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Inequality reproduction, higher education, and the double major choice in college

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Abstract
Inequality scholarship has long highlighted the role of education, including higher education, in both mobility processes and the reproduction of disadvantage. This article, drawing on a unique sample of nearly 22,000 undergraduate students in Israel, builds on and extends this body of work by analyzing the extent to which double majoring in college, types of double major combinations, and their potential labor market returns are stratified by social class. Two competing theories are proposed for explaining variations by subgroup: social reproduction theory and rational choice theory. My analyses and findings in these regards are strikingly clear: there are significant social class background advantages in the choice to double major, and with especially unique combinations of lucrative and non-lucrative fields among the more advantaged students. While students from disadvantaged backgrounds were less likely to double major, they were more likely to choose double lucrative majors. These results and the accompanying discussion, beyond highlighting the role of double majoring as a higher ordered and seldom discussed mechanism of inequality, point to the ways in which students across the social class hierarchy negotiate not only college but also their perceptions of how employers will eventually assess educational credentials.

Keywords Double major · Field of study · Mobility · Social inequality · Student choice

Introduction

Despite broadening access to higher education and the increasing participation of underrepresented groups, several recent studies have raised concerns about the meritocratic power of the college degree (e.g., Manzoni & Streib, 2019; Oh & Kim, 2020). These studies highlight the stratified nature of the institution type and the field of study as sources of income inequalities among college graduates. This study focuses on a neglected aspect of stratification in higher education: the combination of different fields of study. About one-quarter of bachelor degree holders in the USA graduate from university with more than one major, and the trend of multiple majors is progressively increasing (Del Rossi & Hersch,

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2008; Zafar, 2012). The expectation of social stratification emerging from double major combinations derives from sociological approaches which argue that in an expanded system of higher education, socially advantaged groups use their advantages to secure a qualitatively superior education (Lucas, 2001). Prior research has considered single major selection; but this did not succeed in capturing the range of possibilities available to students, and the ways that students from different social backgrounds manage the complexities of multiple majors. Building on higher education and social stratification literatures, this article examines social stratification in the choice of double major and the type of combinations that students from different social backgrounds are more likely to choose.

Although it is beyond the scope of this paper to outline all possible explanations for the increasing number of students electing for double majors,[1] I will highlight the link between double majors and the increasing value of credentials in the twenty-first century labor market (e.g., Brown, 2001; Collins, 1979). Previous research suggests that field of study is an important source of stratification in higher education, with substantial consequences for lifetime earnings (Kim et al., 2015). Even though the research on this topic is limited, there is some evidence that double majors are highly valued in the labor market, with an income premium above and beyond student fields of study (Del Rossi & Hersch, 2008; Hemelt, 2010). Del Rossi and Hersch (2008) show that graduates with a double major earn, on average, 3% more than graduates who completed single major degree programs, with even larger gaps among graduates from different faculties.

Given the potential financial and intellectual benefits of double major programs, and the burden associated with it—such as the challenge of managing academic obligations for two majors simultaneously (Russell et al., 2008) and adapting to the different learning styles of two discipline-specific contexts (e.g., Becher, 1989)—the current study explores social stratification in the choice of double major programs and differences in the types of fields of study combinations taken by university students. The study uses the Israeli case to examine the research questions. Israel has experienced rapid growth in its higher education system over the last three decades, shifting the focus of inequalities in access to higher education to inequalities in the opportunity to attend selective institutions and lucrative fields of study (Ayalon & Mcdossi, 2016; Shavit et al., 2007). The choice of double major and types of field combinations therein are emerging sources of horizontal stratification, making the Israeli case particularly relevant to research into the reproduction of inequalities in general, and specifically for countries that have experienced similar trends. The contribution of this study to the existing research lies in (1) its focus on a neglected aspect of credentialism and stratification in higher education—the choice of double major programs—and type of double major combinations; (2) it compares two contradictory theoretical approaches to analyzing the type of double major combinations chosen by students across a range of socioeconomic backgrounds; and (3) it uses a large dataset, assembled from multiple administrative sources, and including key control variables that allow for the rigorous examination of the research question.

[1] Reasons for double majoring suggested by the literature include, but are not limited to, weighing different motivations or constraints, such as one field for labor market and one for personal fulfilment (Zafar 2012); to expand horizons; to balance between breadth and depth of knowledge (Klein 1990; Lattuca and Stark 2011); and to develop different ways for thinking, writing, and practicing (Pitt and Tepper 2012).

Social stratification and college major choice

It is important to put the choice of college major of students who come from a disadvantaged background—and particularly those who are first-generation students—into a broader context of stratification and inequality within higher education. Bourdieu's (1996) conception of field, and the uses of cultural capital within the field of higher education, is particularly relevant for this discussion. Focusing on students who belong to the French *bourgeoisie,* Bourdieu and Passeron (1979) found that these students accumulate greater amounts of cultural capital, through their previous experiences and the lifestyles of their families. The familiarity with elite forms of knowledge—knowledge that is commensurate with higher education, and that can facilitate academic success——allows these students to navigate college life more easily. Cultural capital, according to Bourdieu (1986), shapes students' norms, values, and beliefs about education—all of which eventually lead to different preferences, choices, and experiences within higher education.

The unequal possession of cultural capital is accompanied by the influence of context-specific savvy parents with firsthand familiarity with the higher education setting, able to provide the support, guidance, and knowledge needed to navigate the hierarchical arrangement of higher education and to succeed in college (Hamilton et al., 2018; Lareau, 2015; Yee, 2016). Inspired by the work of Bourdieu, several studies have suggested that advantaged students are more likely to be involved in college life and student organizations and to interact with faculty or college officials——activities which increase their access to the valued knowledge important for success in college (Lee, 2016; Stuber, 2009) and perhaps particularly important with regard to the choice of the college major(s). Bourdieu and Passeron (1979) argued that students from advantaged social groups enter higher education with much more confidence in their abilities, and that they are more comfortable and familiar with the academic environment. The choices of fields of study by this group are largely motivated by personal interest, authenticity, the desire to expand their horizons, and personal fulfilment. These students tend to be "committed" to acquiring a higher education, due to their social status (e.g., Grodsky & Riegle-Crumb, 2010). However, their choice of field of study is based on awareness of, and confidence in, their social status, which allows them to demonstrate a detachment from traditional choices without the fear of being judged for these choices by their families or by society at large. Indeed, previous studies have suggested that students from disadvantaged backgrounds experience difficulty in choosing a field of study (Chen & Carroll, 2005), while their more advantaged peers consider the wider consequences of their choice of field of study (Mullen, 2014). Assuming that the choice of double major program requires more knowledge on higher education; allows for more flexibility in the choice of major; and is sometimes considered an advantage over the single major, the expectation in this regard is:

> **Hypothesis 1**: Students from advantaged social backgrounds will be more likely to choose a double major over a single major program.

While there are ample grounds to presume that a double major program will appeal to students from advantaged backgrounds, the type of combinations chosen by students from different social backgrounds is a much more complex question. Studies examining the link between socioeconomic background and choice of college major suggest that once students from disadvantaged backgrounds choose their major, they are more likely to view higher education as a channel for social mobility and thus highlight the advantage of

these students in the choice of lucrative and professional fields (Davies & Guppy, 1997; Goyette & Mullen, 2006; Ma, 2009). Although these findings suggest that there are large differences in choice of major by students from diverse social backgrounds, they nonetheless do not imply that students from disadvantaged background are disadvantaged in regard to the economic prospect of their college major, much the opposite in fact.

Given the significance of horizontal stratification in expanded systems of higher education (e.g., Gerber & Cheung, 2008), the relative advantage of students from low socioeconomic backgrounds in the selection of lucrative college majors raises the question of how can we explain the choice of college major of students from higher socioeconomic backgrounds. Previous studies attempting to address this puzzle suggest that although economic advantage does allow students from advantaged backgrounds to detach from utilitarian choices, they still understand the risk that their educational choices may bear once they enter the labor market (Mullen, 2014; Thomsen, 2012). Findings indicate that middle-class students have a high awareness of the uncertainty of future labor market conditions when selecting non-lucrative fields of study. Regardless, they recognize the need to be creative, original, and to "invest in themselves," as part of the process of academic training and in preparation for the challenges of the labor market (Mullen, 2014; Thomsen, 2012). Goyette and Mullen (2006) assert that by choosing liberal arts courses, privileged students maintain their advantaged position in the social structure. Moreover, while field of study is an important source of horizontal stratification, there are several other sources that should be taken into account, particularly the prestige of the higher education institution (Gerber & Cheung, 2008; Ma & Savas, 2014). Students from a higher socioeconomic background are overrepresented in 4-year institutions of higher education, and are more likely to gain admission into the more selective and prestigious institutions (Alon, 2009).

The abovementioned findings suggest that students from advantaged backgrounds are set apart by their choices. At a time when students prefer practical fields (e.g., Brint et al., 2005), the choice of double major program, particularly at the higher echelon of the institutional hierarchy, and a combination of a lucrative field with a non-lucrative field, may suit the wider requirements and aspirations of these privileged students. By understanding the field of higher education, the choices of students from advantaged backgrounds are neither an expression of inability nor lack of seriousness. Rather, their choices indicate a clear understanding of the nature of the academic process, the ability to maximize the benefits of the university, and are particularly valued within academia. Thus, it is hypothesized that:

> **Hypothesis 2**: Students from advantaged backgrounds will be less concerned about the economic implications of their choices, and thus are more likely to combine two non-lucrative fields, or a lucrative with a non-lucrative field. Conversely, when students from disadvantaged backgrounds choose a double major, they will be more likely to combine two lucrative fields.

An alternative, if not contradictory, expectation is rooted in rational choice theory (RCT). In trying to explain persisting social class differences in educational attainment, Breen and Goldthorpe (1997) proposed the relative risk aversion framework (see also Breen, et al., 2014; Goldthorpe, 1996; Jackson, 2013). This places emphasis on the cost–benefit considerations that students (and their families) take into account when making strategic educational choices. According to this framework, students' main motivation in their educational decisions is to minimize the risk of downward mobility and to maintain at least the same class as their parents. This approach was found to be valuable in explaining vertical inequality or alternatives of a hierarchical nature (Jackson, 2013). One example

is the decision to enroll (or not) in postsecondary education after high school graduation. Very few studies have analyzed horizontal inequality (i.e., disciplinary choices) in relation to the differential costs and benefits attached to the educational decisions of students from different social backgrounds (see, for example, Hällsten, 2010; van de Werfhorst et al.,. 2003). However, it is possible to propose an explanation for the type of combinations of field on the basis of rational choice framework. An example of risk would be an inconsistency between the combination chosen and the expected returns, taking into account the ambiguity surrounding the preferred combinations in the labor market (e.g., mathematics and computer science vs. mathematics and philosophy). Choosing fields from two related disciplines may signal to employers a depth of knowledge and expertise in the field. However, choosing fields from unrelated disciplines may be interpreted as too broad, unfocused, and superficial, and thus could be conceptualized as a risk.

A central component of RCT is the desire to maximize the benefits of previous academic achievements (as reflected in standardized test scores). In Israel, the study context of this article, fields of study are stratified according to higher education admission requirements, which themselves are determined by the principles of supply and demand. In the Israeli academic system, lucrative majors have high admission requirements, while non-lucrative majors are generally less competitive. Based on rational choice theory, the expectation is:

> **Hypothesis 3**: Students will act to maximize their choices according to their achievement boundaries. Therefore, high-achieving students would seek to maintain their advantage: to choose lucrative majors, single or double (with relatively similar admission requirements), and to avoid combinations that differ in their expected returns and their admission requirements. Conversely, relatively low-achieving students will settle for the single non-lucrative major, and will avoid the risk associated with double majoring.

Hypothesis 3 refers to *all* students, regardless of social background. Thus, it may influence social inequality through what Boudon (1974: 29–31) calls *primary effects* (also known as performance effects)—the extent to which individual choice is influenced by class inequalities in previous educational achievement, as measured by standardized tests.

Thus far, the assumption regarding capitalization on previous achievements is that both groups will act similarly to maximize their possibilities regarding choice of field. I therefore consider another possibility: that students from advantaged and disadvantaged social backgrounds will differ in the way they permute previous achievements with regard to their choice of type of double major. One possibility is that RCT will better explain the choices of qualified and disadvantaged students, as the college major choices of this group will reflect more clearly their scholastic ability. Another possibility is that RCT will more clearly characterize the choices of the qualified advantaged students who wish to preserve their advantages, by maximizing their previous achievements so as to secure the most rewarding tracks (Gabay-Egozi et al., 2010). As there is no straightforward hypothesis regarding the choice of type of double major among high- and low-achieving students from diverse social backgrounds, I discuss the interaction between social background and scholastic ability in an explorative way.

Higher education in Israel and social inequality

Higher education in Israel is mostly public; tuition for a full-time bachelor's degree is subsidized by the government in all public institutions.[2] Students enroll in higher education after completing high school and (for most Jewish students) compulsory military service. Students may apply (and pay admission fees) to as many institutions as they want. The choice of major or double major begins on admission to a specific institution. University applicants are asked to list and rank preferences for fields of study, and the type of program (single or double major), for each university they apply to (3–5 preferences, depending on the university). Selection for each expressed preference is in line with the principles of supply and demand of fields; admission is based on previous ability, measured by a composite score of high school matriculation grades and a psychometric test (similar to an SAT score). Acceptance for a higher rank preference will lead to the freezing of decisions for lower rank preferences. In the case that the applicant does not meet the requirements for any of the expressed preferences, the application is rejected by the institution.

All universities in Israel offer double major degree programs; generally, students can choose to study toward either a single or a double major degree. However, some departments, mainly in the social sciences and the humanities, require students to take a double major, and some majors cannot be taken as single major—an institutional constraint that makes it possible to estimate, from the data, its impact on students' choices. The cost of taking a single or double major is the same, as students are expected to complete the same number of credits before graduation, regardless of the type of program. This makes the Israeli double major case particularly interesting with regard to considering student curricular preferences beyond the possibility of financial constraints.

During the early 1990s, Israel's higher education system underwent massive expansion, greatly enhancing access to higher education. However, the proliferation of academic degrees was accompanied by a horizontal stratification according to type of institutions—particularly research universities (first-tier institutions) versus academic colleges (second-tier institutions), and to a lesser extent field of study (Ayalon & Mcdossi, 2016). While there is some internal variation between the universities, they are more selective, focus on research, and grant all levels of degree across a range of fields of study, professional, as well as liberal arts and sciences.

Following the expansion of the higher education system, students from advantaged socioeconomic backgrounds, and students from Israel's advantaged ethnic groups, have tended to favor research universities over academic colleges (Ayalon & Mcdossi, 2016; Ayalon & Yogev, 2006). The picture regarding field of study is less straightforward. Ayalon and Mcdossi (2016) did not identify any substantial differences, with respect to choice of field, between first- and continuing-generation students, as both groups prefer to study the most rewarding and prestigious professional fields. The question explored here is how the combination of fields within first-tier institutions, the selective universities, can add to our understanding of the stratification process.

[2] Basic tuition for one year of a bachelor's degree program, in 2021, was 10,198 NIS (about 3,090 USD).

Research method

Data and sample

The dataset for the present study was prepared by the Israeli Central Bureau of Statistics (ICBS), by combining data from the 1995 census of population and housing with data from the Ministry of Education and from tertiary education institutions. It is constituted of information regarding a sample of 20% of all Israelis born between 1978 and 1984.[3] Members of this cohort were aged 11–17 years at the time of the 1995 census, and most were sampled in their parents' households. The census file provides data on sociodemographic and socioeconomic characteristics. These data were merged with the matriculation files of the Ministry of Education; the psychometric files of the National Institute for Testing and Evaluation; and student files drawn from the universities. Collectively, these provide high-quality administrative longitudinal information regarding the sample and its transition from high school to higher education. The latest year of enrollment was 2010, covering the latest participation of the youngest cohort. While studies on choice of field of study generally use broad categories of field, the administrative data of this study allows for the use of detailed information on specific fields of study, and from this the execution of a careful and precise analysis. I focus on enrolled field of study, that is the field for which students applied, were accepted, and enrolled on. The analytic sample consists of 21,650 students, who attended one of the five universities in Israel.[4]

Variables

Outcomes: double major and type of mixture of field of study

I analyzed the determinant of two dependent variables: type of program and type of mixture of field of study. The first dependent variable consists of two categories, and distinguishes between the choice of single and double major program. About 33% of the sample studied on a double major program. The second dependent variable is the type of combination of field of study, and distinguishes between combinations of fields with relation to their expected return in the labor market. Given the centrality of the labor market perspective in the choice of a major (or majors), and the consequences of this choice for inequality in the labor market and lifetime earnings (e.g., Kim, et al., 2015), I used the expected economic payoff as a measure for field of study. Thus, the second dependent variable is based on the classification of the fields of study according to their expected economic returns.

The variable measuring the type of mixture of field of study was created in two steps: first, fields were classified according to expected annual income 2 years after graduation,

[3] The primary sampling unit of the 1995 Census of Population and Housing is the household. Every household was sampled, and asked to complete a short questionnaire on its demographic composition; every fifth household (20%) was given a long questionnaire, which sought information across a range of socioeconomic fields. All members of the household were asked to fill the questionnaire. According to the official report of the ICBS (2000), the distribution of Israelis born between 1978 and 1984 in the 20% sample and population with regard to various demographic characteristics is balanced and representative.

[4] As at the time of the study, double major programs were offered almost exclusively by the universities. This is very similar to the USA, where double major programs are found in elite and multidisciplinary institutions (Pitt and Tepper 2012).

using detailed information on the earnings of the recipients of all bachelor's degree awarded by Israel's universities in the early 2000s (ICBS 2009). The expected economic return for each field was calculated based on the median individual income of bachelor's degree holders in similar fields of study, employed for at least 6 months in the 2 years following graduation. To avoid age and experience biases, the sample of graduates was restricted to workers under the age of 35. A list of main fields of study, by median income, is presented in Table 5 of the Appendix. As expected, STEM fields and professional fields are more likely to appear in the lucrative fields category, while art, the humanities, and the social sciences are in the non-lucrative fields category. Field of study was then collapsed to two categories: (1) lucrative fields, those with an expected annual income higher than the median income for all graduates (82 K NIS per annum, about 20.5 K USD); (2) non-lucrative fields, those where the expected income is lower than the overall median for all graduates. Sensitivity analysis was used to examine the effect of the cut point between lucrative and non-lucrative fields, by moving the threshold 5 K NIS (about 1.5 K USD) above and below the median. I discuss the results of these analyses in the findings section.

At the second step, the lucrative and non-lucrative categories were assigned to all the students, according to their fields of study. In the case of students on a double major program, these categories were assigned twice, to each of the two majors. Eventually, the second dependent variable consisted of five categories according to the number of majors and type of combinations: (1) single major in non-lucrative fields (30%); (2) single major in lucrative fields (38%); (3) double major in two non-lucrative fields (17%); (4) double major in two lucrative fields (8%); and (5) double major with a combination of one lucrative and one non-lucrative field (8%). A list of the prominent combinations of fields of study across all categories is presented in Table 6 of the Appendix.

Social and academic background

My main explanatory and comparative focus is on the effect of social background, as measured by parental higher education, on choice of major(s). I distinguish between first-generation students, those whom neither parent possesses a bachelor's degree or higher (coded 1) versus those whom at least one parent possesses a bachelor's degree or higher (Wilbur & Roscigno, 2016). Approximately 53% of the sample are of a first-generation background. Given the ample and consistent evidence regarding the large gender differences in field of study selection (e.g., Alon & Gelbgiser, 2011), I also included a control for gender (male coded = 1). Previous research in Israel shows the centrality of ethnicity in the stratification process; this is evident across a number of indicators, such as choice of institution and field of study in higher education (e.g., Feniger et al., 2015). For this reason, I also adjusted for Ethno-religious group. Five main groups were constructed, using information on both parents' religious affiliation and grandfather's country of origin: (1) Ashkenazim, the privileged Jewish group, including Jews of European or American origin; and mixed-origin Jews, where one of parent is Mizrachi and the other Ashkenazi[5]; (2) Mizrachim, a disadvantaged Jewish group, made up of Jews from North African and of Middle Eastern origin; (3) FSU, Jews who immigrated to Israel during the 1990s from the former Soviet Union; (4) Arabs, Christian, Muslim, and Druze, due to the relatively small number of

[5] Preliminary analysis showed no differences between students from families with two Ashkenazi parents and students from families with one Ashkenazi and one Mizrachi parent, so these two groups were combined.

Arabs in the double major combinations, the various religious groups in the Arab sector were grouped into one category, labeled "Arabs"; and (5) Other, recent Jewish immigrants to Israel from countries other than the FSU, and Jews of unknown parental country of origin were grouped together, represented as a residual "Other" category. I also controlled for the number of siblings.

I adjusted the models for previous achievements as measured by an aggregate score of two components, as required by the universities: (1) the weighted average of the matriculation diploma score; and (2) the psychometric score on a standardized test (similar to the SAT), with a range of 200–800 and a mean of 500. The weighted score was calculated according to the formula[6] used by most universities to evaluate the academic ability of applicants. I divided the ability score by 50 to allow for a clearer interpretation of its effect. In addition, I added high school track to all the models, as an adjustment for academic background. This is because specialization in high school may influence specialization subsequently in higher education. Students who specialize in the sciences are more likely to maintain their advantage when entering higher education, and thus concentrate on the lucrative fields. The specialization in high school variable is based on the advanced courses taken in high school. Descriptive statistics for the dependent and independent variables are shown in Table 1.

Analytical strategy

My analyses begin with a description of the social and educational characteristics of the students on single and double major programs, as formulated by the first hypothesis. Using logistic regression analysis, I predicted the choice of double versus single major by first- and continuing-generation students, while adjusting for other background characteristics (model 1). In model 2, I added scholastic ability to examine the extent to which the odds choosing a double major could be explained by previous achievements for first- versus continuing-generation students. For a clearer interpretation of the analysis, average marginal effects are presented. The advantage of the AMEs over logit estimates is that they facilitate comparing of the magnitude of the coefficients across models (Mize, 2019). The AME for generation status represents the (average) difference in the probability of first- versus continuing-generation students choosing a double rather than single major program. Since the odds of double major may be endogenous to the choice of institution (i.e., institutions that offer more programs, or are more likely to motivate students to double major) and field of study (i.e., fields more likely to be studied as a double major), I reviewed the robustness of the model for these possibilities. Model 2a includes university fixed effect, to remove between-institution differences in the probability of double majoring. In models 2b and 2c, I limit the sample to fields in which no more than 75% and 66% of the student population, respectively, are double majors. Setting these thresholds allows me to examine the odds of double majoring while removing majors that either require double majoring or are more likely to be studied as double majors. These kinds of majors are generally offered in the humanities and social sciences. Setting these thresholds allows me to estimate the contribution of populated double majors on the generation gap, and to identify the influence of institutional constraints on the probability of double majors. Lowering the threshold

[6] The formula for calculating the ability score is as follows: Ability score = ((weighted matriculation score * 10.446–403.235) + (psychometric score)) * 0.516—47.710.

Table 1 Descriptive statistics for the dependent and independent variables

Variable	Mean/percent	SD	5th percentile	95th percentile	% missing
Generation status					13.3%
Continuing-generation	46.6%				
First-generation	53.4%				
Gender					—
Female	57.2%				
Male	42.8%				
Ethnicity					—
Ashkenazi	50.1%				
Mizrachi	26.3%				
FSU	9.6%				
Arab	8.3%				
Other	5.7%				
Number of siblings	3.26	(1.49)	2	6	14.1%
Ability score	572.76	(91.03)	402.42	698.17	7.1%
Specialization in high school					—
Without specialization	4.7%				
Humanities and social sciences	30.1%				
Sciences	24.3%				
Technological/vocational	8.3%				
Mixture of sciences and humanities and social sciences	32.6%				
Type of program					—
Single major	67.4%				
Double major	32.6%				
Type of mixture of field of study					—
Single major: non-lucrative field	29.7%				
Single major: lucrative field	37.7%				
Double major: non-lucrative fields	16.7%				
Double major: lucrative fields	7.7%				
Double major: combination of lucrative and non-lucrative fields	8.1%				

Minimum and maximum values replaced by 5th and 95th percentiles due to confidentiality restrictions

further, however, will have a strong impact on the sample size and the ability to compare the results across models.

The second and third hypotheses relate to the social and academic gaps between students who made different field combinations and were tested using multinomial logistic regression. The algebraic specification of the model takes the form of:

$$\Pr(y_i = m|x_i) = \frac{exp(x_i\beta_m)}{\sum_{j=1}^{J} exp(x_i\beta_j)}$$

where $\Pr\left(y_i = m|x_i\right)$ is a function of the linear combination $x_i\beta_m$. The vector β_m includes the intercept β_{0m} and coefficients β_{km} for the effect of x_k on outcome m (Long & Freeze 2001:171).[7] I examined the effect of generation status and scholastic ability on the type of combinations of fields, while adjusting for other background characteristics. I report the findings using AMEs[8] in which the generation status coefficient represents the differences in probabilities between first- and continuing-generation students, and the ability score coefficients represent the change in the probability of choosing each of the combination of fields with one unit (or more precisely 50 points) change in the ability score. To test the robustness of the results with regard to the cut point between lucrative and non-lucrative fields, I conducted three supplementary analyses in which the threshold between lucrative and non-lucrative fields was set 1.5 K USD above and beyond the median income; and a third scenario in which the cut point was set on the 75th percentile of the annual income distribution.

The last part examines the possibility that the two generations will capitalize their previous achievements differently in their choice of fields of study. I used multinomial regression analysis, including an interaction term between generation status and ability score, to consider this possibility. I supplemented this analysis with adjusted predicted probabilities comparing the choices made by first- and continuing-generation students, holding the ability score for select levels of ability with all other control variables set on their observed values (Mize, 2019).

I use multiple imputations[9] with 10 imputed datasets to adjust and estimate the effect of missing values on the findings.

Results

The determinants of double versus single major programs

My first objective was to determine whether double major programs are more likely to attract students from socially advantaged backgrounds, as suggested by the first hypothesis. My data show that 31.0% of first-generation students studied on a double major program, as compared to 34.3% of continuing-generation students. Table 2 presents the AMEs for a model predicting double majoring, adjusted for sociodemographic characteristics (model 1) and educational background (model 2). Despite rigorous adjustments, the probability of first-generation students enrolling on a double major program is about 3% lower than that of continuing-generation students.[10] Moreover, my analysis shows that choice of double major is associated with a higher socioeconomic background and stronger academic ability. Students from the advantaged ethnic group (Ashkenazim) and those from smaller family units are more likely to double major. In accordance with previous research documenting the increased advantage of women in higher education (DiPrete & Buchman, 2013), I find

[7] Multinomial logit is an appropriate model to use if the independence of irrelevant alternatives (IIA) assumption holds. Results of the Small-Hsiao tests (Long & Freeze 2001:188) on each of the ten separate files were not statistically significant, which suggests that IIA assumption was not violated.

[8] While the multinomial regression includes j-1 sets of coefficients, there are j sets of marginal effects.

[9] Multiple imputation is a statistical technique for handling missing data that accounts for uncertainty in single imputation and replaces the missing values with plausible values based on observed association in the data (Allison 2001). Specifically, I used Stata's multiple imputation with chained equations command to impute 10 complete datasets.

[10] Controlling for parental occupation (not shown here) did not improve the model fit or alter the results of Table 2. These analyses are available upon request.

Table 2 Social and academic backgrounds and double versus single major program (average marginal effects)

	(1)		(2)		Robustness checks					
					(2a)		(2b)		(2c)	
	Model 1		Model 2		University fix effects		Sample restriction, 75%(1)		Sample restriction, 66%(2)	
First generation	−0.027***	(0.007)	−0.029***	(0.007)	−0.017*	(0.007)	−0.024**	(0.007)	−0.020**	(0.007)
Male	−0.064***	(0.006)	−0.037***	(0.007)	−0.015*	(0.006)	−0.033***	(0.007)	−0.027***	(0.007)
Ethnicity (*ref* = Ashkenazi)										
Mizrachi	−0.049***	(0.008)	−0.049***	(0.008)	−0.026***	(0.008)	−0.044***	(0.008)	−0.043***	(0.008)
FSU	−0.114***	(0.011)	−0.096***	(0.011)	−0.062***	(0.011)	−0.084***	(0.011)	−0.078***	(0.011)
Arab	−0.061***	(0.013)	−0.050***	(0.014)	−0.085***	(0.013)	−0.042**	(0.014)	−0.016	(0.015)
Other	−0.005	(0.014)	−0.015	(0.014)	−0.016	(0.013)	−0.008	(0.015)	−0.005	(0.015)
Number of siblings	−0.008**	(0.003)	−0.009***	(0.003)	−0.006*	(0.003)	−0.008**	(0.003)	−0.011***	(0.003)
Specialization in high school (*ref* = Sciences)										
Without specialization			0.105***	(0.017)	0.061***	(0.016)	0.087***	(0.018)	0.085***	(0.018)
Humanities and social sciences			0.167***	(0.009)	0.127***	(0.009)	0.148***	(0.010)	0.130***	(0.010)
Technological/vocational			0.001	(0.012)	0.008	(0.012)	−0.007	(0.012)	−0.008	(0.012)
Mixture			0.066***	(0.008)	0.054***	(0.008)	0.056***	(0.008)	0.045***	(0.008)
Ability score (×50)			0.009***	(0.002)	0.004	(0.002)	0.009***	(0.002)	0.013***	(0.002)
University fix effects	No		No		Yes		No		No	
Observations	21,650		21,650		21,650		19,708		19,179	
Average pseudo R^2	0.010		0.023		0.087		0.019		0.017	

AMEs based on logistic regression (see Table 7) with correction for missing values using multiple imputation on 10 imputed datasets; standard errors in parentheses

(1)(2)Sample restriction 1 refers to fields of study in which no more than 75% of the student population are double majors; sample restriction 2 refers to fields of study in which no more than 66% of the student population are double majors

*$p < 0.05$; **$p < 0.010$; ***$p < 0.001$

that women are more likely to double major. These findings are in line with Hypothesis 1, revealing that adjusting for previous achievements, double major programs attract students from advantaged background.

I further examined the robustness of the model across different specifications. In model 2a, institution fixed effects were added, examining the possibility that the generation gap stems from differences in university of destination. Institutions differ in the supply of double major programs, and in the extent to which they motivate students to choose these programs. The findings, however, disprove this possibility, as continuing-generation students had an advantage with regard to double majoring, net of higher education institution. The last two models of Table 2 examine the possibility that the disadvantage of first-generation students in choice of double major is a result of structural constraints, as some majors require students to double major. In these models (models 2b and 2c), I limited the sample to majors where less than 75 and 66% of their students, respectively, are double majors. Despite the loss in the sample size, the findings are similar, albeit with a smaller gap between generations. These findings suggest that the higher odds of continuing-generation students double majoring are not inflated by majors that require students to double major, i.e., majors more likely to be offered in the humanities and social sciences departments.

Social background and the type of single and double major combinations

My next step was to examine the types of single and double major combinations chosen by first- and continuing-generation students. Table 3 shows AMEs of a model predicting the combination of single and double majors and types of mixture of fields of study. The model includes sociodemographic characteristics and educational background, but presents only the coefficients of generation status and ability (full table is presented in Appendix Table 8). The findings suggest that, adjusting for ability, first-generation students are more likely to study lucrative fields of study as a single or double major, and are less likely to double major with a non-lucrative or a mix of lucrative and non-lucrative fields. These findings align with the second hypothesis, which predicts that net of academic achievement, students from advantaged backgrounds will be less concerned about the economic implications of their choices, and are thus more likely to combine two non-lucrative fields, or a lucrative and a non-lucrative field.

The bottom part of Table 3 presents three robustness checks, in which I replicate the model using different configurations of the dependent variable. In the first two, the threshold between lucrative and non-lucrative fields was set 1.5 K USD above and below the median. In the third panel, a more restrictive criterion was applied whereby the cut point between lucrative and non-lucrative fields was moved from the median income to the top quarter. Changing the splitting criterion between fields left the results unchanged, except that the lower likelihood of first-generation students choosing the mix combination lost its significance when the threshold was moved up the income distribution.[11] Moreover, robustness check C suggests that moving the threshold from the median to the top quarter also changes the odds of first-generation students choosing a single lucrative major—as seen in the main model and the other robustness checks—to choosing a single non-lucrative major. This change reflects the change in the meaning of non-lucrative majors, which now include majors that are medium remunerative at the early career stage (e.g., Nursing, Economics, Public administration, and Optometry), and that first-generation students are likely to choose.

[11] Moving the threshold between lucrative and non-lucrative fields from the 50th to the 75th percentile of the income distribution reduced the number of double majors with at least one lucrative field from 15.9 to 4.9%.

Table 3 Social and academic backgrounds and type of single and double major

	Single major				Double major					
	Non-lucrative		Lucrative		Non-lucrative		Lucrative		Mixture	
First generation	−0.006	(0.007)	0.034***	(0.007)	−0.030***	(0.006)	0.010**	(0.004)	−0.009*	(0.004)
Ability score (×50)	−0.047***	(0.002)	0.033***	(0.002)	−0.023***	(0.002)	0.031***	(0.002)	0.006***	(0.001)
Controls	Yes									
Observations	21,650									
Robustness checks										
A. Setting the threshold between lucrative and non-lucrative by 1.5 K US$ *below* the median										
First generation	0.000	(0.007)	0.028***	(0.007)	−0.025***	(0.006)	0.010*	(0.004)	−0.013**	(0.004)
Ability score (×50)	−0.057***	(0.002)	0.045***	(0.002)	−0.024***	(0.001)	0.031***	(0.002)	0.005***	(0.001)
Controls	Yes									
Observations	21,650									
B. Setting the threshold between lucrative and non-lucrative fields by 1.5 K US$ *above* the median										
First generation	−0.002	(0.007)	0.030***	(0.007)	−0.034***	(0.006)	0.007*	(0.003)	−0.001	(0.004)
Ability score (×50)	−0.049***	(0.002)	0.035***	(0.002)	−0.025***	(0.002)	0.024***	(0.001)	0.015***	(0.001)
Controls	Yes									
Observations	21,650									
C. Setting the threshold between lucrative and non-lucrative fields in the top quarter										
First generation	0.022**	(0.008)	0.007	(0.005)	−0.032***	(0.007)	0.006*	(0.003)	−0.002	(0.002)
Ability score (×50)	−0.051***	(0.002)	0.041***	(0.002)	−0.013***	(0.002)	0.014***	(0.001)	0.010***	(0.001)
Controls	Yes									
Observations	21,650									

AMEs based on multinomial logistic regression estimates with correction for missing values using multiple imputation on 10 imputed datasets. Standard errors in parentheses. All models include similar control variable as of Table 2 model 2. Full models can be found in the appendix *$p<0.05$; **$p<0.010$; ***$p<0.001$

Rational choice theory proposes that high achievers will tend to maximize their previous record of achievement, and thus will be more likely to choose single lucrative or double lucrative fields, and to avoid combinations of lucrative and non-lucrative fields. The coefficient of ability score partially supports this expectation. Even though high achievers are more likely to choose lucrative fields (as either a single or double major) and less likely to choose non-lucrative fields, they are also more likely to choose a combination of a lucrative and a non-lucrative field. First-generation students are disadvantaged in this regard, given that on average, their previous academic achievements are lower than those of their more advantaged peers.[12]

The last step is to examine whether students of different academic backgrounds differ in the ways they utilize their previous achievements in choice of major. Table 4 replicates Table 3, but also includes an interaction term between generation status and ability score. For the sake of simplicity, I present in Fig. 1 the predicted probabilities for first- and continuing-generation students, when their previous achievements are low and high (measured by the 25th and the 75th percentile of the ability score distribution, respectively). When the ability score of the two groups is relatively low, the differences in the probabilities of first- and continuing-generation students concentrate on the non-lucrative fields; first-generation students are more likely to choose a single major from a non-lucrative field while continuing-generation students are more likely to choose double non-lucrative fields.

When a student's ability is higher, then options in higher education—especially with regard to lucrative fields—are greater. The lower part of Fig. 1 suggests a wealth of difference in the preferences of first- and continuing-generation students. High-achieving students with college-educated parents are more likely to choose non-lucrative fields as a single or double major, and a double major with a combination of lucrative fields. High-achieving first-generation students, however, are inclined to choose a single lucrative major or double major with two lucrative fields.

Discussion

Despite the promises of the college degree as a great equalizer (e.g., Hout, 1988; Torche, 2011), recent evidences suggest that graduates from advantaged backgrounds enjoy higher returns from a college degree, especially due to attendance at selective institutions and majoring in lucrative fields of study (Manzoni & Streib, 2019; Oh & Kim, 2020). With some support for the economic value of double major degrees (e.g., Del Rossi & Hersch, 2008; 2016; Hemelt, 2010), the objective of this study was to examine the role played by double major programs in the creation of inequality among students of the more selective institutions—university students. Building on sociological theory, particularly social reproduction theory and rational choice theory, and growing literature and research on horizontal stratification in higher education, my analyses and findings, which draw on a large body of representative data, advance the literature by (1) examining a relatively neglected aspect of the horizontal stratification in higher education, choice of double major and the type of double major combination; (2) systematically comparing first- and continuing-generation students across types of single and double major combinations; and (3) measuring the expected labor market return for detailed field of study categories. My findings in

[12] On a standardized scale running from 200 to 800, the average ability score of continuing-generation students is 604.2 (SD = 77.6) and the average for first-generation students is 543.3 (SD = 93.0); the difference is significant at $p < .001$.

Table 4 Type of single and double major and the interaction of social and academic backgrounds

	Single major				Double major			
	Non-lucrative		Lucrative		Non-lucrative		Mixture	
First generation	−0.155	(0.081)	−0.034	(0.079)	−0.280***	(0.085)	−0.184*	(0.093)
Ability score (×50)	−0.544***	(0.035)	−0.365***	(0.033)	−0.645***	(0.036)	−0.327***	(0.040)
First generation × ability score	−0.203***	(0.047)	0.015	(0.045)	−0.032	(0.049)	−0.140**	(0.053)
Controls	Yes							
Observations	21,650							

Multinomial logistic regression estimates with correction for missing values using multiple imputation on 10 imputed datasets. The base outcome is double major lucrative. Standard errors in parentheses. All models include similar control variable as of Table 2 model 2. Full models can be found in the appendix. Ability score is centered around the sample mean

*$p < 0.05$; **$p < 0.010$; ***$p < 0.001$

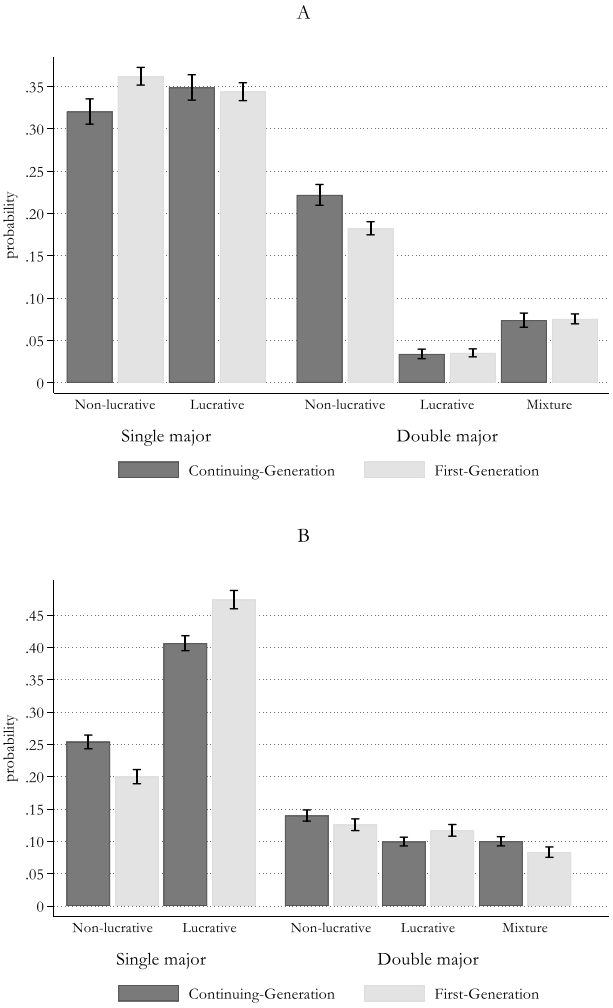

Fig. 1 Adjusted predicted probabilities of type of single and double major choice by generation status and previous achievements. **A** Low ability score, **B** high ability score

Notes: Predicted probabilities are based on model 1 of Table 8 of the appendix. Low and high ability scores defined as the 25th and the 75th percentiles of the ability score distribution (respectively).

this regard are clear: there are significant social class background advantages in the choice to double major, and with especially unique combinations of lucrative and non-lucrative fields for the more advantaged students.

Gaps in cultural capital, parents with knowhow, and better academic preparation certify that continuing-generation students will secure the advantage of the double major as higher education becomes (quantitatively) more equal. Although my analyses are limited by tracing the motivation for double major—something that future research should address more qualitatively—I suspect that the choice reflects both aspirations for distinction in a crowded higher education environment, and also different preferences and attitudes to higher education to get the most out of the university experience, personally, intellectually, and as preparation for a future career (Mullen, 2014). Nevertheless, it is possible that beyond the type of double major combination, the double major itself

improves engagement on campus, and increases and diversifies social ties with faculty and students in their chosen fields—something that the continuing-generation students are well aware of in terms of its importance, and are more likely to do (Stuber, 2009). Of course, better engagement on campus and unique experiences are likely to be translated later into a better resume, one with a specific appeal for certain type of occupations and employers (Rivera, 2016).

Conversely, first-generation students lack the context-specific knowledge important for navigating college. Thus, they are less likely to double major, even after adjusting for previous achievements and institution type. Double majors require more effort from students, with a potential effect on the likelihood of timely graduation from both fields. As compared to single major programs, where the curriculum is more structured and students generally follow a specific path, double majors require students to have more knowledge about each major, and they need to be able to juggle the bureaucratic complexity and coursework that comes with this choice.

Under rational choice theory, previous academic achievement plays a central role in student academic decisions. Students of stronger academic ability may wish to maximize the potential of their ability, and to choose fields of study with relatively similar admission criteria. Given that lucrative fields are more selective than non-lucrative fields, it was hypothesized that high achievers will be more likely to choose lucrative single and double majors, and avoid non-lucrative or mixed majors. The findings, however, partially support this hypothesis. It was found that among the high achievers, continuing-generation students were more likely to take a risk by choosing a single or double major with non-lucrative fields, or to combine lucrative and non-lucrative fields. This finding suggests that both social reproduction and rational choice theories are needed to explain the interaction between social background and scholastic ability. Qualified advantaged groups are less constrained by their prior achievements, as their scores are high enough to choose most majors. As suggested by social reproduction theory, they are less motivated by immediate profit considerations and are more likely to express choices informed by the desire to broaden their horizons and to benefit from the range of knowledge offered by the university. It may also be that advantaged students have better information regarding high-ranking jobs and their application requirements, preparing themselves accordingly by choosing seemingly atypical combinations. Of course, choosing atypical combinations is something that advantaged students are better able to explain and neatly laid up when required to wrap the educational trajectory in a meaningful way for employers (see Rivera, 2016).

Although students from disadvantaged backgrounds were less likely to double major, they were more likely to choose lucrative and double lucrative majors. This was particularly evident among the qualified first-generation group. This suggests that the choice of high-achieving first-generation students is better explained by the prediction of RCT, as this group is more likely to maximize previous achievement in gravitating toward the most lucrative fields. This interesting finding suggests that the choice of field by qualified and disadvantaged students is directed at the highest income potential—challenging the presumption that horizontal stratification works in favor of students from advantaged backgrounds, highlighting the importance of field of study in social mobility processes.

Finally, access to valued credentials capable of securing labor market advantages is only part of the mobility process. Without conversion of these credentials into labor market returns and success, we will be limited by our understanding of the inequality reproduction process and the role played by higher education institutions in exacerbating or mitigating existing inequalities. Different majors lead to different short- and long-term trajectories in the labor market. Even more complex are trajectories of double major combinations, something that future research should address thoroughly.

Appendix

Tables 5, 6, 7, 8

Table 5 List of lucrative and non-lucrative fields of study

Lucrative fields of study	*Non-lucrative fields of study*	
Economics (93,908)	General Humanities (73,312)	Multidisciplinary Judaism (39,389)
Law (100,944)	Social Work (64,976)	Geodetic Engineering (55,799)
Computer Science (191,066)	Sociology and Anthropology (68,405)	Arts (66,149)
Math (165,474)	Education (61,510)	Hotel Management (82,279)
Nursing (96,776)	Interdisciplinary Studies in Social Sciences (56,745)	Librarianship (59,108)
Electrical Engineering (232,889)	Behavioral Sciences (73,531)	Director of Health Systems (74,599)
Political Science (86,087)	Geography (66,508)	Educational Counseling (58,354)
Industrial Engineering and Management (155,832)	Hebrew Literature (55,754)	Veterinary (74,833)
History of The Islamic Countries (98,052)	History (69,621)	Talmud and Oral Law (60,887)
Civil Engineering (106,053)	Statistics (78,963)	Musicology (53,631)
Accounting (85,759)	Occupational Therapy (60,830)	Spanish And Latin American Studies (65,094)
Mechanical Engineering (149,285)	Biology (74,455)	Linguistics (62,150)
Computer Engineering—Electricity (234,853)	English Language and Literature (60,312)	Teaching Mathematics, Natural Sciences (60,488)
Physiotherapy (97,654)	Criminology (65,199)	Judaism (47,314)
Data System Engineering (189,711)	Israeli History (70,934)	Landscape Architecture (78,463)
Pharmacy (114,703)	Psychology (67,253)	Music (48,656)
Communication (85,924)	Arabic Language and Literature (51,681)	History of Jewish Thought (61,617)
General Administration and Public Administration (92,812)	Hebrew Language (56,593)	Laboratory Medical Sciences (79,974)
Business Administration (112,421)	Art History (52,277)	Multidisciplinary Sciences (60,369)
Physics (156,554)	Land of Israel Studies (69,342)	Geology (68,465)
Optometry (93,677)	Architecture and City Planning (80,751)	Jewish Philosophy (60,099)

Table 5 (continued)

Lucrative fields of study	*Non-lucrative fields of study*	
Chemical Engineering (143,677)	Bible Studies (57,957)	Dietetics (58,644)
Communication Systems Engineering (214,798)	Educational Administration (69,229)	Special Education (50,764)
Chemistry (90,990)	General Philosophy (73,552)	Cinema and Television (76,615)
Agricultural Economics (99,436)	Theater Arts (53,088)	International Relations (77,703)
Food Science (88,762)	French Language and Literature (57,528)	Research Education (52,695)
Food Engineering and Biotechnology (108,134)	East Asian Studies (75,147)	Archeology (58,375)
Agricultural Engineering (95,412)	History and Culture of Islam (75,185)	Literature and General Literature (58,662)
Materials Engineering (151,641)		Communication Disorders (70,137)
Plant Protection (84,024)		
Aeronautics and Aerospace Engineering (119,996)		
Plant Sciences (85,645)		
Environmental Engineering (108,105)		
Emergency Medicine (113,485)		
Soil and Water Sciences (89,226)		
Nuclear Engineering (146,045)		

The number in parentheses refers to the median annual income of graduates in the field

Table 6 List of main fields of study by type of double major combination

Double major non-lucrative		
Field-1	Field-2	N
Behavioral Sciences	General Humanities	242
Sociology and Anthropology	Psychology	108
Psychology	Biology	101
Education	Sociology and Anthropology	100
Sociology and Anthropology	Criminology	97
History	General Humanities	94
Geography	General Humanities	60
Hebrew literature	Education	59
Sociology and Anthropology	Human Services	55
Sociology and Anthropology	General Humanities	49
Psychology	Criminology	49
Psychology	General Humanities	44
Educational Counseling	Sociology and Anthropology	39
General Philosophy	General Humanities	33
East Asian Studies	International Relations	29
East Asian Studies	General Humanities	29
General Philosophy	History	27
Hebrew literature	Sociology and Anthropology	27
Art History	General Humanities	26
Double major lucrative		
Field-1	Field-2	N
Math	Computer Science	274
Economics	Accounting	227
Computer Science	Electrical Engineering	216
Economics	Law	153
Economics	General Administration	104
Math	Physics	69
History of Islamic Countries	Political Science	62
Economics	Business Administration	56
Political Science	Communication	56
Computer Science	Physics	56
Economics	Computer Science	50
Economics	Communication	47
Physics	Electrical Engineering	31
Economics	Political Science	27
Accounting	Law	27
Economics	Math	21
Political Science	Law	18
Communication	Business Administration	18
Communication	Law	18

Table 6 (continued)

Double major mix		
Field-1	Field-2	N
Sociology and Anthropology	Political Science	112
Psychology	Communication	87
Political Science	General Humanities	76
Chemistry	Biology	75
History and General History	Political Science	68
Political Science	International Relations	53
Computer Science	Biology	52
Psychology	Law	42
East Asian Studies	Political Science	38
Behavioral Sciences	General Administration	38
Math	Statistics	36
Economics	Psychology	33
Sociology and Anthropology	Communication	32
Biology	Pre-Medical Sciences	32
History of Islamic Countries	General Humanities	31
History of Islamic Countries	Arabic Language and Literature	29
Economics	International Relations	26
Psychology	General Administration	26
Economics	Statistics	25

Table 7 Logistic regression estimates for double major

	(1)		(2)		Robustness checks					
					(3)		(4)		(5)	
	Model 1		Model 2		University fix effects		Sample restriction, 75%[(1)]		Sample restriction, 66%[(2)]	
First generation	−0.123***	(0.032)	−0.135***	(0.034)	−0.086*	(0.036)	−0.117**	(0.036)	−0.100**	(0.037)
Male	−0.296***	(0.030)	−0.176***	(0.031)	−0.074*	(0.032)	−0.159***	(0.033)	−0.137***	(0.034)
Ethnicity (*ref* = Ashkenazi)										
Mizrachi	−0.221***	(0.037)	−0.229***	(0.038)	−0.130**	(0.039)	−0.214***	(0.041)	−0.218***	(0.042)
FSU	−0.555***	(0.056)	−0.467***	(0.058)	−0.316***	(0.061)	−0.424***	(0.061)	−0.407***	(0.063)
Arab	−0.281***	(0.064)	−0.231***	(0.067)	−0.443***	(0.071)	−0.203**	(0.072)	−0.077	(0.073)
Other	−0.022	(0.063)	−0.066	(0.064)	−0.078	(0.066)	−0.035	(0.069)	−0.026	(0.071)
Number of siblings	−0.035**	(0.012)	−0.043***	(0.012)	−0.030*	(0.013)	−0.041**	(0.013)	−0.058***	(0.014)
Specialization in high school (*ref* = Sciences)										
Without specialization			0.508***	(0.077)	0.322***	(0.080)	0.438***	(0.086)	0.434***	(0.088)
Humanities and social sciences			0.775***	(0.044)	0.637***	(0.045)	0.705***	(0.046)	0.641***	(0.048)
Technological/vocational			0.008	(0.064)	0.047	(0.067)	−0.038	(0.068)	−0.045	(0.069)
Mixture			0.331***	(0.042)	0.283***	(0.045)	0.291***	(0.044)	0.242***	(0.045)
Ability score			0.001***	(0.000)	0.000	(0.000)	0.001***	(0.000)	0.001***	(0.000)
Institution (*ref* = The Hebrew University of Jerusalem)										
Technion—Israel Institute of Technology					−2.630***	(0.110)				
Tel Aviv University					−0.216***	(0.046)				
Bar-Ilan University					−0.921***	(0.050)				
University of Haifa					0.191***	(0.054)				
Ben-Gurion University of the Negev					−1.065***	(0.052)				
Observations	21,650		21,650		21,650		19,708		19,179	
Average RVI	0.010		0.008		0.007		0.009		0.009	
Largest FMI	0.041		0.042		0.060		0.060		0.057	

Table 7 (continued)

	(1)	(2)	Robustness checks		
			(3)	(4)	(5)
	Model 1	Model 2	University fix effects	Sample restriction, 75%(1)	Sample restriction, 66%(2)
$F_{(df1,df2)}$	$35.9_{(7,437431.5)}$	$50.6_{(12,1484426.7)}$	$104.5_{(17,2371717.3)}$	$37.7_{(12,1010785.7)}$	$31.1_{(12,1199481.3)}$
Average pseudo R^2	0.010	0.023	0.087	0.019	0.017

Logistic regression estimates; standard errors in parentheses

Multiple imputation estimates on 10 imputed datasets

Sample restriction 1 refers to fields of study in which no more than 75% of the students study in a double major program; sample restriction 2 refers to fields of study in which no more than 66% of the students study in a double major program

*$p < 0.05$; **$p < 0.010$; ***$p < 0.001$

Table 8 Multinomial logistic regression for type of double major combination

	(1)		(2)		(3)		(4)		(5)	
	Table 3, base model		Alternative model A		Alternative model B		Alternative model C		Table 4, interaction	
Single major non-lucrative										
First generation	-0.214**	(0.066)	-0.166*	(0.065)	-0.189*	(0.077)	-0.163	(0.096)	-0.155	(0.081)
Male	-1.359***	(0.061)	-1.384***	(0.061)	-1.482***	(0.073)	-1.442***	(0.092)	-1.357***	(0.061)
Ethnicity (*ref* = Ashkenazi)										
Mizrachi	-0.208**	(0.075)	-0.194**	(0.074)	-0.262**	(0.087)	-0.279**	(0.108)	-0.206**	(0.075)
FSU	-0.527***	(0.110)	-0.526***	(0.110)	-0.796***	(0.123)	-0.800***	(0.139)	-0.465***	(0.110)
Arab	0.628***	(0.161)	0.603***	(0.160)	0.834***	(0.213)	1.114***	(0.286)	0.614***	(0.161)
Other	0.380**	(0.133)	0.258*	(0.128)	0.378*	(0.157)	0.345	(0.201)	0.367**	(0.133)
Number of siblings	0.076**	(0.028)	0.094***	(0.028)	0.051	(0.033)	0.013	(0.042)	0.070*	(0.028)
Specialization in high school (*ref* = Sciences)										
Without specialization	0.263	(0.176)	0.271	(0.173)	0.530*	(0.223)	0.467	(0.278)	0.246	(0.177)
Hum/Soc. science	0.465***	(0.090)	0.407***	(0.087)	0.894***	(0.117)	1.448***	(0.182)	0.470***	(0.090)
Tech/vocational	0.179	(0.112)	0.215	(0.114)	0.164	(0.123)	0.093	(0.139)	0.175	(0.112)
Mixture	0.238**	(0.073)	0.221**	(0.074)	0.271***	(0.081)	0.317***	(0.096)	0.236**	(0.073)
Ability score (×50)	-0.663***	(0.024)	-0.720***	(0.023)	-0.730***	(0.029)	-0.693***	(0.038)	-0.544***	(0.035)
First generation × ability score									-0.203***	(0.047)
Constant	1.946***	(0.115)	1.643***	(0.114)	2.646***	(0.137)	3.822***	(0.178)	1.876***	(0.118)
Single major lucrative										
First generation	-0.059	(0.061)	-0.057	(0.059)	-0.057	(0.074)	-0.135	(0.097)	-0.034	(0.079)
Male	-0.361***	(0.058)	-0.380***	(0.055)	-0.489***	(0.070)	-0.002	(0.097)	-0.359***	(0.058)
Ethnicity (*ref* = Ashkenazi)										
Mizrachi	0.043	(0.071)	0.058	(0.068)	-0.035	(0.084)	-0.110	(0.111)	0.041	(0.070)
FSU	0.190	(0.101)	0.205*	(0.098)	0.023	(0.115)	-0.257	(0.142)	0.186	(0.101)
Arab	0.585***	(0.158)	0.629***	(0.153)	0.959***	(0.211)	0.827**	(0.295)	0.590***	(0.158)
Other	0.120	(0.128)	0.060	(0.119)	0.123	(0.154)	-0.029	(0.211)	0.122	(0.128)
Number of siblings	0.037	(0.028)	0.052*	(0.027)	0.026	(0.032)	0.006	(0.044)	0.038	(0.028)

Table 8 (continued)

	(1)		(2)		(3)		(4)		(5)	
	Table 3, base model		Alternative model A		Alternative model B		Alternative model C		Table 4, interaction	
Specialization in high school (*ref* = Sciences)										
Without specialization	-0.079	(0.170)	-0.040	(0.165)	0.073	(0.220)	-0.109	(0.289)	-0.080	(0.170)
Hum/Soc. science	-0.166	(0.087)	-0.274***	(0.081)	0.167	(0.116)	-0.325	(0.196)	-0.166	(0.087)
Tech/vocational	0.239*	(0.099)	0.272**	(0.098)	0.222*	(0.112)	0.220	(0.138)	0.240*	(0.099)
Mixture	-0.072	(0.066)	-0.056	(0.064)	-0.105	(0.076)	-0.364***	(0.099)	-0.074	(0.066)
Ability score (×50)	-0.351***	(0.023)	-0.299***	(0.022)	-0.405***	(0.029)	-0.208***	(0.039)	-0.365***	(0.033)
First generation × ability score									0.015	(0.045)
Constant	1.975***	(0.113)	1.894***	(0.108)	2.476***	(0.136)	2.097***	(0.187)	1.967***	(0.117)
Double major non-lucrative										
First generation	-0.383***	(0.071)	-0.332***	(0.070)	-0.353***	(0.080)	-0.327***	(0.099)	-0.280***	(0.085)
Male	-1.640***	(0.068)	-1.660***	(0.067)	-1.662***	(0.076)	-1.515***	(0.094)	-1.638***	(0.068)
Ethnicity (*ref* = Ashkenazi)										
Mizrachi	-0.377***	(0.081)	-0.357***	(0.080)	-0.472***	(0.091)	-0.536***	(0.111)	-0.380***	(0.081)
FSU	-0.797***	(0.123)	-0.813***	(0.122)	-1.095***	(0.131)	-1.330***	(0.147)	-0.789***	(0.123)
Arab	0.524**	(0.170)	0.544**	(0.167)	0.700**	(0.219)	0.915**	(0.290)	0.526**	(0.170)
Other	0.230	(0.143)	0.107	(0.137)	0.243	(0.162)	0.242	(0.204)	0.231	(0.143)
Number of siblings	0.030	(0.030)	0.048	(0.030)	-0.011	(0.034)	-0.035	(0.043)	0.030	(0.030)
Specialization in high school (*ref* = Sciences)										
Without specialization	0.965***	(0.187)	0.937***	(0.184)	1.216***	(0.229)	0.942***	(0.281)	0.955***	(0.187)
Hum/Soc. science	1.356***	(0.100)	1.209***	(0.096)	1.794***	(0.123)	2.132***	(0.184)	1.350***	(0.100)
Tech/vocational	0.533***	(0.133)	0.544***	(0.134)	0.488***	(0.137)	0.201	(0.148)	0.529***	(0.133)
Mixture	0.703***	(0.088)	0.689***	(0.087)	0.705***	(0.091)	0.547***	(0.101)	0.699***	(0.088)
Ability score (×50)	-0.657***	(0.025)	-0.664***	(0.025)	-0.712***	(0.030)	-0.649***	(0.038)	-0.645***	(0.036)
First generation × ability score									-0.032	(0.049)
Constant	1.204***	(0.129)	1.019***	(0.126)	2.088***	(0.146)	3.258***	(0.183)	1.150***	(0.132)

Table 8 (continued)

	(1)		(2)		(3)		(4)		(5)	
	Table 3, base model		Alternative model A		Alternative model B		Alternative model C		Table 4, interaction	
Double major mix of lucrative and non-lucrative										
First generation	-0.284***	(0.079)	-0.306***	(0.077)	-0.167	(0.093)	-0.307*	(0.149)	-0.184*	(0.093)
Male	-0.761***	(0.073)	-0.768***	(0.071)	-0.668***	(0.086)	-0.604***	(0.136)	-0.759***	(0.073)
Ethnicity (*ref* = Ashkenazi)										
Mizrachi	-0.440***	(0.092)	-0.410***	(0.090)	-0.394***	(0.107)	-0.339*	(0.173)	-0.441***	(0.092)
FSU	-0.736***	(0.139)	-0.636***	(0.135)	-0.715***	(0.155)	-0.866***	(0.239)	-0.702***	(0.139)
Arab	0.221	(0.191)	0.216	(0.189)	0.796***	(0.238)	0.409	(0.407)	0.212	(0.191)
Other	0.227	(0.153)	0.129	(0.146)	0.174	(0.183)	0.014	(0.294)	0.221	(0.153)
Number of siblings	-0.031	(0.033)	0.001	(0.032)	0.003	(0.038)	-0.027	(0.063)	-0.034	(0.033)
Specialization in high school (*ref* = Sciences)										
Without specialization	0.587**	(0.206)	0.723***	(0.200)	0.356	(0.267)	-0.133	(0.498)	0.575**	(0.206)
Hum/Soc. science	0.983***	(0.106)	0.965***	(0.103)	0.882***	(0.135)	0.520	(0.266)	0.985***	(0.106)
Tech/vocational	0.177	(0.147)	0.318*	(0.145)	-0.033	(0.157)	0.003	(0.232)	0.175	(0.147)
Mixture	0.475***	(0.092)	0.485***	(0.092)	0.220*	(0.099)	0.263	(0.146)	0.472***	(0.092)
Ability score (×50)	-0.402***	(0.028)	-0.399***	(0.027)	-0.271***	(0.035)	0.062	(0.061)	-0.327***	(0.040)
First generation × ability score									-0.140**	(0.053)
Constant	0.684***	(0.139)	0.467***	(0.136)	0.840***	(0.164)	0.013	(0.268)	0.609***	(0.143)
Observations	21,650		21,650		21,650		21,650		21,650	
Average RVI	0.016		0.016		0.018		0.013		0.023	
Largest FMI	0.151		0.140		0.095		0.148		0.152	
Average pseudo R^2	0.088		0.099		0.096		0.123		0.090	

Standard errors in parentheses

Multiple imputation estimates on 10 imputed datasets; the base outcome is double major lucrative; alternative models A, B, and C correspond with the robustness checks of Table 3

*$p < 0.05$, **$p < 0.010$, ***$p < 0.001$

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Declarations

Conflict of interest The author declares no competing interests.

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