

# Equity in education: the Israeli case

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## Abstract

**Purpose** – The purpose of this paper is twofold. First, it examines the extent of equity in the academic achievement distribution by analyzing Israeli students' high school matriculation scores, controlling for background characteristics (e.g. parental education) and for previous achievement. Second, it analyzes the trends in equity during the examined period from 2001 to 2011.

**Design/methodology/approach** – Nationwide extensive data sets, at the student level, of 11 cohorts are analyzed using logistic regression models.

**Findings** – Major findings reveal that the odds ratios (ORs) are in favor of students from families with a high level of parental education (an increment of one year of parental education increases the odds of student's success by 3 percent). In addition, the ORs are less favorable for Arab students (30 percent lower). Furthermore, a high previous achievement level increases the odds of success (an increment of 1 percent in achievement increases the odds by 6 percent). In addition, the extent of inequity remains stable throughout the examined period.

**Originality/value** – Israel serves as an interesting case study, as its student achievement distribution in international examinations is characterized by the highest gap compared with other OECD countries, although its policy aspires to achieve equity. This puzzle, is the motivation for this study. Moreover, insights from this research might assist policy makers to promote equitable education.

**Keywords** Equity, Student performance, Achievement gap, Education inequality

**Paper type** Research paper

## Introduction

Education is an important human right. It has both private and public returns. The private benefits of a quality education are manifested, among others, in a high level of income and good health. Its social benefits are represented in a high level of well-being and a maintained social cohesiveness. Furthermore, equitable public education is perceived as a key factor in promoting social and economic equity, as it aspires to provide educational opportunities, regardless of background characteristics. Hence, equity in the academic achievement distribution is a key to social and economic equity.

The research literature measures equity in the academic achievement distribution by measuring the standard deviation and the educational Gini coefficient of years of schooling (Thomas *et al.*, 2002; Tomul, 2011). Yet, such measurements neither identify the sources of inequity nor are they sensitive enough to serve as qualitative indicators.

The current study measures equity in the academic achievement distribution, over the past decade, by examining the matriculation certificates of Israeli students, accounting for their background characteristics (e.g. ethnicity and parental education) and previous academic achievement. Israel serves as an interesting case study, as its educational



policy aspires to achieve equity, yet, compared with other OECD countries, Israeli students' academic achievement distribution is characterized by a large achievement gap (BenDavid-Hadar, 2018a, b).

The objective of this research is twofold. First, it measures equity in the academic achievement distribution using logistic regression models to estimate the probability of success (odds ratio (OR)) while controlling for student background characteristics and previous achievement. Second, it examines the evolution and trends in educational equity over a decade (2001–2011) by analyzing the level of change in the probability of success.

## Literature review

This section is comprised of three main subsections. The first subsection reviews the literature on equity in academic achievement. The second subsection reviews the literature on equity measurements used in education. In the third subsection, the literature on the relationships among student background characteristics and equity in academic achievement is reviewed.

### *What is equity in academic achievement*

The research literature has devoted a great deal of attention to equity in academic achievement, generally examining this topic from the point of view of the disparity indices (e.g. standard deviation) (Coons *et al.*, 1970; Berne and Stiefel, 1999). In contrast, this paper measures equity using logistic regression models, taking a distributional approach.

The 2006 OECD report defines equity in academic achievement in terms of fairness (OECD, 2006). According to the OECD, fairness entails ensuring that the personal and social circumstances of each student, such as gender, socioeconomic status or ethnic origin, should not hinder the academic achievement. This approach is based on Roemer (1998), who contends that equity in academic achievement will be achieved when full equality of opportunity exists in education. Such equity can only be achieved when efforts are made to “level the playing field” so that a student's academic achievement is not dependent upon background variables and or other circumstances.

### *How is equity in academic achievement measured in the literature?*

The literature on measuring equity in academic achievement distinguishes between measurement using standard deviation (Birdsall and Londono, 1997; O'Neil, 1995; Ram, 1990) and measurement using the educational Gini coefficient (Mesa, 2007; Thomas *et al.*, 2002; Tomul, 2011). More recently a new method has emerged that measures equity in academic achievement by estimating the probability of success using logistic regression models (Dahan *et al.*, 2001; Shai *et al.*, 2005).

Many researchers measure equity in academic achievement by using the standard deviation of the number of years of schooling (Birdsall and Londono, 1997; O'Neil, 1995; Ram, 1990). Standard deviation as a measure of equity in education is not optimal, because it does not enable us to understand trends in equity (Tomul, 2011). Moreover, calculating the standard deviation of an individual's number of years of schooling does not describe the extent of equity when the average number of years of schooling changes (Thomas *et al.*, 2002).

Measuring equity in academic achievement using the number of years of schooling alone is also a caveat, because developed and well-established countries invest more in educational resources (e.g. teacher education and teacher-pupil ratio) compared with developing countries. These differences generate significant differentiation over time and might affect the quality of education. Therefore, a student who completed six years of schooling, for example, in Africa and a student who completed six years of study, for example, in Europe might not be equally educated, though both assigned the value 6 as a measure of their level of education. Similarly, the

value of one school year in different school systems in the same environment, for example, in Europe, might vary from country to country, or within a country, from city to city.

Ram (1990) and Lam and Levinson (1990) measured inequity in education in Brazil by calculating the standard deviation of years of schooling. Their findings show that the standard deviation is not sufficient as an equity indicator in education. Therefore, they argued, equity can be more appropriately measured by a regression that, if statistically significant, serves as a more robust indicator.

Other studies have found that calculating equity using the educational Gini coefficient for the number of years of schooling was more reliable and accurate (Mesa, 2007; Thomas *et al.*, 2002; Tomul, 2011) than the standard deviation. The Gini coefficient reflects the relative share of each group in the general population, and therefore, measures the extent of equity more reliably. The educational Gini coefficient was borrowed from the field of economics, where it is used to measure income inequity. In education, the Gini coefficient is calculated based on the number of years of schooling. The results that are close to 0 indicate that the extent of equity in education is large, while the results close to 1 indicate that the extent of educational equity is small. Recently, the educational Gini coefficient was calculated based on the academic achievement of high school students in Israel (BenDavid-Hadar, 2008; Dadon-Golan, 2016).

In Addition, in recent years, equity in academic achievement has been measured based on estimations of the OR using logistic regression models (Dahan *et al.*, 2001; Shai *et al.*, 2005; St Johan, 1991; BenDavid-Hadar, 2016). Logistic regression measures the relationships between the independent variables (e.g. student background characteristics) and the dichotomous dependent variable, which can be assigned two values (eligible for/not eligible for a high school matriculation certificate). The advantage of estimation by logistic regression is that it measures the odds or ratio of success (in this case, matriculation eligibility), thus facilitating understanding of equity trends (BenDavid-Hadar, 2016).

Stampen and Cabrera (1988) used logistic regression to measure the probability of acquiring higher education. St Johan (1991) also used logistic regression to measure the impact of academic readiness, academic abilities, residential area and social background on the probability that minority groups in the USA would be admitted to institutions of higher education.

Dahan *et al.* (2001) used logistic regression to examine the relationships between background characteristics and matriculation certificate eligibility in Israel in 1995. Similarly, Shai *et al.* (2005) used logistic regression to measure equity in academic achievement in Israel in the period 1997–2000, and BenDavid-Hadar (2016) used logistic regression to measure equity in academic achievement in Israel in the period 1999–2007.

The current study also uses logistic regression to measure equity in academic achievement in Israel. This study adds to previous studies in three ways. First, while previous research in Israel examined data up to 2007 (data available at that time), this study examines more current data from the period 2001–2011. Second, the current model also includes statistical control of previous achievement. Previous studies measured equity in academic achievement among students, accounting solely for their background characteristics, yet, no controlling for previous achievement. Finally, this study is a longitudinal study, thus adding to the existing literature by considering the issue of whether inequity in academic achievement improved during the period 2001–2011.

#### *What are the sources of inequity in academic achievement?*

In the next section, we review the research literature that examines the relationships among students' background characteristics, previous achievement and equity in the academic achievement.

*Gender and equity in academic achievement.* Many studies have found a gender gap in the academic achievement in favor of female students compared with male students

(e.g. Ferreira and Gignoux, 2010; Dahan *et al.*, 2002; Dobrin, 2015; Shai *et al.*, 2005). Ferreira and Gignoux (2010) found that in Turkey, the achievement of female students upon school entrance is higher than that of male students. Moreover, female students have higher achievement in reading compared with male students, but this gap is reversed in mathematics.

Similarly, Israeli researchers found a gender gap in academic achievement in favor of female students (Dahan *et al.*, 2002; Dobrin, 2015; Shai *et al.*, 2005). Dahan *et al.* (2002) found that, according to the 1995 national population census data, Israeli female students are more likely to be eligible for matriculation diploma compared with male students. It should be noted that the researchers did not distinguish between high-quality matriculation certificates and those considered inferior. Similarly, Shai *et al.* (2005) found that according to data for 1997–2000, female students have a higher rate of eligibility compared with male students.

*Ethnicity and equity in academic achievement.* Most studies worldwide examine equity in academic achievement based on race and ethnicity. In the USA, for example, most policy reports examine equity in academic achievement based on race (e.g. whites, blacks, Hispanics and Asians). The findings of these reports show a higher level of inequity in academic achievement among Blacks and Hispanics compared with Whites. Similarly, Ersado and Gignoux (2014) examined inequity in achievement according to religious group affiliation in Egypt. Their results showed no difference in the level of achievement in mathematics between Muslim and non-Muslim students. In Israel such studies focus on ethnicity (Jewish, Arab, Druze and Bedouin).

Furthermore, Dvir *et al.* (2009) found that among the Jewish population, in Israel, as the paternal education increases, the probability of taking the psychometric exam (which is mandatory for tertiary education) rises by 70 percent. In contrast, the percentage of examinees and the average examination scores are lower among the Arab population. Dobrin (2015) found that 33 percent of Jews aged 25 and above were college graduates, compared with 13 percent of Arabs; 15 percent of Jews did not complete high school compared with 44 percent of Arabs; and Jews were twice as likely as Arabs to acquire an academic education. Dahan *et al.* (2002) found that in Israel the level of education relates with income and with ethnicity. These researchers contend that excessive overlap between students' ethnicity and their chances of success creates persistent economic and social gaps.

Recently, Feniger (2015) found that the most prominent increase in equity in the academic achievement, measured by eligibility rate for high school matriculation certificate, was connected to the students' origin of birth continent.

*Student and parental origin of birth continent and equity in academic achievement.* Many studies have found that the origin of birth continent of students and their parents is directly related to equity in academic achievement. Olivos and Mendoza (2009) examined the relationship between equity in academic achievement and the migration of Latino parents to the USA. They found that the challenges of integrating Latino immigrants in the public schools in the USA stem from parental exclusion and will continue for at least another decade. They also found that children of immigrant parents often had low achievement and high dropout rates.

Dahan *et al.* (2002) found that the eligibility rate for a high school matriculation certificate is 51 percent among students born in Israel. Moreover, this rate is 22 percent lower compared with that of Israeli students born in western countries. They also found that this discrepancy has not diminished over the years. However, Gilboa (2010) found that after controlling for parental education, the origin of birth continent of students and their parents is not a significant factor.

*Parental education and equity in academic achievement.* An important source of the inequity in the academic achievement distribution is parental education (measured by the

number of years of schooling) (Ersado and Gignoux, 2014; Hans-Vaughn, 2004; Horn and Bobbitt). Moreover, the achievement of students of educated parents tends to be much higher compared with their counterparts.

Several theoretical models worldwide have examined the effect of parental education on their children's academic achievement. All these models found a statistically significant positive relationship between the two (Hans-Vaughn, 2004). Ersado and Gignoux (2014) also conducted an ordinary least squares regression analysis and found that in Egypt, the variable with the most influence on students' mathematics scores, as reported by the TIMSS 2007, was their parental level of education.

Horn and Bobbitt (2000) found that students in the USA, whose parents had a high school or below level of education, had lower chances of obtaining a bachelor's degree than those whose parents acquire post-secondary education.

Lee and Barro (2001) analyzed the findings of the TIMSS examinations and found that parental education significantly contributes to explained variance in student academic achievement. Furthermore, in Chile, Munoz and Redondo (2013) found that two students from two different family backgrounds (from one with a high and the other with a low socioeconomic background, examined, among other things, by parental education) who scored the same in mathematics and language on the exams at the age of eight, developed a discrepancy of more than 70 exam points, four years later. This finding emphasizes that equity is decreasing along time.

Dahan *et al.* (2002) found that using different models of logistic regression, parental education had a positive and statistically significant effect on students' achievement. In addition, children of parents with university degrees are four times more likely to achieve higher education compared with their counterparts. The chances that a child of an educated mother will acquire an academic education are twice as high as those of other children. For those with an educated father, the chances are three times as high (Dobrin, 2015). Similarly, Shai *et al.* (2005) found that the effect of parental education was positive and statistically significant. In other words, as the level of parental education increases, a student's probability of being eligible for a matriculation certificate increases as well. Gilboa (2010) also found that parental education is the most contributing variable in explaining the variance among students' academic achievement.

*Number of siblings and equity in academic achievement.* The research literature points to a negative relationship between family size and equity in academic achievement (Horn and Bobbitt, 2000). Dahan *et al.* (2002) found that the number of siblings in a family is one of the important factors influencing the chances of being eligible for a matriculation certificate. The addition of a sibling to a family reduces a student's chances of obtaining a matriculation certificate. This is apparently because the large number of siblings is a drain on the parents' available economic resources.

Similarly, Levin-Epstein (2000) found that the number of siblings is negatively correlated with achievement. He also notes that the importance of scarcity in resources is greater when it comes to exclusive resources, which by their very nature diminish the parents' resources when placed at their children's disposal.

*Tracking and equity in academic achievement.* Despite their stated intention of providing equal educational opportunity for all, many democratic countries separate their students into different classes or even different schools, based on their demonstrated academic achievement and likely future career.

Leichte (2013) analyzed data from the 2009 Program for International Student Assessment, indicating that tracking generally does increase score disparities between children from different educational backgrounds. Tracking is also associated with higher overall variance of scores. At the same time, tracking may have a slight positive effect on average achievement.

Many studies conducted in Israel examining the effect of the chosen track of study (academic vs vocational) on inequity in scholastic achievement found a discrepancy favoring students in the academic track. Rash and Ben-Abut (2004) found that vocational schools devoted fewer hours to mathematics (3.6 vs 5), the sciences (3 vs 4.5), foreign languages (3 vs 4.4) and Hebrew (2.1 vs 4). In the academic track, matriculation eligibility was 60.8 percent, compared with 48 percent in the vocational track (Swirski and Dagan-Buzaglo, 2009). It was also found that around one-third of high school students were enrolled in vocational tracks and two-thirds in academic tracks.

*Prior achievement and equity.* In recent years, studies examining inequity in academic achievement have focused on assessing inequity in education when students' previous achievement is statistically controlled through growth models (Bontempo *et al.*, 2012; Hofer *et al.*, 2012). These models measure variance in achievement according to student background variables and accounting for previous achievement (Anderman *et al.*, 2015).

In Israel as well, Gilboa (2010) used multi-variable linear regression to examine the relationship between students previous achievement (measured by prior achievement on the fifth-grade national examinations) and their achievement in the eighth grade. His findings indicate that prior achievement contributes to explaining variance in achievement. In other words, the higher the previous achievement, the higher the present achievement.

### Research questions and variables

The objective of this research is twofold. First, it seeks to measure educational equity by measuring the strength of the relationships among student background variables (gender, ethnicity, student's origin of birth continent, parental origin of birth continent, parental education, number of siblings and study track), student previous achievement, and the probability of success. In addition, the study analyzes trends of educational equity along the examined period from 2001 to 2011. To this end, it considers the following research questions:

*RQ1.* What are the sources of inequity in academic achievement in Israeli high schools during the period 2001–2011?

*RQ2.* What are the trends of inequity in academic achievement during this same period?

The study's independent variables and their values are described in Table I.

The independent variables include student background variables and previous achievement.

### Method

This study uses logistic regression models, one for each year along the examined period. The ORs were calculated each year according to the different background characteristics. In addition, in order to analyze the trends in educational equity, the OR over the examined period was compared.

The OR expresses the likelihood that an event will occur. More specifically, for each independent variable, the logistic regression calculates its OR relative to the dependent variable. The result obtained indicates whether the probability that an event will occur (in the dependent variable) has increased or decreased. That is, it expresses the ratio between the predicted probability of matriculation certificate eligibility and the predicted probability of ineligibility. A value greater than one indicates that the probability of the dependent variable increases, while a value lower than one indicates that the probability of the dependent variable decreases. As BenDavid-Hadar (2016) noted, it is possible to analyze the trend of change in the independent variables, according to the change in the OR over time (BenDavid-Hadar, 2016).

**Table I.**  
Independent variables  
used in  
logistic regression

	Variables (reference)	Values
Student prior math achievements Educational program Background variable	Final score on mathematics matriculation exam	1–100
	No. of units in mathematics matriculation exam	1–5
	Educational program (Academic, non-academic)	Nominal
	Gender (female)	Male
		Female
	Ethnicity (other)	Jewish
		Druze
		Arab (Circassian/Samaritan/Black Hebrews)
		Israel
	Student origin of birth continent (Israel)	Europe and America
		Asia and Africa
		Ethiopia
		Commonwealth of Independent States
	Father's origin of birth continent (Israel)	Israel
		Europe and America
		Asia and Africa
		Ethiopia
	Mother's origin of birth continent (Israel)	Commonwealth of Independent States
		Israel
		Europe and America
		Asia and Africa
		Ethiopia
		Commonwealth of Independent States
		Israel
	Paternal education	Continuous
	Maternal education	Continuous
	Number of siblings	0–39

In this study, 11 logistic regression equations were estimated, one for each year (2001–2011), as can be seen from the following equation:

$$\frac{\hat{p}_i}{1-\hat{p}_i} = \beta_0 + \beta_1 \times \text{Gender} + \beta_2 \times \text{Ethnicity} + \beta_3 \times \text{Orgin of birth} \\ + \beta_4 \times \text{Paternal education} + \beta_5 \times \text{Maternal education} \\ + \beta_6 \times \text{Number of sibling} + \beta_7 \times \text{Lane of etudy} \\ + \beta_8 \times \text{Prior math achievment} + e, \tag{1}$$

where  $\hat{p}_i$  is the probability to be eligible for a matriculation diploma,  $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$  and  $\beta_8$  are vectors of student  $i$  background characteristics (e.g. gender and ethnicity) and  $e$  is the error term.

**Data**

Nationwide, student level, data sets were generated specifically for this study by the Ministry of Education's ICT Department. The data are comprised of student background variables

(e.g. ethnicity and parental education), student previous achievement (e.g. matriculation scores in mathematics) and eligibility. The data sets include the entire cohorts at the national level between 2001 and 2011.

### *Participants*

The descriptive statistics of the sample show that on average for each year examined (2001–2011), approximately 55 percent of the students were female students and 45 percent were male. About 75 percent of those who took the matriculation exams were Jews, about 19 percent were Arabs, about 2 percent were Druze and about 4 percent were classified as others (these rates resemble that of the entire population). In addition, on average, in each year examined, about 65 percent of the students were eligible for a matriculation certificate.

### **Findings**

The regression equations estimated for each of the years between 2001 and 2011 were all statistically significant. That is, the independent variables accounted for 32 percent of the explained variance in eligibility for a matriculation certificate during the period 2001–2011 (on average). Table II shows the OR results for the findings of the logistic regression estimated for each year between 2001 and 2011.

In the following sections, we summarize the findings of the logistic regression analyses, estimating equity in academic achievement for 2001–2011.

#### *Sources and trends – gender*

A statistically significant gender inequity in favor of female students was found. Specifically, female students are on average 60 percent more likely to be eligible for a matriculation certificate compared with male students (e.g. OR = 1.615\*\*, in 2010, Table II, Line 1). In addition, similar OR was maintained in each of the examined years. In other words, the trend of inequity was maintained over the examined period (i.e. the OR remains stable along the examined period).

#### *Sources and trends – ethnicity*

Arab students were found to be 30 percent less likely to be eligible for a matriculation certificate, compared with their counterparts (e.g. OR = 0.664\*\*, in 2010, Table II, Line 2). This finding was stable along 7 of the 11 years examined (2001, 2002, 2004, 2007, 2008, 2009 and 2010). In addition, the probability of Jewish students to be eligible for a matriculation certificate was about 30 percent higher compared with their counterparts (e.g. OR = 1.328\*\*, in 2006, Table II, Line 2). This result was stable in 5 out of the 11 years examined (2003, 2004, 2005, 2006 and 2007). In all other years the results were insignificant. Furthermore, the probability that Druze students would be eligible for a matriculation certificate was significantly higher compared with their counterparts (about 70 percent higher) (e.g. OR = 1.975\*\*, in 2006, Table II, Line 2). This result was evident in 3 of the 11 years examined (2005, 2006 and 2007). In all other years the results were statistically insignificant.

In general, the analysis of ethnicity-based inequity shows that the ORs were stable during almost all the examined years. In other words, the trend of inequity was not reduced, but rather maintained stable throughout the decade.

#### *Sources and trends – students and parental origin of birth continent*

This study examined whether origin of the birth continent (of the student and of the parents) is related to the extent of inequity in academic achievement. Contrary to other studies conducted in the field, the current study found that origin of birth is not a statistically significant variable in explaining inequity in academic achievement.



**Table II.**  
Results of the logistic  
regression (2001–2011)

Indicator	2001 <i>n</i> =47,285	2002 <i>n</i> =48,160	2003 <i>n</i> =49,027	2004 <i>n</i> =49,993	2005 <i>n</i> =47,522	2006 <i>n</i> =48,218	2007 <i>n</i> =47,931	2008 <i>n</i> =44,824	2009 <i>n</i> =45,843	2010 <i>n</i> =50,569	2011 <i>n</i> =48,754
	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR	OR
Gender	1.612**	1.629**	1.622**	1.567**	1.621**	1.702**	1.642*	1.631**	1.69**	1.615**	1.65**
Ethnicity	1.08	1.2	1.38**	1.434**	1.262**	1.328**	1.238*	1	1.07	1.16	1.08
Arab	0.675**	0.7	0.85	0.818*	0.91	0.89	0.729**	0.644**	0.61**	0.664**	0.84
Druze	0.91	0.84	1.24	1.09	1.758**	1.975**	1.51**	1.06	1.08	1.11	1.24
Student's origin of birth continent	0.59	1.1	0.43	0.59	1	0.82	2.114**	1.59	0.7	1.73	1.77
Europe and America	0.63	1.1	0.35	0.47	0.79	0.81	1.68	1.68	0.57	1.4	1.27
Ethiopia	1.54	2.337**	3.708**	2.23**	1.8	0.56	1.11	1.82	0.57	2.016**	5.18
Africa and Asia	0.77	1.05	0.29	0.49	0.83	1.15	2.2	1.28	0.64	1.59	1.02
Commonwealth of Independent States	0.5	0.75	0.3	0.39	0.68	0.647*	1.59	1.31	0.5	1.35	1.45
Israel	1.04	0.9	1.02	1.24	0.97	1.19	0.81	1.21	0.94	1.08	1.03
Father's origin of birth continent	1.14	0.87	1.265*	1.2	1	1.198*	0.87	1.23	0.94	1.03	0.82
Europe and America	1.37	2.12	0.66	0.92	2	1.65	0.68	2.07	0.79	0.62	4.09
Ethiopia	1.05	0.834**	1.01	1.322**	1.07	1.13	0.84	1.27	0.97	1.16	1.15
Africa and Asia											
Commonwealth of Independent States	1.1	1.21	1.22	1.26	1.29	1.36	1.1	1.16	1.03	1.08	1.3
Israel	0.88	1	0.92	0.78	0.98	0.64	0.76	0.78	0.97	1.3	0.92
Mother's origin of birth continent	0.97	1.06	0.97	0.77	1.01	0.67	0.85	0.77	0.88	1.18	0.82
Europe and America	1.33	0.59	1.27	1.46	0.45	0.64	1.65	0.58	1.33	0.66	0.22
Ethiopia	0.86	1.05	0.97	0.79	1.03	0.644*	0.77	0.74	1.01	1.3	0.99
Africa and Asia	0.99	0.91	0.9	0.94	0.89	0.59*	0.65*	0.82	0.9	1.13	0.72
Commonwealth of Independent States											
Father's education	1.029**	1.025**	1.027**	1.019**	1.02**	1.018**	1.016**	1.023**	1.01*	1.01	1.01
Mother's education	1.016**	1.034**	1.023**	1.04**	1.036**	1.031**	1.024**	1.022**	1.01*	1.01	1.01
Number of siblings	0.961**	0.955**	1.131**	0.927**	0.94**	0.659**	0.953**	0.933**	0.93**	0.928**	0.91**
Educational track (academic)											
Math Scores	1.241**	1.072**	0.967**	4.065*	0.92	0.92	1.26	1.178**	1.21	1.145**	1.17**
Prior achievements	5.03**	3.875**	3.8**	4.047**	4.05**	4.8**	4.477**	5.087**	4.27**	5.648**	5.06**
Math Level	1.06**	1.057**	1.054**	1.061**	1.065**	1.062**	1.059**	1.061**	1.05**	1.058**	1.06**
<i>R</i> <sup>2</sup>	0.35	0.34	0.32	0.35	0.32	0.32	0.29	0.29	0.27	0.36	0.28

**Notes:** \**p* < 0.05; \*\**p* < 0.01

It should also be noted that the ORs were stable for almost all the years examined. In other words, the trend toward inequity was maintained throughout the decade[1].

#### *Sources and trends – parental education*

Parental education has a statistically significant effect on the probability that their children will be eligible for matriculation. In other words, each additional year of schooling of the father or of the mother increases the probability of matriculation eligibility by an average of 2 and 3 percent, respectively (e.g.  $OR = 1.02^{**}$ , in 2005 and  $OR = 1.036^{**}$ , in 2005, Table II, Lines 4 and 5, respectively).

This finding was stable for almost all the 11 years examined (except 2010 and 2011). In other words, the trend toward inequity was maintained throughout the decade.

#### *Sources and trends – number of siblings*

The addition of a sibling to the family reduces the probability for matriculation certificate eligibility by an average of 8 percent ( $OR = 0.928^{**}$ , in 2010, Table II, Line 6). These ORs were maintained in each of the years during the decade under review (2001–2011).

#### *Sources and trends – educational track*

Those studying in an academic track are 17 percent more likely to be eligible for a matriculation certificate than those studying in other tracks ( $OR = 1.145^{**}$ , in 2010, Table II, Line 7). These ORs were stable for most of the years during the decade under review (2001–2011). In other words, the trend toward inequity was maintained over the examined decade.

#### *Sources and trends – previous academic achievement*

The results show that a student's score on the mathematics exam and the level of studying this subject significantly affect the probability of eligibility for a matriculation certificate. In other words, an increase of one level of study or of one point on the math exam increases the probability of matriculation eligibility by an average of 5 and 6 percent, respectively ( $OR = 5.64^{**}$ , in 2010 and  $OR = 1.058^{**}$ , in 2010, Table II, Line 8).

These ORs were also maintained for each of the years during the studied decade (2001–2011).

### **Discussion**

Similar to other studies, the findings of our study indicate that gender, ethnicity, number of siblings, parental education and study track are related to the level of inequity in academic achievement (Adler and Blass, 2003; BenDavid-Hadar, 2016; Dahan *et al.*, 2001; Dobrin, 2015; Swirski and Dagan-Buzaglo, 2009). Specifically, the probability to obtain a matriculation certificate of female students was found to be 60 percent higher compared with the male students. This result emphasizes on the result of Dobrin (2015), which found that the probability of male students to be eligible for matriculation certificates was 20 percent lower compared with female students.

In addition, our findings reveal that Arab students have a 30 percent lower probability of obtaining a matriculation certificate compared with their counterparts. Our finding resembles that of Dobrin (2015) who found that the chances of Jews obtaining an academic education were twice as high as the chances of Arabs.

The relationship between origin of birth continent and matriculation eligibility was not found as statistically significant in our research. This finding contradicts the findings in previous studies (Adler and Blass, 2003; Dahan *et al.*, 2001; Dobrin, 2015; Swirski and Dagan-Buzaglo, 2009; Roksa, 2011). This difference may be due to the time period under investigation, as well as to methodological differences. While Shai *et al.* (2005) measured inequity in academic achievement in 1995 and Shai *et al.* (2005) measured this inequity for

1997–2000, the current study measured inequity in academic achievement in a longer and more recent period (2001–2011). Moreover, a possible explanation for this difference is that this study accounts for students' previous achievement in addition to their background characteristics, while other researches account solely for their background characteristics.

In addition, in our study, it was found that each additional year of parental education increases the probability of matriculation eligibility by about 3 percent. Similarly, parental education was found to be the most dominant variable in determining a student's chances of achieving matriculation eligibility (Adler and Blass, 2003; Horn and Bobbitt, 2000; Shavit and Pierce, 1991).

In our study, the addition of a sibling to the family reduces the probability for matriculation certificate eligibility by an average of 8 percent. Similar to our findings, Dahan *et al.* (2001) also found that adding a sibling to the family reduces the probability of obtaining a matriculation certificate.

Moreover, similar to our findings, Leichte (2013), Rash and Ben-Abut (2004) and Swirski and Dagan-Buzaglo (2009) found that students at the academic track are more likely to be eligible for a matriculation certificate compared with those studying in other tracks.

In addition, this study analyzed inequity in academic achievement while statistically controlling for background characteristics and for previous achievement. Thus, previous studies measured inequity while statistically controlling solely for background characteristics, not taking into account previous academic achievement (BenDavid-Hadar, 2016; Dobrin, 2014; Dahan *et al.*, 2001; Shai *et al.*, 2005). The findings of our study are consistent with current demographic trends in Israel and the relative increase in the proportion of students from disadvantaged groups with low academic achievement that portrayed ill for the future socioeconomic strength of Israel (BenDavid-Hadar, 2016).

The findings of our research also contribute to enhancing existing knowledge on the issue of inequity in academic achievement (Browning and Johnson, 1984; Rawls, 2001; Yilmazer, 2008; BenDavid-Hadar and Ziderman, 2011; BenDavid-Hadar, 2013a, b, c, 2014a). This issue has been the focus of research literature, as well as the center of public debate. This study contributes to enhancing empirical knowledge about inequity levels and trends in academic achievement in the State of Israel over the past decade. The study's findings may contribute to shaping educational policy. Analysis of the trends over the past 11 years shows that inequity in achievement in Israel has been maintained.

Analyzing these trends may assist policy makers and decision-makers act to provide all children with equal opportunities, thus enabling them to develop their knowledge and enhance their academic achievement independent of their family backgrounds.

Inequity in academic achievement that is related to the circumstances into which students were born is considered unfair and defined as inequality of opportunities. Roemer (1998) used the word "circumstances" to encompass all the variables with which an individual is born. He used the word "effort" to refer to the productivity, abilities, talents and achievement a student invests. According to Roemer's theory, equality in opportunities occurs when one individual invests the same efforts as another, regardless of the life circumstances of either, leading to equal distribution of achievement. Therefore, apart from estimating inequity in academic achievement, it is very important to identify the variables that may affect this inequity.

Implications for education policy makers are twofold. First, they should aspire to develop an education fiscal policy that is more aligned with and aware of the inequity in student academic achievement. This research emphasizes the relationships between students' diverse background characteristics and educational inequality. According to our research findings, more emphasis on effectively helping groups with lower ORs might decrease their inequity in academic achievement. For example, developing a supportive educational program to advance the Arabic-speaking students might decrease the inequity in academic achievement in this population.

Second, according to the implications of this research, policy makers need to revise and improve the funding formula and the current allocation mechanism in order to be more equitable. This is because equitable and sustainable funding reduces inequality in academic achievement (BenDavid-Hadar, 2018a, b; Jackson *et al.*, 2015; Lafortune *et al.*, 2016; Johnson, 2015; Ladd and Goertz, 2015). Notably, the education system in Israel aspires to advance equity in academic achievement.

Furthermore, in order to advance such a policy, there is also a need to annually measure the extent of equity in academic achievement. Publishing an annual report on educational equity might assist in promoting equity and public awareness of this problem.

## Note

1. At the beginning of the decade in 3 out of the 11 years examined, students of Ethiopian origin had a high probability of obtaining eligibility. In these years the percentage of their eligibility for a matriculation certificate was indeed high. However, this trend was diminished throughout the decade.

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