The Impact of Socioeconomic Factors on Achievement Gaps on Reading Literacy Between Hebrew-Speaking and Arabic-Speaking Students in Israel

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Abstract

The study intends to make it possible to decide between two alternative explanations for the low attainment of Arabic-speaking students in reading literacy compared with Hebrew-speaking students who participated in the PIRLS (2006), i.e., one that associates the variability in reading literacy scores the with the variability in socioeconomic measures, and another that considers the diglossia typical of Arabic (two linguistic codes: standard written Arabic and the spoken form) as the critical variable responsible for the low attainment in reading literacy among Arabic-speaking students.

Analyses of covariance were used to explore achievement gaps between the two groups while statistically controlling for the effect of socioeconomic factors. Repeating the analysis carried out on reading scores, on mathematics and science scores, considered to be less affected by diglossia, the achievement gap in favor of Hebrew-speaking students disappeared and even reversed.

The findings of the study supported the explanation that Arabic diglossia is the main cause of the low results of Arabic-speaking students and recommends educational interventions aimed to directly treat the problem of diglossia rather than focus only on improving socioeconomic conditions in schools.

Keywords: *socioeconomic factors, Arabic diglossia, reading literacy achievement*

Introduction

The educational system in Israel consists of two separate subsystems, each catering for the needs of a distinct ethnic subpopulation: the Hebrew-speaking majority (about 80%) and the Arabic-speaking citizens (about 20%).

In 2006/7 almost 25% of the primary and secondary students in Israel studied in schools where students, teachers and principals are all Arab citizens of Israel and the language of instruction is Arabic.

The separation between the two educational systems that was meant primarily to enable the two so called "sectors" to shape their education in accordance with their culture and heritage, led in retrospect, although unintentionally, to inequality between the two systems and to the deprivation of the Arabic-speaking population. This has been criticized from the 1970s when implementation of reforms in the Israeli education system that aimed to eliminate inequalities, turned out to lag behind in the Arab system (Mari 1978; Mari & Dahir, 1978; Peled, 1976). With time, this critique (Al Haj, 1995; Eisikovitz, 1997, Kahan & Yelnik, 2000; Shavit, 1990; Zarzure, 1995), led the Ministry of Education to announce three, mainly affirmative, 5-year plans for the Arab sector (1990, 1999, 2001).

These 5-year plans resulted in several improvements. For instance, from 1990-2001, enrolment rates of 14-17 year-olds in the upper elementary schools increased in the Arab sector by 26% versus only 6% in the Jewish sector. More study hours were allocated to Arabic-speaking schools, increasing the average hours per class and the average hours per pupil at all school levels, and especially the upper secondary level, more in the Arab sector than in the Jewish sector (Sprinzak, Bar, Levi, & Piterman, 2003).

Despite some improvement, inequalities in terms of inputs and outputs between the two education systems still continued to appear (Abu-Asba, 2005; Gazit, 2006; Golan-Agnon, 2004; Lavi, 1997; Lewin & Stier, 2002) (see Table 1). Data from a collection of official publications on allocation of inputs as well as on some yielded outputs reveal the gap in favor of the Hebrew-speaking system (Segev et al., 2007; Sprinzak, et al., 2003; Ministry of Education – Economic and Budgeting Administration, 2007).

Take in Table 1 about here

Inequalities between Israel's Jewish and Arab populations go beyond the education system. According to various sources (Haidar, 2005; Knesset Research and Information Center, 2004), the Arab population is characterized by larger families, lower levels of parental education, lower income levels, higher ratio of families living below the poverty line, and lower percentage of employment (see Table 2).

Take in Table 2 about here

These disparities are in line with the persistent achievement gaps between the two populations, as intensively reported in national and international studies (Abu-Asba, 2005; Aviram, Cafir & Ben Simon, 1996; Cafir, Aviram, & Ben Simon, 1999; Karmarski & Mevarech, 2004; Mevarech & Karmarsky, 2007; Sprinzak et al., 2003; Zuzovsky, 2001, 2005).

Even though it is difficult to compare results obtained from studies that differ in their testing instruments, grade level and subjects tested, the picture that appears from recent studies remains the same and demonstrates the high achievement gaps in favor of Hebrew-speaking students in all school subjects tested. Figure 1 presents these gaps.

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The huge and still growing achievement gap (above 1 *SD*) in reading literacy revealed in the last PIRLS study, despite all efforts to close it, was the trigger for this study, which aims to explain why Arabic-speaking students in Israel are doing poorly in international reading literacy studies and why they are lagging behind Hebrew-speaking students who participated in the PIRLS 2006 study in Israel.

More specifically, the study aims to make it possible to decide between the alternative explanations for this phenomenon: the one that associates these gaps with socioeconomic inequalities between the two sectors, another that considers the diglossic nature of the Arabic language to be the main cause for the low attainment of Arabic-speakers in reading literacy, or an explanation that rests on both alternatives.

Both of these rival explanations are supported by a vast amount of empirical studies. Among those that associate reading achievement with socioeconomic factors - most of which do not deal specifically with reading achievement in Arabic - there are some that focus on home material resources (Benabou, 1996; Bradley & Corwyn, 2002; Coleman, 1988), and others that focus more on the human capital at home – i.e., parents' level of education, language spoken at home (Willms, 1999, 2003, 2006), or mother-child interaction at home (Aram & Levin, 2001; Korat & Levin, 2001). When aggregating these family background socioeconomic measures at the school level, their effect even increases (Chin & McBride-Chang, 2006). Findings from other studies show that the wealth of the schools also plays a role. Students studying in richer schools tend to outperform those in poorer schools (Ogle et al., 2003; Snow, Burns, & Griffin, 1998).

The other explanation, which targets linguistic factors and considers diglossia to be the main reason for the spread of illiteracy amongst Arabic-speaking students, is also supported by many studies. Ferguson (1959), who first introduced a theory regarding the phenomenon of diglossia, used the Arabic language as an example of a diglossic situation. He defined it as follows:

> …a relatively stable language situation, in which in addition to the primary dialects of the language, which may include a standard or regional standards, there is a very divergent, highly codified, often grammatically more complex, superposed variety, the vehicle of a large and respected body of written literature, either of an earlier period or in another speech community, which is learned largely by formal education and is used for most written and formal spoken purposes but is not used by any sector of the community for ordinary conversation. (p. 336)

The diglossic situation that characterizes the Arabic language is a result of the existence of two varieties of the same language that are used for socially distinct functions – modern standard Arabic known as *literary or classical Arabic*, and spoken Arabic which is used for everyday communication. The two varieties differ in vocabulary, phonology, syntax and grammar. While spoken Arabic is the language the children use at home and with friends, they first encounter literary Arabic at a relatively late stage in their linguistic development, only at school. Thus the latter can be viewed as almost a second language (Ayari, 1996). Adding to this the fact that the literary Arabic, originally the language of the Quran, has higher prestige and is used by educated persons, the two forms of language have become distant. When the linguistic distance is significant it creates discontinuity between the two forms of language and hinders the acquisition of the written language.

Maamouri (1998) uses the concept of "diglossic continuum" to describe the linguistic distance between the written and the oral language. He places the Arabic diglossia in the middle of a diglossic continuum because all the varieties of Arabic included in this continuum are mutually understandable. Despite this, the existing linguistic distance in the Arabic language clearly interferes with the acquisition of reading skills (Saiegh-Haddad, 2003).

Data obtained in the PIRLS 2006 study in Israel on reading literacy achievement, and in the TIMSS-2003 study on mathematics and science achievement of Hebrew-speaking students tested in Hebrew, and of Arabic-speaking students tested in Arabic in these subject areas, as well as data on socioeconomic measures of students' homes and schools, enabled me to examine and evaluate the two alternative main explanations.

Comparison between the achievements of both populations while controlling for the socioeconomic factors reveals the net effect of the linguistic factors in reading literacy, an area supposed to be highly affected by diglossia, and in mathematics and science, which are considered to be less affected by it.

Methodology

Analysis of covariance (Ancova) was used to explore achievement differences (dependent variable) between groups while statistically controlling for the effect of an additional variable (a covariate) on the dependent variable. The use of a well-chosen covariate helps to reduce the effect of a confounding variable on the group differences in achievement. The reduced achievement gap between the compared groups after controlling for the socioeconomic covariates is an indication of the role of these covariates in explaining this gap.

The dependent variables used in the analyses were the mean of the five estimated proficiency scores (plausible values) in reading literacy, in mathematics and in science (Foy, Galia & Li, 2007) that were computed for each student participating in PIRLS-2006 and in TIMSS-2003 studies.

The covariates used were socioeconomic indices derived mostly from the above-mentioned studies by means of similar questions that appeared in both studies in the student and principal questionnaires, as well as from other countries' official sources. Some represented socioeconomic factors that operate at the micro-level – e.g., in students' homes - and some represented macro-level factors related to the country's affirmative budgeting policy.

Two of the indices were socioeconomic measures obtained at the level of the individual students. These were aggregated at the school level, thus constituting continuous indices that describe socioeconomic attributes of the school's student population. One index was a measure primarily obtained at the school level.

All indices were also cut into three levels: high level – indicating school with students from affluent homes, medium level and low levels – indicating schools with students from poor socioeconomic backgrounds. The different forms of the indices were used for different purposes.

The categorical form of the indices was used to sort schools into the different socioeconomic categories. Breakdown of school's mean achievement by school's socioeconomic category and computing achievement gaps between schools belonging to the higher socioeconomic category (affluent) and those belonging to the lowest category (poor), enabled to measure the achievement gap due to socioeconomic inequality. The indices in their continuous form were used as the covariates in the analyses of covariance.

All analyses were performed at the school level and all statistics were weighted by school weights.

Ancova assumes that the covariate will correlate substantially with the dependent variable and that the relationship between the dependent variable and the covariate is linear. These assumptions were met with by our data, but this was not the case with another assumption that requires the relationship between the covariate and the dependent variable for each of the compared groups to be the same. This assumption (homogeneity of regression slopes) was tested in preliminary analyses. Regressing school means in reading literacy, mathematics and science, on the covariates used in the study, the sector variable and the interaction term between the "sector" variable and the relevant covariate, revealed significant interaction effects related to two covariates (the *official school SES index* (Strauss)– and *educational aids at home* index) that will be described later in this paper. In order to understand the effect of the covariate, these significant interactions required to predict adjusted achievement scores at different values of the covariate for students in Hebrew-speaking and Arabic-speaking schools. The values used were the standardized "z" scores of the covariate at the maximal values, the mean value set to zero, and at the minimal value. Predicted scores for different levels of the covariate were used for computing the achievement gaps between the sectors in each of these levels.

Data Source

Sample

Responses of 3908 4th graders from 149 schools who participated in PIRLS-2006 were used this study. Of these students, 1775 were from 69 secular Hebrew-speaking schools, 940 from 40 religious Hebrew-speaking schools and 1193 from 40 Arabic-speaking schools. The data that served the analyses were obtained from 109 Hebrew-speaking schools and only 35 from Arabic-speaking schools.

The data from TIMSS-2003 were obtained from 4318 8th graders who studied in Hebrew-speaking schools. Two-thousand and sixty-nine students studied in 69 secular Hebrew-speaking schools, 1098 in 39 religious Hebrew-speaking schools and 1159 in 38 in Arabic-speaking schools. Missing data on the official school SES index restricted the analyses to 119 Hebrew-speaking schools and 31 Arabic-speaking schools.

The Covariates Used in the Study

Index of Educational Resources at Home

Student reports on the number (0 – 4) of four educational aids (computer, study desk, books of their own, and a daily newspaper) present in their homes were averaged at the class/school level providing a continuous index that ranged according to PIRLS data from 1.41-3.71 and according to TIMSS data from 2.89-4.0. Cutting these scales into three equal parts resulted in three distinct levels indicating schools with students coming mostly from homes with few (1), some (2), or many (3) educational aids.

Index of Student Body Socioeconomic Composition in School

Principals were asked to estimate the percentage of students in their schools coming from economically disadvantaged homes (1= 0%-10%; 2=11%-25%; 3=26%-50%; 4=more than 50%). These categories were recoded into three levels: high (affluent schools) with no more than 25% of students from disadvantaged homes; medium with 26%-50% of students from disadvantages homes, and low (disadvantaged schools) with more than 50% of their students coming from economically disadvantaged homes.

The Official Socioeconomic Index of the School

This measure is an official index used by the Ministry of Education as a scale for budgeting purposes. Since 1963, different affirmative school budgeting policies have been used in Israel. These policies, mainly aimed to compensate schools, served disadvantaged student populations. Several indices describing the socioeconomic background of the school population served as a budgeting scale. Over the years, changes in the components of these indices, in the weights assigned to each of them, and in their aggregated unit (per school, per class, or per pupil), usually as a response to some critique leveled against them, have occurred. As these indices were associated with achievement, they served as an implicit stratum in the sampling design of TIMSS and PIRLS studies in Israel. The official index (Shoshani Index) used for this purpose in both studies (PIRLS-2006 and TIMSS-2003), was constructed from variables describing the student's and family country of origin, immigration status (when applicable) and residence in what was politically defined as "a national priority location". This index was computed for every student. The distribution of its values was divided into deciles, each determining the number of study hours (converted into money) a student is entitled to. Students classified into higher deciles (lower socioeconomic background) were entitled to more study hours. The overall number of study hours allocated to the school is the sum of the hours allocated for its students. Although this appears a differential and fair method for allocating money to schools, this index was criticized as some of its components discriminated against the Arab population group (not immigrant, not living in national priority areas). In response a new index (Strauss index) based only on socioeconomic factors was developed: parents' education level (40%); family's annual net income (20%); country of origin of student and his/her parents (20%), and the geographic periphery of the student's home (20%). This index was also computed at the individual student level and then was aggregated at the school level, forming a continuous scale. Schools with index values ranging from 1.2-4.13 were considered high SES schools (affluent); schools with values ranging from 4.24-7.02 – medium SES, and schools with values ranging from 7.01-9.78 – low SES schools (disadvantaged).

The same criteria were used to compute identical indices using recent data for schools that participated in TIMSS-2003. Due to quite stable background characteristics of the student population in Israeli schools, it was assumed that only minor changes had occurred in these students' socioeconomic background since 2003. This allowed us to regard indices that were based on 2006 data as satisfactory proxies of the relevant characteristics in 2003. The aggregated values of this index at the school level were treated in the same way to form three equal groups of schools – affluent, medium and low SES schools.

All indices used as covariates were associated with achievement. Pearson correlation coefficients between indices in their continuous form and the school means in reading literacy for all schools, and separately for Hebrew-speaking and Arabic-speaking schools, were all high and statistically significant. Table 3 presents these data.

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Pearson correlation coefficients between the school indices in their continuous forms and school mean achievement in mathematics and in science for all schools with applicable data, separately for Hebrew-speaking schools and Arabic-speaking schools, are presented in Table 4.

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The index of educational aids at home was found to be highly and significantly correlated with both mathematics and science in the Hebrew-speaking sectors, but only moderately so in the Arabic-speaking sector, while the official socioeconomic index (Strauss) was found to be associated with achievement in both subjects only in the Hebrew-speaking schools. These are signs of possible interaction between the covariates and the sector variable that will need to be considered in later stages of the analysis.

Findings and Discussion

Data on inequality in socioeconomic measures and on achievement gaps between affluent and disadvantaged schools as defined by the covariates, both in the Hebrew-speaking sector and in the Arabic-speaking sector, demonstrate the association between the socioeconomic measures and reading achievement.

Results of the one-way analysis of covariance using separately each time, a different socioeconomic measure as covariate reveals the covariates' role in determining the achievement gap between students in Hebrew-speaking and in Arabic-speaking schools.

Signs of Socioeconomic Inequality Between Hebrew-Speaking and Arabic-Speaking Schools in Israel

The distribution of schools by the three levels of all socioeconomic indices highlights the existing inequality between the two sectors in Israel. A higher percentage of Hebrew-speaking schools are regarded high SES schools, while a higher percentage of Arabic-speaking schools are among the low SES schools. Table 5, based on PIRLS-2006 data, describes the situation in primary schools in 2006 and Table 6, referring to TIMSS data, describes the situation in lower secondary schools in 2003. Both tables bear out this inequality.

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The distribution of schools that participated in TIMSS 2003, by levels of the covariates shows that, even in 2003, the socioeconomic inequality between the two sectors existed. Table 6 demonstrates this inequality.

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The socioeconomic inequality revealed was found to be associated with achievement. Breakdown of school's mean reading achievement by levels of the socioeconomic indices they belong to indicate a linear relationship between reading achievement and the levels of the indices.

Table 7 presents weighted school means in reading achievement in the two sectors with their standard deviation in brackets, and the achievement gap between schools classified as high SES schools and those classified as low SES schools. In cases where there are no high SES Arabic-speaking schools, gaps between medium and low SES schools are also presented.

Take in Table 7 about here

Breakdown of school means in the two sectors in mathematics and in science by level of the different socioeconomic covariates to which they belong yields, in most cases, a linear relationship between the two variables. In the case of the official school SES index, since most of the Arabic-speaking schools are classified as low SES schools, linearity can be observed only in the Hebrew-speaking sector. Table 8a for mathematics and Table 8b for science, present these findings.

Take in Tables 8a and 8b about here

The Role of the Socioeconomic Measures in Narrowing the Achievement Gap Between Hebrew-speaking and Arabic-Speaking Schools

Adjusted school means in reading literacy after controlling for the different socioeconomic covariates in the two sectors differ significantly as indicated by their *F*-value and significance, and the gap in reading literacy between students in Hebrew-speaking schools and Arabic-speaking schools, although narrowed, remained large. Table 9 presents the observed scores in reading literacy and the adjusted scores after controlling for the SES covariates.

Repeating this analysis with data obtained in TIMSS-2003, on mathematics and science scores, using two of the covariates which were found to behave similarly: the index of home educational resources and the official new index of school SES, revealed quite a different picture.

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Table 10 presents the observed mean score in mathematics and science and the adjusted scores, after controlling for the two covariates in the two sectors, and the achievement gap between the two sectors, before and after controlling for SES covariates.

Take in Table 10 about here

Figure 2 illustrates the gaps in the three subject areas.

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The narrowing of the gap between Hebrew-speaking and Arabic-speaking schools after controlling for the index of home educational aids, and the inversion of the gap in favor of students in Arabic-speaking schools when using the official school SES index, indicate that these covariates are highly associated with achievement in mathematics and science and their unequal distribution between the two sectors might explain the fact that students in Arabic-speaking schools lag behind students in Hebrew-speaking schools in these subjects. However, taking into account these same covariates in the case of reading literacy fails to eliminate achievement gaps between the two sectors.

As discussed earlier, the existence of significant interactions between the sector variable and the socioeconomic covariates required the prediction of adjusted school means at three levels of the standardized covariates in order to better understand their role in affecting the achievement gap between students studying in Hebrew-speaking and Arabic-speaking schools.

Table 11 presents the predicted school means in reading literacy and Table 12 presents the predicted school means in mathematics and science, in the two sectors, after taking into account the interaction between the covariates and the sector variables. Predicted scores are given for the three values of the standardized covariate: those indicating high SES schools, medium SES schools and low SES schools.

Take in Table 11 about here

Results of this extra analysis support the conclusion that even after taking into consideration the interaction between the sector variable and schools' SES index controlling for this socioeconomic measure, the gaps in reading literacy between the two sectors remains large. This gap is evident mostly in the medium and low SES categories, where all the Arabic-speaking schools are concentrated.

The narrowing of the achievement gap in mathematics and science between students in Hebrew-speaking and Arabic-speaking schools, after taking into consideration the interaction effect between the covariate and the sector variable, is evident mostly in low SES schools, most of which are Arabic-speaking (71%, according to the index of home educational aids and 83% according to the official school SES index). The findings of this extra analysis thus support earlier ones regarding the

role of the socioeconomic factor in eliminating the achievement gap between the two sectors in mathematics and science.

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These results led us to look for factors other than socioeconomic ones in order to explain the disadvantage of Arabic-speaking students in reading literacy.

Conclusion and Implications

The present study aimed to explain the low attainment of Arabic-speaking students in reading and to choose between the two, usual, alternative explanations to this phenomenon – the one that relates to lower socioeconomic conditions both at home and in school in the Arabic- speaking sector, and the other to the occurrence of diglossia.

Maamouri (1998), and others, regard the diglossia to be a critical variable for the spread of illiteracy in the Arab region:

> …even though it cannot by itself bear all the blame for the crisis in Arab education. Arabic diglossia is a definite aggravating factor in the low results of schooling (p. 72)

In contrast to other scholars (Neustupny. 1968), who believe that alleviation of poverty and the promotion of better socioeconomic life conditions alone can help eliminate the effect of any diglossic situation, Maamouri claims that this would not be possible in the case of Arabic diglossia, as this phenomenon affects all the social classes of the Arab society without discrimination.

Findings from this study support this claim. Despite evidence on socioeconomic inequality between the Arab sector and the Hebrew sector obtained from official resources in Israel and confirmed by data obtained from PIRLS-2006 in Israel, measures of this inequality were found to have only a limited impact on reading achievement. After controlling for the effect of several socioeconomic factors, the achievement gap in reading literacy between students in Hebrew-speaking and Arabic-speaking schools in favor of the former, although decreased, remained large, whilst in mathematics and science, it almost completely disappeared and even reversed.

My reading of these findings is that they support the explanation that Arabic diglossia is probably the main cause for the low reading attainment of Arabic speakers in Israel and might be so for students in other Arabic-speaking countries.

These findings also suggest an educational intervention in the Arab sector should target diglossia rather than only focus on socioeconomic factors.

Attempts to overcome the distance between the two forms of language by early exposure to written language at home and kindergarten (Abu-Rabia, 2000; Feitelson et al., 1992) or through a more structured and systemic approach both at kindergarten and school (Levin, Saiegh-Haddad, Hende & Ziv, 2007; Saiegh-Haddad, 2003, 2007, 2008; Somech, 1980) were already reported in small scale studies in Israel. Their findings should serve large scale language planning for the Arab sector in Israel.

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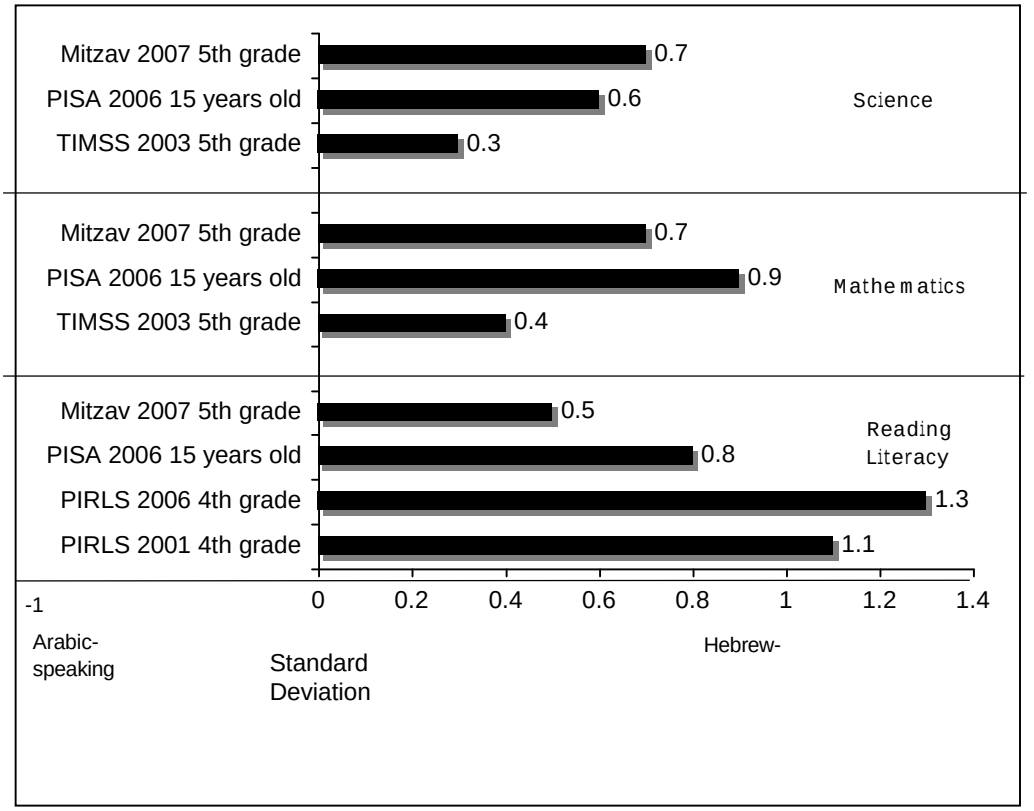

Figure 1: Achievement Gaps Between Hebrew-Speaking and Arabic-Speaking Students

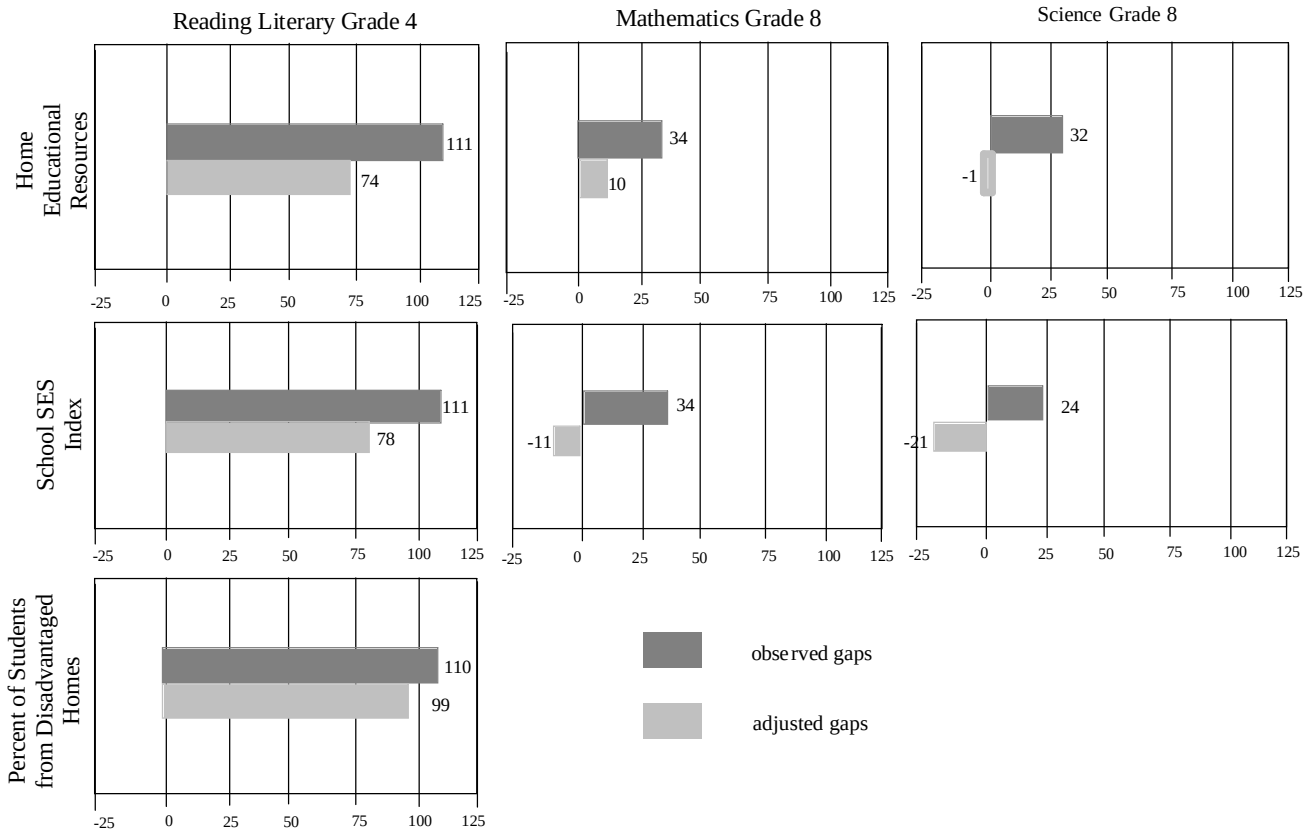

Figure 2: Observed and Adjusted Achievement Gaps Between Hebrew-speaking and Arabic-speaking Students in Reading Literacy, Mathematics and Science

Table 1: Input and Output Indicators in Hebrew and Arabic Education

	Hebrew sector	Arabic sector
Average no. of hours per pupil*	1.88	1.61
No. of students per FTP** (primary)	9.9	15.6
No. of students per FTP** (secondary)	8.6	11.6
Average no. of students per class***	26	29
Enrolment rates - ages 14-17***	97%	91%
Percentage of 12th grade students entitled to matriculation certificates	51%	30%
Annual student dropout rate between 9th – 12th grade***	4.7%	8.3%

Note: * Total school hours / number of pupils (Budget Proposal – 2007)
** FTP = Full time teachers' position
*** Source: Segev et al. (2007). Tables D55, D56, and D59

Source: Sprinzak et al. (2003) - The educational system in Figures 2003 - Table - C9; C11; C23, F1– Ministry of Education, Economic and Budgeting Administration.

Table 2: Demographic Characteristics of Hebrew-speaking and Arabic-speaking Population Groups in Israel (2004)

	Hebrew Population	Arabic Population
Percentage of women with upper secondary education	42.0	22.8
Percentage of men with upper secondary education	37.9	23.4
Average number of children per household	3.13	5.06
Percentage of families below poverty line	17.7	44.7
Percentage of employed persons	57.0	39.0

Source: Knesset Research and Information Center, 2004: Background report on school outcomes in the Arabic sector presented to the Child Rights Committee in the Knesset.

Table 3: Pearson Correlation Between Schools' Socioeconomic Measures and Schools' Weighted* Mean in Reading Literacy – PIRLS 2006 Data

	All schools	Hebrew-speaking schools	Arabic-speaking schools
Educational resources at home	.73*** *n*=149	.68*** *n*=114	.35* *n*=35
Socioeconomic student body composition	-.46*** *n*=140	-.40*** *n*=107	-.35* *n*=33
Official socioeconomic index of the school (Strauss)	-.69*** *n*=149	-.56*** *n*=114	-.53** *n*=35

* Using school weight multiplied by (number of sampled schools/total number of schools)

Table 4: Pearson Correlation Between Schools' Socioeconomic Measures and Schools' Weighted* Mean in Mathematics and Science – TIMSS-2003 Data

	All Schools			Hebrew-Speaking Schools			Arabic-Speaking Schools		
	n	*r* math	*r* science	n	*r* math	*r* science	n	*r* math	*r* science
Home edu. aids	150	.44***	.51***	119	.44***	.51***	31	.29	.39*
School SES index (Strauss)	131	-.54***	-.56***	102	-.58***	-.63***	29	-.01	-.06

* Using school weight multiplied by (number of sampled schools/total number of schools)

Table 5: Arabic-Speaking and Hebrew-Speaking Schools by Three Levels of the Socioeconomic Indices (in percents) – PIRLS -2006 Data

	High (affluent schools)		Medium		Low (disadvantaged schools)	
	Hebrew-speaking	Arabic-speaking	Hebrew-speaking	Arabic-speaking	Hebrew-speaking	Arabic-speaking
Index of educational aide at home	43% *n*=49	3% *n*=1	40% *n*=45	26% *n*=9	17% *n*=20	71% *n*=25
Percentage of students from economically disadvantages homes in school	53% *n*=57	25% *n*=8	27% *n*=29	28% *n*=9	20% *n*=22	47% *n*=15
School SES index (Strauss)	43% *n*=49	0% *n*=1	40% *n*=46	20% *n*=7	17% *n*=20	80% *n*=28

Table 6: Hebrew-Speaking and Arabic-Speaking Schools by Three Levels of School's SES Measures (in percents) – TIMSS-2003 Data

	High SES		Medium SES		Low SES	
	Hebrew-speaking schools	Arabic-speaking schools	Hebrew-speaking schools	Arabic-speaking schools	Hebrew-speaking schools	Arabic-speaking schools
Index of edu. aids	37% *n*=45	10% *n*=3	36% *n*=43	19% *n*=6	27% *n*=432	71% *n*=22
School SES index (Strauss)	49% *n*=50	0% *n*=1	38% *n*=39	17% *n*=5	13% *n*=3	83% *n*=24

Table 7: Reading Achievement* School Means by Level of the Socioeconomic Covariate in Arabic-Speaking and Hebrew-Speaking Schools in Israel

Indices	High SES schools		Medium SES Schools		Low SES Schools		Achievement Gaps Between High and Low SES Schools		Achievement Gaps Between Medium and Low SES Schools	
	H.S.	A.S.	H.S.	A.S.	H.S.	A.S.	H.S.	A.S.	H.S.	A.S.
Educational aids at students home	562 (27) *n*=49	*n*=0	536 (32) *n*=45	461 (51) *n*=9	501 (45) *n*=20	419 (51) *n*=25	61	-	35	42
Socioeconomic student body composition	552 (34) *n*=57	454 (43) *n*=8	540 (35) *n*=29	443 (44) *n*=9	510 (43) *n*=22	410 (62) *n*=15	42	44		
School SES index (Strauss)	561 (35) *n*=49	- *n*=0	530 (37) *n*=46	450 (40) *n*=7	517 (30) *n*=20	424 (56) *n*=28	44	-	13	26

Note: H.S. Schools: Hebrew-speaking schools; A.S. Schools: Arabic-speaking schools; Bracketed numbers: *SD.*

Table 8a: Breakdown of Schools' Mean of Mathematics Achievement by Levels of Two Covariates: Home Educational Aids and SES Index

	High		Medium		Low		Achievement Gaps High-Low SES Index	Achievement Gaps Medium-Low SES Index
	n	Mathematics Mean (*SD*)	*n*	Mathematics Mean (*SD*)	*n*	Mathematics Mean (*SD*)	Mathematics	Mathematics
Educational aids at home:								
H.S. schools	45	523 (45)	42	510 (34)	32	477 (55)	46	
A.S. schools	3	508 (49)	6	503 (37)	22	458 (48)	53	
School SES index:								
H.S. schools	50	534 (38)	39	491 (46)	13	464 (54)	70	27
A.S. schools	-	-	5	471 (33)	24	475 (52)	-	-4

Note: H.S. Schools: Hebrew-speaking schools; A.S. Schools: Arabic-speaking schools; Bracketed numbers: *SD.*

Table 8b: Breakdown of Schools' Mean of Science Achievement by Levels of Two Covariates: Home Educational Aids and SES Index

	High		Medium		Low		Achievement Gaps High-Low SES Index	Achievement Gaps Medium-Low SES Index
	n	Science Mean (*SD*)	*n*	Science Mean (*SD*)	*n*	Science Mean (*SD*)	Science	Science
Educational aids at home:								
H.S. schools	45	514 (36)	42	477 (32)	32	461 (46)	50	
A.S. schools	3	510 (37)	6	490 (27)	22	458 (42)	52	
School SES index:								
H.S. schools	50	520 (35)	39	480 (34)	13	452 (53)	68	28
A.S. schools	-	-	5	470 (25)	24	473 (44)	-	-3

Note: H.S. Schools: Hebrew-speaking schools; A.S. Schools: Arabic-speaking schools; Bracketed numbers: *SD.*

Table 9: Estimated (Observed) and Adjusted School Means in Reading Literacy (After Controlling for Different Socioeconomic Covariates) for Students in Hebrew-Speaking and Arabic-Speaking Schools

	Observed Mean	Adjusted Mean	F & *Sig.*
School index of educational aids at home:			
Hebrew-speaking	541	522	82.1***
Arabic-speaking	430	448	
Sector gap	111	74	
Socioeconomic student body composition:			
Hebrew-speaking	540	535	137.2***
Arabic-speaking	430	436	
Sector gap	110	99	
School SES index (Strauss):			
Hebrew-speaking	541	524	86.2**
Arabic-speaking	430	446	
Sector gap	111	78	

Table 10: Estimated School Means on Mathematics and Science Before (observed) and After (adjusted) Controlling for SES Covariates in Hebrew-Speaking and Arabic-Speaking Schools – TIMSS-2003 Data

	Mathematics			Science		
	Ob.	Adj.	*F*	Ob.	Adj.	*F*
Educational aids at home						
Hebrew-speaking	506	494	.85	495	481	.02
Arabic-speaking	472	484		469	482	
Achievement gap	34	10		33	-1	
School SES index						
Hebrew-speaking	508	486	.98	496	473	4.6*
Arabic-speaking	474	497		472	495	
Achievement gap	34	-11		24	-22	

Table 11: Predicted School Means in Reading Literacy for Different Values of the Socioeconomic Covariate

	Values of Schools' SES Index		
	High SES Schools	Medium SES Schools	Low SES Schools
Hebrew-speaking	557	554	511
Arabic-speaking	554	491	428
Gaps – Hebrew- and Arabic-speaking schools	3	63	83

Table 12: Predicated School Means in Science and Mathematics for Different Values of the SES Covariates

	Values of the Socioeconomic Covariates that Indicate:					
	Affluent Schools		Medium SES Schools		Disadvantaged Schools	
	Math	Science	Math	Science	Math	Science
Educational aids at home						
H.S.	528	519	499	487	470	456
A.S.	493	493	482	481	471	467
Gaps Hebrew-Arabic	35	25	17	6	-1	-13
School's SES index (Strauss)						
H.S.	531	518	497	585	463	452
A.S.	477	482	476	477	474	473
Gaps Hebrew-Arabic	54	36	21	8	-11	-21

Note: H.S. – Hebrew-speaking
A.S. = Arabic-speaking