The relationship between school resources and mathematics achievement at grade 8: A comparison of Israeli and Palestinian schools in TIMSS 2007

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Abstract

The relationship between school resources such as textbooks, libraries, computers, laboratories, teacher qualifications and number of pupils per teacher as input on the one hand and student achievement as output on the other hand has been shown to be important (e.g., Hanushek 1986, 2003; Krueger 2003).

In this paper, comparative analyses of school resources and their relationship with student achievement are undertaken for Israeli and Palestinian Authority (PA) schools for a number of reasons. First, results of the TIMSS studies gave rise to discussions about differences in performance between students in Hebrew and Arab speaking schools in Israel and how these could be reduced (Human Rights Watch, 2003; Zuzovsky, 2006). In response, the Ministry of Education in Israel developed a 5-year plan specifically aimed at improving the conditions of education in the Arab schools. Second, the Palestinian Authority participated for the first time in TIMSS in 2003 and again in 2007. This enables comparative analyses of school resources and their relationship with achievement of Arab students who are educated by the PA. More specifically, descriptive, cross tabulation, simple regression and hierarchical linear model analyses are used in this paper to examine differences in school resources, particularly computer resources, other instructional resources as well as physical infrastructure and their relationships with mathematics achievement of Grade 8 students in Palestinian schools, Israeli Arab schools and Israeli Hebrew schools.

Results show indeed some differences in the availability of school resources between the three groups of schools. However, only shortages regarding computer hardware, software and support are found to have a significant effect on mathematics achievement once the socio-economic level of schools and students' home background status have been taken into account. In addition, these effects are found for the Arab-speaking schools in Israel and PA but not for the Hebrew-speaking schools in Israel.

Key words: School resources, mathematics achievement, HLM

Introduction

The relationship between school resources such as textbooks, computers, calculators, number of pupils per teacher as input on the one hand and student achievement as output on the other hand is one of the most debated issues in education (e.g., Hanushek 1986, 2003; Krueger 2003). This relationship is of particular interest to policy-makers who are responsible for making decisions regarding the allocation of resources to schools.

In this paper, a comparative analysis of the relationship between school resources and student achievement is conducted for Israel and PA with TIMSS 2007 data for a number of reasons. Israel has participated in all TIMSS studies since 1995. Results from these studies gave rise to discussions about differences in performance between Hebrew and Arab students in Israel and how these could be reduced (Human Rights Watch, 2001; Zuzovsky, 2006). In particular, it was argued (e.g. by the "Dovrat Committee"[1]) that the differences in performance could be reduced by improving the equipment of Arab schools. In response, the Ministry of Education in Israel developed a 5-year plan specifically aimed at improving the conditions of education in the Arab schools. As a consequence, some changes were made to the resourcing of schools attended by Arab students in Israel which led Zuzovsky (2006) to conclude that "although inequality in input between the two sectors still remains, gaps in learning outcomes have narrowed".

The Palestinian Authority participated for the first time in TIMSS in 2003 and again in 2007. As the Arab students in this educational system and the Arab students in Israel can be argued to have a similar cultural background "as they are descendents of the same nation", it is of interest to extend the two-way comparison between schools attended by Arab and Hebrew students in Israel to a three-way comparison by including the Arab students taught in PA schools. In this way, differences can be examined in patterns of how school resources are linked to mathematics achievement of Grade 8 students between three groups, namely Arab students attending schools in PA, students attending Arab-speaking schools in Israel and students attending Hebrew-speaking schools in Israel.

Taking into consideration the above, the paper addresses the following major research questions:

RQ1: To what extent do school resources differ between the three groups of interest, namely (a) Palestinian schools, (b) Israeli Hebrew-speaking schools and (c) Israeli Arab-speaking schools?

RQ2: To what extent does the relationship between school resources and students' achievement in mathematics in TIMSS 2007 differ between the three groups specified in RQ1, once students' home background and schools socio-economic status are taken into account?

RQ3: Do effects emerge for school resource variables on the relationship between student-level predictors and mathematics achievement (i.e. interaction effects)? In other words, do school resources amplify or reduce the effects of student-level predictors on achievement in mathematics?

[1] The "Dovrat Committee was officially the "National Task Force for the Advancement of Education in Israel" undertook a review of the Israeli education system in 2001-2006.

Method

Data

The data used in this paper were collected in Israel and the Palestinian Authority as part of the Trends in International Mathematics and Science Study (TIMSS) in 2007. TIMSS 2007 is the fourth cycle in a series of studies assessing students' mathematics and science performance undertaken by the International Association for the Evaluation of Educational Achievement (IEA). In addition to collecting student achievement data based on mathematics and science tests, information was collected from students, their teachers and schools were taken to answer the research questions by way of background questionnaires. While TIMSS is conducted at two grade levels and in mathematics and science, only 8th grade level (14-year students) and mathematics achievement are considered in this paper. A complete list of variables in the analyses is given in Appendix A.

Analyses

In order to address the above research questions, two types of analyses were conducted. First, descriptive analyses of all school resource variables specified in Appendix A were undertaken and compared for Arab students in Palestinian schools, Arab students in Israeli schools and Hebrew students in Israeli schools. Based on the results, composites as measures of school resources and students' home background status were formed for the subsequent HLM analysis. In preparation for the HLM analyses, which, like other regression techniques can only handle dummy or continuous variables, these composites were recoded into dummy variables (i.e. coded '0' and '1', see Appendix B for how composites were derived and coded), except for parental education, which was recoded into six categories and considered to be continuous. In addition, it was investigated whether the three kinds of schools differed considerably on any of these variables by way of cross-tabulations.

For the descriptive as well as for the regression analyses, SAS 9.2 (2008) was used. In these analyses, the Jackknifing replication method was applied to accommodate the complex clustered sampling design of the TIMSS 2007 data in order to produce unbiased and corrected standard errors. For the purpose of examining the dependency and strength of association between school resources and the three groups of schools, cross-tabulation, Chi-square test and Contingency coefficient 'Cramer's V' were calculated.

Second, hierarchical linear modeling analysis (HLM, Raudenbush and Bryk 2002) was employed to overcome the limitations of traditional single level multiple regression analyses. Traditional models of multiple regression analyses can examine relationship between variables at only one level at the time. This means that either only student or only school variables may be related to each other and achievement. Alternatively, student variables need to be aggregated to the school level or school variables need to be disaggregated to the student level in order to be analyzed in one multiple regression model. In both cases, the analysis does not reflect the nested structure of formal education. Moreover, misleading conclusions are likely to be drawn as a result of applying principles of testing for statistical significance which tend to be based on simple random samples and do not take into account the clustered nature of a sample such as the one in this paper - and many other large-scale international studies – where schools are sampled first followed by some form of student sample within schools.

Therefore, analyses were undertaken using the HLM software (HLM-6; Raudenbush, Bryk, Cheong, Congdon and du Toit, 2004) firstly to examine the relationship between school resources and mathematics performance once the socio-economic status of schools and

students has been taken into account at the appropriate levels. This was done by specifying direct effects of the school resource variables as well as the direct effects of students' home background status variables on mathematics achievement. Secondly, the HLM analyses were aimed at identifying possible interaction effects whereby school resources changed (i.e. reduced or amplified) the relationship between students' home background status and mathematics achievement.

The dependent variable used in the analyses consisted of the five plausible values calculated for each student as a measure of mathematics achievement. Plausible values were first proposed by Mislevy et al. (1992) and, according to the American Institute for Research (2009), are defined as:

> "imputed values that resemble individual test scores and have approximately the same distribution as the latent trait being measured. Plausible values were developed as a computational approximation to obtain consistent estimates of population characteristics in assessment situations where individuals are administered too few items to allow precise estimates of their ability. Plausible values represent random draws from an empirically derived distribution of proficiency values that are conditional on the observed values of the assessment items and the background variables".

The original TIMSS variable of the first plausible values BSMMAT01 was selected, alongside the other four plausible values as the outcome variable at level-1. Although centering of predictors around their group mean is recommended (Lüdtke, Robitzsch, Trautwein & Kunter, 2009, p. 128) for analyses that wish to examine cross-level interaction effects such as those required to address the third research question, predictors were left uncentered in order to facilitate interpretation of the results. In order to take into account the complex sampling design employed in TIMSS, data at level-1 were weighted using the total students weight (TOTWGT) while data at level-2 were weighted using the School weight (SCHWGT).

Hierarchical linear modelling with HLM 6 allows for missing data only at the first level. As some of the data were missing at the school level, the number of schools in the analyses was reduced by 5 to 143 Palestinian schools, by 9 to 30 Israeli Arab schools and by 26 to 81 Israeli Hebrew schools. All students within those schools for which data were missing were also removed during the analysis.

The initial two-level model that was analyzed included data from students at the first and information from schools at the second level. The same model was estimated separately three times, for (a) all Palestinian schools, (b) Israeli Arab schools and (c) Israeli Hebrew schools. The equations for the initial two-level model are as follows:

Level 1 model (no centering):

Student Mathematics Achievement (BSMMAT01-05) = β_0 + β_1(Parental education-PAREDU)

+ β_2(Student gender-ITSEX) + β_3(Student home background-HMEPOSS) + r

Level 2 model (no centering):

β_0 = γ_{00} + γ_{01}(Student comes from economically disadvantaged homes-BC4GSDIR) +

γ_{02}(Total school enrolment-BC4GTENR) + γ_{03}(School material resources-BCDSRMI) +

γ_{04}(Computers resources-BCDCOMPS) + γ_{05}(Equipments resources-BCDEQUPS) + u_0

Next, those variables for which the effects did not exceed twice the associated standard error were considered to be not significant and removed from the analysis. The model was re-estimated and only those effects that were significant were retained. Then, possible interaction effects of level-2 variables were examined in instances where an effect of a student level variable on achievement emerged as being significant. This was done by inserting the possible interaction effect of one school variable at a time and examining whether or not its effect on the relationship between the level-1 predictor and achievement was significant. The final model included only direct and interaction effects that were significant.

Results

Results are presented first for the cross-tabulation analyses followed by the results of the descriptive and regression analyses. In the final section, findings from the HLM analyses are discussed.

Cross-tabulation analyses

In preparation for the analyses, composite variables as indicators of school resources were created as follows:

1. Extent to which instruction is affected by a shortage or inadequacy of the following resources, BCDSRMI, was created from the following questions:
   - BC4GST01 Instructional materials (e.g. textbooks)
   - BC4GST02 Budget for supplies (e.g. paper, pencils)
   - BC4GST03 School buildings and grounds
   - BC4GST04 Heating, cooling, lighting systems
   - BC4GST05 Instructional space and classrooms
   - BC4MST07 Computers for mathematics instruction
   - BC4MST08 Computer software for mathematics instruction
   - BC4MST09 Calculators for mathematics instruction
   - BC4MST10 Library materials relevant to mathematics instruction
   - BC4MST11 Audio-visual resources for mathematics instruction
2. Extent to which teaching in TIMSS class is limited by a shortage in equipment, BCDEQUPS, was based on the following questions:
   - BT4MLI09 Shortage of textbook for student use
   - BT4MLI10 Shortage of other instructional equipment for student use
   - BT4MLI11 Shortage of equipment for your use in demonstrations and other exercises
   - BT4MLI12 Inadequate physical facilities
   - BT4MLI13 High student-teacher ratio
3. Extent to which teaching in TIMSS class is limited by a shortage in computer resources, BCDCOMPS, was based on the following questions:
   - BT4MLI06 Shortage of computer hardware
   - BT4MLI07 Shortage of computer software
   - BT4MLI08 Shortage of support for using computers

All composites were recoded into dummy variables with a higher level of shortage coded as "0" and lower level of shortage coded as "1". Details regarding the way in which the composites were created are given in Appendix B.

Tables 1-3, summarizes the results of the cross-tabulation analyses aimed at examining possible differences in school resources for the three groups. Results show some differences in school resources between the three groups. With respect to the extent teachers regard computer hardware, software and support as a shortage in their school (BCDCOMPS), the

lowest percentage (7%) is recorded for the Israeli Hebrew schools. In contrast, for more than 20 per cent of students in Israeli Arab Schools and Palestinian Arab schools such a shortage is recorded.

A similar difference in resources emerges for the other two school resource variables. Thus, the lowest percentage of shortage in equipment (BCDEQUPS) is shown for Israeli Hebrew schools (2 %) compared to nine per cent in Palestinian Arab schools and 15 per cent in Israeli Arab schools. Likewise, for 56 per cent of students in Israeli Hebrew a low level of buildings and classroom space and mathematics specific resources compared with 81 per cent in Palestinian Arab schools and 86 per cent in Israeli Arab schools. In other words, while still more than half of students in Hebrew-speaking schools are taught in schools with shortages in terms of physical infrastructure and mathematics specific resources, this percentage rises to more than 80 percent in Palestinian Arab schools and more than three quarters in Israeli Arab schools.

Below each cross-tabulation table, the chi-square (X^2) statistics is given to examine whether or not any difference between the three groups (i.e. Palestinian Arab Schools, Israeli Hebrew Schools and Israeli Arab Schools) in terms of the school resources available to them (i.e. BCDCOMPS, BCDEQUPS and BCDSRMI) is significant. In addition, Cramer's V^2 has been calculated to evaluate the strength of the relationships. Results show an association for BCDCOMPS and BCDSRMI which border on being medium (r=0.24 and 0.28 respectively), and a small association for BCDEQUPS (r=0.15)[3].

The Jackknifing method (JK2) was additionally applied using WesVar (v5.1.17) as it produces the Rao-Scott chi-square test which is a cluster design-adjusted version of Chi-square. For results of the Rao-Scott (JK2) method of contingency and chi-square analyses, see Appendix E.

[2] Chi-square and Cramer's V statistics are used as they are considered appropriate test for categorical data.
[3] For an operational definition of small, medium, and large effect size indexes see Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159.

Table 1: Contingency table of Groups associated with shortage in computer resources limit teaching (SCRLT)			
Groups of analysis	**BCDCOMPS**		
	Shortage does limit teaching	**Shortage does not limit teaching**	**Total**
Palestinian Arab Schools	26680	64295	90975
	29	**71**	
	79	52	
Israeli Hebrew Schools	3552	44251	47803
	7	**93**	
	10	36	
Israeli Arab Schools	3648	13983	17631
	21	**79**	
	11	11	
Total	33880	122529	156409
	22	78	100

Statistic	*DF*	*Value*	*Prob*
Chi-Square	**2**	8865	**<.0001**
Phi Coefficient		0.24	
Contingency Coefficient		0.23	
Cramer's V		**0.24**	

Table 2: Contingency table of Groups associated with shortage in equipment resources limit teaching (SERLT)			
Groups of analysis	**BCDEQUPS**		
	Shortage does limit teaching	**Shortage does not limit teaching**	**Total**
Palestinian Arab Schools	7949	83814	91763
	9	**91**	
	68	58	
Israeli Hebrew Schools	1138	46308	47446
	2	**98**	
	10	32	
Israeli Arab Schools	2609	14987	17596
	15	**85**	
	22	10	
Total	11696	145109	156805
	7	93	100

Statistic	*DF*	*Value*	*Prob*
Chi-Square	**2**	3337	**<.0001**
Phi Coefficient		0.15	
Contingency Coefficient		0.14	
Cramer's V		**0.15**	

Table 3: Contingency table of Groups associated with availability of school resources for Mathematics Instructions (ASRMI)			
Groups of analysis	**BCDSRMI**		
	Low	**High**	**Total**
Palestinian Arab Schools	74676	17933	92609
	81	**19**	
	59	38	
Israeli Hebrew Schools	32229	25833	58062
	56	**44**	
	26	55	
Israeli Arab Schools	19144	3074	22218
	86	**14**	
	15	7	
Total	126049	46840	172889
	73	27	100

Statistic	*DF*	*Value*	*Prob*
Chi-Square	**2**	13677	**<.0001**
Phi Coefficient		0.28	
Contingency Coefficient		0.27	
Cramer's V		**0.28**	

Tables 1-3 *Summary of the cross-tabulation analyses for the three school resource composites*

Descriptive and regression analyses

Tables 4 to 9 summarize the results of the descriptive and regression analyses aimed at examining possible differences in mathematics achievement associated with school resources for the three groups.

In Table 4, results show differences in mathematics achievement associated with the availability of school resources for mathematics instruction between the three groups. It can be seen that in Palestinian Arab schools and Israeli Arab schools higher achievement is recorded for schools with a greater availability of school resources. In the Israeli Hebrew Schools, in contrast, the achievement level is similar for schools with high and low availability of resources for mathematics instruction. The results of the regression analysis in Table 5 show that the difference is only significant for the Palestinian Arab Schools in that schools with greater availability of resources perform at a significantly[4] higher level than schools with lower availability of school resources for mathematics instruction.

Table 4: Differences in mathematics achievement associated with availability of school resources for Mathematics Instructions (ASRMI)

Groups of analysis	ASRMI	N	TOTWGT	MNPV[5]	MNPV_SE	PCT[6]	PCT_SE
Palestinian Arab Schools	Low	3395	74676	362	4.2	81	3.2
	High	983	17933	390	5.9	19	3.2
Israeli Hebrew Schools	Low	1257	32229	487	7.5	56	5.7
	High	962	25833	484	8.3	44	5.7
Israeli Arab Schools	Low	783	19144	404	6.6	86	5.0
	High	134	3074	444	30.4	14	5.0

Table 5: Regression Analysis for differences in mathematics achievement associated with availability of school resources for Mathematics Instructions

Groups of analysis	N	MULT_RSQ	SS_TOTAL	SS_REG	B00	B00_SE	B01	B01_SE
Palestinian Arab Schools	4378	0.012	971822404	11320762	362	4.2	28	7.6
Israeli Hebrew Schools	2219	0.000	488022300	123933	487	7.5	-3	11.2
Israeli Arab Schools	917	0.021	207120531	4302161	404	6.6	40	31.4

In Table 6, results are presented regarding differences in mathematics achievement associated with shortage in schools' computer resources between the three groups. The results of the regression analysis (see Table 7), however, suggest that none of these differences are

[4] Value of Alpha, (Confidence level %): $\alpha = 0.05$, (95.00 %)

[5] Mean of the five plausible values computed in line with the theory stated in Ch11of the technical report for TIMSS 2007.

[6] Percentage of students.

significant as none of the coefficients for the predictor (i.e. B01) exceeds twice the corresponding standard error.

Table 6: Differences in mathematics achievement associated with shortage in computer resources limit teaching (SCRLT)

Groups of analysis	SCRLT	N	MATWGT[7]	MNPV	MNPV_SE	PCT	PCT_SE
Palestinian Arab Schools	Shortage does limit teaching	1205	26680	356	8.2	29	4.0
	Shortage does not limit teaching	3073	64295	372	4.5	71	4.0
Israeli Hebrew Schools	Shortage does limit teaching	156	3552	484	11.5	7	2.2
	Shortage does not limit teaching	1726	44251	489	6.0	93	2.2
Israeli Arab Schools	Shortage does limit teaching	152	3648	396	10.7	21	7.7
	Shortage does not limit teaching	614	13983	413	10.6	79	7.7

Table 7: Regression Analysis for differences in mathematics achievement associated with shortage in computer resources limit teaching

Groups of analysis	N	MULT_RSQ	SS_TOTAL	SS_REG	B00	B00_SE	B01	B01_SE
Palestinian Arab Schools	4278	0.005	957210957	5058337	356	8.2	16	9.8
Israeli Hebrew Schools	1882	0.000	399525835	77843	484	11.5	5	12.8
Israeli Arab Schools	766	0.005	160047781	777354	396	10.7	16	16.1

In Table 8, differences in mathematics are presented associated with shortage in equipment (e.g. textbooks, high student-teacher ratio) between the three groups. Results of the simple regression analyses in Table 9, however, show no significant differences associated with shortage in equipment resources for the three groups of analysis.

[7] Mathematics teacher weight.

Table 8: Differences in mathematics achievement associated with shortage in equipments resources limit teaching (SERLT)

Groups of analysis	SERLT	N	MATWGT	MNPV	MNPV_SE	PCT	PCT_SE
Palestinian Arab Schools	Shortage does limit teaching	400	7949	351	13.5	9	2.0
	Shortage does not limit teaching	3914	83814	369	3.7	91	2.0
Israeli Hebrew Schools	Shortage does limit teaching	49	1138	478	30.6	2	1.0
	Shortage does not limit teaching	1834	46308	490	5.5	98	1.0
Israeli Arab Schools	Shortage does limit teaching	101	2609	387	19.6	15	5.9
	Shortage does not limit teaching	664	14986	412	9.8	85	5.9

Table 9: Regression Analysis for differences in mathematics achievement associated with shortage in equipments resources limit teaching

Groups of analysis	N	MULT_RSQ	SS_TOTAL	SS_REG	B00	B00_SE	B01	B01_SE
Palestinian Arab Schools	4314	0.003	964457065	2437935	351	13.5	18	13.9
Israeli Hebrew Schools	1883	0.000	391628439	169797	478	30.6	12	31.1
Israeli Arab Schools	765	0.008	164111699	1383633	387	19.6	25	21.9

HLM analyses

Although the analyses reported in the previous section provide first insights into the differences in the availability of school resources and their relationship to mathematics achievement, they are limited in two ways. First, they consider only bivariate relationships between achievement and one variable at time. Second, they do not allow for the multilevel nature of the data where achievement is measured at the student level and school resources are measured at the schools level. Hence, results of a multilevel model which, for each of the three school types, examines simultaneously the relationship of the three school resource constructs on mathematics achievement while taking into account students' home background in terms of home possessions and parental education, are presented and discussed in this section.

One of the first results of interest in an HLM analysis is to examine the variance associated with the levels in the analysis. In addition to the number of schools and students in the analysis, Table 10 presents results of the estimation of variance components (column 3-6) that are required to calculate the variance (a) associated with the student and school levels

respectively (columns 7 and 8) and (b) accounted for between students and schools (columns 9 and 10). Usually, the variance accounted for would be calculated for a final model in which only significant effects were retained. However, since the aim of the analyses in this paper was to examine possible differences in the effects of school resources on mathematics achievement for the three kinds of schools, results were calculated for the initial model which included the same variables.

Table 10 *Estimation of variance components*

			Estimation of variance components for				Variance associated with		Variance accounted for by initial model between	
	N Sch.	N std	Fully unconditional model		Initial model					
			schools ($\hat{\tau}_\pi$)	students ($\hat{\sigma}^2$)	schools ($\hat{\tau}_\pi$)	students ($\hat{\sigma}^2$)	schools	students	schools	students
Palestinian Arab schools	143	4097	2107.00	8245.54	1682.49	7470.31	0.20	0.80	0.20	0.09
Israeli Arab schools	30	769	2208.25	6773.51	1530.13	6545.63	0.25	0.75	0.31	0.03
Israeli Hebrew schools	81	1878	2653.32	5835.92	2342.62	5203.09	0.31	0.69	0.12	0.11

It can be seen from Table 10 that the variance in mathematics achievement between schools is lowest in Palestinian schools (20%), higher for the Israeli Arab schools (25%) and highest between the Israeli Hebrew schools. In other words, differences between schools are greatest for Israeli Hebrew schools, followed by Israeli Arab schools and lowest between Palestinian schools. Correspondingly, differences in achievement between students are greatest in Palestinian schools (80%), smaller for students in Israeli Arab schools (75%) and smallest between students in Israeli Hebrew schools (69%).

When examining how much of the variance is explained by the initial model in the three kinds of schools, differences also emerge. Thus, the largest amount of variance between schools that is accounted for by the model is recorded for the Israeli Arab schools (31%), followed by the Palestinian schools (20%) and the Israeli Hebrew schools (12%). This relatively large amount of explained variance for the Israeli Arab schools is interesting given that they are not the schools with the largest variance associated with the school level. At the student level, the model has the largest explanatory power for students in Israeli Hebrew schools (11%), followed by students in Palestinian schools (9%). Again, this is of interest as one might have expected the explanatory power to be greatest where the largest differences can be observed (i.e. PA at level-1) The variables in the initial model explain the least of the variance between students in Israeli Arab schools (3%).

Table 11 provides a summary of the effects that emerge from the HLM analyses. The school resource variable for which a significant effect on achievement is found in Palestinian and the Israeli Arab schools is BCDCOMPS, which represents the teachers' indications of shortages of computer hardware, software and support at schools. Thus, students in schools in which teachers report less of a shortage on the computer related matters perform at a higher level than students in schools where teachers report a greater shortage.

Table 11 *HLM analysis – Summary*

	Palestinian Arab schools	**Israeli Arab schools**	**Israeli Hebrew schools**
Level-1, Students			
ITSEX (Gender)	ns	ns	ns
PAREDU (Parental education)	✓	ns	✓
HMEPOSS (Home possessions)	✓	✓	ns
Level-2, Schools			
BC4GSDIR (% students from economically disadvantaged backgrounds)	ns	ns	✓
BC4GTENR (Total enrolment)	ns	✓(-)	ns
BCDSRMI (School material resources)	ns	ns	ns
BCDCOMPS (School computers resources)	✓	✓	ns
BCDEQUPS (School equipment resources)	ns	ns	ns
Interaction effects	none	none	none

Notes:

✓ Significant effect on mathematics achievement/Significant interaction effect of school resource on relationship between level-1 variable and achievement. Except for the effect of BC4GTENR, which is negative, all other effects are positive (for coding of variables see Appendix B).

ns Effect not significant.

It can be seen that the other two school resource variables, namely the shortage of equipment and the school resources for mathematics instruction, no significant effect on achievement are found. This result suggests that differences in equipment of schools in terms of inadequate physical facilities or a high student-teacher ratio do not contribute to differences in achievement in any of the three kinds of schools. Likewise, principals' reported limitations with respect to general and mathematics specific resources do not emerge as significant predictors of achievement in the three models, after students' home background status and schools socio-economic status have been taken into account at the appropriate levels.

Two further significant level-2 effects on achievement emerge, one in the Israeli Arab schools and one in the Israeli Hebrew schools. In the Israeli Arab schools, total school enrolment has a negative effect on achievement indicating that students in larger schools perform at a lower level than students in smaller schools. In the Israeli Hebrew schools, the proportion of students from economically disadvantaged homes has an effect whereby schools with lower than 50 per cent of students from such homes perform at a higher level than schools where more than half of student come from such homes. No such differential effect of socio-economic intake of the school is found for the Israeli Arab or Palestinian schools.

No interaction effects are found in any of the three HLM models. This means that none of the three school resource variables either amplifies or reduces the relationship between home background in terms of possessions or parental education and mathematics achievement.

While the summary table above indicates whether or not the effects examined in the initial model are significant, Tables 12 to 14 present details regarding the size of the coefficients and the associated standard error of those variables that were found to be significant and included in the final model.

Table 12 *Final model – Schools in PA*

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	312.012394	11.706658	26.653	141	0.000
BCDCOMPS, G01	26.326412	11.420779	2.305	141	0.023
For PAREDU slope, B1					
INTRCPT2, G10	10.016921	1.941782	5.159	100	0.000
For HMEPOSS slope, B2					
INTRCPT2, G20	30.561835	6.014050	5.082	879	0.000

The value of the intercept indicates the mathematics score when the values of the predictors in the model are zero. Hence, the average performance of students with a low level of home possessions whose parents have not completed school and who attend schools in which teachers indicate a shortage of computer hardware, software and support is a score of 312 with a standard error of 11.7. This score increases by 26 for schools in which teachers do not report such shortages with regard to computer equipment and support and by 31 for students from homes with high levels of possessions. The third coefficient indicates an increase of about 10 points in average performance for each additional level of education that has been completed by parents (i.e. lower secondary, upper secondary, post-secondary non tertiary, first degree, beyond first degree).

Table 13 *Final model –Arab-speaking schools in Israel*

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	397.030420	17.439666	22.766	27	0.000
BC4GTENR, G01	-0.061495	0.026004	-2.365	27	0.026
BCDCOMPS, G02	48.147909	19.094745	2.522	27	0.018
For HMEPOSS slope, B1					
INTRCPT2, G10	25.981410	12.148341	2.139	66	0.036

In the final model for the Arab-speaking schools in Israel three direct effects emerge (see Table 13). At the school level, size of school and computer shortage have a direct effect on achievement. The negative effect of total enrolment indicates smaller schools perform at a higher level. More specifically, for each additional student in the school, the performance decreases by 0.06. The positive effect of BCDCOMPS indicates that schools in which teachers do not report a shortage of computer hardware, software and support, the average score of 397 is increased by 48 points. At the student level, the direct effect of HMEPOSS indicates that students with a higher number of possessions at home (i.e. calculator, computer, study desk, dictionary, internet connection, TV, video camera, dishwasher, air conditioning) perform 26 points higher in mathematics than students from less affluent homes.

The two positive interaction effects of BC4GTENR and BCDCOMPS on the slope of HMEPOSS indicate that this effect of home possessions on achievement is amplified in smaller schools and in schools where teachers do not report computer related shortages. In other words, the differences in mathematics achievement between students from more and less affluent homes is increased further in smaller schools and schools where teachers do not report shortages with respect to computer hardware, software and support.

Table 14 *Final model – Hebrew-speaking schools in Israel*

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	420.585393	19.966980	21.064	79	0.000
BC4GSDIR, G01	33.194494	16.123316	2.059	79	0.042
For PAREDU slope, B1					
INTRCPT2, G10	14.535227	2.694969	5.393	40	0.000

Of the three models, the smallest number of effects emerges as being significant in the final model for Hebrew-speaking schools in Israel. Here, only two variables have a non-trivial effect and both are measures of socio-economic background. At the school level, students in schools with less than 50 per cent of students from economically disadvantaged homes perform 33 points higher than the 421 average score than students in schools with more than 50 per cent of students from economically disadvantaged homes. At the student level, for each additional level of completed parental education, mathematics achievement increases by 15 points. Thus, school resources, school size, student gender or home possessions do not contribute significantly to explaining differences in mathematics achievement. However, a school's intake in terms of the percentage of students from economically disadvantaged homes as well as parental education emerge as significant predictors of achievement, emphasizing the importance of socio-economic background in Hebrew-speaking schools in Israel.

Summary and conclusion

The findings of this study can best be summarized by answering the three research questions posed at the beginning of the paper. First, results of the cross-tabulation analyses showed that school resources differed between the three groups of interest, namely (a) Palestinian schools, (b) Israeli Hebrew-speaking schools and (c) Israeli Arab-speaking schools. Hebrew-speaking schools in Israel recorded lower levels of resource shortages with respect to computers, other equipment, buildings and classrooms as well as resources specific to mathematics instruction. Second, the relationship between school resources and students' achievement in mathematics in TIMSS 2007 was found to differ between the three groups of schools. Thus, no effects of school resources on achievement emerged for the Hebrew-speaking schools in Israel, probably because the differences between the resource levels of the schools in that group were not as large as they were between schools in the other two groups. In Arab-speaking schools in Israel as well as the Palestinian schools, the level of shortages regarding computer hardware, software and support had an effect on achievement with schools recording less shortages performing at a higher level in mathematics. The other two school resource variables, namely shortages in other equipment as well as limitations as regards buildings, classrooms and mathematics-specific instructional equipment, did not contribute to explaining differences in mathematics achievement. Third, no interaction effects emerged indicating that none of the three school resource variables was able to reduce the relationship between home background in terms of possessions and parental education and mathematics achievement.

In conclusion, the results presented in this paper point to the importance of adequate computer hardware, software and support in the Arab-speaking schools in Israel and PA and the large effects of student's home background status at the student level and socio-economic status at school level in Hebrew-speaking schools in Israel.

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Appendix A *List of variables in the analyses*

School questionnaire

Variable name	***Variable label***
BC4GTENR	Total school enrolment
BC4GSBED	Percentage of student from economically disadvantaged homes

Extent to which instruction is affected by a shortage or inadequacy of (BCDSRMI):

BC4GST01	Instructional materials (e.g. textbooks)
BC4GST02	Budget for supplies (e.g. paper, pencils)
BC4GST03	School buildings and grounds
BC4GST04	Heating, cooling, lighting systems
BC4GST05	Instructional space and classrooms
BC4MST07	Computers for mathematics instruction
BC4MST08	Computer software for mathematics instruction
BC4MST09	Calculators for mathematics instruction
BC4MST10	Library materials relevant to mathematics instruction
BC4MST11	Audio-visual resources for mathematics instruction

Teacher questionnaire

Extent to which teaching in TIMSS class is limited by:

(Shortage in equipment, BCDEQUPS)

BT4MLI09	Shortage of textbook for student use
BT4MLI10	Shortage of other instructional equipment for student use
BT4MLI11	Shortage of equipment for your use in demonstrations and other exercises
BT4MLI12	Inadequate physical facilities
BT4MLI13	High student-teacher ratio

(Shortage in computer resources, BCDCOMPS)

BT4MLI06	Shortage of computer hardware
BT4MLI07	Shortage of computer software
BT4MLI08	Shortage of support for using computers

"In our analyses, BCDCOMPS and BCDEQUPS were considered at level-2 (i.e., the school level) as the reference point of the questions was the TIMSS class at school".

Student questionnaire

ITSEX	Sex of student

Index indicating home possessions (HMEPOSS) built from the following questions:

BS4GTH01	Calculator
BS4GTH02	Computer
BS4GTH03	Study desk
BS4GTH04	Dictionary
BS4GTH05	Internet connection
BS4GTH06	Country-specific
BS4GTH07	Country-specific
BS4GTH08	Country-specific
BS4GTH09	Country-specific

The country-specific home possessions for the two countries in the analyses were as follows:

For Israel:

BS4GTH06	Two TVs, plasma screen
BS4GTH07	Video camera
BS4GTH08	Air conditioning
BS4GTH09	Dishwasher

For PA, only two of the four possible country-specific options were spelt out:

BS4GTH06 TV without satellite

BS4GTH07 TV with satellite

Index indicating parental education (PAREDU) taking the highest value from the following questions:

BS4GMFED	Highest level of mother's education
BS4GFMED	Highest level of father's education

Appendix B *List of composites and derived variables*

- **BCDSRMI** (Index of Availability of School Resources for Mathematics Instruction - ASRMI)

Source Variable:
BC4GST01, BC4GST02, BC4GST03, BC4GST04, BC4GST05, BC4MST07, BC4MST08, BC4MST09, BC4MST10, BC4MST11
Procedure:
Based on responses to the following question in the school questionnaire:
Is your school's capacity to provide instruction affected by a shortage or inadequacy of any of the following?

- Instructional materials (e.g., textbook) (SCQ2_19a, BC4GST01)
- Budget for supplies (e.g., paper, pencils) (SCQ2_19b, BC4GST02)
- School buildings and grounds (SCQ2_19c, BC4GST03)
- Heating/cooling and lighting systems (SCQ2_19d, BC4GST04)
- Instructional space (e.g., classrooms) (SCQ2_19e, BC4GST05)
- Computers for Mathematics instruction (SCQ2_19g, BC4MST07)
- Computer software for Mathematics instruction (SCQ2_19h, BC4MST08)
- Calculators for Mathematics instruction (SCQ2_19i, BC4GST09)
- Library materials relevant to Mathematics instruction (SCQ2_19j, BC4GST10)
- Audio-visual resources for Mathematics instruction (SCQ2_19k, BC4GST11)

Response options: none=1; a little=2; some=3; a lot=4
The index is computed by averaging the responses to the 10 source questions.
1=High=Average of BC4GST01 to BC4GST05 is less than 2 and the average of BC4MST07 to BC4GST11 is less than 2
2=Medium=All other responses combinations
3=Low= Average of BC4GST01 to BC4GST05 is greater than or equal to 3 and the average of BC4MST07 to BC4GST11 is greater than or equal to 3

The index is coded as missing if there are 2 or more source questions of BC4GST01 to BC4GST05 with invalid data OR 2 or more source questions of BC4MST07 to BC4GST11 with invalid data.
Dummy recoding for the Cross-tabulation, regression & HLM analyses:
1 → 1 (High)
2 → 0 (Low)
3 → 0 (Low)

- **BCDCOMPS** (Index of Shortage in Computer Resources Limit Teaching - SCRLT)

Source Variable:
BT4MLI06, BT4MLI07, BT4MLI08
Procedure:
Based on responses to the following question in the teacher questionnaire:
In your view, to what extent do the following limit how you teach the TIMSS class?

- Shortage of computer hardware (TQM2_18f, BT4MLI06)
- Shortage of computer software (TQM2_18g, BT4MLI07)
- Shortage of support for using computers (TQM2_18h, BT4MLI08)

Response options: not applicable=1; not at all=2; a little=3; some=4; a lot=5
The index is computed by averaging the responses to the 3 source questions.
1=Shortage Does Not limit Teaching=Average of BT4MLI06 to BT4MLI08 is less than or equal 4
2=Shortage Does limit Teaching= Average of BT4MLI06 to BT4MLI08 is greater than 4

The index is coded as missing if there are 2 or more source questions of BT4MLI06 to BT4MLI08 with invalid data.
"In our analyses, BCDCOMPS was considered at level-2 (i.e., the school level) as the reference point of the questions was the TIMSS class at school".

Dummy recoding for the Cross-tabulation, regression & HLM analyses:
1 → 1 (Shortage Does Not limit Teaching)
2 → 0 (Shortage Does limit Teaching)

- **BCDEQUPS** (Index of Shortage in Equipments Resources Limit Teaching - SERLT)

Source Variable:
BT4MLI09, BT4MLI10, BT4MLI11, BT4MLI12, BT4MLI13
Procedure:
Based on responses to the following question in the teacher questionnaire:
In your view, to what extent do the following limit how you teach the TIMSS class?

- Shortage of textbooks for student use (TQM2_18i, BT4MLI09)
- Shortage of other instructional equipment for students' use (TQM2_18j, BT4MLI10)
- Shortage of equipment for your use in demonstrations and other exercises (TQM2_18k, BT4MLI11)
- Inadequate physical facilities (TQM2_18l, BT4MLI12)
- High student/teacher ratio (TQM2_18m, BT4MLI13)

Response options: not applicable=1; not at all=2; a little=3; some=4; a lot=5
The index is computed by averaging the responses to the 5 source questions.
1=Shortage Does Not limit Teaching=Average of BT4MLI06 to BT4MLI08 is less than or equal 4
2=Shortage Does limit Teaching= Average of BT4MLI06 to BT4MLI08 is greater than 4

The index is coded as missing if there are 2 or more source questions of BT4MLI09 to BT4MLI13 with invalid data.
"In our analyses, BCDEQUPS was considered at level-2 (i.e., the school level) as the reference point of the questions was the TIMSS class at school".

Dummy recoding for the Cross-tabulation, regression & HLM analyses:
1 → 1 (Shortage Does Not limit Teaching)
2 → 0 (Shortage Does limit Teaching)

- **HMEPOSS** (Index of Home Possession - HPI)

Source Variable:
BS4GTH01, BS4GTH02, BS4GTH03, BS4GTH04, BS4GTH05, BS4GTH06, BS4GTH07, BS4GTH08, BS4GTH09
Procedure:
Based on responses to the following question in the student questionnaire:
Do you have any of these things at your home?

- Calculator (SQ2_5a, BS4GTH01)
- Computer (SQ2_5b, BS4GTH02)
- Study desk/table for your use (SQ2_5c, BS4GTH03)
- Dictionary (SQ2_5d, BS4GTH04)
- Internet connection (SQ2_5e, BS4GTH05)
- Country-specific (SQ2_5f, g, h, i; BS4GTH06, BS4GTH07, BS4GTH08, BS4GTH09)

PA used 2 country-specific options:
TV without satellite for BS4GTH06
TV with satellite for BS4GTH07

Israel used 4 country-specific options:
TVs, plasma screen for BS4GTH06
Video camera for BS4GTH07
Air conditioning for BS4GTH08
Dishwasher for BS4GTH09

Response options: Yes=1; No=2
The index is computed by averaging the responses to the 8, respectively 10 source questions.
1=Yes=Rounded Average is equal to 1
2=No= Rounded Average is equal to 2
The index is coded as missing if there are more than one third of the variables with invalid data.
Dummy recoding for HLM analysis:
1 → 1 (High)
2 → 0 (Low)

- **PAREDU** (Index of Parents Education - PEI)

Source Variable:
BS4GMFED, BS4GFMED
Procedure:
Based on responses to the following questions in the student questionnaire:

- What is the highest level of education completed by your mother (or stepmother or female guardian)?
- What is the highest level of education completed by your father (or stepmother or male guardian)?

Response options:
1 = 'Some ISCED Level 1 or 2, or did not go to school'
2 = 'ISCED 2'
3 = 'ISCED 3'
4 = 'ISCED 4'
5 = 'ISCED 5B'
6 = 'ISCED 5A, first degree'
7 = 'Beyond ISCED 5A'
8 = 'I do not know'

The index is computed by taking the highest value "MAX" of both variables. If one of the answers was "I do not know", the other response had been taken.

The index is coded as missing if both variables are missing.
Recoding for HLM analysis:
1 → 0
2 → 1
3 → 2
4 → 3
5 → (Not used by both countries)
6 → 4
7 → 5
8 → Missing

- **ITSEX** (Student gender)

Source Variable:
ITSEX and BS4GSEX
Procedure:
Based on responses to the Students' information provided by the national centers and the following question in the student questionnaire:

- Are you a girl or a boy?

Response options:
1 = 'Girl'
2 = 'Boy'
Dummy recoding for HLM analysis:
1 → 0
2 → 1

- **BC4GSDIR** (Percentage of student from economically disadvantaged homes)

Source Variable:
BC4GSBED
Procedure:
Based on responses to the following question in the school questionnaire:

- Approximately what percentage of students in your school has the following backgrounds?
  a) Come from economically disadvantage homes.

Response options:
1 = '0 to 10%'
2 = '11 to 25%'
3 = '26 to 50%'
4 = 'More than 50%'

Dummy recoding for HLM analysis:
1 → 1
2 → 1
3 → 1
4 → 0

Appendix C *Descriptive statistics of variables in the HLM analysis*

Table C1 *Descriptive statistics of variables in HLM analysis – PA*

VARIABLE	N	MEAN	SD	MIN	MAX
Level-1, Students					
BSMMAT01	4097	370.02	101.67	6.91	738.06
BSMMAT02	4097	369.21	102.48	5.00	687.74
BSMMAT03	4097	369.09	102.49	5.00	696.57
BSMMAT04	4097	367.35	104.09	19.74	705.52
BSMMAT05	4097	369.90	101.75	11.65	699.03
PAREDU	3687	2.51	1.43	0.00	5.00
ITSEX	4097	0.45	0.50	0.00	1.00
HMEPOSS	4017	0.71	0.45	0.00	1.00
Level-2, Schools					
BC4GSDIR	143	0.43	0.50	0.00	1.00
BC4GTENR	143	752.56	388.10	102.00	1606.00
BCDSRMI	143	0.21	0.41	0.00	1.00
BCDCOMPS	143	0.73	0.44	0.00	1.00
BCDEQUPS	143	0.91	0.29	0.00	1.00

Table C2 *Descriptive statistics of variables in HLM analysis – Israel, Arab schools*

VARIABLE	N	MEAN	SD	MIN	MAX
Level-1, Students					
BSMMAT01	769	409.74	95.08	137.10	690.22
BSMMAT02	769	408.52	96.02	121.48	709.34
BSMMAT03	769	408.28	99.70	130.24	734.18
BSMMAT04	769	409.13	98.77	111.05	650.51
BSMMAT05	769	411.69	94.95	177.68	687.43
PAREDU	660	2.67	1.42	0.00	5.00
ITSEX	769	0.49	0.50	0.00	1.00
HMEPOSS	737	0.87	0.34	0.00	1.00
Level-2, Schools					
BC4GSDIR	30	0.47	0.51	0.00	1.00
BC4GTENR	30	659.10	257.94	217.00	1683.00
BCDSRMI	30	0.17	0.38	0.00	1.00
BCDCOMPS	30	0.83	0.38	0.00	1.00
BCDEQUPS	30	0.90	0.31	0.00	1.00

Table C3 *Descriptive statistics of variables in HLM analysis – Israel, Hebrew schools*

VARIABLE	N	MEAN	SD	MIN	MAX
Level-1, Students					
BSMMAT01	1878	490.87	90.36	127.61	750.29
BSMMAT02	1878	490.18	89.53	170.39	732.49
BSMMAT03	1878	491.32	89.74	120.86	780.74
BSMMAT04	1878	490.55	90.65	134.14	790.01
BSMMAT05	1878	489.90	89.85	160.92	738.94
PAREDU	1263	3.57	1.34	0.00	5.00
ITSEX	1875	0.47	0.50	0.00	1.00
HMEPOSS	1850	0.97	0.17	0.00	1.00
Level-2, Schools					
BC4GSDIR	81	0.79	0.41	0.00	1.00
BC4GTENR	81	693.26	363.56	134.00	1808.00
BCDSRMI	81	0.46	0.50	0.00	1.00
BCDCOMPS	81	0.93	0.26	0.00	1.00
BCDEQUPS	81	0.98	0.16	0.00	1.00

Appendix D *Calculation of variance components and explained variance*

Variance at each level:

Between students $\frac{\hat{\sigma}^2[\text{fully unc.}]}{(\hat{\tau}_{00}[\text{fully unc}] + \hat{\sigma}^2[\text{fully unc.}])}$

Between schools $\frac{\hat{\tau}_{00}[\text{fully unc.}]}{(\hat{\tau}_{00}[\text{fully unc}] + \hat{\sigma}^2[\text{fully unc.}])}$

Proportion of variance explained by initial two-level model:

Between students $\frac{(\hat{\sigma}^2[\text{fully unc.}] - \hat{\sigma}^2[\text{final}])}{\hat{\sigma}^2[\text{fully unc.}]}$

Between schools $\frac{(\hat{\tau}_{\pi}[\text{fully unc}] - \hat{\tau}_{\pi}[\text{final}])}{\hat{\tau}_{\pi}[\text{fully unc.}]}$

Appendix E *Rao-Scott (JK2) method of contingency and chi-square analyses*

Table E1 *Contingency table of Groups association with availability of school resources for Mathematics Instructions (ASRMI)*

Groups of analysis	ASRMI	ESTIMATE	STDERROR	t VALUE	PROB>|T|
Palestinian Arab Schools	Low	81	3.2	24.88	0.00
	High	19	3.2	6.05	0.00
Israeli Hebrew Schools	Low	56	5.7	9.73	0.00
	High	44	5.7	7.78	0.00
Israeli Arab Schools	Low	86	5.0	17.38	0.00
	High	14	5.0	2.80	0.01

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	2.0	572	0.00
RS2	2.0	25	0.00
RS3	1.7	21	0.00

WESVAR VERSION NUMBER :	v5.1.17
FULL SAMPLE WEIGHT :	TOTWGT
REPLICATE WEIGHTS :	RWTS1...RWTS75
VARIANCE ESTIMATION METHOD :	JK2
FINITE POPULATION CORRECTION FACTOR :	1
VALUE OF ALPHA (CONFIDENCE LEVEL %) :	0.05000 (95.00000 %)
DEGREES OF FREEDOM :	75
t VALUE :	1.992
SUBSET CRITERIA :	
ANALYSIS VARIABLES :	Group_B, ASRMI
TABLE(S) :	Group_B*ASRMI
FACTOR(S) :	1
NUMBER OF REPLICATES :	75
NUMBER OF OBSERVATIONS READ :	7794
WEIGHTED NUMBER OF OBSERVATIONS READ :	179559

Table E2 *Contingency table of Groups association with shortage in computer resources limit teaching (SCRLT)*

Groups of analysis	SCRLT	ESTIMATE	STDERROR	t VALUE	PROB>|T|
Palestinian Arab Schools	Shortage limit teaching	29	4.0	7.38	0.00
	Shortage does not limit teaching	71	4.0	17.78	0.00
Israeli Hebrew Schools	Shortage limit teaching	7	2.4	3.06	0.00
	Shortage does not limit teaching	93	2.4	38.10	0.00
Israeli Arab Schools	Shortage limit teaching	21	10.8	1.92	0.06
	Shortage does not limit teaching	79	10.8	7.34	0.00

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	2.0	393	0.00
RS2	2.0	11	0.00
RS3	1.5	9	0.00

WESVAR VERSION NUMBER :	v5.1.17
FULL SAMPLE WEIGHT :	MATWGT
REPLICATE WEIGHTS :	RWTS1...RWTS75
VARIANCE ESTIMATION METHOD :	JK2
FINITE POPULATION CORRECTION FACTOR :	1
VALUE OF ALPHA (CONFIDENCE LEVEL %) :	0.05000 (95.00000 %)
DEGREES OF FREEDOM :	75
t VALUE :	1.992
SUBSET CRITERIA :	
ANALYSIS VARIABLES :	Group_B, SCRLT
TABLE(S) :	Group_B*SCRLT
FACTOR(S) :	1
NUMBER OF REPLICATES :	75
NUMBER OF OBSERVATIONS READ :	7794
WEIGHTED NUMBER OF OBSERVATIONS READ :	176464.421

Table E3 *Contingency table of Groups association with shortage in equipment resources limit teaching (SERLT)*

Groups of analysis	SERLT	ESTIMATE	STDERROR	t VALUE	PROB>|T|
Palestinian Arab Schools	Shortage limit teaching	9	2.0	4.25	0.00
	Shortage does not limit teaching	91	2.0	44.86	0.00
Israeli Hebrew Schools	Shortage limit teaching	2	1.2	1.97	0.05
	Shortage does not limit teaching	98	1.2	79.99	0.00
Israeli Arab Schools	Shortage limit teaching	15	6.5	2.29	0.03
	Shortage does not limit teaching	85	6.5	13.13	0.00

CHI-SQUARE	D.F.	VALUE	PROB
PEARSON	2.0	148	0.00
RS2	2.0	6	0.06
RS3	1.5	4	0.08

WESVAR VERSION NUMBER :	v5.1.17
FULL SAMPLE WEIGHT :	MATWGT
REPLICATE WEIGHTS :	RWTS1...RWTS75
VARIANCE ESTIMATION METHOD :	JK2
FINITE POPULATION CORRECTION FACTOR :	1
VALUE OF ALPHA (CONFIDENCE LEVEL %) :	0.05000 (95.00000 %)
DEGREES OF FREEDOM :	75
t VALUE :	1.992
SUBSET CRITERIA :	
ANALYSIS VARIABLES :	Group_B, SERLT
TABLE(S) :	Group_B*SERLT
FACTOR(S) :	1
NUMBER OF REPLICATES :	75
NUMBER OF OBSERVATIONS READ :	7794
WEIGHTED NUMBER OF OBSERVATIONS READ :	176464.421