from negative in Year 1 (2000) to positive in Year 3 (2002). These results are qualitatively similar to the effect of employment during studies on the likelihood of earning a first degree within six years of the beginning of studies (Column B in Table 8).

Earnings during studies have no effect on the likelihood that recipients of first degrees will progress toward advanced degrees in the following year (Column C of Table 8). The prolongation of first-degree studies reduces the likelihood of this outcome because it may attest to scholastic difficulties, as Table 1 suggests. In contrast, working for the higher-studies institution increases the likelihood of

progressing toward an advanced degree in the following year – a foreseeable outcome given that many students who are employed by higher-education institutions are research assistants, lab administrators, auxiliary teaching staff etc., and were chosen on the basis of their scholastic achievements. Ehrenberg and Sherman (1987) report a similar outcome.

6. Conclusions

The study shows that Israeli first-degree students who began their studies in the 1999/2000 academic year had high rates of employment – 52% in Year 1 and 64% in Year 3 – and that their earnings rose from 46% of the national average wage to 57% in the respective years.

The empirical literature that probes the effect of working while studying on the prolongation of studies disagrees about the sign and the very existence of this effect. The endogeneity problem is customarily solved by using the instrumental variable of regional unemployment rate, even though this apparently leaves the problem of individual heterogeneity unsolved. Accordingly, we try to solve both problems by using a predetermined individual-level IV – the extent of employment shortly before the beginning of academic studies.

In the TSLS model that applied the regional unemployment-rate IV to all students, employment was found to have a *negative* effect on the prolongation of studies until a degree is earned, even among “typical” students, those who began the studies at age 22–26. However, when the same model with the additional IV – the individual’s employment shortly before the beginning of academic studies – was used, the number of months worked during studies was not found to have a statistically

significant effect and the effect of earnings on the duration of studies was found to be *positive*. Among students aged 22–26, *no effect whatsoever* was found.

The weak relationship between extent of employment and duration of studies may be explained in several ways: those who find it difficult to combine work and study choose not to go for a first degree; there may be non-cognitive abilities (such as diligence) that correspond positively with both holding a job and scholastic success; those who have high wage rate earn more and also tend to complete their studies quickly due to their reservation wage; some may rely on stipends and other subsidies that make work less necessary and about which we have no information.

Earnings during the first two years of degree studies had a statistically significant negative effect on the likelihood of earning a first degree within six years of the beginning of studies, whereas in the third year of the degree program the effect changed signs. Earnings during studies had no effect on the likelihood of a degree recipient's progressing toward an advanced degree in the following academic year, whereas employment of an undergraduate by h/her academic institution increased the likelihood that the degree recipient would go on to such studies.

Acknowledgments

The authors thank Shlomo Yitzhaki for his useful remarks and Lior Dopaz and Ariel Feitelberg for their research assistance.

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Table 1. Proportion of First-Degree Recipients, Deviation of Duration of Degree Studies from Standard Years, Mean Duration of Study, and Proportion of Students Beginning Advanced-Degree Studies after Completion of First Degree, by Major¹
(Percent)

<i>Major</i>	<i>Mean duration of studies (years)</i>	<i>Deviation of duration of degree studies from standard years (S.D.)</i>	<i>Proportion of first-degree recipients who completed degree within standard years</i>	<i>Proportion of students who received degree within 6 years from beginning of studies</i>	<i>Proportion of first-degree recipients who began advanced-degree studies immediately after first degree, by duration of first-degree studies</i>
					Total
					3 yrs
					4 yrs
					5 yrs
Total	3.7	0.37 (0.89)	68.7	79.4	14.8
Humanities and general studies ²	3.8	0.73 (1.06)	47.4	65.8	10.5
Social sciences	3.4	0.44 (0.85)	69.5	85.4	13.1
Business and administration sciences	3.4	0.38 (0.81)	68.0	81.6	8.3
Law ²	4.0	-0.03 (0.62)	90.8	87.6	15.8
Medicine	3.4	0.41 (0.79)	76.4	97.8	8.8
Paramedical professions ²	3.8	-0.03 (0.74)	87.9	91.1	4.7
Mathematics, statistics, and computer sciences	3.7	0.67 (0.89)	52.4	73.9	47.1
Physical, biological sciences and agriculture	3.5	0.49 (0.78)	66.6	81.9	14.2
Engineering and architecture ²	4.1	0.13 (0.83)	75.1	77.1	13.8
					9.0
					42.8
					81.9
					32.7
					24.8
					8.9
					77.1
					10.7
					6.4

Notes: (1) Major at time of award of degree. (2) The standard number of years is 4 at colleges that teach art history and art and at the academy of music (humanities); law, the following paramedical professions: pharmacy, nursing, occupational, therapy, physical therapy, and optometrics; and engineering. The standard is 5 years in architecture and 3 years in all other disciplines.

Table 2. Occupations of 20–29 Age Group, by Standing in Academic Studies¹

<i>Occupation</i>	<i>Holds first degree</i>	<i>Studying for first degree</i>	<i>Neither</i>
Academic professionals	41.0	16.3	2.7
Associate professionals and technicians	25.0	21.8	14.8
Managers	2.3	0.3	1.2
Clerical workers	16.6	19.8	21.6
Agents, sales workers, and service workers	11.0	34.6	32.1
Thereof:			
Salespersons	1.8	8.4	8.6
Waiters and bartenders	1.4	7.8	4.9
Security workers	2.2	10.9	6.3
Agricultural, industrial, construction, and other skilled workers	3.5	4.8	19.2
Unskilled workers	0.6	2.3	8.3

Source: Central Bureau of Statistics, *Household Expenditure Survey 2006*, data processed by the authors.

Note: (1) occupations according to *Standard Classification of Occupations 1994*, ICBS Technical Publication No. 64.

Table 3. Estimates of Controlling Variables in OLS and TSLS Models

<i>Explanatory variable</i>	<i>OLS model</i>		<i>Stage 1 of TSLS</i>	
	<i>Explained variable: Deviation of duration of degree studies from standard years</i>		<i>Explained variable: (log) annual earnings in 2000 (Year 1)¹</i>	
	<i>All students</i>	<i>Age 22–26</i>	<i>All students</i>	<i>Age 22–26</i>
	A	B	C	D
Male	0.020 (0.013)	**0.038 (0.015)	–0.102 (0.074)	–0.114 (0.088)
Age (in 2000)	***–0.011 (0.003)	0.007 (0.006)	***0.146 (0.009)	***0.113 (0.023)
Arab	***0.224 (0.024)	0.048 (0.054)	***–1.049 (0.089)	***–0.555 (0.191)
Recent immigrant (after 1994)	***0.263 (0.031)	***0.195 (0.045)	–0.086 (0.218)	–0.380 (0.355)
Married (in 2000)	***–0.096 (0.022)	**–0.062 (0.029)	0.115 (0.082)	*–0.203 (0.112)
Number of children (in 2000)	***–0.108 (0.018)	–0.041 (0.048)	***–0.439 (0.058)	***–0.433 (0.159)
Scholastic abilities	***0.001 (0.000)	***0.001 (0.000)		
Private academic college	**0.044 (0.020)	0.034 (0.022)	*0.140 (0.083)	*0.167 (0.090)
Switched schools	***0.359 (0.025)	***0.372 (0.027)		
Took dual-major program	***0.055 (0.016)	***0.072 (0.019)		
Accepted for most-preferred major at enrollment	***–0.062 (0.016)	**–0.043 (0.019)		
Switched majors	***0.227 (0.015)	***0.192 (0.017)		
Worked for same employer throughout studies			***1.104 (0.080)	***0.945 (0.092)
Mother’s residence (in 2000) and location of school in same region			**0.118 (0.047)	**0.153 (0.055)
School (in 2000) in central Israel			0.045 (0.055)	0.099 (0.064)
(Log) parents’ earnings (in 2000)			***0.054 (0.007)	***0.059 (0.008)
Regional unemployment rate			**–0.085 (0.014)	**–0.083 (0.016)
(Log) earnings in 1999			***0.356 (0.006)	***0.335 (0.007)
Humanities and general studies (4 years)	***–0.231 (0.068)	***–0.256 (0.068)	***–0.622 (0.182)	***–0.836 (0.205)
Social sciences	***–0.339 (0.021)	***–0.358 (0.025)	**0.146 (0.074)	*0.159 (0.088)
Business and administration sciences	***–0.374 (0.025)	***–0.397 (0.029)	***0.293 (0.087)	***0.301 (0.100)
Law	***–0.718 (0.029)	***–0.734 (0.034)	0.067 (0.106)	0.117 (0.125)
Medicine	***–0.479 (0.047)	***–0.468 (0.056)	**–0.517 (0.209)	0.025 (0.252)
Paramedical professions (3 years)	***–0.525 (0.058)	***–0.580 (0.071)	–0.040 (0.203)	0.015 (0.237)

<i>Explanatory variable</i>	<i>OLS model</i>		<i>Stage 1 of TSLS</i>	
	<i>Explained variable: Deviation of duration of degree studies from standard years</i>		<i>Explained variable: (log) annual earnings in 2000 (Year 1)¹</i>	
	<i>All students</i>	<i>Age 22–26</i>	<i>All students</i>	<i>Age 22–26</i>
	A	B	C	D
Paramedical professions (4 years)	***-0.827 (0.034)	***-0.827 (0.042)	***-0.568 (0.135)	***-0.747 (0.171)
Mathematics, statistics, and computer sciences	***-0.185 (0.027)	***-0.221 (0.031)	** -0.182 (0.090)	-0.098 (0.108)
Physical, biological, and agriculture	***-0.342 (0.029)	***-0.396 (0.034)	***-0.589 (0.100)	***-0.411 (0.115)
Engineering and architecture	***-0.616 (0.025)	***-0.651 (0.029)	***-0.241 (0.080)	-0.114 (0.093)
Adjusted R ²	0.1351	0.1256	0.2056	0.1470
Observations (N)	20372	14585	27107	18454

Notes:

Parentheses denote Standard Error value.

*, **, and *** denote 10%, 5%, and 1% significance, respectively.

Table 4. Effect of Students' Employment (Annual Months Worked) on Standard Deviation of Years of Study until Award of First Degree¹

<i>Year of study</i>	<i>OLS²</i>	<i>TSLS with regional unemployment rate as IV, Stage 1^{3,4,5}</i>	<i>TSLS with regional unemployment rate and employment before beginning of studies as IVs, Stage 1^{4,5,6,7}</i>
	A	B	C
2000	***-0.003 (0.001) [0.135 ; 20,372]	***-0.179 (0.059) [0.135 ; 19,306]	*0.063 (0.033) [0.135 ; 19,306]
2001	***-0.005 (0.001) [0.136 ; 20,372]	***-0.205 (0.067) [0.135 ; 19,306]	0.063 (0.041) [0.135 ; 19,306]
2002	***-0.008 (0.001) [0.137 ; 20,372]	***-0.201 (0.074) [0.135 ; 19,306]	0.069 (0.049) [0.135 ; 19,306]
2003 (only majors with 4 standard years)	***-0.006 (0.002) [0.085 ; 6,375]	0.061 (0.129) [0.079 ; 6,020]	0.105 (0.085) [0.080 ; 6,020]

Notes:

*, **, and *** denote 10%, 5%, and 1% significance, respectively.

Parentheses denote Standard Error value; brackets denote Adjusted R² (on left) and number of observations (on right).

(1) Received first degree by 2005/06 academic year, aged 50 or below in 2000.

(2) The estimate includes the following controlling variables: male, age (in 2000), Arab, immigrant (1995 or later), married (in 2000), number of children (in 2000), psychometric exam score, admission to first-preference department, switched schools, switched majors, earned dual-major first degree, private academic college, dummy variables for major.

(3) The Stage 1 estimate includes the following controlling variables: male, age (in 2000), Arab, immigrant (1995 or later), married (in 2000), number of children (in 2000), private academic college, dummy variables for major. Unique variables for equation: regional unemployment rate, (log) parents' income (in 2000), mother's area of residence (in 2000) and school in same region, working for same employer before beginning of studies and after award of degree; school (in 2000) in central Israel (Central Region, Tel Aviv Region, Judea-Samaria). Explained variable: months worked in year.

(4) The regional unemployment rate is defined as the unemployment rate in the academic year by region and sex of Jews aged 21–30 who have 12–14 years of schooling. The country is divided into the following regions: Northern, Haifa, Central, Tel Aviv and Judea-Samaria, Jerusalem, Southern, and Gaza.

(5) The Stage 2 estimate includes the controlling variables in the Stage 1 equation and the following unique variables: switching schools, switching majors, earning a dual-major first degree, psychometric exam score, taking preferred major. Explained variable: deviation of duration of degree studies from standard years.

(6) The Stage 1 estimate includes the following controlling variables: male, age (in 2000), Arab, immigrant (1995 or later), married (in 2000), number of children (in 2000), private academic college, dummy variable for major. Unique variables for equation: months worked in 1999, regional unemployment rate, (log) parents' income (in 2000), school (in 2000) in central Israel (Central Region, Tel Aviv Region, Judea-Samaria). Explained variable: months worked in year.

(7) Months worked in 1999 as an explanatory variable for months worked in subsequent years.

Table 5. Effect of Students' Employment (log Annual Earnings) on Standard Deviation of Years of Study until Award of First Degree¹

<i>Year of study</i>	<i>OLS²</i>	<i>TSLS with regional unemployment rate as IV, Stage 1^{3,4,5}</i>	<i>TSLS with regional unemployment rate and employment before beginning of studies as IVs, Stage 1^{4,5,6,7}</i>
	A	B	C
2000	**−0.003 (0.001) [0.135 ; 20,372]	***−0.026 (0.008) [0.135 ; 19,306]	***0.010 (0.004) [0.135 ; 19,306]
2001	***−0.007 (0.001) [0.136 ; 20,372]	***−0.027 (0.008) [0.135 ; 19,306]	**0.011 (0.004) [0.135 ; 19,306]
2002	***−0.014 (0.002) [0.139 ; 20,372]	***−0.025 (0.009) [0.135 ; 19,306]	**0.012 (0.005) [0.135 ; 19,306]
2003 (only majors with 4 standard years)	***−0.008 (0.002) [0.086 ; 6,375]	0.009 (0.014) [0.079 ; 6,020]	0.011 (0.008) [0.080 ; 6,020]

Notes:

Parentheses denote Standard Error value; brackets denote Adjusted R² (on left) and number of observations (on right).

*, **, and *** denote 10%, 5%, and 1% significance, respectively.

- (1) Received first degree by 2005/06 academic year, aged 50 or below in 2000.
- (2) The estimate includes the following controlling variables: male, age (in 2000), Arab, immigrant (1995 or later), married (in 2000), number of children (in 2000), psychometric exam score, admission to first-preference department, switched schools, switched majors, earned dual-major first degree, private academic college, dummy variables for major.
- (3) The Stage 1 estimate includes the following controlling variables: male, age (in 2000), Arab, immigrant (1995 or later), married (in 2000), number of children (in 2000), private academic college, dummy variables for major. Unique variables for equation: regional unemployment rate, (log) parents' income (in 2000), mother's area of residence (in 2000) and school in same region, working for same employer before beginning of studies and after award of degree; school (in 2000) in central Israel (Central Region, Tel Aviv Region, Judea-Samaria). Explained variable: months worked in year. Explained variable: (log) annual earnings.
- (4) The regional unemployment rate is defined as the unemployment rate in the academic year by region and sex of Jews aged 21–30 who have 12–14 years of schooling. The country is divided into the following regions: Northern, Haifa, Central, Tel Aviv and Judea-Samaria, Jerusalem, Southern, and Gaza.
- (5) The Stage 2 estimate includes the controlling variables in the Stage 1 equation and the following unique variables: switching schools, switching majors, earning a dual-major first degree, psychometric exam score, taking preferred major. Explained variable: deviation of duration of degree studies from standard years.
- (6) The Stage 1 estimate includes the following controlling variables: male, age (in 2000), Arab, immigrant (1995 or later), married (in 2000), number of children (in 2000), private academic college, dummy variable for major. Unique variables for equation: (log) earnings/months worked in 1999, regional unemployment rate, (log) parents' income (in 2000), school (in 2000) in central Israel (Central Region, Tel Aviv Region, Judea-Samaria). Explained variable: (log) annual earnings.
- (7) (Log) earnings in 1999 as an explanatory variable for (log) earnings in each subsequent year.

Table 6. Effect of Students' Employment (Annual Months Worked) on Standard Deviation of Years of Study until Award of First Degree^{1,2}

Age 22–26 (in 2000)

<i>Year of study</i>	<i>OLS²</i>	<i>TSLS with regional unemployment rate as IV, Stage 1</i>	<i>TSLS with regional unemployment rate and employment before beginning of studies as IVs, Stage 1</i>
	A	B	C
2000	–0.001 (0.001) [0.124 ; 14,585]	***–0.209 (0.069) [0.124 ; 13,962]	0.016 (0.039) [0.124 ; 13,962]
2001	**–0.003 (0.001) [0.124 ; 14,585]	***–0.249 (0.080) [0.124 ; 13,962]	0.003 (0.049) [0.124 ; 13,962]
2002	***–0.007 (0.001) [0.126 ; 14,585]	***–0.252 (0.092) [0.124 ; 13,962]	–0.001 (0.062) [0.124 ; 13,962]
2003 (only majors with 4 standard years)	***–0.008 (0.002) [0.065 ; 4,535]	0.227 (0.179) [0.065 ; 4,323]	**0.261 (0.133) [0.066 ; 4,323]

Notes:

Parentheses denote Standard Error value; brackets denote Adjusted R² (on left) and number of observations (on right).

*, **, and *** denote 10%, 5%, and 1% significance, respectively.

(1) Received first degree by 2005/06 academic year, aged 50 or below in 2000.

(2) The notes to Table 4 are valid for this table as well.

Table 7. Effect of Students' Employment (log Annual Earnings) on Standard Deviation of Years of Study until Award of First Degree^{1,2}

Age 22–26 (in 2000)

<i>Year of study</i>	<i>OLS²</i>	<i>TSLS with regional unemployment rate as IV, Stage 1</i>	<i>TSLS with regional unemployment rate and employment before beginning of studies as IVs, Stage 1</i>
	A	B	C
2000	–0.001 (0.001) [0.124 ; 14,585]	***–0.035 (0.010) [0.125 ; 13,962]	0.005 (0.005) [0.124 ; 13,962]
2001	***–0.005 (0.002) [0.125 ; 14,585]	***–0.033 (0.011) [0.124 ; 13,962]	0.004 (0.006) [0.124 ; 13,962]
2002	***–0.014 (0.002) [0.127 ; 14,585]	***–0.029 (0.011) [0.124 ; 13,962]	0.005 (0.007) [0.124 ; 13,962]
2003 (only majors with 4 standard years)	***–0.011 (0.003) [0.066 ; 4,535]	0.028 (0.022) [0.065 ; 4,323]	**0.030 (0.014) [0.066 ; 4,323]

Notes:

Parentheses denote Standard Error value; brackets denote Adjusted R² (on left) and number of observations (on right).

*, **, and *** denote 10%, 5%, and 1% significance, respectively.

(1) Received first degree by 2005/06 academic year, aged 50 or below in 2000.

(2) The notes to Table 4 are valid for this table as well.

Table 8. Effect of Students' Employment and Traits on Likelihood of Earning First Degree and Progressing to Advanced Studies^{1,2}

<i>Variable</i>	(Odds Ratio)		
	<i>Award of first degree</i>		<i>Continuing to advanced studies^{2,3}</i>
	<i>Within standard years²</i>	<i>Within 6 years</i>	
	A	B	C
Male	***0.92	***0.60	**1.12
Age (in 2000), years	0.99	***0.95	**0.97
Arab	***0.48	***0.66	0.95
Immigrant (1995 or later)	***0.52	***0.53	0.88
Married (in 2000)	1.03	***1.25	***1.31
Married in 2001–2006		***1.58	
Number of children in 2000	***1.30		*0.86
Children added in 2001–2006		***0.88	0.97
Score on psychometric exam ⁴	***1.00	***1.01	***1.00
Admission to first-preference department ⁵	1.04	0.98	
Switched schools ⁶	***0.30		
Switched majors ^{5,6}	***0.58		
Earned dual-major first degree ^{5,6}	***0.63		
Private academic college	0.99		
S.D. of years of study for first degree			***0.61
Worked at higher-education institution during first-degree studies, by year:			
2000			1.04
2001			**1.20
2002			***3.35
Worked for same employer before beginning of studies and after award of degree	1.09		
(Log) earnings during year:			
2000	**0.98	**0.97	**1.01
2001	1.00	***0.97	0.99
2002	***1.05	***1.05	1.00
Observations (N)	20,360	24,947	20,360

Notes:

*, **, and *** denote 10%, 5%, and 1% significance, respectively.

(1) Age 50 or below in 2000. The estimates include dummy variables for disciplines of study.

(2) Received first degree by 2005/06 academic year.

(3) Continued to advanced studies in the year following award of first degree.

(4) Psychometric exam scores fall within a 250–750 range.

(5) At universities only.

(6) Variable calculated for first-degree recipients only.

Figure 1. Mean Annual Months Worked by First-Degree Students Who Began Studies in 1999/2000 Academic Year, by Year of Employment and Major

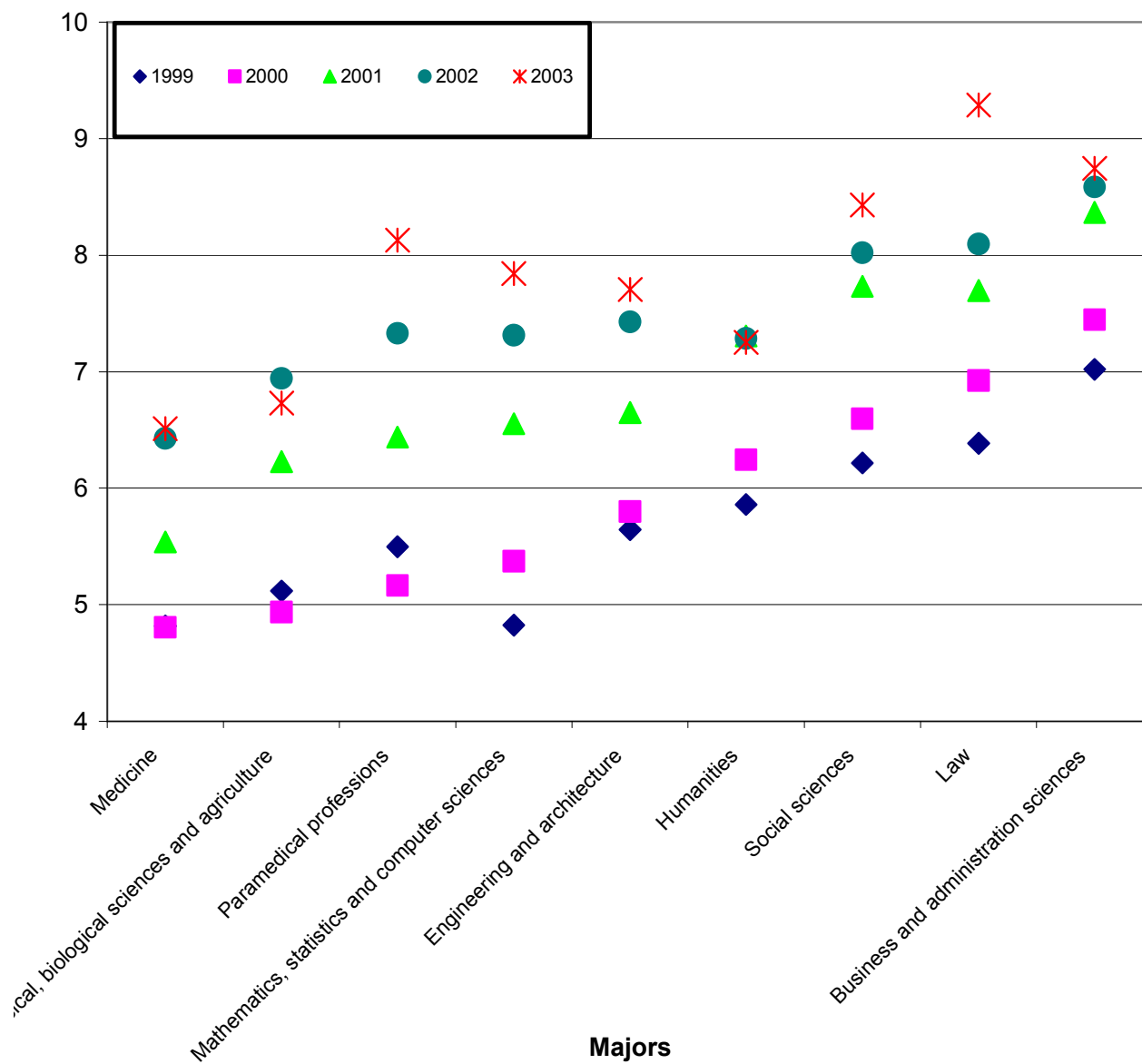
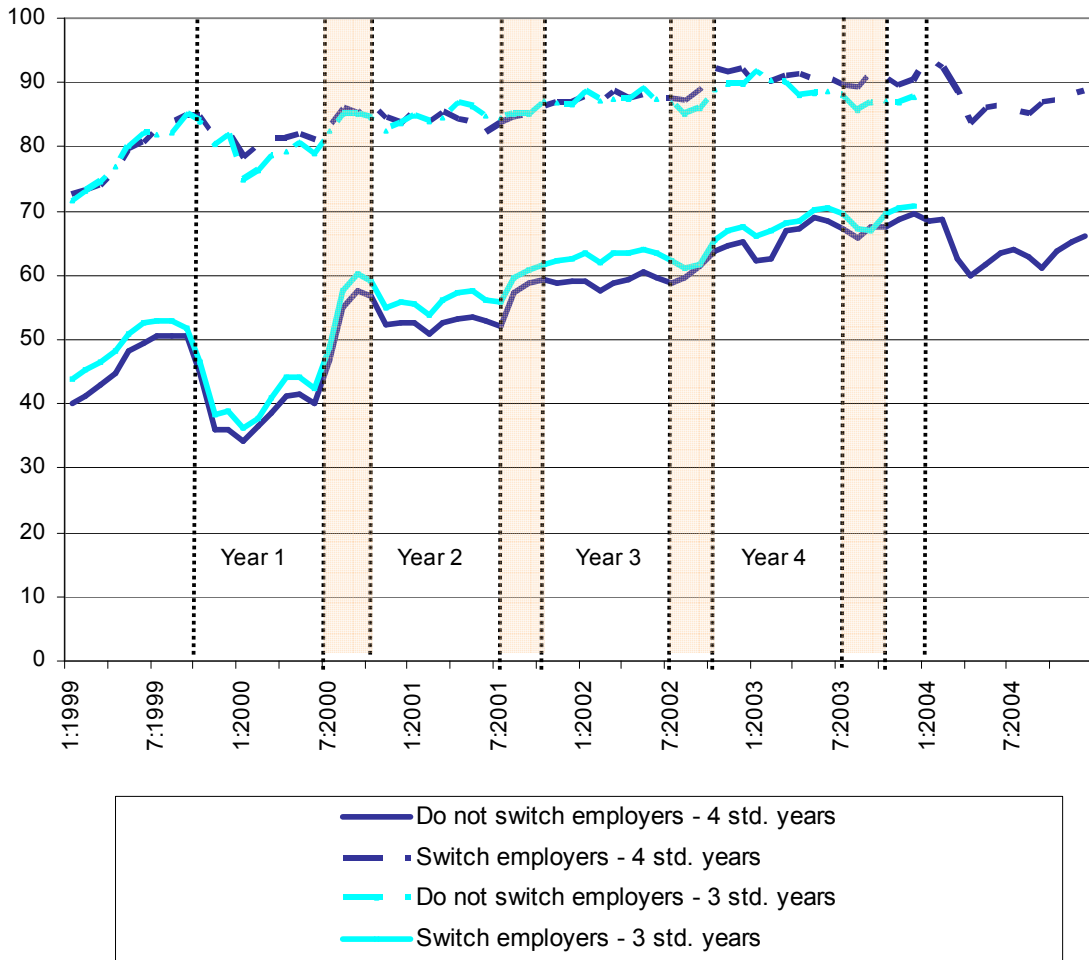
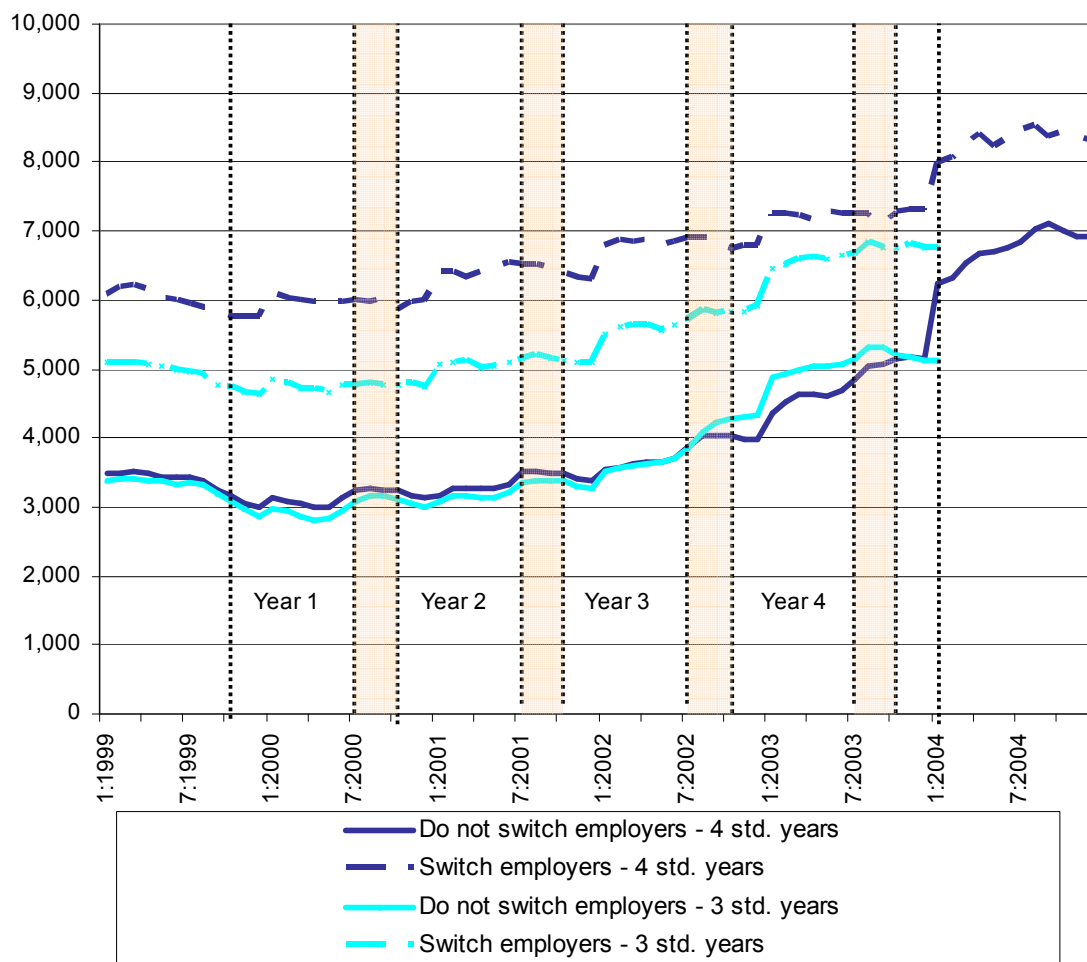


Figure 2. Employment Rate of First-Degree Students Who Began Studies in 1999/2000 Academic Year, by Year of Study and Employment with Same Employer before and after Studies (Percent)



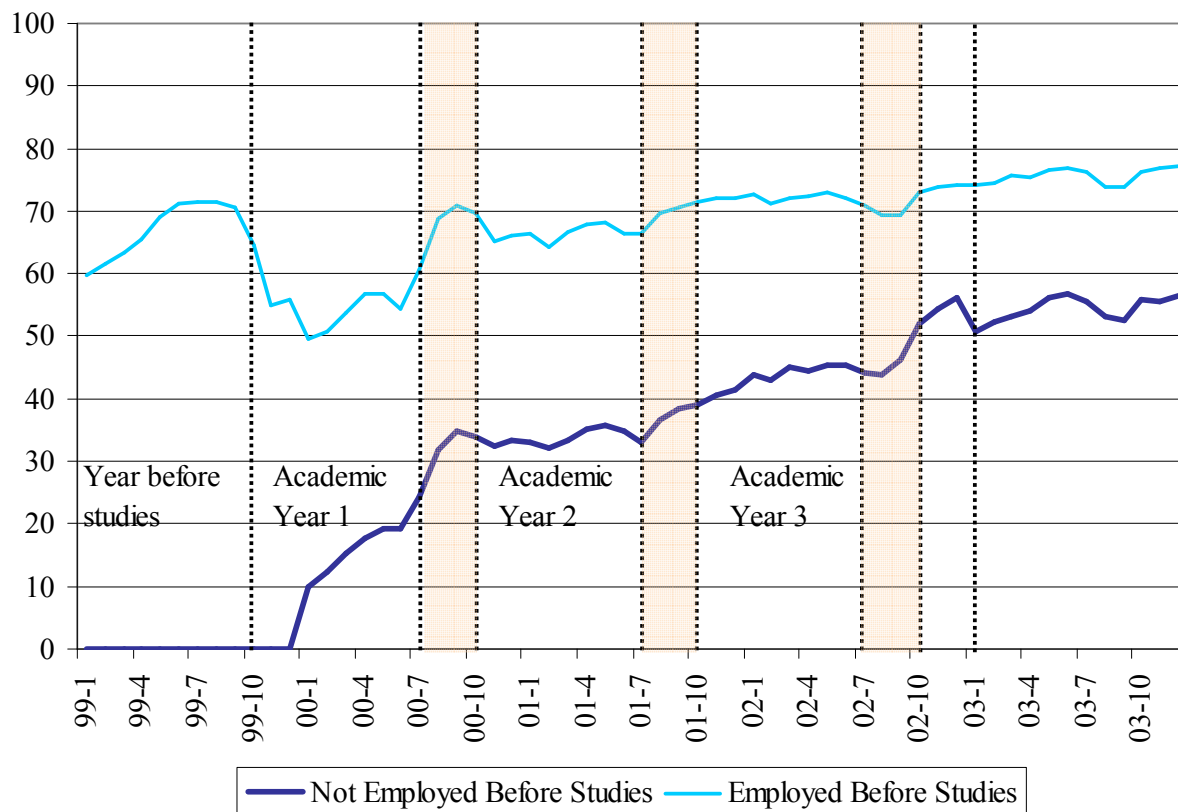
Note: “Do not switch employers”: students who worked for the same employer before the beginning of studies and after receiving first degree.

Figure 3. Monthly Earnings of First-Degree Students Who Began Studies in 1999/2000 Academic Year, by Year of Study and Employment with Same Employer before and after Studies
(NIS, current prices)



Note: “Do not switch employers”: students who worked for the same employer before the beginning of studies and after receiving first degree.

**Appendix A. Employment Rate of First-Degree Students, by Employment Status Before Studies
(Percent)**



The figure shows that there are two distinct patterns of work from the year preceding the studies throughout the study term: those who worked before, keep working (except a sharp drop in employment during Academic Year 1); those who did not, begin working, but work less than the former group. Coefficient of correlation between the number of months worked in the year preceding the beginning of studies and deviation of years of study from the standard programme length is -0.008, statistically insignificant.

Overeducation, Job Mobility, and Earnings Mobility among Holders of First Degrees in Israel

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Abstract

Overeducation—the situation in which one has more schooling than is needed to do one’s job—has been researched extensively for nearly three decades, but some major issues in regard to it are still topics of ongoing debate. By using a panel data, that combines a survey of two cohorts of Israeli first-degree holders and data from administrative sources on jobs and wages, we examine the contribution of job turnover, cognitive abilities and continuing graduate studies to the likelihood of overeducation and wage dynamics. The study produces four main findings. First, rapid job-switching makes a negative contribution to the increase in employee’s wage and there is a negative correlation between two variables—an employee’s tenure and the number of past employers in the years after the completion of degree studies—and the probability of being overeducated. Second, the contribution of the individual’s cognitive abilities and quantitative reasoning skills to the likelihood of becoming overeducated is negative. Third, the wages of overeducated employees are some 11 percent lower and rise more slowly than the wages of those whose level of schooling corresponds to their jobs; this outcome may be interpreted as indicating that the "scars" of being overeducated tend to be long-lasting. Fourth, the overeducated workers have lower propensity to continue to advanced academic studies.

***JEL Classification:* J24, J31, J62**

Keywords: cohort, graduate studies, job turnover, cognitive abilities

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A. Introduction

The phenomenon of overeducation was introduced by Freeman (1976) in the context of the American baby-boomer cohorts. Since then, it has been researched intensively in many countries and has been linked to major topics in labor economics.⁷ Overeducation is defined as a situation in which an individual's schooling surpasses what s/he needs in order to do h/her job. Overeducated workers achieve a lower return on schooling than that among the non-overeducated (those whose schooling matches the requirements of their jobs). Notably, however, schooling generates a positive return for members of both groups, overeducated workers and non-overeducated workers alike.⁸

However, after three decades of extensive empirical research, some central issues related to overeducation are still the topics of ongoing debate. Is overeducation a short-term phenomenon or a permanent one? According to Sicherman and Galor (1990) and Sicherman (1991), it is predominantly a transitory condition. However, there is evidence that the state of overeducation lasts for many years and may even be considered permanent (Dolton and Vignoles, 2000; Battu et al., 1999). The notion of occupational mobility is in the core of Sicherman and Galor (1990) model of overeducation. However, even though occupational mobility is achieved mainly by switching jobs, the question to what degree is job mobility useful for moving the individuals out of overeducation still awaits for elaboration (Alba-Ramirez, 1993; Sloane et al., 1999). Exploration of the individual's cognitive abilities has progressed in empirical research the context of wage formation and income inequality. Thus far, however, the contribution of individual cognitive abilities to the likelihood of being overeducated and extricating oneself from this situation has not yet been tested.

In Israel, as in several other developed countries, the share of the population that acquires academic schooling—toward first degrees and advanced degrees alike—has been rising steeply in recent decades.⁹ About one-third of first-degree recipients in Israel (hereinafter: “graduates”) immediately go on to master's studies. This process reflects, first of all, one of the prime avenues of training for an academic career. However, one may also surmise that some graduates who fail to find work in the

⁷ For a recent survey of literature, see Sloane (2003) and McGuinness (2006).

⁸ See, for example, Groot (1996), and Bauer (2002).

⁹ See *Education at a Glance 2007*, Table A3.2.

discipline that they studied tend to take further schooling in order to improve their chances of adjusting to the labor market's needs. Apart from Robst (2007), who found a negative correlation between the level of the academic degree and the incidence of overeducation, research overlooks this issue totally.

Accordingly, this study will attempt to test and answer the following four questions: (a) Is the employment of overeducated workers a short-term transitory phenomenon or does it tend to be long-lasting? (b) Do overeducated individuals typically have higher job mobility, as the occupational-mobility theory predicts? (c) What do cognitive abilities contribute to one's likelihood of becoming overeducated? (d) Does the continuation of academic studies after the first degree serve as a mean of escape from overeducation, or does it reinforce the individual's chances of remaining overeducated? Because of evidence of wide variance in the incidence of overeducation among graduates of different disciplines,¹⁰ we tackle our research questions by controlling for the graduates' fields of degree studies.

The incidence of overeducation has not been examined in Israel to this day. Therefore, we shall attempt to estimate the extent of this phenomenon among graduates by measuring overeducation in two ways and comparing the extent of overeducation in Israel within a cross-country perspective.

The data for this study were gathered on the basis of two graduating classes of first-degree recipients at institutes of higher education (hereinafter: the survey of graduates)—the classes of 2000/01 and 2001/02. For each class, the survey was performed about two years after graduation. Thus, the survey of 2000/01 graduates took place in March–July 2003 and the survey of 2001/02 graduates took place in the corresponding period in 2004.¹¹ The information obtained from the survey of graduates was linked to two administrative sources from the Israel Central Bureau of Statistics (hereinafter: CBS). One of these sources is a database of scores on the psychometric examination that the National Institute for Testing and Evaluation administers to candidates for academic studies.¹² For the purpose of this study, we

¹⁰ See, for example, Dolton and Vignoles, 2000, and Battu et al., 1999.

¹¹ For further information on the survey and details of its findings, see Israel Central Bureau of Statistics, Special Publication 1296, 2007.

¹² The psychometric examination is composed of three exams: verbal reasoning, quantitative reasoning, and English. The score weights each of the first two at 40 percent and the English exam at 20 percent weight.

culled for each graduate the highest score among the tests that s/he took between 1991 and the beginning year of h/her first-degree studies. The second administrative information source is a matched employer–employee database that CBS developed on the basis of employers’ annual reports to the Israel Tax Authority. The database includes, among other things, the number of months worked, annual wage, and date of job's beginning.¹³ From this source, we culled information on tenure, earnings, and identification of employer in relation to all salaried jobs for each of the graduating classes in the survey, for five consecutive years: the survey year, the three years preceding the survey year, and the year after the survey year. In other words, for the 2000/01 graduates who took part in the survey in 2003, data on jobs and earnings were gathered for 2000–2004; for the 2001/02 graduates who took part in the survey in 2004, data were gathered for 2001–2005. These three information sources were linked by means of the participating graduates’ ID numbers. Furthermore, in order to identify the graduate’s principal job, i.e., that which s/he addressed in the survey (thereby allowing us to know h/her overeducation status and occupation), we linked the survey data and matched employer-employee database by name of business, its industry and tenure in post as of the survey date.

The study is presented in the following order: we begin with a theoretical background, focusing on unanswered questions in respect of overeducation. Part C presents the indicators that we will use to measure overeducation, compares the extent of the phenomenon in Israel with that in other countries, and presents several facts associated with overeducation among our research population. Part D specifies the econometric model that the study uses to investigate overeducation, job mobility, and earnings mobility on our data. Part E presents empirical findings and Part F concludes with a summary.

B. Theoretical Background

The economic literature recognizes overeducation as a phenomenon that is often characteristic of tertiary-level institutions’ students who finish their studies and, a short time later, seek a job that corresponds to their educational and professional credentials as closely as possible and in a lasting way. Such workers are defined as

¹³ Importantly, this database has no information about extent of hours worked and about individual's occupation.

overeducated when having more years of schooling than they need and than others who practice the same occupation (McGuinness, 2006; Rubb, 2005; Mendes de Oliveira et al., 2000).

The theory of occupational mobility, presented by Sicherman and Galor (1990) (hereinafter: SG), has been corroborated by quite a few studies on the topic. According to Sicherman (1991), overeducated workers tend to be younger, have less on-the-job training, and have a higher rate of occupational mobility than non-overeducated workers (those whose schooling corresponds to the requirements of their jobs).¹⁴ Robst (1995a) finds that overeducated workers tend more easily to switch to better jobs over time, i.e., to climb the occupational scale. Garcia-Serrano and Malo-Ocana (1996) and McGuinness (2003) argue to the contrary. According to the first-mentioned, overeducated workers have less likelihood of promotion than non-overeducated workers. According to the latter, much occupational mobility that is attributed to overeducated workers takes place among overeducated workers who switch occupations but remain overeducated at their new jobs.

Even though job mobility is an integral part of the occupational mobility, the relationship and the causality between the two concepts seem to be far from clear. On one hand, Alba-Ramirez (1993) finds that work histories of overeducated workers are typified by a higher rate of job-switching and a shorter stay in one post than non-overeducated workers.¹⁵ This finding is consistent with Sicherman's (1991) argument about a certain degree of substitutability between education and job-specific experience in the human-capital function. On the other hand, it is not clear whether strong job mobility leads the overeducated to occupational mobility. Furthermore, Sloane et al. (1999) proves that switching jobs does not guarantee an improvement in job suitability for the overeducated, contrary to what SG's occupational-mobility theory predicts.¹⁶

¹⁴ Abundant research literature explores the relationship between overeducation and on-the-job training. See, for example, Sicherman (1991), Alba-Ramirez (1993), Groot (1993, 1996), Sloane et al. (1996), Chevalier (2000), Pischke (2001), Buchel and Mertens (2004), and Sloane (2003). The current study overlooks the aspect of the extent of training given at various workplaces because the authors have no information about it

¹⁵ Robst (1995a), Kiker et al. (1997), Dolton and Vignoles (2000), and Mendes de Oliveira et al. (2000) obtained similar results.

¹⁶ According to Rubb (2003a), studies that included a tenure variable in the wage equation found a 3.4 percent lower return on overeducation than that obtained in studies that lacked this variable.

In accordance with SG's occupational-mobility theory, individuals' situation as overeducated workers may be short-lived and the wage "penalty" that overeducated workers pay is compensated for by the greater likelihood that these workers will be promoted.¹⁷ Sicherman (1991) lends this argument empirical support and shows that in any comparison between these workers and non-overeducated counterparts, the former will have higher rates of career and occupational mobility. Other empirical studies, however, counter this evidence by indicating that overeducation may be long-lasting or even permanent. Battu et al. (1999) found that during seven years of investigation 30 percent of graduates had never been employed in a post that required a degree and that at least 40 percent of graduates held non-degree posts at any given point in time. Similarly, Dolton and Vignoles (2000) found that 38 percent of graduates were overeducated in their first jobs and that 30 percent still held such jobs six years later. Dolton and Silles (2003) added to the foregoing by arguing that overeducation in a graduate's very first job tends to impede the graduate in finding and being hired for a job in a higher occupation later. In contrast to both sides of the divide presented thus far, Rubb (2003b) finds that overeducation may be a short-lived phenomenon for individuals if it occurs as the temporary effect of a career path, e.g., if it gives the individual an opportunity to develop career options or gain experience. For others, however, it may serve as a way to compensate for personal weaknesses in various other areas of human capital (quality of academic institution, experience, etc.).¹⁸ Therefore, it may be a long-lasting phenomenon for them.

It is a well-documented fact that the probability of a worker's being overeducated is affected by h/her major field of study. Graduates who studied professions such as medicine, engineering, science, and law have usually higher chances to be employed in posts that match their education, relative to graduates in other disciplines (Dolton and Vignoles, 2000; Battu et al., 1999; McGuinness and Bennett, 2007). Nonetheless, lacking credible controls for individuals' cognitive abilities, these findings may confound the effects of individual abilities and professions studied, for admission to

¹⁷ Linsley (2005) examines the employment of overeducated persons in Australia by means of four economic models: the human-capital theory, occupational-mobility model, the job-competition model, and the assignment theory. He concludes that the job-competition model is the main explanatory factor for the existence of this phenomenon in the Australian labor market.

¹⁸ Robst (1995b) finds a negative correspondence between quality of scholastic institution and the probability of overeducated employment.

studies of medicine, engineering, science and law is generally more selective than to other academic disciplines. Exceptions in this context are Dolton and Kidd (1998) and Dolton and Vignoles (2000), who used individuals' grades in their degree programs as a proxy for cognitive abilities.¹⁹ Grades were found to make a significant contribution to the likelihood of career advancement and job mobility (Dolton and Kidd), and a negative correspondence was established between grades in degree studies and the likelihood of being overeducated (Dolton and Vignoles).

Sicherman and Galor's occupational-mobility theory does not address itself directly to the question of correspondence between overeducation and income mobility, although the matter stems naturally from the very fact of occupational upgrade. Verdugo and Verdugo (1989), Rubb (2003a), and McGuinness and Bennett (2007) find that overeducated individuals earn more than non-overeducated counterparts but earn less than those whose schooling is identical to their own. The return to schooling is lower among the overeducated than among the non-overeducated but is positive in both cases. Buchel and Mertens (2004) and Voon and Miller (2005) back this premise with empirical evidence, showing that the wages of overeducated workers increase less rapidly than those of the non-overeducated.²⁰ The question of the correspondence between an individual's degree level and h/her likelihood of being overeducated on the job has been investigated recently by Robst (2007), who found a negative correlation between the two, seemingly contradicting the fact that the return to schooling diminishes with the number of years of academic study (Heckman et al., 2006).

The mass immigration that Israel received from the former Soviet Union in the early 1990s had, on average, a higher level of schooling than that of the nonimmigrants. This brought on a spate of studies that probed the immigrants' occupational mobility and wage dynamics relative to those of nonimmigrants (see Eckstein and Weiss, 2002, 2004; Weiss et al., 2003). The research showed that after a steep decline in earnings upon arrival, in the long run (7–10 years), the immigrants' return to schooling caught up with that of the Israel-born. The process took place as the immigrants learned the Hebrew language and acquired skills that they needed in

¹⁹ For further elaboration on this topic, see McGuinness and Bennett (2007).

²⁰ Further studies that examine this issue and elicit the same findings are Hartog and Oosterbeek (1988), Van Smoorenbug and Van der Velden (1997), and Bauer (2002).

the domestic labor market (vocational training and/or professional certification) and was manifested in gradual upward progress on the occupational scale.

C. Measurement and Magnitude of Overeducation in Israel

1. Measuring Overeducation

There are three principal ways of measuring overeducation: objective, subjective, and empirical.

- (1) Objective measuring identifies the level of abilities (years of schooling) that are required for the performance of a given task (occupation).
- (2) Subjective measuring is based on direct questions regarding a degree of correspondence between the worker's education and job qualifications, e.g., “How many years of study does it take to do a job such as the one that you hold?” or “How satisfied are you with the correlation between your work and your abilities?”.
- (3) Empirical measuring uses a statistical metric: a worker is identified as overeducated in h/her job placement when h/her level of schooling surpasses the average among workers in h/her occupation by more than one standard deviation.

By and large, one would expect the three methods of measurement to elicit different estimates of overeducation. According to Van Der Velden and Van Smoorenburg (1997), the use of the objective method overestimates the extent of overeducation; therefore, they favor the use of the subjective method. Hartog and Oosterbeek (1988), in contrast, believe that subjective measurement may result in an overestimate; therefore, they encourage the use of the objective method.

Our study uses two of the three measurement methods, the objective and the subjective.²¹ Objective measurement is performed on the basis of the classification of the graduate's occupation in h/her main job at the time the survey was performed²²; we settled for accuracy at the first digit in the three-digit code, as detailed below. The subjective measurement was based on the answer to the question, “**Is your current**

²¹ In the context of a graduates' cohort survey empirical measuring is in fact trivial.

²² According to Israel's Standard Classification of Occupations (1994), which is based on the ISCO-88 classification.

job related to the discipline that you studied? (Please relate to the totality of your first-degree studies),” with four possible answers: “very closely,” “closely,” “slightly,” and “not at all.”

Table 1 presents the distribution of graduates in each discipline of study by employment status at the time of the survey and, among those who were working, by occupation. The highest rate of non-working (unemployed or out of labor force) graduates (45 percent) was found among holders of degrees in natural sciences, life sciences, and agriculture, mainly because they were continuing their academic studies at the time of the survey. The lowest rate of non-working graduates (10 percent) was among holders of business-administration degrees. On average, 17 percent of graduates in 2000/01–2001/02 were not working two years after having been awarded their degrees. The two reasons most frequently offered for this were studies (7 percent) and looking for work (4 percent).²³

As for the distribution of occupations, 70 percent of graduates who were working at the time of the survey were either in academic occupation, or worked as professionals, technicians or associate professionals. The proportion of those working in these occupations was especially high (above 80 percent) among graduates in law; medicine and paramedic occupations; mathematics, statistics and computers; and engineering and architecture. Since the occupation of “manager” is not directly related to the schooling acquired (with the exception of graduates in business administration, of whom 14 percent were working in this occupation) and the remaining occupations do not require academic schooling, it is reasonable to define a graduate as being overeducated at work, by the objective standard of measurement, if s/he is not employed in an academic occupation and is not a professional, technician or associate professional, and, among holders of business-administration degrees, if they are not working in managerial jobs. Thus, according to the objective metric, 29 percent of graduates who were working at the time of the survey were overeducated.

Table 2 compares the extent of overeducation by the objective and the subjective methods and reports that 29 percent of working graduates using the former method, and 37 percent of them using the latter method, are overeducated. Both methods of measurement elicit similar rankings among the disciplines of study. The lowest rates of overeducation were found among graduates in law; medicine; mathematics,

²³ CBS Publication 1296, Table 6.

statistics, and computers; and engineering and architecture. Graduates in the humanities and “other” disciplines²⁴ were typified by high rates of overeducation. The right-hand column of the table shows the extent of overlap between the two definitions of overeducation: only 20 percent of graduates who were working at the time of the survey were defined as overeducated according to both measurement methods. This finding is compatible with the results of the comparative studies of various indicators (Cohn and Kahn, 1995; McGoldrick and Robst, 1996; Battu et al., 2000; Groot and Maassen Den Brink, 2000, and Chevalier, 2003). The extent of overeducation in Israel resides at the upper end of estimates of the phenomenon in Western countries (by the subjective measurement). For a survey of findings in various countries, see McGuinness (2006) and Sloane (2003).

It is customary in the literature to calculate the ratio of overeducated workers among a population of workers, as we have done thus far. In a cohort study, however, since we know the number of degree holders who have completed their academic studies, we may also calculate the ratio among all graduates. Table 2 provides two columns for each of the two methods of measurement. In the columns named “Pct. of all graduates”, the numerator is equal to the sum of overeducated workers and non-working graduates, whereas the denominator includes all graduates of the cohort. Such a calculation is logical and compatible with the essence of the concept of overeducation, because obviously one’s academic schooling is not being utilized if one is not working. As the data in Table 2 show, such a calculation raises the percentage of the overeducated to 42 percent and 47 percent by the objective and the subjective measurements, respectively. Since the difference between the two proportions—total graduates vs. working graduates—originates in the share of non-working graduates, overeducation among total graduates becomes much more prevalent in the field of natural sciences, life sciences, and agriculture, since 45 percent of them were not working at the time of the survey (Table 1).

In the continuation of the study, we use the subjective measuring method to identify overeducation on the basis of a question about the strength of the relationship between the individual’s principal job at the time of the survey and the academic discipline that s/he studied.

²⁴ Liberal arts, librarianship, nutrition science, etc.

2. Descriptive Statistics

According to the survey reportage, 73 percent of jobs held by graduates two years after the award of degrees were begun after the graduates had completed their studies. The other posts were longer-tenured: 8 percent were first taken up before the beginning of studies (i.e., at least five or six years before the time of the survey) and 19 percent were begun in the course of first-degree studies. As expected, the long-tenured posts, those that the graduates filled before they completed their studies, were better paying: the average wage per post begun after studies was NIS 7,774 per month as against NIS 10,948 in jobs begun before or during studies. However, there was a higher percentage of the overeducated among the graduates holding long-tenured jobs than among their counterparts who held the jobs that had started after the graduation (40 percent vs. 35 percent, respectively). This fact seemingly contradicts the evidence of the substitutability, known in the literature, between tenure with employer and education in the human-capital model (Sicherman, 1991; Dolton and Vignoles, 2000; and Mendes de Oliveira et al., 2000). On the other hand, Figure 1 shows that academic disciplines with a higher return to tenure are characterized by a lower extent of overeducation.

About 40 percent of graduates went on to further academic studies after completing their first degrees and 87 percent of them—34 percent of all graduates—progressed toward advanced degrees (mainly Master's degree). In all academic disciplines studied, graduates who continued toward another academic degree typically had stronger cognitive abilities than those who did not continue to study, giving evidence of the positive selection of continuing students in academic programs (Table 3). Notably, the difference in cognitive abilities between continuing students and others was rather small in most disciplines of study—less than 4 percent, on average.

As one might expect in view of the workload that one accepts when pursuing an advanced degree, the rate of non-working is higher among first-degree holders who go on to further studies than among non-students—24 percent versus 13 percent, respectively. This phenomenon is observed in all disciplines of study except humanities and business administration. On average, however, there is no significant difference between the two groups in their rates of overeducation. Overeducation is more common among continuing students in some academic disciplines and less common in others. Importantly, the rate of overeducation in Table 3 pertains to schooling acquired within the framework of first-degree studies. Accounting for

continuing studies toward an advanced degree would be expected to raise the rate of overeducation. After all, few continuing students switch to new disciplines of study (those who do so switch mainly to business administration), and if they were overeducated upon earning their first degrees, they will remain so after adding a year or two of advanced studies. Individuals who were not overeducated when they received their first degrees increase their likelihood of becoming overeducated when they augment their academic studies. In other words, the estimate of overeducation among continuing students in Table 3 should be an underestimate, if we took into account their additional years of schooling.

The most conspicuous difference between continuing students (those going for an additional academic degree) and other graduates is in earnings: the former earned 30 percent less. Wage gaps in favor of non-continuing students were found in all fields of study. Since we measure monthly wages, which are a product of hours worked and an hourly wage rate, these wage differentials may be explained in two ways. First, the academic workload forces graduates who continue their studies to work relatively few hours (part time); thus, even though their hourly wage is high when they work in the occupations that match their education, their earnings fall short of that of graduates who do not continue with their studies. Furthermore, some continuing students are employed by higher-education institutions as research assistants and teaching aides; such jobs pay modest wages but are convenient for people who wish to invest in study and/or in the development of an academic career. The second explanation is related to the prevalent pattern of employment among first-degree students.²⁵ Some second-degree students may find odd jobs in the secondary labor market too, few of which are compatible with their schooling, i.e., they are overeducated at work.

We now divide the graduates on the basis of overeducation at the time of the survey (about two years after they earned their degrees) and measure wage gaps between working graduates whose schooling corresponds to the requirements of their jobs and those who are overeducated at work, from the year preceding the award of the degree to the third year after receiving it. Here we find again an earnings disparity in favor of the non-overeducated graduates (Figure 2). In fact, the gap widens from 13 percent a year before the completion of studies to 27 percent three years after the degree is awarded. In contrast, when we examine the graduates' job mobility via the

²⁵ For further details, see Romanov, Tur-Sinai, and Zussman, 2007, Table 2.

average number of jobs per year, we find no significant difference between the two groups. When we parse the earnings disparities between non-overeducated graduates and overeducated graduates by academic disciplines studied (Table 4), we obtain an interesting picture. In three fields—medicine and paramedical occupations; mathematics, statistics, and computers; and engineering and architecture—we find wage gaps of 20–40 percent in the year of receipt of degree in favor of graduates whose work corresponds to their schooling. During the next three years, the gap remains stable in mathematics, statistics, and computers but narrows greatly in medicine and paramedical occupations. In the other disciplines, there is an earnings gap *in favor of the overeducated* in the year of degree award, and over the next three years this gap either narrows (in the humanities; law; and natural sciences, life sciences, and agriculture) or reverses (social sciences, business administration). As a result of these two trends—stability of earnings disparities in fields that favor non-overeducated graduates, and narrowing of earnings disparities in favor of the overeducated and reversal of disparities in other fields—a general trend of widening earnings gaps takes shape over five years considered.

D. Econometric Model

To examine the factors that affect the probability of overeducation and its relationship with job and earnings mobility among first-degree recipients in Israel, we estimated three econometric models.

We used a binary-selection model (logit) to analyze the likelihood that individual i who holds a first degree in discipline j will be overeducated in job k at the time of the survey:

$$(1) \quad \Pr(OE_{ijk} = 1) = \beta X_{ij} + \gamma_1 Ability_i + \gamma_2 T_{ik} + \gamma_3 PastJobs_i + \varepsilon_i$$

where:

OE an indicator of overeducation on the job. This variable was designed on the basis of the subjective method of measurement as explained in Section C1 above.

X an array of the graduate's demographic traits, the institution that awarded h/her degree, and the discipline studied.

Ability as a proxy for cognitive abilities, we used the score of the psychometric test that each graduate took before beginning academic studies (total score) and its components: verbal reasoning, quantitative reasoning, and English. In our opinion, this variable is superior to degree-course grades for the following reasons: the degree grades, which employers usually request in order to evaluate the graduate’s “quality” upon hiring and in order to determine h/her starting wage, provide a biased estimate of cognitive abilities because they are not calibrated across academic institutions. Therefore, they confuse two intermingling effects – the individual’s cognitive abilities and the reputation of the academic institution. Psychometric test scores, in contrast, are calibrated for a full cohort of examinees and, therefore, elicit an accurate ranking of individuals’ abilities.²⁶

T tenure, number of months on the job.

The wage equation for year t is estimated as follows:

$$(2) \quad \ln(W_{ijkt}) = \alpha X_{ij} + \gamma Emp_{ikt} + \kappa_1 OE_{ijk} + \kappa_2 T_{ik} + \kappa_3 T_{ik}^2 + \kappa_4 JobChanges_{it} + u_i$$

where:

W monthly wage in the graduate’s principal job in year t. The principal job is defined as the job that pays the highest wage among all jobs that the individual held during the year.

Emp employer characteristics: positioning in the public sector and size of business (five size groups, by headcount).

JobChanges a measure of job mobility from the year of degree award to year t (inclusive). This variable is defined as the average annual number of job changes; for example, for an individual who worked for two employers in year 1, one employer in year 2 and four employers in year 3, we calculate $JobChanges = ((2+1+4)-3)/3 = 1.33$.

²⁶ A significant positive correlation has been found between the psychometric exam score and first-year grades (and the final first-degree grade), see Willingham et al., 1990; Oren, 1992; Beller, 1994; and Kennet-Cohen et al., 1999.

The dynamic of wage increase from the year of award of degree is estimated in the following way:

$$(3) \quad (W_{ijt}/W_{ij0})^{1/t} - 1 = \eta X_{ij} + \lambda_1 \ln W_{ij0} + \lambda_2 OE_{ij} + \lambda_3 JobChanges_{it} + v_i$$

where:

W_t monthly wage in graduate's principal job in year t (t=1,2,3).

W_0 monthly wage in graduate's principal job in year of award of degree.

E. Empirical Findings

Tables 5–9 present estimates of the likelihood of overeducation, the wage equation, the likelihood of continuing to advanced studies, and the rate of wage increase, as a dependency of the worker's being overeducated on the job at the time of the survey.

The likelihood of a graduate's having a job that is unrelated to h/her schooling was estimated by means of a logit model. The results are shown in Tables 5 and 6.

The most common finding in the empirical literature (see Renes and Ridder, 1995; Groot and Maassen Van Den Brink, 2000; and Bauer, 2002) is that the likelihood of overeducation is greater among women than among men. We found this only in "hard" academic subjects – mathematics, statistics, and computers; engineering and architecture – whereas women are less likely to be overeducated among graduates in the social sciences, medicine and paramedic occupations, and no significant difference was found between the two gender groups among graduates at large (Table 5). The estimates point to a positive correlation between worker's age and likelihood of being overeducated (with the exception of graduates in medicine and paramedic occupations) – a result that supports Sicherman (1991) and Robst (2007). If the graduate is Jewish, s/he has a higher likelihood of being overeducated on the job (except for graduates in engineering and architecture, for whom the relationship is reversed, and graduates in business administration, law, medicine and paramedic occupations, and natural sciences, life sciences, and agriculture, among whom the religion variable was found to have no effect). This result supposedly originates in an oversupply of well-schooled personnel among graduates in the Jewish

sector or, alternately, surplus demand for educated personnel among graduates in the Arab sector.

The likelihood of overeducation is smaller among married graduates than among others in most disciplines studied. First-degree recipients in humanities, law, and mathematics, statistics, and computers who immigrated to Israel in or after 1989 were found to have a greater likelihood of being overeducated than do other Israelis, whereas immigrants who completed engineering and architecture studies are less likely to be in this situation.

The estimations show a negative correlation between tenure with current employer and the probability of being overeducated. These results recur in regard to estimates of number of employers in the three years preceding the survey. Both results reinforce the argument of substitutability between education and specific experience in the human-capital function, as found by Sicherman (1991), Alba-Ramirez (1993), Robst (1995a), Kiker et al. (1997), Dolton and Vignoles (2000), and Mendes de Oliveira et al. (2000).

The estimates indicate that continuing one's study for an additional first degree or certification (teaching certification, in most cases) raises the chances to be overeducated in the job (except for graduates in the humanities, social sciences, and law). In contrast, graduates who go on for an advanced degree (Masters or Ph.D.) are less likely to be overeducated at work, much as Robst (2007) found. These results are highly intuitive: people who acquire a second bachelor's degree or take certification studies evidently do not pin their hopes on working in the field of study that they learned in their previous degree, it stands to reason that their jobs are less related to it. In contrast, those who go on to an advanced degree, for the most part in the same discipline as in the first degree, expect to develop a professional career in this field, and this is reflected in a stronger likelihood of a good match between job and studies.

The contribution of the individual's overall cognitive abilities to the likelihood of overeducation proved to be negative for most graduates. However, for those who earned degrees in some disciplines – business administration, law, medicine and paramedical occupations, and natural sciences, life sciences, and agriculture – a positive correlation was found. It also turns out that quantitative reasoning abilities also reduce the likelihood of overeducation.

Israel's universities, as long-standing and well-established academic institutions that have international reputations in teaching and research,²⁷ are perceived as sources of higher quality schooling than the country's academic colleges, most of which were established in the mid-1990s. Consequently, it was surprising to find (Table 5) that the acquisition of a first degree from a university usually has no significant (negative) effect on the likelihood of being overeducated on the job. This result, one may surmise, originates in control or graduates' cognitive abilities by means of variables such as psychometric test score and continued academic studies. To test this hypothesis, we estimated a model (for all academic disciplines combined) that gradually omitted these controlling variables (Table 6). When the regression included only a dummy variable for a university degree (control group: degree from academic college), we did find a significant negative effect (Model I in Table 6) at three times the intensity of the effect in Table 5 (that appears as Model III in Table 6.) When we added information about the continuation of academic studies (Model II in Table 6), the effect persisted. The upshot of this exercise is that absent explicit control of cognitive abilities on the individual level, an indicator of institution attended captures the effect due to the positive selectivity of enrollment in higher-quality academic institutions. Consequently, the effect of institution attended on the likelihood of overeducation may be upward-biased (in absolute value) unless a variable that controls for cognitive abilities is included.

We now analyze the effect of overeducation on graduates' earnings by means of the wage equations shown in Table 7. The equations were estimated for the survey year and the subsequent year (the third year after the award of degree); apart from the variables explaining the probability of overeducation, we included five additional variables that might help us better identify the factors that affect graduates' wages: overeducation, average annual number of job changes (from the year of award of degree), employment in the public sector, occupation, and size of business. Notably, we know about overeducation and occupation only for a job that a graduate held in the survey year. Therefore, we did not add occupation to the wage equation for the third year after the award of degree, whereas a dummy variable for overeducation will point to the "wage premium" that overeducated graduates in the survey year paid for being in this situation.

²⁷ All six Israel's universities are included in the THES (The Times Higher Education Supplement) rating list of the top 500 academic institutions.

The estimates in Table 7 show that overeducated graduates earned 11–12 percent less than graduates who held jobs that corresponded to their schooling, *ceteris paribus*. This finding is consistent with the magnitude of the effect of overeducation reported by Verdugo and Verdugo (1989), Rubb (2003a), and McGuinness and Bennett (2007). A high rate of job mobility exerts a strong negative effect on graduates' wages. The annual average number of employer-switches from the year of award of degree in the wage equation to Year 2 (and Year 3) after the completion of studies is defined as the total number of jobs in three (four) years less three (four) years, divided by three (four). Accordingly, a marginal increase in this variable means one switch of employers each year during the first three (four) years of work after earning the degree. The effect of heightened job mobility is estimated at 15 percent in the wage equation for two years after award of degree (three years' mobility) and 19 percent in the wage equation for three years after award of degree (4 years of mobility). In other words, one job switch per year reduces a graduate's wage by 5 percent.

An additional a year of tenure in one's current job increases one's wage by 5–6 percent. Notably, the return to tenure is positive and significant if one controls for job mobility before the graduate takes up h/her current job. By inference, heightened mobility in the past lowers the graduate's starting wage whereas the acquisition of employer-specific experience affects the pace of wage increase as long as the graduate stays with the same employer.

The wage equation elicits several additional findings. Jews earn 15 percent more than Arabs and university graduates earn 10 percent more than academic college graduates, all other factors held constant. Employment in the public sector reduces wages by more than one-third relative to those who work in the private sector. The estimates show that business size correlates negatively with workers' wages. This may be indicative of the wealth of occupations that large workplaces offer and the ability of such employers to shift workers internally in accordance with their abilities (intra-firm occupational mobility), two factors that small employers cannot match.

When we used a logit model to examine the likelihood of continuation to advanced studies (Table 8), we found that it was smaller among overeducated workers than among the others. This indicates that most graduates who continue their academic studies do not do this in search of a refuge from difficulties in breaking into the labor market; instead, it is a deliberate step along an academic career path. The likelihood of going onto advanced studies was greater among university graduates

than among academic-college graduates because master's degrees in Israel are pursued mostly at universities and because college graduates confront "transition costs" related to supplemental academic requirements for some first-degree curricula that the colleges offer. Holding a job with an academic institution during first-degree studies increases the likelihood of continuing to advanced studies – predictably, considering that many students who work for higher-education institutions are research assistants, exercise supervisors, and so on, and were chosen for these posts on the basis of their academic achievements.

We estimated the annual average rate of wage increase at graduates' principal jobs since the year of graduation, for one year, two years, and three years after the award of the degree (Table 9). The estimates indicate that the wages of graduates who have strong cognitive abilities grow more rapidly over the years. When we controlled for individuals' cognitive abilities, we found that a more select academic institution (a university) has no effect of its own. Those who continued to study, be it for an additional degree or certification or for an advanced degree, found their wages growing more slowly but that the gap narrowed from one year to the next. In the third year after the completion of first-degree studies, by which time they almost certainly completed their masters studies (which ordinarily last two years), the restraining effect of advanced-degree studies on wages approached zero (from below). The negative slope of (log) graduate's wage in the year of degree received reflects the phenomenon of regression to the mean: the lower the starting wage is, the faster the rate of wage increase. Although this is an arithmetic result of calculating the ratio on a low basis, it also reflects rapid wage increase in occupations such as accountancy and law, for in these cases graduates spend the first two years after earning their degrees preparing for professional guild tests in the course of an internship. In the third year, after they have been admitted to their guilds, their wages move upward in a stepwise manner. Rapid job mobility (average annual number of job-switches) from the year in which the degree is received to the research year slows the rate of wage increase but its effect diminishes as the year of degree award received recedes into the past, providing further evidence for the presentation in Table 5.

The estimates indicate that the rate of wage increase is 2-5 percent lower among overeducated workers than those whose schooling corresponds to the requirements of their jobs. This finding provides a clue to our research question, whether overeducation leaves a "scar" that lasts for years or whether the wages of the overeducated ultimately converge. Here we circumscribe the inferential possibilities

by noting that our study deals with a short period of time, the first three years after the completion of studies. Therefore, we cannot make any inferences about the long-term trend, but we do mention that with a 11-12 percent wage gap two years after the award of degree and a slower pace of wage growth thereafter, there are no signs of wage convergence for the overeducated. This outcome supports the findings of Buchel and Mertens (2004) and Voon and Miller (2005), that indicate that wage differentials related to overeducation do not tend to close in the short term.

F. Conclusion

Since the phenomenon of overeducation was first studied, its purview has expanded and it has been linked with main themes in labor economics. However, certain key issues in overeducation continue to be debated by the economists. The study presented above attempts to identify and respond to several unanswered questions in this field: the role of job mobility in a person's chances of being overeducated, the contribution of cognitive abilities and the quality of the academic institution that awarded the graduate h/her schooling to the likelihood of becoming overeducated, and the relationship between continuing academic studies and overeducation.

The study found that the extent of overeducation in Israel, by objective and subjective measures, was 29 percent and 37 percent, respectively, of working graduates – placing Israel at the upper end of the estimates of this phenomenon in Western countries.

The wage-function estimates show that graduates whose schooling corresponds to the requirements of their jobs earn some 11-12 percent more than their counterparts in a situation of overeducated, during the first three years after the completion of their studies. Furthermore, the rate of wage increase is slower among the overeducated than among the non-overeducated. Job mobility (switching employers), which according to the Sichernan and Galor (1990) model, should extricate the overeducated individual from h/her plight, actually has the opposite effect, i.e., it restrains the rate of wage increase.

The study found a negative correlation between employee's tenure with current employer and likelihood of being overeducated. The same was found in regard to the estimates of number of employers in the three years preceding the survey. Both results support the argument of substitutability between schooling and tenure in the human-capital function. An individual's decision to continue studying for another first degree

or certification raises the probability of becoming overeducated in regard to most disciplines of first-degree studies. In contrast, if the individual decides to go on to an advanced degree (Masters or Ph.D.), h/her chances of becoming overeducated decline in most cases. The likelihood of being overeducated is lower among those who have strong cognitive abilities than among those with weaker ones. The contribution of quantitative-reasoning abilities to the likelihood of becoming overeducated on the job is also negative in most disciplines of academic study.

Being overeducated makes it less likely that a graduate will go on to advanced studies. By implication, most graduates who continue their academic studies do so not in search of a refuge from difficulties in joining the labor market but rather as an academic career move that does not involve choosing a job that is poorly matched with the discipline studied.

The final contribution of the study is its empirical attempt to answer the question of whether the employment of overeducated workers is a short-lived phenomenon or tends to be long-lasting. The estimates show that the wages of overeducated employees rise more slowly than the wages of workers whose education corresponds to the requirements of their jobs. This result suggests that the employment of the overeducated tends to last at least several years.

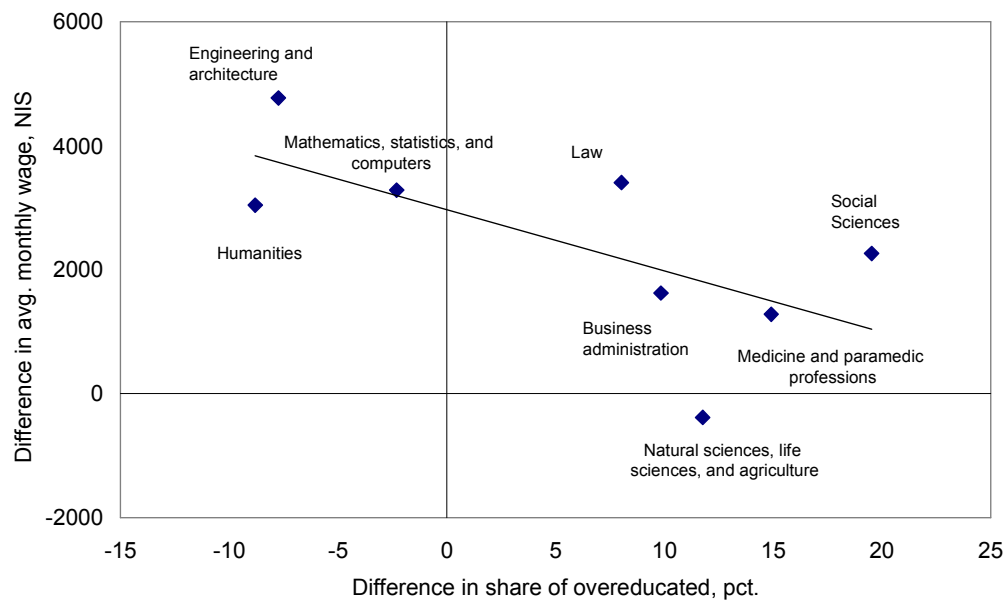
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Figure 1.
Differentials of Wages and Share of Overeducated Among Graduates Whose Jobs Began Before and After Graduation, by Academic Disciplines Studied⁽¹⁾

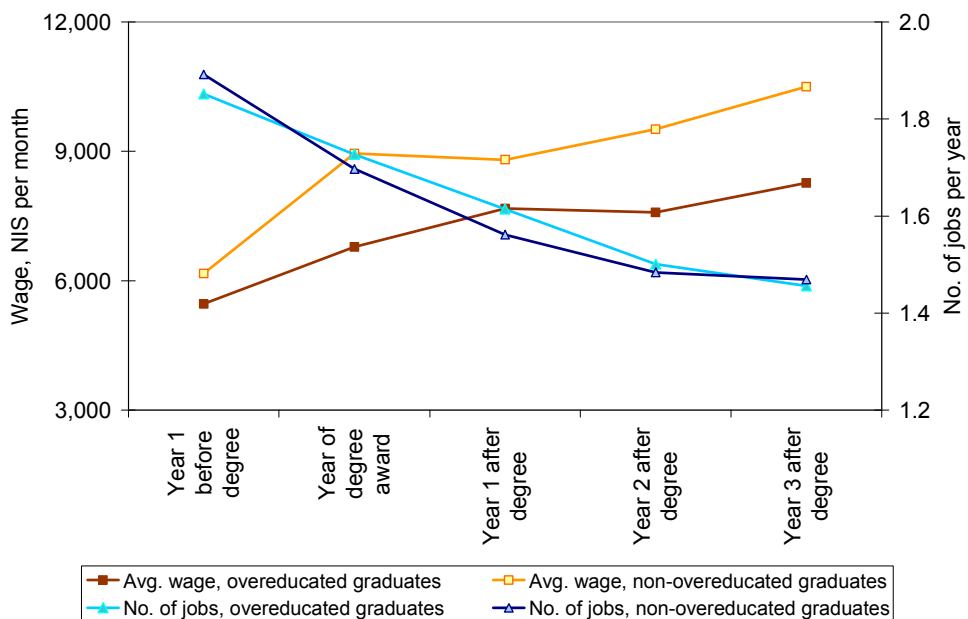


Source: survey of recipients of first degrees from higher-education institutions, 2000/01–2001/02, Income Tax Administration; calculations by authors.

Note:

(1) Overeducation identified by subjective measurement.

Figure 2.
Graduates' Wage and Number of Jobs Held in Five Years Surrounding Receipt of Degree, by State of Overeducation⁽¹⁾



Source: survey of recipients of first degrees from higher-education institutions, 2000/01–2001/02, Income Tax Administration; calculations by authors.

Note:

(1) Overeducation identified by subjective measurement.

**Table 1. Graduates' Employment and Occupations at Time of Survey,
by Academic Disciplines Studied (Pct.)**

Academic discipline	Non-working graduates	Occupations of graduates working at time of survey ⁽¹⁾						
		Total	Academic	Professionals, technicians and assoc. professionals	Managers	Clerks	Agents, service and sale workers	Other
Occupation code			0	1	2	3	4	5-9
Humanities	16.7	100.0	34.2	26.0	7.9	17.0	7.5	7.4
Social sciences	14.1	100.0	38.2	20.3	9.4	18.7	8.1	5.2
Business admin.	10.0	100.0	27.9	20.6	14.2	26.6	6.8	3.9
Law	14.6	100.0	85.3	4.8	5.1	2.0	1.6	1.2
Medicine and paramedical	14.6	100.0	42.0	48.2	2.1	2.8	3.0	1.9
Math, statistics, and computers	16.1	100.0	42.9	43.2	4.6	4.0	2.5	2.8
Natural & life sciences and agriculture	45.0	100.0	50.4	18.1	8.1	6.2	10.3	6.7
Engineering and architecture	16.0	100.0	69.3	12.4	5.7	3.5	2.1	7.0
Other	23.3	100.0	32.9	16.4	16.6	17.2	9.1	7.7
Total	17.3	100.0	46.1	23.9	7.4	11.7	5.6	5.3

Source: survey of recipients of first degrees from higher-education institutions, 2000/01–2001/02; calculations by authors.

Note:

- (1) According to Israel's Standard Classification of Occupations. 'Other' including unknown occupation (X) and non-civilian (armed forces) occupation (Y).

**Table 2. Two Ways of Measuring Overeducation,
by Academic Disciplines Studied (Pct.)**

Academic discipline	By objective measurement: not working in occupations 0 or 1 ⁽¹⁾		By subjective measurement: slight or no relationship between work and studies		Overeducated by both measurements
	Pct. of workers	Pct. of all graduates	Pct. of workers	Pct. of all graduates	Pct. of workers
Humanities	39.8	49.9	53.4	61.1	32.0
Social sciences	41.5	49.8	46.9	54.4	29.6
Business admin. ⁽¹⁾	37.3	43.5	38.8	44.9	22.1
Law	9.9	23.1	20.9	32.5	7.6
Medicine and paramedical	9.8	23.0	15.6	27.9	5.3
Math, statistics, and computers	13.9	27.8	22.6	35.1	9.7
Natural & life sciences and agriculture	31.4	62.3	35.0	64.3	18.5
Engineering and architecture	18.2	31.3	21.2	33.8	8.2
Other	50.7	62.2	59.1	68.6	39.2
Total	29.3	41.5	36.7	47.3	20.3

Source: survey of recipients of first degrees from higher-education institutions, 2000/01–2001/02, Income Tax Administration; calculations by authors.

Note:

- (1) In objective measurement, business administration graduates are *not* considered overeducated if they hold managerial posts (Occupation Code 2).

Table 3. Continuation of Academic Studies, Cognitive Abilities, Employment, Overeducation, and Wage, by Academic Discipline Studied and Continuation of Academic Studies at Time of Survey (Pct.)

Academic discipline	Continuing toward further degree	Continuing toward master's or Ph.D.	Graduates' avg. psychometric score		Graduates not working at time of survey		Graduates' overeducation ⁽¹⁾		Avg. monthly wages (NIS)	
			Not continuing toward further degree	Continuing toward further degree	Not continuing toward further degree	Continuing toward further degree	Not continuing toward further degree	Continuing toward further degree		
Humanities	40.3	30.5	537	549	16.5	17.2	55.4	51.1	5658	4617
Social sciences	42.0	35.4	573	600	12.4	17.2	50.6	41.8	6841	5677
Business admin.	31.0	26.9	605	624	10.2	9.5	39.4	35.5	8399	7990
Law	28.4	25.6	681	685	9.4	27.7	19.5	27.0	10099	7451
Medicine and paramedical	41.2	38.7	579	671	3.9	29.6	10.8	27.0	6781	4310
Math, statistics, and computers	35.0	31.7	636	662	12.4	23.1	23.6	21.0	13616	10017
Natural & life sciences and agriculture	70.9	66.0	604	634	23.0	50.8	45.3	35.1	7773	4539
Engineering and architecture	29.3	27.1	616	626	12.5	24.7	21.2	21.9	13126	10369
Other	33.2	28.3	540	589	18.9	30.6	59.9	60.8	9093	6419
Total	39.3	34.0	591	614	12.7	24.3	36.5	37.1	9053	6337

Source: survey of recipients of first degrees from higher-education institutions, 2000/01–2001/02, Income Tax Administration, National Institute for Testing and Evaluation; calculations by authors.

Note:

(1) Overeducation identified by subjective measurement.

Table 4. Wage Gaps between Non-Overeducated and Overeducated Graduates, by Academic Discipline Studied (Pct.)⁽¹⁾

	Year before award of degree	Year of award of degree	1 year after award of degree	2 years after award of degree ⁽²⁾	3 years after award of degree
Humanities	-21.7	-19.4	-18.0	-16.4	-16.5
Social sciences	-10.3	-8.2	-5.8	1.8	4.1
Business admin.	-14.2	-11.8	-7.7	0.8	20.9
Law	-34.8	-19.4	-20.8	-19.8	-16.9
Medicine and paramedical	-0.7	22.6	21.6	21.9	2.3
Math, statistics, and computers	41.0	36.7	40.1	40.2	33.0
Natural & life sciences and agriculture	-30.1	-17.0	-14.3	-3.8	-6.9
Engineering and architecture	24.8	61.4	26.7	32.1	32.3
Other	-26.4	10.4	-64.2	-41.3	-23.5
Total	13.0	31.9	14.7	25.5	27.0

Source: survey of recipients of first degrees from higher-education institutions, 2000/01–2001/02, Income Tax Administration; calculations by authors.

Notes:

- (1) Overeducation identified by subjective measurement, for a principal job at time of survey.
- (2) Survey year.

Table 5. Factors Affecting Probability of Overeducation, by Academic Discipline Studied
 Dependent variable: 1 if graduate noted that h/her work at the time of the survey was slightly related or unrelated to discipline studied

Explanatory variable	All disciplines ⁽¹⁾	Humanities	Social sciences	Bus. Admin.	Law	Medicine and paramedic	Math, statistics, computers	Natural & life sciences and agric.	Engineering and architecture
	I	II	III	IX	X	XI	XII	XIII	IX
Male	0.0217	0.0167	0.1963***	-0.1231	0.1214	0.4178***	-0.3899***	-0.0876	-0.3572***
Age	0.1469***	0.2724***	0.3013***	-0.2030	3.7224***	-0.2788***	-0.0085	0.0025	0.5082***
Age (squared)	-0.0020***	-0.0039***	-0.0049***	0.0032	-0.0693***	0.0057***	0.0023	0.0005	-0.0075***
Jewish	0.5484***	1.1675***	0.8115***	15.4052	0.0120	-0.3138	-0.8801***	15.9799	-0.6695***
Immigrated 1989 or later	0.0467	0.6078***	0.0644	-0.0686	0.6817*	0.1703	0.3871***	0.1771	-0.4227***
Married	-0.2180***	-0.2462***	-0.3055***	-0.1110	0.4618***	0.2556*	-0.0848	-0.5382***	-0.3441***
University graduate	-0.0549	0.9533***	-0.3711***	-0.0517		-0.4816	-0.0057	0.7058**	-0.2361**
Continuing studies—parallel degree/certification	0.3799***	-0.1611	0.1612	1.3784***	16.7589	0.7222**	1.3947***	1.0080***	0.5279**
Continuing studies—advanced degree	-0.0886***	-0.3095***	-0.2241***	-0.2981**	0.6526***	0.5474***	-0.0707	-0.7345***	0.1402*
Total psychometric score	-0.0012***	-0.0019***	-0.0027***	0.0044***	0.0066**	0.0071***	-0.0030***	0.0104***	-0.0049***
Psychometric score—quantitative reasoning	-0.0057***	-0.0009	-0.0027	-0.0394***	-0.0256*	0.0171**	-0.0138**	-0.0455***	0.0084*
Tenure with employer	-0.0383***	-0.0825***	0.0271	-0.0955*	-0.5251***	0.1117	-0.4565***	0.0953	-0.1438***
Tenure with employer (squared)	0.0027***	0.0049***	0.0002	0.0026	0.0805***	-0.0103	0.0557***	0.0116	0.0096***
No. of employers in 3 years preceding survey	-0.0446***	-0.1121***	-0.0373***	0.1103***	-0.2573***	-0.0649**	0.0524**	-0.0004	0.0422*
Observations (N)	5919	841	1267	385	165	515	1072	302	1267
R ² Max-rescaled	0.3980	0.4246	0.2280	0.2439	0.6537	0.4513	0.2632	0.4683	0.1579

Source: Central Bureau of Statistics and processing of data by authors.

Notes:

*, **, and *** = significant at 10%, 5%, and 1% levels, respectively.

(1) The model includes dummy variables for academic disciplines.

Table 6. Effect of Cognitive Abilities on Probability of Overeducation⁽¹⁾

Dependent variable: 1 if graduate noted that h/her work at the time of the survey was slightly related or unrelated to discipline studied

Explanatory variable	All disciplines	All disciplines	All disciplines
	I	II	III
University graduate	-0.1688***	-0.1508***	-0.0549
Continuing studies— parallel degree or certification		0.3499***	0.3799***
Continuing studies— advanced degree		-0.1178***	-0.0886***
Total psychometric test score			-0.0012***
Psychometric test— quantitative reasoning			-0.0057***
Observations (N)	6819	6819	5919
R ² Max-rescaled	0.3629	0.3689	0.3980

Source: Central Bureau of Statistics and processing of data by authors.

Notes:

*, **, and *** = significant at 10%, 5%, and 1% levels, respectively.

- (1) The estimation includes the following controlling variables: male, age, age squared, Jewish, immigration in 1989 or later, married, tenure with employer, tenure with employer squared, no. of employers in 3 years preceding survey, and dummy variables for academic disciplines.

Table 7. Wage Equations, All Academic Disciplines

Dependent variable: (log) monthly wage in principal job two/three years after award of degree

Explanatory variable	2 years after award of degree ⁽¹⁾	3 years after award of degree ⁽¹⁾
Male	0.1573***	0.2851***
Age	0.0627***	0.0118
Age squared	-0.0007***	0.0001
Jewish	0.1571***	0.1505***
Immigration in 1989 or later	-0.0300	0.0090
Married	0.0502***	0.0308*
University graduate	0.1084***	0.1081***
(log) total psychometric score	0.0599	0.1457**
Continuing studies—parallel degree or certification	-0.2545***	-0.2431***
Continuing studies—advanced degree	-0.1341***	-0.0625***
Overeducated	-0.1119***	-0.1246***
Avg. annual number of jobs (from year of award of degree)	-0.1569***	-0.1941***
Tenure with employer	0.0656***	0.0465***
Tenure with employer squared	-0.0014***	-0.0009***
Employment in public sector	-0.3986***	-0.3395***
No. of employees in business:		
0–9	-0.2552***	-0.3001***
10–49	-0.0436*	-0.0606**
50–99	-0.0102	0.0117
100–499	0.0521**	0.0257
Academic occupation	0.0888**	
Professional, technician, assoc. professional	0.0871**	
Manager	0.3589***	
Clerk	0.0290	
Agent, service and sales worker	-0.0042	
Observations (N)	5621	5356
R ² adjusted	0.4480	0.4132

Source: Central Bureau of Statistics and processing of data by authors.

Notes:

*, **, and *** = significant at 10%, 5%, and 1% levels, respectively.

(1) The model includes dummy variables for academic disciplines.

Table 8. Factors Affecting Probability of Continuing Advanced Studies
 Dependent variable: 1 if respondent takes advanced studies two years after receiving degree

Explanatory variable	All academic disciplines ⁽¹⁾
Male	0.2214***
Age	-0.3386***
Age (squared)	0.0039***
Jewish	0.9363***
Immigrated 1989 or later	-0.1735***
Married	-0.2694***
University graduate	0.5432***
Total psychometric score	0.0029***
Worked for university during Year 3	0.5938***
Overeducated at work	-0.1292***
Observations (N)	5523
R ² Max-rescaled	0.3394

Source: Central Bureau of Statistics and processing of data by authors.

Notes:

*, **, and *** = significant at 10%, 5%, and 1% levels, respectively.

(1) The model includes dummy variables for academic disciplines.

Table 9. Pace of Wage Increase

Dependent variable: average rate of wage increase at principal job relative to wage in year of award of degree

Explanatory variable	Year after award of degree ⁽¹⁾	2 years after award of degree ⁽¹⁾	3 years after award of degree ⁽¹⁾
	I	II	III
Male	0.1842***	0.0737***	0.0880***
Age	0.0050	-0.0003	-0.0138**
Age (squared)	0.0001	0.0001	0.0002***
Jewish	0.0409	0.0719***	0.0227*
Immigration in 1989 or later	0.0438	0.0045	0.0100
Married	0.1324***	0.0058	0.0024
University graduate	-0.0019	0.0112	0.0153*
Continuing studies—parallel degree/certification	-0.3805***	-0.1354***	-0.0905***
Continuing studies—advanced degree	-0.2096***	-0.0611***	-0.0157**
Total psychometric score	0.0003	0.0002***	0.0002***
(ln) wage in year of award of degree	-0.8624***	-0.3531***	-0.2424***
Overeducation at work	-0.0299	-0.0514***	-0.0243***
Avg. annual number of jobs since graduation	-0.1432***	-0.0723***	-0.0575***
Observations (N)	5531	5363	5086
R ² adjusted	0.1355	0.3484	0.3883

Source: Central Bureau of Statistics and processing of data by authors.

Notes:

*, **, and *** = significant at 10%, 5%, and 1% levels, respectively.

(1) The model includes dummy variables for academic disciplines.