

Is Less Really More? On the Relationship Between Class Size and Educational Achievement in Israel

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Abstract

The impact of class size on pupil achievement has been a matter of concern to education professionals for many years. Parents and teachers argue that large classes are detrimental to learning, but education researchers have yet to reach an unequivocal conclusion on the topic. The main challenge in assessing the relationship between class size and pupil performance is controlling for class placement, which is not random and could therefore potentially distort findings. The present study seeks to answer the question of class size impact through a hierarchical analysis of the scores of pupils who took the Israeli Meitzav exams in 2006 and 2009.¹ The study finds that, although the relationship between class size and achievement is actually positive — that is, pupils in larger classes perform better scholastically — it is spurious and is affected by other factors. Controlling for earlier achievements and for parental educational levels, no significant relationship was found between class size and achievement.

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1 Meitzav is a Hebrew acronym for Measurement of School Growth and Efficiency.

Introduction

Recent years have witnessed vigorous public debate in Israel regarding class size. In 2014, an organization of parents of primary school pupils launched a campaign to reduce the number of pupils per class. The effort was dubbed the “Sardine Protest,” reflecting claims that overcrowded classrooms were negatively affecting pupils. The campaign drew legitimacy from international data on class size and pupil achievement. Of the 34 countries that participated in the relevant OECD study, Israel placed fifth in terms of large class size, with 27 pupils per primary school class and 32 pupils per middle school class. The mean OECD figures were 21 pupils per class at the primary level and 24 at the middle school level (OECD, 2011). At the same time, a look at Israeli pupil achievements on the OECD’s international PISA (Programme for International Student Assessment) exams, which test 15-year-olds in mathematics, reading and science, shows Israeli pupils to be in the lower half of the attainment ranking for all subjects tested. Of the 65 countries that participated in PISA 2012, Israel ranked 41st in math and science, and 34th in reading (OECD, 2014). The data from these studies raise questions about the relationship between class size and pupil achievement.

A report submitted to the Knesset Committee on Education, Culture and Sports in 2015 pointed out that the maximum class size in Israeli schools, in accordance with previous Ministry of Education administrative decisions, is 40 pupils at all grade levels. In 2008, a government resolution called for the gradual reduction of class size to 32, and Minister of Education Naftali Bennett’s plan for implementing the decision within five years in all Israeli primary schools was approved in late 2015. The plan also called for teachers-in-training to be assigned to classrooms to help teachers cope with overly large classes by lowering the pupil-teacher ratio (Weissblei and Wininger, 2015; Ministry of Education, 2015).

Despite these efforts and governmental measures, it is still unclear whether class size actually affects pupil achievement, and if so, how. Although the question has generated interest among researchers, education professionals and lawmakers for many years, no unequivocal answer has been found to date. Studies on pupil achievement point to a number of other factors that affect educational performance, including pupil abilities, socioeconomic background, quality of teaching, and the like. Moreover, in many cases, class size is not randomly determined but rather reflects systemic, educational and economic considerations that themselves could potentially affect pupil attainment. The main issue is that of the placement

of relatively low-achieving pupils in small classes, in the hope that this will help them improve their performance. Given the extensive resources and high costs involved in reducing Israeli class sizes, the relationship between class size and pupil achievement is worthy of further study.

This study aims to contribute to the research discussion from a local perspective, by looking at the achievements of Israeli pupils studying in official educational frameworks. The research question is: When controlling for differential class placement, based on prior achievement and socioeconomic level, is class size related to pupil achievement? To test the hypothesis, the researchers used panel data (observations gathered at several points in time) that was generated by merging Meitzav exams administered in Israel in 2006 and 2009. The data were analyzed using hierarchical linear modeling. This method allows us to differentiate between the contribution of individual and class attributes to pupil achievement.

Earlier research on the relationships between class size and pupil achievement

Small classes enjoy great popularity among teachers, parents and policy makers, thanks to the perception that they constitute better learning environments. Teachers of small classes tend to devote more attention to their pupils (Mueller, Chase, and Walden, 1988) – resulting in, for example, greater time allocated per pupil than in large classes (Betts and Shkolnik, 1999). Noise levels in small classes are lower (Bourke, 1986) and disruptions are fewer (Finn, Pannozzo and Achilles, 2003; Hruz, 2000). No differences were found in teaching method – e.g., frontal instruction versus independent work – on the part of teachers in different sized classes (Shapson, Wright, Eason, and Fitzgerald, 1980). However, positive teaching and learning experiences were shown to be more prevalent in small classes – although, as will be discussed, small class size does not result in higher pupil achievements.

Pupils are not assigned to classes at random. Schools place pupils in different classes based on a range of variables, primarily prior achievement and educational ability (Ayalon and Yogev, 1997; Oakes, 1995; Yogev, 1984). For instance, MABAR (“regular matriculation track”) classes, which are intended to encourage low-achieving pupils, are smaller than other matriculation-track classes. This means that the relationship between class size and pupil attainment stems (entirely or in part) from the education system’s tendency to place relatively weak pupils in small classes, and does not, in principle, show a causal effect of class size on achievement. Another

example is that of honors classes, which are usually small and whose pupils are high-achieving in any case. In this instance as well, we cannot point to a cause-and-effect relationship between class size and achievement, as the class size is determined by the number of outstanding pupils in the school – not vice versa. This being the case, the main methodological challenge when investigating the relationship between class size and achievement is that of controlling, insofar as possible, for differential class placement, so as to determine whether or not the relationship between class size and achievement is spurious. Researchers have tried to address this challenge through an array of methods with conflicting results.

Two groundbreaking studies in the field – Project STAR and Project SAGE – were carried out in the United States during the 1980s and 1990s. Pupils were randomly assigned to classes of different sizes over a period of several years. Various tests were administered during that time to estimate the impact of class size on pupil attainment. The findings showed that pupils in small classes earned higher scores than did pupils in larger classes (Finn, 2002; Mosteller, 1995) and black pupils made greater gains in achievement than did white pupils (Hruz, 2000; Molnar et al., 1999). Heinesen (2010) also found that class size impact is differential, and that small classes do more for boys and for lower-achieving pupils than for girls and higher-achieving pupils. This hypothesis – that small classes are more helpful for certain populations – will be examined further below.

Angrist and Lavy (1999) looked at the relationship between class size and achievement in Israel using an instrumental variable² approach and found that the relationship between them is negative. By contrast, Altinok and Kingdon (2012) examined pupil achievement in subjects studied in different sized classes in 41 countries. In 14 of these countries, significant and negative relationship was found between class size and achievement, but the authors attributed these results to differences in the quality of teaching and in budgetary allocations per pupil. Wößmann and West (2006) compared 13-year-olds studying in two different grades – 7 and 8 – differentiated by size. Of the 11 countries included in the study, a significant negative relationship was found between class size and achievement in only two.

This review attests to the complexity of the topic under discussion. Although the methods used to investigate the relationship between class

2 An instrumental variable is a variable that is correlated with the independent variable (in the present instance, class size), but is not correlated under any conditions with the dependent variable (in this case, pupil achievements). Using an instrumental variable makes it possible to isolate the independent variable's statistical impact on the dependent variable from the impact of other factors that are common to both. (Angrist and Krueger, 2001).

size and pupil achievement have been many and varied, the scholarly community has yet to reach a consensus about the nature of the relationship. In those studies that have shown a negative relationship between class size and performance, the relationship has usually been weak, and has not been uniform across different groups of research subjects. Moreover, the existing literature raises speculation about whether class size has a more substantial impact among children from lower socioeconomic backgrounds than among children from affluent ones.

The present study seeks to contribute to the research discussion by examining the relationship between class size and achievement through the use of data that make it possible to control, to a reasonable degree, for the differential placement of pupils in classes of different sizes. The way in which differences between groups that differ in socioeconomic background and prior achievements affect the strength of the relationship between class size and achievement will be examined as well.

The data

This study is based on an analysis of the Meitzav exams administered by the National Authority for Measurement and Evaluation in Education (RAMA). These tests are meant to determine the degree to which primary school pupils (grades 2 and 5) and middle school pupils (grade 8) meet the requirements of Israeli curricula in four core subjects: English, language arts (Hebrew or Arabic, depending on the sector), mathematics and science/technology. Until 2015, Israeli schools were divided into four clusters approximately equal in size, such that each cluster was representative of all Israeli schools and Meitzav exams were administered in each school (except for those in the Haredi education system) every two years. Starting in 2007, schools were tested on each occasion in alternating subject pairs (English and science/technology, or mathematics and language arts), so that every year 25 percent of the pupils were tested in each of the four subjects.

In addition to the Meitzav achievements, the researchers examined the Ministry of Education's pupil file, which contains background data on pupils (parental educational level, ethnic background and the like). Using a special identification code that the Central Bureau of Statistics assigns to each pupil and to each school, the various files were merged into a database for purposes of the present study (this was carried out in the Ministry of Education's virtual research room). Eighth graders in 2009 who had taken the Meitzav exams as fifth graders in 2006 were identified. This made it possible to build a longitudinal data file since achievement measurements were available for

each identified pupil at two points in time — grade 5 and grade 8.³ Of the four subjects in which pupils are tested in Meitzav, two are studied in homeroom classes (language arts — Hebrew or Arabic — and science/technology), while the other two are often studied in classes divided by ability level. In the dataset, it was impossible to identify an ability-grouping breakdown; only a homeroom breakdown could be identified. Thus, in order to avoid deviation in study group size originating from ability grouping divisions, the present study focuses on pupil achievement in language arts (Hebrew).

Study variables

As noted, the dependent variable is that of pupil performance on the grade 8 Meitzav exams in Hebrew. Below are the independent variables:

Homeroom class size. This variable was calculated by counting the pupils in each of the grade 8 classes that took the Meitzav tests in 2009.

Prior pupil achievement. Achievement was measured in terms of pupil Meitzav scores in grade 5 in all four subjects (Hebrew, science/technology, English and mathematics). These variables represent the pupil's abilities, and also include the effects of other variables that have an impact on prior achievement and on ability: number of siblings, economic status, and the like. Controlling for these variables was meant to neutralize the effects of achievement/ability-based selection on pupil placement in different sized classes.⁴

Education level of the pupil's parents. This was measured in terms of the number of years of schooling of the more-educated parent.

Average parental education level of the pupils in the class. The literature has established that class socioeconomic composition has a substantial impact on achievement (e.g., Rumberger and Palardy, 2005). Moreover, in

3 Due to the unique Meitzav sampling method, only a quarter of the pupils (10,000 pupils per year) have measurements at two different points in time. However, assessments indicate no notable difference between those measured twice and those measured once (Blank and Shavit, 2016).

4 The majority of pupils in the sample were in primary school in 2006 and by 2009 had entered middle school. This means that the composition of the class and its size changed between measurement in grade 5 and in grade 8. The correlation between class size in grade 5 and the size in grade 8 is 0.15.

Israel there is a relationship between class composition and class size, due to the policy of “nurturing” in the Jewish sector, whereby pupils from the lower socioeconomic strata learn in relatively smaller classes (Blass, 2010). This variable was calculated as the class average of parental educational levels and represents the socioeconomic composition of the class.

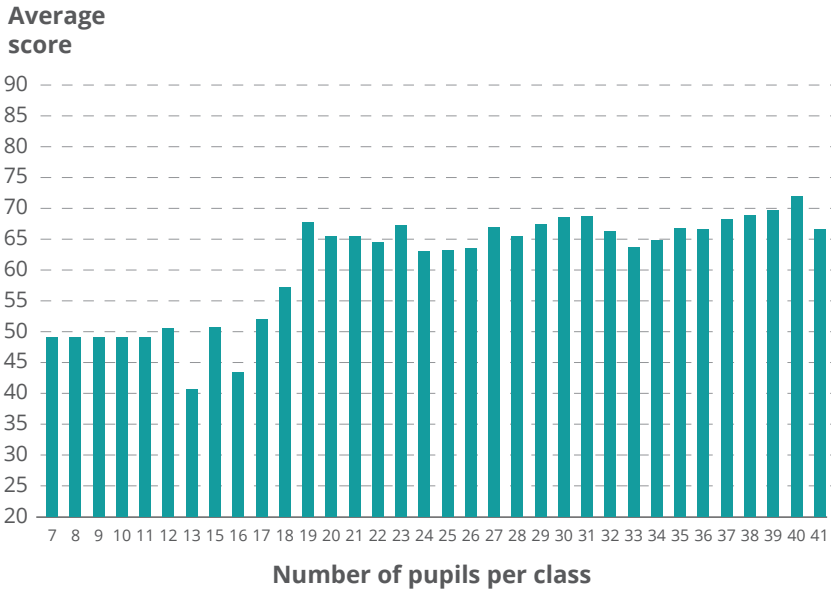
Type of school supervisory framework. This variable distinguishes between state and state religious schools. In Israel, the state religious schools receive supplementary allocations (Blass, Tsur and Zussman, 2010). Moreover, due to gender separation in these schools, some have relatively smaller classes than is common in other state schools (Shir, 2014). It is therefore necessary to control for type of school supervisory framework.

Gender. This variable was introduced due to the recognized differences between girls and boys in educational achievement (e.g., DiPrete and Buchmann, 2013).

1. The relationship between pupil achievement and selected variables

The multivariate analysis will be preceded by a discussion of the relationship between class size and achievement. Figure 1 presents the moving averages of grade 8 achievements in Hebrew by class size. The figure shows that in classes with fewer than 19 pupils there is a positive relationship between class size and achievement, while in classes with more than 19 pupils, the relationship – though also positive – is weaker. A possible reason for this is deliberate placement practice, in which lower-achieving pupils are placed in small classes and stronger pupils in large classes. The figure shows great fluctuation in average achievement among the smaller classes.

Figure 1. Average score in language arts (Hebrew)
By class size, three-year moving average

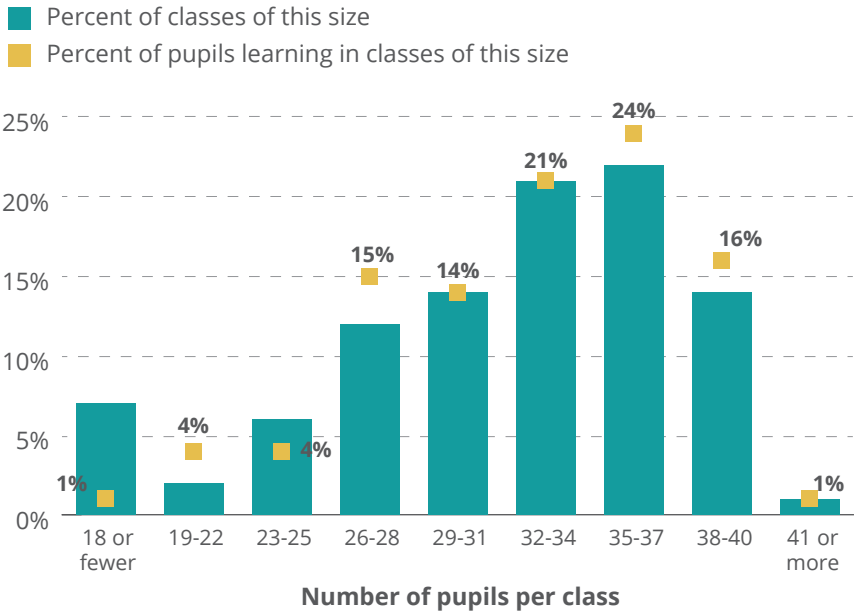


Source: Reut Shafir, Yossi Shavit and Carmel Blank, Taub Center.
Data: Meitzav, 2009.

A possible explanation for the fluctuation is the limited number of those studying in small classes, and the paucity of such classes (Figure 2). The figure shows that the most prevalent Grade 8 class size is 35 to 37 pupils: 22 percent of the classes are of this size, while 24 percent of the pupils study in such classes. Only a very small number of pupils (3 percent) study in classes with fewer than 19 pupils, and the percentage of very small classes (fewer than 19 pupils) is also quite low. The scarcity of small classes and the low percentage of pupils enrolled in them could be a source of measurement “noise” and may not accurately reflect pupil achievement. Also, these classes are liable to distort the analysis, as they are selective to begin with. For this reason, the relationship between class size and achievement was assessed twice: the first time, all classes of all sizes were included, while the second time, pupils studying in classes with fewer than 19 pupils were omitted. These analyses appear in the upcoming section that presents the multivariate analysis.

Figure 2. Distribution of classes and pupil population

By class size



Source: Reut Shafir, Yossi Shavit and Carmel Blank, Taub Center.
 Data: Meitzav, 2009.

Table 1 presents the averages and standard deviations for the research variables. In it we see that the average score on the Hebrew Meitzav is 67. The average score in science and technology is the highest of all the subjects in which fifth-graders were tested (81), while the math score is the lowest (72). The average level of parental education at the pupil level is similar to that at the class level – 13.5 years of schooling. Pupils in state religious schools constitute 20 percent of all pupils in the Jewish education system, and the average class size in Jewish schools is 32.

**Table 1. Averages and standard deviation for the study variables
Among Hebrew-speaking (mother tongue) pupils**

Pupil level variables	Average	Standard deviation
Language arts (Hebrew) score, grade 8	67.32	(20.58)
Science and technology score, grade 5	81.15	(12.61)
Language arts (Hebrew) score, grade 5	76.03	(15.69)
Mathematics score, grade 5	72.11	(19.18)
English (second language) score, grade 5	79.53	(16.35)
Parents' education level (years of schooling)	13.48	(2.83)
Share of boys among all pupils	0.47	(0.49)
State-religious supervision (as share of all Jewish education)	0.20	(0.40)
Number of pupils in the sample	2,944	
Class level variables	Average	Standard deviation
Class size, grade 8	32.39	(5.00)
Parents' education level (average), grade 8	13.63	(1.56)
Number of classes in sample	313	

The number of pupils in the sample differs from the simple multiple of the number of classes by the average class size. The explanation for this is that the sample includes only pupils who took the Meitzav exams in both grade 5 and grade 8. Only about 25 percent of pupils took the Meitzav exams in both grades. For example, in the sample there are four classes of 20 pupils. That is, 80 pupils attended classes of this size in 2009. However, only 39 of these pupils have a score for both periods in time, so only they are included in the sample.

Source: Reut Shafir, Yossi Shavit and Carmel Blank, Taub Center.
Data: Ministry of Education; RAMA.

2. Multivariate analysis

This study is a panel study based on background data for the pupils and their achievement on national achievement exams, controlling for prior attainment. Since pupils in the same class share a number of attributes, including class size, hierarchical linear modeling was carried out. This method facilitates the handling of several levels of data, such as pupils nested within classes. An advantage of this method is the ability to distinguish between the effects of factors at the various levels of analysis, and contend with situations in which observations are interdependent due to belonging to groups at the aggregate level (e.g., to classes). Hierarchical models were estimated in SPSS Mixed procedure.

The analysis was performed using three nested models. Model 1 includes only class size. Model 2 also controls for pupil background variables and for class socioeconomic composition as indicated by the mean of parents' education. Controlling for these variables makes it possible to estimate which part of the relationship between class size and achievement is explained by the selective allocation of pupils with certain attributes to classes of differing sizes. Model 3 looks at whether there are differences in the relationship between class size and achievement among different social strata, and among stronger versus weaker pupils. This test was conducted by adding interactions between class size and mean parental educational as well as between class size and achievement in grade 5.

Table 2 presents the results of the analysis of achievement on the Hebrew Meitzav exams. Examination of Model 1 reveals that class size is positively related to Hebrew achievement, which means that increasing class size raises the Hebrew score. This finding is true for both analysis groups, but is statistically significant only for the group of all pupils. The finding reinforces concerns that class placement is selective, as in the assignment of special education pupils to particularly small classes.

Table 2. The effect of selected variables on pupil achievement on the Hebrew Meitzav exams, 2009

Variable coefficients in the explanatory models for pupil achievement, standard deviation in parentheses

	Model 1		Model 2		Model 3	
	All pupils	Classes of 19+	All pupils	Classes of 19+	All pupils	Classes of 19+
Class size	0.509*	0.229	0.176	0.060	0.201	0.082
	(0.125)	(0.148)	(0.100)	(0.115)	(0.106)	(0.124)
English (second language) score, grade 5			0.108*	0.107*	0.108*	0.106*
			(0.020)	(0.020)	(0.020)	(0.020)
Language arts (Hebrew) score, grade 5			0.447*	0.452*	0.460*	0.465*
			(0.024)	(0.024)	(0.026)	(0.027)
Mathematics score, grade 5			0.177*	0.176*	0.178*	0.177*
			(0.020)	(0.020)	(0.020)	(0.020)
Science/Technology score, grade 5			0.198*	0.195*	0.199*	0.197*
			(0.030)	(0.030)	(0.030)	(0.030)
Parents' education (average), grade 8			0.676*	0.673*	0.643*	0.619*
			(0.118)	(0.118)	(0.134)	(0.135)
Boys (gender variable)			-7.185*	-7.002*	-7.195*	-7.002*
			(0.617)	(0.617)	(0.618)	(0.618)
State-religious (supervision type)			1.981	2.661*	1.953	2.628*
			(1.337)	(1.309)	(1.333)	(1.306)
Hebrew score in grade 5 * Class size					-0.973	-0.888
					(0.888)	(0.895)
Parents' education * Class size					0.058	0.329
					(0.943)	(0.943)
Intercept	50.631*	60.069*	-18.201*	-12.578*	-19.734*	-13.683*
	(4.036)	(4.845)	(5.450)	(5.571)	(5.825)	(6.095)

*p<0.05.

Source: Reut Shafir, Yossi Shavit and Carmel Blank, Taub Center.

Data: RAMA.

Model 2 indicates that class size coefficient declines substantially after adding the control variables, becoming non-significant for both groups.⁵ Prior-achievement coefficients are similar for both groups, indicating that the prior score in Hebrew is the variable with the greatest impact on the grade 8 Hebrew score. As expected, parental education is also positively and significantly related to achievement, but the class mean of parental education (a variable indicative of the class socioeconomic level) is weakly and not-significantly related to achievements for both groups.

The coefficient of the “boys” variable is negative, indicating that girls have an advantage over boys in Hebrew, and the coefficient is similar in size and significance for both analysis groups. The supervisory framework coefficient indicates that pupils in the state religious education system have a two-point advantage over pupils in the state education system, but it is significant only for the group of pupils that are enrolled in classes of all sizes. The emphasis placed on religious studies among the state religious pupil group is likely the source of these pupils’ superior achievements in Hebrew language, along with the extra resources allocated to schools in this supervisory framework.

Model 3 aims to determine whether the relationship between class size and achievement differs among the various populations. Earlier studies indicate that weaker groups, such as ethnic minorities and those belonging to lower socioeconomic strata, are likely to benefit more from smaller classes than are stronger, more affluent groups. This trend can be seen in the two American studies mentioned in the previous section: Project STAR, which found a greater score disparity between black pupils who studied in small classes and black pupils who studied in regular classes, than between white pupils (Finn and Achilles, 1990), and Project SAGE, which produced similar findings. Class size was identified as one of several factors found to have a differential effect on achievement, including the variable impact of class socioeconomic composition on the achievements of boys and girls (Legewie and DiPrete, 2012), and the variable impact of socioeconomic background on parental involvement in school affairs (Lareau, 1987).

5 We estimated several alternative models for the effects of class size on achievement. In one of the models, we included the class size in both grades 8 and 5. This model tests the plausible hypothesis that achievement is affected not only by the size of the current class but also by the sizes of previous classes that the pupil attended. The empirical results refuted the hypothesis showing insignificant effects of both variables. In another alternative model, we tested the hypothesis that the effects of class sizes (both in grades 5 and 8) are quadratic rather than linear. The results of this model, too, yielded insignificant effects of class size.

Two research hypotheses emerge in light of the above:

1. Large classes are more detrimental to the achievements of weak pupils than to those of strong pupils.
2. Large classes are more detrimental to the achievements of pupils of low socioeconomic standing than to pupils of high socioeconomic standing.

Behind these hypotheses lies the assumption that pupils who are strong both scholastically and socioeconomically are better able to compensate for the difficulties posed by the school than weaker pupils.

To test these hypotheses, three dummy variables were created. The first distinguishes between pupils who studied in a larger than average class and pupils who studied in a smaller than average class, in the relevant subject. The second dummy variable distinguishes between pupils with parents whose education level is higher than average and pupils with parents whose education level is lower than average. The third variable distinguishes between pupils whose prior achievements are higher than average in the relevant subject, and pupils whose achievements are lower than average. Afterward, these variables were then used to build two interaction variables by multiplying the first by the other two. To err on the side of caution, the model was also estimated using interaction terms that were computed using continuous (rather than dummy) variables representing class size, parents' education and prior achievements, but no differences in outcome were found between the two versions of the model.

Model 3 presents the coefficients of the variables after adding the interaction variables. In general, neither group showed a substantial change in the coefficient values after the interactions were added. The class coefficient increased slightly but remained non-significant, while the value and significance of the prior achievement coefficients showed no change at all. The gender, supervisory framework and parental education level coefficients also showed no change, while the value of the class average parental education level coefficient increased slightly but remained small and not significant. The hypotheses that class size would have differential impacts on pupils of differing achievement levels or socioeconomic attributes were rejected because the interaction coefficients are not statistically significantly different from zero.

The comparison between Model 1 and 2 indicates that adding the control variables reduces the value of the class size coefficient. This means that the additional variables explain the positive relationship between class size and achievement, and the relationship presented in Model 1 is spurious.

Conclusion and discussion

Policy makers and education professionals devote considerable effort to helping pupils improve their educational achievement; reducing the number of pupils per class is regarded as a tool for attaining this goal. The negative relationship between class size and achievement may be perceived as completely intuitive, as it is hard to imagine that studying in a large group is preferable to studying in a small group. Big classes are generally associated with noise, overcrowding and heterogeneity, while small classes might be viewed as enlarged versions of a private lesson in which each pupil receives individual attention according to his or her needs. Although education researchers have obtained conflicting results regarding the nature of this relationship, teachers, parents, and public figures tend to prefer small classes and work to achieve them.

The present study looks at the topic in the Israeli context, and is important for two main reasons. First, the demand that class sizes be reduced in order to improve pupil achievement – which has been voiced in Israel for a number of years – justifies an investigation into the possible outcomes of such a measure. Second, the Meitzav database makes it possible to control for differential class placement by prior achievement and the socioeconomic background of students, which usually poses a major methodological problem to the study of class size impact. The research question was examined by means of a hierarchical analysis of pupil achievements on the Meitzav exams using three nested models: a model containing only class size, a model controlling for background variables such as prior achievements and parental educational levels, and a model that also includes interaction variables aimed at determining whether class size has a different effect on pupils from populations with weaker educational abilities and lower socioeconomic backgrounds than pupils with high educational abilities from high socioeconomic backgrounds.

The findings indicate that, in contrast to prevailing assumptions, there is actually a positive relationship between class size and achievement: the grades of pupils in large classes are higher. However, this relationship is spurious and is due to the fact that, on the whole, high-achieving pupils

are placed in large classes, while the pupils placed in smaller classes are relatively low achievers. When controlling statistically for parental education levels and prior attainments, the relationship between class size and achievement is not significant. The hypothesis that the impact of class size on achievement varies between social strata and between stronger and weaker pupils was examined in this study as well. This hypothesis was also refuted: no difference in the relationship between class size and achievement was found among the groups.

This study is not without limitations. First, unlike the studies that use instrumental variables to control for spurious relationships between class size and achievement, this study may have controlled more weakly for the effects of these relationships. Yet it is hard to imagine what variables other than prior pupil attainment might have been controlled for, given that the latter embodies the effects of all of the factors that have already been shown to affect achievement. Secondly, this study is limited to a specific age group. Since the only achievement examined were those of pupils in grade 8 compared with their prior achievements in grade 5, we are unable to conclude that there is no negative relationship between class size and achievement among other age groups. To the contrary, some studies have found a differential impact for class size on achievement among other age groups (e.g., Angrist and Lavy, 1999; Finn, 2002). Thus, it could be that a study of other age groups would yield different findings.

Earlier studies found an advantage for small classes of 15 to 25 pupils (e.g., Finn et al., 2003). The findings of the present study, which looks at classes with 19 to 40 pupils, are relevant to a large range of classrooms; it is possible that within this range there is no substantial advantage to small classes. However, this possibility was taken into account early on in the study: we tested whether achievement differences exist between pupils who studied in small classes (up to 24 pupils), medium-sized classes (25 to 30 pupils), and large classes (over 31 pupils). This analysis as well found no relationship between class size and achievement.

It is important to note that the study's findings indicate that class size in and of itself does not ensure improved pupil achievement, although it does facilitate the use of other learning methods — for example, individualized or small-group instruction. These methods make it possible to effectively monitor any learning difficulties displayed by pupils in the class, and to adjust the teaching approach so that these problems can be addressed.

However, it is unclear whether teachers working in small classes do, in fact, take advantage of the possibilities that such classes present, including the teaching methods suited to them. They might be using forms of pedagogy similar to those commonly employed in large classes, and effectively neutralizing the small-class advantage.

References

English

Altinok, Nadir and Geeta Kingdon, (2012), "New Evidence on Class Size Effects: A Pupil Fixed Effects Approach," *Oxford Bulletin of Economics and Statistics*, 74, No. 2, pp. 203-234.

Angrist, Joshua, and Alan B. Krueger (2001), *Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments*, National Bureau of Economic Research No. w8456.

Angrist, Joshua and Victor Lavy (1999), "Using Maimonides' Rule to Estimate the Effect of Class Size on Scholastic Achievement," *Technology*, 114, No. 2, pp. 533-575.

Ayalon, Hanna and Abraham Yogev (1997), "Students, Schools, and Enrollment in Science and Humanity Courses in Israeli Secondary Education," *Educational Evaluation and Policy Analysis*, 19, No. 4, pp. 339-353.

Betts, Julian R. and Jamie L. Shkolnik (1999), "The Behavioral Effects of Variations in Class Size: The Case of Math Teachers," *Educational Evaluation and Policy Analysis*, 21, No. 2, pp. 193-213. doi: 10.3102/01623737021002193.

Blank, Carmel and Yossi Shavit (2016), "The Association Between Student Reports of Classmates' Disruptive Behavior and Student Achievement," *AERA Open*, 2, No. 3, Doi: 2332858416653921.

Blass, Nachum (2010), "Israel's Education System — A Domestic Perspective," in Dan Ben-David (ed.), *State of the Nation Report: Society, Economy and Policy in Israel 2009*, Taub Center for Social Policy Studies in Israel, pp. 157-212.

Blass, Nachum, Shay Tsur and Noam Zussman (2010), *The Allocation of Teachers' Working Hours in Primary Education, 2001-2009*, Bank of Israel, Research Department, Discussion Paper No. 2010.18.

Bourke, Sid (1986), "How Smaller Is Better: Some Relationships Between Class Size, Teaching Practices, and Student Achievement," *American Educational Research Journal*, 23, No. 4, pp. 558-571.

DiPrete, Thomas A. and Claudia Buchmann (2013), *The Rise of Women: The Growing Gender Gap in Education and What It Means for American Schools*, Russell Sage Foundation.

Finn, Jeremy D. (2002), "Small Classes in American Schools: Research, Practice, and Politics," *Phi Delta Kappan*, 83, No. 7, pp. 551-560.

Finn, Jeremy D. and Charles M. Achilles (1990), "Answers and Questions About Class Size: A Statewide Experiment," *American Educational Research Journal*, 27, No. 3, pp. 557-577.

Finn, Jeremy D., Gina M. Pannozzo, and Charles M. Achilles (2003), "The 'Why's of Class Size: Student Behavior in Small Classes," *Review of Educational Research*, 73, No. 3, pp. 321-368.

Heinesen, Eskil (2010), "Estimating Class-Size Effects Using Within-School Variation in Subject-Specific Classes," *The Economic Journal*, 120, No. 545, pp. 737-760.

Hruz, Thomas (2000), The Costs and Benefits of Smaller Classes in Wisconsin: A Further Evaluation of the SAGE Program, *Wisconsin Policy Research Institute Report*, 13, No. 6, p. 6.

Lareau, Annette (1987), "Social Class Differences in Family-School Relationships: The Importance of Cultural Capital," *Sociology of Education*, 60, No. 2, pp. 73-85. doi: 10.2307/2112583.

Legewie, Joscha and Thomas A. DiPrete (2012), "School Context and the Gender Gap in Educational Achievement," *American Sociological Review*, 77, No. 3, pp. 463-485.

Molnar, Alex, Philip Smith, John Zahorik, Amanda Palmer, Anke Halbach, and Karen Ehrle (1999), "Evaluating the SAGE Program: A Pilot Program in Targeted Pupil-Teacher Reduction in Wisconsin," *Educational Evaluation and Policy Analysis*, 21, No. 2, pp. 165-177.

Mosteller, Frederick (1995), "The Tennessee Study of Class Size in the Early School Grades," *The Future of Children*, 5, No. 2, pp. 113-127.

Mueller, Daniel J., Clinton I. Chase, and James D. Walden (1988), "Effects of Reduced Class Size in Primary Classes," *Educational Leadership*, 45, No. 5, p. 48.

OECD (2001), *Education at a Glance: 2001*, OECD Indicators, pp. 392-405.

OECD (2014), *PISA 2012 Results in Focus: What 15-Year-Olds Know and What They Can Do With What They Know*.

Oakes, Jeannie (1995), "Two Cities' Tracking and Within-School Segregation," *Teachers College Record*, 96, No. 4, pp. 681-690.

Rumberger, Russell W. and Gregory J. Palardy (2005), "Does Segregation Still Matter? The Impact of Student Composition on Academic Achievement in High School," *Teachers College Record*, 107, No. 9, p. 1999.

Shapson, Stan. M., Edgar N. Wright, Gary Eason, and John Fitzgerald (1980), "An Experimental Study of the Effects of Class Size," *American Educational Research Journal*, 17, No. 2, pp. 141-152.

Shavit, Yossi (1984), "Tracking and Ethnicity in Israeli Secondary Education," *American Sociological Review*, 49, No. 2, pp. 210-220.

Wößmann, Ludger and Martin West (2006), "Class-Size Effects in School Systems Around the World: Evidence from Between-Grade Variation in TIMSS," *European Economic Review*, 50, No. 3, pp. 695-736.

Hebrew

Ministry of Education (2015), *The Bennett Layout for Reducing Classroom Crowding: 32-24 Pupils in Primary School Classes*, Ministry of Education, <http://edu.gov.il/owleb/AboutUs/MinisterOfEducation/Pages/reducing-class-size.aspx>.

Shir, Tzvi (2014), *Gender Segregation in Hebrew State Religious Primary Schools*, Bank of Israel.

Weissblei, Eti and Assaf Wininger (2015), *The Israeli Education System — Selected Issues from the Knesset Committee on Education, Culture and Sport*, Information and Research Center, Knesset.