Israel's Education System

An International Perspective and Recommendations for Reform

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Abstract

This chapter compares Israel's education system over the past decade in relation to OECD countries. The achievement levels of Israel's children are consistently below those of each country in the reference group of 25 OECD countries in nearly all of the years surveyed. Achievement gaps within Israel are wider than in each of the OECD countries in each of the years, while the achievement levels of both the weakest and the strongest pupils are at the bottom – or very close to the bottom – of achievements in the Western world. If, in the past, it was possible to argue that the country's education system was not short of money, budgeting cuts over the past decade have effectively removed this argument. The chapter concludes with highlights of a proposed systemic educational reform.

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1. *Quality versus quantity – the relationship between education and the country's economy and society*

The underlying reason for the relative decline in Israel's standard of living – compared to leading Western countries – and the country's high rates of poverty and income inequality (major socioeconomic problems described in the chapter "A Macro Perspective of Israel's Society and Economy") is neither destiny nor misfortune. These outcomes are not preordained consequences of war or of immigrant absorption, but direct outcomes of national priorities, policies, implementation, and enforcement.

One of the primary causes – albeit not the only one – of the current socioeconomic situation is Israel's educational system. Numerous studies show the impact that education has on a wide range of phenomena, from incomes and job prospects at the personal level to the rate of economic growth at the national level. Less educated individuals are much more likely to be poor than highly educated ones. Strong correlations have also been found between years of schooling and rates of employment.

Other than the unique exception of the ultra-Orthodox Jews, who adopt the model of life-long learning in subjects that do not generally contribute much toward increasing skills required by modern competitive economies, Israel is similar to other Western countries. That is, the higher a person's level of education, the greater the chances of finding work and increasing income (Figure 16 in the chapter "Israel's Labor Market"). What benefits people at the personal level also contributes at the national level. In the mid-1980s and early 1990s, a series of studies were published examining the impact of policy factors on steady state economic growth – that is, their effect not only on the height but also on the slope of the long run growth path. At the theoretical level, Lucas's (1988) seminal paper demonstrated how individual decisions on the amount of time spent on acquiring education affected not only the level of production, but also its rate of growth.

Studies by Barro (1991), Mankiw, Romer and Weil (1992), and Barro and Lee (1993) were among the earliest empirical corroborations of the link between education and economic growth. More years of schooling per person where found to be related to faster economic growth. Furthermore, greater education among the poor also improves their employment and income opportunities. But what about the third side of the triangle – income disparity? Preliminary findings in Israel by Ayal Kimhi (2009) indicate that more years of schooling in Israel also help to reduce income disparity.

While learning – measured in years of schooling – can have a major effect on economic growth, poverty and income inequality, the impact of education quality appears to be at least as substantial. The measurement of education quality's effect on a country's rate of economic growth began in earnest just over a decade ago. In an economy that is open to the world, not only do firms have to compete with one another, but so do workers. In modern economies, the ability to compete is determined by physical and human resources. Workers change jobs several times during their lifetimes and need a first-rate educational toolbox – one that contains as much knowledge as possible in fundamental areas such as reading, writing, mathematics, science, etc. – in order to cope with transitions between jobs.

It is no coincidence that for many years, Western countries have been conducting comparative examinations of their children's knowledge in the core subjects. Early last decade, a pioneering study (Hanushek and Kimko, 2000) examined the relationship between economic growth and the quality of education in core fields of study. Using a sample of 76 countries between 1960 and 1990, Hanushek and Kimko examined how economic growth was affected by several variables: years of schooling, student/teacher ratios, ratios of education expenditures to GDP, and educational quality, as reflected by students' achievements in international tests in core fields of study. When the achievements variable is not included in the examination, the years of schooling variable provides a statistically significant explanation for economic growth.

However, when all the aforementioned variables are included in the examination, the variable found to have the strongest effect on economic growth is the level of student achievements. The higher the national level of achievements in the core subjects, the higher the country's rate of growth.

Follow-up research by Hanushek and Woessmann (2009) searched for causal relationships, finding that improvements in the quality of education are related to increases in individual earnings and in national economic growth. Findings pertaining to immigrants from the same country who obtained their education in different countries – with different qualities of education – indicate that those who studied in a country with better education (as measured by student achievements) also attained higher earnings. Hanushek and Woessmann also found that increases in educational achievement within countries are related to increases in rates of economic growth.

In light of the accumulating findings concerning the relationship between education quality and socioeconomic outcomes, and in view of the fact that Israel is currently situated on socioeconomic trajectories that are unsustainable in the long run, what future contribution can Israel's society and economy expect from the country's current educational system?

2. *Educational Achievements in Core Fields of Study*

Comparing the achievements of Israeli pupils in the core fields to the achievements of pupils in other countries is a sobering exercise when one takes into account the socioeconomic ramifications for Israel's future. In the 1960s, when the country's growth rate was among the highest in the world and its level of inequality was among the lowest, the achievements of Israeli pupils in international mathematics tests were the highest in the West (Ben-David, 2003). In retrospect, it turns out that the sample of Israeli children was biased, so the rankings should be treated with a measure of caution. Even in later years, Israel's samples were not

representative of the entire pupil population, with Arab pupils not participating in the international tests until the mid-1990s and the ultra-Orthodox (or, as they are referred to in Israel, *haredi*) pupils still not participating. The difficulty in conducting accurate comparisons of Israel with other countries over the years raises important questions regarding the national mechanisms for measurement and assessment in the area of education.

However, even without accounting for *haredi* pupils, how do the rest of Israel's children compare to other Western countries since the late 1990s? Research conducted by Nachum Blass (2008) shows that no deterioration took place in Israeli achievements over the past decade. This is the good news. The bad news is that while achievements may not be falling, the overall level of Israeli achievements over the past decade has been very low.

One of the problems in comparing Israel's relative achievement level to those of other countries in the various international tests stems from the varying groups of countries participating in each test. Israel's ranking consequently tends to fluctuate, which makes it difficult to estimate the real level of education in Israel. In addition, some countries participating in international tests are developed and some are not, further complicating the comparisons. To minimize some of these issues, the focus in Table 1 is on a fixed group of 25 developed countries on each of the tests administered over the past decade and a comparison of these countries to Israel.

In light of an education system's importance in determining the social and economic future of a country, the cross-country comparisons shown here are quite problematic from the Israeli perspective. The average level of achievement demonstrated by Israeli lower secondary school pupils was below that of each of the 25 OECD countries in all but one of the international tests administered over the last decade. In four out of the five tests, the percent difference between the OECD and Israel was in double digits. Considering the Hanushek and Kimko (2000) and the Hanushek and Woessmann (2009) findings of a significant relationship

Table 1. **Average Level of Education in the Western World**
Average achievement levels in 25 OECD countries and in Israel over the last decade* (base: Israel = 100)

		TIMSS[1] 1999	PISA[2] 2000/02	TIMSS[1] 2003	PISA[2] 2006	TIMSS[1] 2007
	Israel	100.0	100.0	100.0	100.0	100.0
	OECD	113.7	115.8	106.2	113.3	111.7
1	Australia	114.0	120.5	104.9	116.9	108.6
2	Austria		116.8		112.9	
3	Belgium[3]	117.0	115.5	107.0	114.8	
4	Canada[4]	113.9	121.0	108.1	119.0	111.5
5	Czech Rep.	113.4	113.8		112.8	112.0
6	Denmark		113.1		112.7	
7	England[5]	110.7	120.1	105.9	112.8	113.3
8	Finland	113.0	122.8		124.3	
9	France		115.4		110.8	
10	Germany		110.8		113.5	
11	Hungary	116.1	111.0	108.9	110.7	113.4
12	Iceland		115.0		111.0	
13	Ireland		117.0		114.4	
14	Italy	104.1	107.8	99.1	105.3	104.7
15	Japan	120.9	123.5	114.0	116.3	120.7
16	Korea	121.6	123.1	116.6	121.8	123.5
17	Netherlands			108.9	117.1	
18	New Zealand	107.2	120.8	103.0	117.9	
19	Norway		114.0	97.1	109.5	102.7
20	Portugal		104.9		105.9	
21	Slovak Rep.			104.2	108.4	
22	Spain		110.7		107.1	
23	Sweden	116.2	116.6	104.0	113.4	107.6
24	Switzerland	114.5	115.2		115.4	
25	U.S.A.	108.9	113.4	104.8	108.3	110.4

* Not including ultra-Orthodox Jews in Israel.
[1] National average in math and science exams.
[2] National average in math, science and reading exams.
[3] Flemish Belgium in TIMSS.
[4] Average of Canadian provinces participating in TIMSS 2003 and 2007.
[5] U.K. rather than England in PISA.

Source: Dan Ben-David, Taub Center and Tel-Aviv University.
Data: from TIMSS and PISA.

between achievements in these tests and economic growth, Israel's current generation of children – who will be the country's next generation of workers – will be at a major disadvantage when they enter the future global marketplace.

The achievement problem is not only one of levels, as reflected in national averages. The full severity of this problem is evident in the wide achievement gaps within Israel. As education is a major springboard to the job market, a country with such large disparities in educational achievements will find it even more difficult to reduce its already large income gaps.

Blass and Adler (2009) describe a broad policy of affirmative action in Israel, but gaps in educational achievement within Israel remain very high. In core areas of education, the gaps between Israeli pupils are higher than the gaps within each of the OECD countries, in every one of the five tests administered over the past decade (Table 2). In fact, educational gaps within OECD countries are about 20 percent lower on average than those within Israel since 1999.

Eleven out of the 25 OECD countries participated in the most recent TIMSS (Trends in International Mathematics and Science Study) exam in 2007. That year, educational differentials within the United Kingdom were so big that the country ended up above all other OECD participating countries – though still in second place to Israel – on measures of educational disparity. Disparity within the U.K. was 15 percent less than the disparity within Israel. Another country providing a relatively unequal education is the United States. In two of the five tests detailed in Table 2, educational gaps within the U.S. placed it above all of the other countries – except Israel. In 2007, educational gaps within the United States were 20 percent lower than within Israel. The gaps among pupils within Israel are unparalleled in the Western world, with all of the social and economic implications that this has for the country's future.

Table 2. **Educational Inequality in the Western World**
Average achievement levels in 25 OECD countries relative to Israel over the last decade* (base: Israel = 100)

		TIMSS[1] 1999	PISA[2] 2000/02	TIMSS[1] 2003	PISA[2] 2006	TIMSS[1] 2007
	Israel	100.0	100.0	100.0	100.0	100.0
	OECD	80.8	77.6	87.4	85.0	77.5
1	Australia	83.1	78.4	92.4	83.4	79.5
2	Austria		75.6		89.9	
3	Belgium[3]	72.6	88.8	82.4	93.4	
4	Canada[4]	75.1	73.7	73.5	81.7	69.8
5	Czech Rep.	79.1	78.4		92.5	72.5
6	Denmark		78.9		79.0	
7	England[5]	86.6	79.5	90.6	88.0	84.5
8	Finland	71.1	69.9		73.3	
9	France		77.5		89.0	
10	Germany		86.6		91.9	
11	Hungary	84.1	80.8	91.8	80.9	81.0
12	Iceland		72.6		79.5	
13	Ireland		74.0		79.5	
14	Italy	86.6	76.4	91.2	88.7	77.0
15	Japan	77.6	72.1	88.8	86.8	81.0
16	Korea	81.6	64.4	90.6	80.1	84.0
17	Netherlands			76.5	83.0	
18	New Zealand	90.5	84.4	89.4	90.4	
19	Norway		80.0	82.9	86.6	69.5
20	Portugal		75.9		82.2	
21	Slovak Rep.			92.9	86.6	
22	Spain		74.2		79.3	
23	Sweden	74.6	76.2	85.3	83.4	74.0
24	Switzerland	76.1	82.7		86.0	
25	U.S.A.	92.0	83.3	94.7	86.8	79.5

* Not including ultra-Orthodox Jews in Israel.
1 National average in math and science exams.
2 National average in math, science and reading exams.
3 Flemish Belgium in TIMSS.
4 Average of Canadian provinces participating in TIMSS 2003 and 2007.
5 U.K. rather than England in PISA.

Source: Dan Ben-David, Taub Center and Tel-Aviv University.
Data: from TIMSS and PISA.

At a time when Israel's poverty rates are among the highest in the West, it is interesting to examine the education provided to the weakest pupils – those who are in the bottom five percentiles – and compare them with the weakest pupils in OECD countries. As it turns out, Israel's weakest students are the weakest in the Western world, and by a relatively large margin.

Over the span of all five international exams administered over the past decade, the average achievements of the OECD's weakest pupils were about one-third higher than their Israeli peers' (Table 3). Italy's weakest pupils were at the bottom of the OECD in 2007. Yet, their low achievements were still 24 percent higher than those of Israel's children.

The problems of Israel's educational achievements do not end with the low national average (lower than every OECD country in nearly every one of the exams), with the highest educational inequality in each exam versus each OECD country, or even with the very poor achievements of its weakest pupils relative to their peers in all other OECD countries in all years. These problems also manifest themselves in the achievements of the country's top pupils.

The State of Israel has one of the finest higher education systems in the world: more Nobel laureates in the sciences over the last decade than in all but four other countries; research universities ranking among the world's 150 best by scientific citations; a high-tech sector with more patents and inventions than most countries of the world; and, physicians who are considered among the world's best. It seems reasonable to assume that behind these achievements in science, research, medicine, and patents are the outstanding pupils of the past. What awaits Israel's next generation? How do Israel's top pupils compare to the top pupils in other Western countries?

Table 3. **Comparison of the Weakest Pupils in the Western World**
Average achievement levels of bottom 5th percentile in 25 OECD countries relative to Israel over the last decade* (base: Israel = 100)

		TIMSS[1] 1999	PISA[2] 2000/02	TIMSS[1] 2003	PISA[2] 2006	TIMSS[1] 2007
	Israel	100.0	100.0	100.0	100.0	100.0
	OECD	135.1	148.9	113.8	131.4	134.6
1	Australia	133.7	157.9	110.1	139.1	129.2
2	Austria		151.7		125.7	
3	Belgium[3]	144.2	132.1	114.0	124.7	
4	Canada[4]	139.0	163.5	123.0	143.0	139.5
5	Czech Rep.	137.8	144.7		126.0	139.3
6	Denmark		143.6		135.3	
7	England[5]	128.5	156.4	113.1	129.4	132.0
8	Finland	140.0	169.2		159.5	
9	France		148.6		122.3	
10	Germany		130.2		126.3	
11	Hungary	136.9	139.7	117.0	131.1	136.2
12	Iceland		153.0		128.5	
13	Ireland		154.4		138.2	
14	Italy	116.0	135.7	102.6	115.6	123.5
15	Japan	148.1	166.0	124.0	134.1	146.4
16	Korea	146.7	173.8	126.2	149.0	148.7
17	Netherlands			121.9	138.4	
18	New Zealand	118.4	151.6	108.9	135.4	
19	Norway		143.0	102.4	124.5	124.5
20	Portugal		130.9		121.2	
21	Slovak Rep.			109.5	121.8	
22	Spain		143.3		125.2	
23	Sweden	141.1	151.6	111.5	133.2	129.4
24	Switzerland	139.7	143.4		132.8	
25	U.S.A.	121.1	140.0	108.8	124.7	131.7

* Not including ultra-Orthodox Jews in Israel.
1 National average in math and science exams.
2 National average in math, science and reading exams.
3 Flemish Belgium in TIMSS.
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5 U.K. rather than England in PISA.

Source: Dan Ben-David, Taub Center and Tel-Aviv University.
Data: from TIMSS and PISA.

A comparison of the outstanding pupils in different countries – the top five percentiles of each country – appears in Table 4, and it does not provide much support for the expectation of continued national success in academia, medicine, or high tech at the levels and rates that the country has thus far known. Israel's top pupils ranked below those of nearly all OECD countries in each of the years examined.

These outcomes pertain primarily to lower secondary school pupils who participate in the international exams. Bridging the gap between this age group and the entrance requirements of Israel's universities, which are still among the best in the world, is not a simple hurdle to overcome – especially for secondary school pupils from families without the financial wherewithal for obtaining oft-needed private assistance that can fill in knowledge deficits left by the public education system. Even with this assistance, there nonetheless exists a sense among much of the senior academic faculty – particularly in the more technical disciplines – that an increasing number of students arrive with knowledge deficits when they begin their academic studies. (Unfortunately, this feeling is based on no more than anecdotal evidence, since it has not been examined in any methodical manner.)

In its six decades of existence, the Israeli educational system has failed to introduce any form of consistent and systematic measurement that would enable it to monitor improvements or deterioration over time. While the industrialized world has been examining itself in core curriculum fields for many years, at least by means of representative samples in international tests, Israel has neither utilized the international exams to evaluate the quality of education provided to all its children, nor has it conducted national examinations that are comparable over time.

There is no evidence that can enable the government to know whether the achievement levels in Israel have risen or fallen over the years. There are only impressions, which are no substitute for facts. Following the recommendations for education reform of the government-appointed Dovrat Commission (2005), a measurement and evaluation unit was created as an independent authority within the Ministry of Education.

Table 4. **Comparison of the Top Pupils in the Western World**
Average achievement levels of top 5th percentile in 25 OECD countries relative to Israel over the last decade* (base: Israel = 100)

		TIMSS[1] 1999	PISA[2] 2000/02	TIMSS[1] 2003	PISA[2] 2006	TIMSS[1] 2007
	Israel	100.0	100.0	100.0	100.0	100.0
	OECD	106.2	103.8	102.1	104.5	103.9
1	Australia	106.6	107.6	102.0	106.8	103.0
2	Austria		103.9		105.0	
3	Belgium[3]	106.0	104.9	100.2	106.2	
4	Canada[4]	105.0	106.5	101.0	107.5	102.0
5	Czech Rep.	106.8	103.2		106.6	103.8
6	Denmark		102.3		102.7	
7	England[5]	106.2	107.9	103.1	105.5	106.5
8	Finland	103.5	106.5		109.3	
9	France		103.6		103.2	
10	Germany		102.8		106.2	
11	Hungary	109.0	102.0	105.5	101.9	105.9
12	Iceland		101.9		102.4	
13	Ireland		103.4		104.1	
14	Italy	100.4	98.2	97.4	99.8	98.2
15	Japan	110.3	106.9	108.5	106.9	111.2
16	Korea	112.3	104.4	110.2	108.9	113.8
17	Netherlands			101.8	106.3	
18	New Zealand	103.5	109.0	100.6	109.5	
19	Norway		103.0	93.7	102.4	94.7
20	Portugal		96.0		98.6	
21	Slovak Rep.			102.1	101.6	
22	Spain		99.4		98.5	
23	Sweden	106.0	104.2	100.1	104.5	100.0
24	Switzerland	106.0	105.0		106.0	
25	U.S.A.	105.5	104.4	102.8	102.8	103.6

* Not including ultra-Orthodox Jews in Israel.
1 National average in math and science exams.
2 National average in math, science and reading exams.
3 Flemish Belgium in TIMSS.
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5 U.K. rather than England in PISA.

Source: Dan Ben-David, Taub Center and Tel-Aviv University.
Data: from TIMSS and PISA.

This authority recently began administering tests that are calibrated and will enable today's results to serve as future benchmarks.

In contrast to the education system, the Israel Defense Forces (IDF) examines all individuals who report for compulsory military duty, though it does not make this information publicly available. Very limited findings pertaining to reading comprehension were made public in lectures by Shlomo Dovrat, who headed the government's education task force.

In the mid-1980s, 60 percent of native-born Israeli children passed the test at level 9 or higher (in the military's literacy tests, level 9 is considered satisfactory). By 1997, this number had dropped to 40 percent. By 2002, it was down to only 32 percent. In other words, within less than two decades, the share of native-born Israelis with satisfactory reading comprehension declined by close to 50 percent. The IDF tests are apparently not calibrated every year, with all that this implies with regard to the accuracy of comparisons over time. However, it is hard to believe that a drop of this magnitude over such a short period of time does not imply a substantial decrease in the reading comprehension abilities of Israel's children.

Despite the statistically significant relationship between achievements in the core disciplines and economic growth, there are a non-negligible number of people in Israel who do not attach great importance to the fact that Israeli pupils' achievements are low. In fact, many argue that education quality is not measurable and, therefore, it makes no sense to try to quantify it. Furthermore, there is a prevailing notion in the country that Israelis tend to think more "outside the box" than is common in other countries. It is unclear whether this presumed advantage can be attributed to Israeli education or to the Israeli character. In any event, developing creativity does not have to come at the expense of basic knowledge and tools.

It is difficult to know, and even more difficult to measure, the importance of creativity. But there is no doubt that this is a very important asset when it comes to coping in the economic marketplace.

However, the measured and proven fact is that the knowledge of Israel's children in fundamental core disciplines is below that of children from other countries, with whom they will have to compete in a few years. Whatever relative advantages Israeli children may or may not possess in the realm of creativity will not be sufficient to overcome major deficiencies in the areas of basic knowledge.

Why are educational achievement levels so low in Israel? Among the reasons commonly provided are insufficient budgets, cutbacks in instructional hours, crowded classrooms, sub-standard teachers, inadequate curricula, discipline problems and violence, large scale immigrant integration, and more.[1] While limited scope and space preclude the possibility of addressing all these claims, the next section, focusing on educational inputs, will address the main conjectures under the following headings: What is being taught? How is the material being taught? Who is doing the teaching?

3. *Educational Inputs*

3.A. *What is being taught?*

Are the poor achievements of Israeli children in international exams due to an insufficient number of instructional hours? A comparison of the number of instructional hours in 21 OECD countries in 2007 indicates that the total number of instructional hours given to 15-year-olds (the age of participants in international tests) varies considerably between countries: from 741 hours per year in Sweden to 1,117 hours per year in Greece. Compared to an average of 921 hours per year for 15-year-olds in 21 OECD countries, Israeli pupils receive 1,040 hours. The study showed not only that the average number of instructional hours in the OECD is lower than Israel's, but also that 18 out of the 21 countries provide fewer

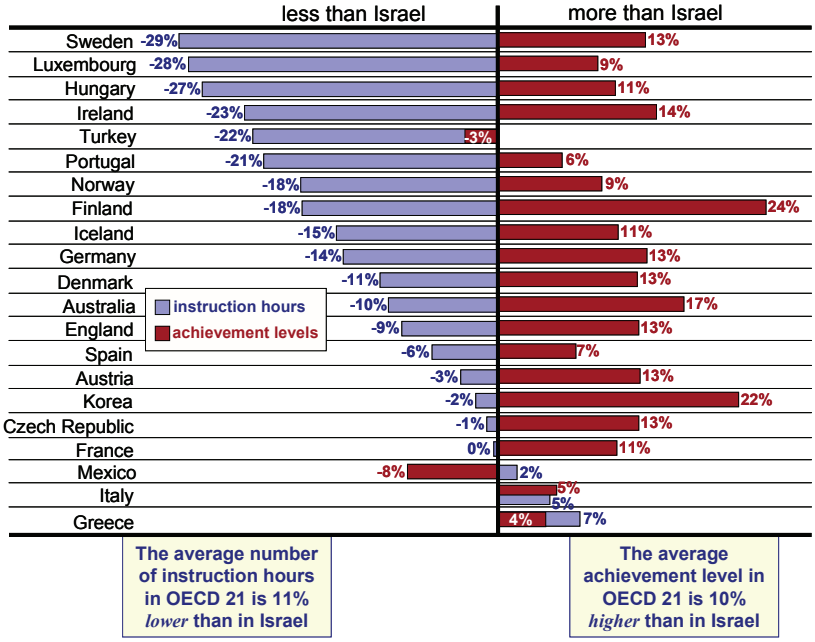
[1] Shavit and Blank (2009) find a significantly link between achievements in the 2003 TIMSS international exams and violence and discipline problems in class.

instructional hours than Israel (Figure 1). This did not prevent 19 of these 21 countries from attaining higher achievement levels than Israel in the latest PISA (Programme for International Student Assessment) tests conducted by the OECD. In other words, although the average number of instructional hours in 21 OECD countries was 11 percent lower than Israel's, their average achievement in the tests was 10 percent higher.

Figure 1

Instruction Hours and Achievement*

21 OECD countries relative to Israel



* Cumulative number of intended instruction hours for 15-year-olds in public institutions (2007) and average achievement levels in math, science and reading in PISA 2006.

Source: Dan Ben-David, Taub Center and Tel-Aviv University.
Data: OECD.

In some respects, this issue is similar to the discussion regarding the impact of education quality versus number of years of schooling as the primary factor affecting incomes and economic growth. The total number of budgeted hours appears to be less important than how those hours are being utilized. Pupil surveys conducted by the OECD in 2006 shed some light on this question. Fifteen-year-old pupils in OECD countries and in Israel reported how many hours per week were spent in school studying the core subjects, and how many hours were devoted to out-of-school lessons, self-study and homework.

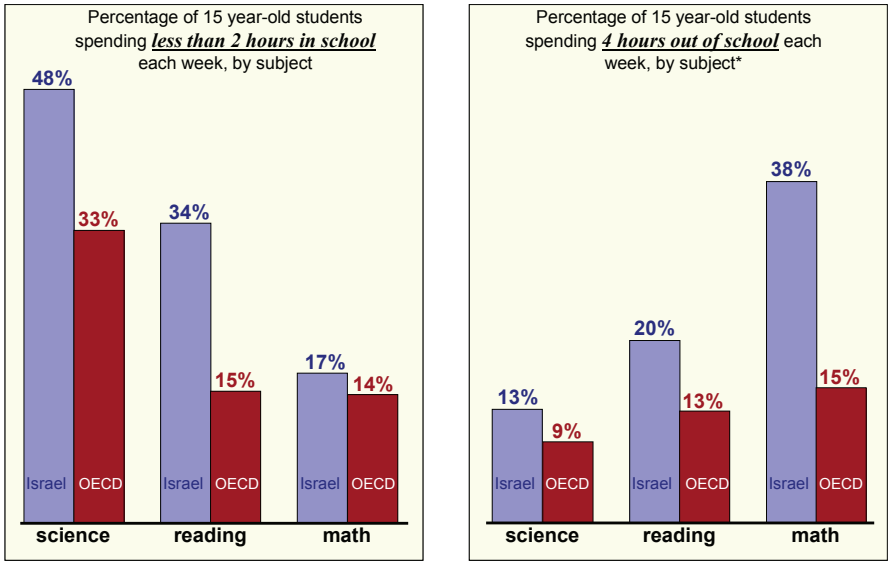
The percentage of pupils studying science for less than two hours a week in school was 33 percent on average in OECD countries. In Israel the share was 48 percent – almost 50 percent more than the OECD (Figure 2). In reading, 15 percent of OECD pupils studied less than two hours per week in school, while more than twice as many, 34 percent, studied under two hours in Israeli schools. The mathematics picture is more balanced, but still tilted toward the OECD, where 14 percent of the pupils had less than two hours per week of math in school compared with 17 percent in Israel. This is the situation despite the fact that Israel budgets more instructional hours than 18 of 21 OECD countries.

Figure 2 also shows the flip side of these findings: the percentage of pupils who studied for four hours outside school every week. In Israel the share of those pupils is higher by roughly 50 percent than in the OECD for science and reading, whereas in mathematics it is more than double – an average of 38 percent in Israel compared with just 15 percent in the OECD studied for four hours outside school every week.

Figure 2

Amount of Learning – In and Out of School

Israel and the OECD, 2006



* Out-of-school lessons, self-study or homework.

Source: Dan Ben-David, Taub Center and Tel-Aviv University.
Data: OECD.

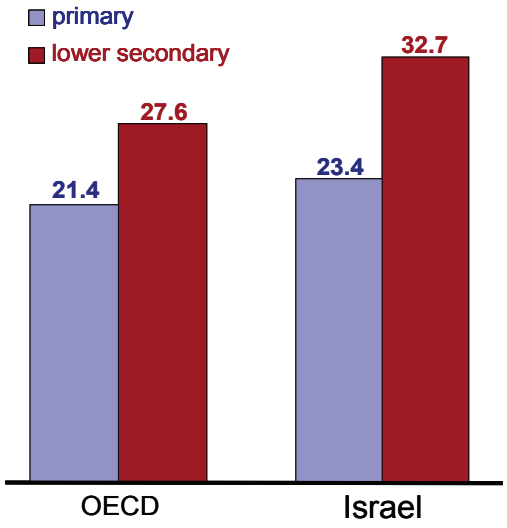
3.B. *How is the material being taught?*

Figure 3 compares class sizes in Israel to the OECD average. In primary schools, the Israeli class has two more pupils on average. In lower secondary schools, classes are larger both in the OECD and in Israel, and the difference rises to five additional pupils in an Israeli class.

Figure 3

Average Class Size, 2007

number of pupils per class



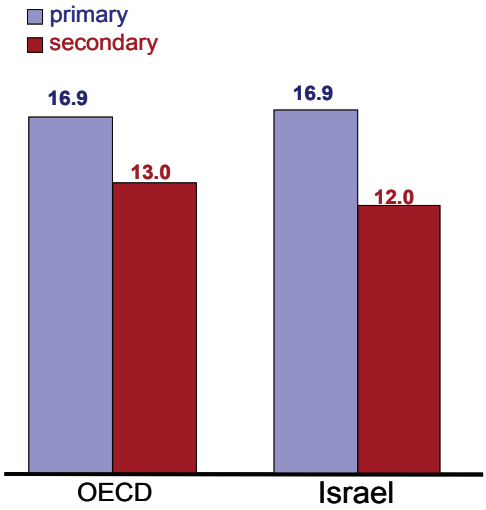
Source: Dan Ben-David, Taub Center and Tel-Aviv University. Data: OECD.

To the extent that large classes have a negative effect on educational achievements – a premise that is not universally accepted – the question remains, why are there so many pupils in Israeli classrooms? Is there really an insufficient number of teachers in Israel to facilitate a reduction of class size to levels that are more common in the West? The OECD publishes comparative data of the number of full-time-equivalent (FTE) positions and pupils. As shown in Figure 4, the number of pupils per teacher in Israeli and OECD primary schools is nearly identical: 16.9 vs. 16.0, respectively. The FTE numbers are very similar for secondary schools, with a slightly lower ratio of pupils to teacher in Israel (12.0) than in the OECD (13.0).

The lack of teacher mobility between Israel's four education streams and the splitting of classes between boys and girls that is done in some of these do not contribute to greater equality in class sizes, but neither do they resolve the conundrum of Israel's relatively large class sizes and the country's pupil per teacher ratios that are on a par with the OECD's. One possible explanation could be the high proportion of part-time teachers in Israel. But since the number of teachers in this analysis reflects full-time equivalent positions, the issue of part-time jobs is not relevant in this context. Thus, the discussion returns to square one: if the number of pupils per teacher in Israel is similar to that of the OECD, then why aren't average class sizes similar as well?

Figure 4

Number of Pupils Per Teacher*, 2007



* According to full-time equivalents.

Source: Dan Ben-David, Taub Center and Tel-Aviv University.
Data: OECD.

Another possibility is that more than one teacher is present in the class – with one teacher, for example, helping a small group of pupils, while the head teacher teaches the larger group. If this is the explanation for the contradiction between class size and the number of pupils per teacher, then the issue is not the lack of teachers but a matter of policy. Alternatively it may be the case that many teachers are not involved in

actual teaching but in other roles (such as administration, training or supervision) while being listed in the records as teachers.

There may be another explanation: If Israeli pupils receive more instructional hours, while the number of instructional hours per teacher in Israel is similar to that of the OECD, and if the number of pupils per teacher is also similar in Israel and in the OECD, then the number of pupils per class should indeed be larger in Israel. But according to data published by the OECD, net in-class teaching time per teacher per school year in the OECD is 22 percent lower, on average, than in Israel. Since pupils receive 10 percent more instructional hours in Israel than in the OECD, then combining these numbers indicates that the ratio of pupils per teacher should be lower in Israel than in the OECD – while in fact the ratios are similar.

OECD data for lower secondary schools show that teachers in Israel teach 11 percent more hours per year – so here, too, there is a problem reconciling the official numbers. Consequently, either the number of hours taught by Israeli teachers is in actual fact lower than the number of hours reported, or the number of instructional hours provided Israeli students is higher than reported. If a full-time position in Israel consists of fewer instruction hours than in the OECD, then for the same number of teachers in Israel and the OECD, the number of positions in Israel, in terms of full-time equivalents, must be higher, and the pupils per teacher ratio in Israel must be lower – which in fact it is not.

The bottom line is that there seems to be substantial discrepancies in data reported regarding the number of instructional hours, the number of teaching hours, class sizes, and the number of pupils per teacher in Israel. It is not possible to reconcile the reported data, which raises questions about the degree of transparency in Israel's education system and about its actual distribution of resources.

The non-compatibility issues in the data regarding crowded classrooms are also reflected within a more specific dimension – namely, science classes. The number of pupils per teacher in science classes is 12.7 in Israel and 13.4 in the OECD. In light of the fact that the OECD

also funds less instruction hours, then it is not clear why almost half of Israel's 15-year-olds receive fewer than two hours of science instruction in school per week while only one-third of the OECD pupils in this age group receive less than two hours in school.

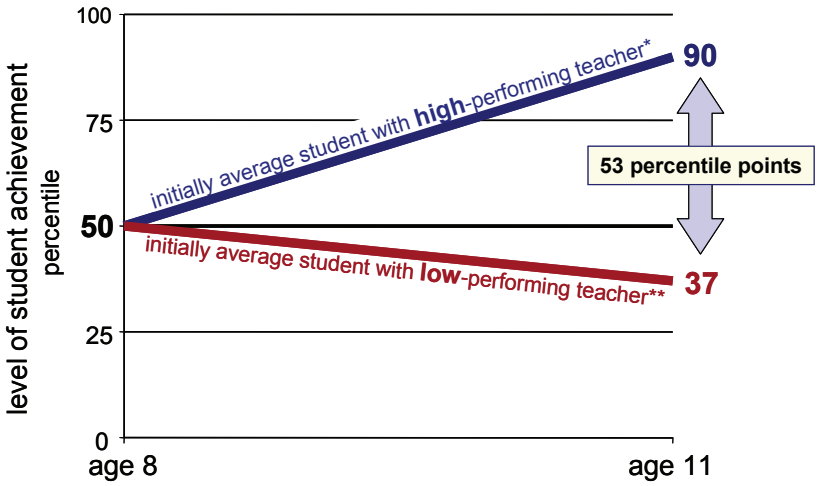
3.C. *Who is doing the teaching?*

In Israel there are about two dozen teaching colleges of varying academic levels. Admission requirements in these teaching colleges are lower than those in almost every academic department in the country's universities. While the personal ability of some teachers is very high, which would have enabled them to be admitted to university studies had they so desired, many teachers choose this vocation due to an inability to get accepted to better academic alternatives. It may be unrealistic to expect teachers with relatively low academic ability to sufficiently challenge and teach children with higher personal capabilities than their own.

In this context, it is useful to note the impact of teachers on children's educational future. Studies emanating from a Tennessee project on the impact of teachers with different qualities on pupils' educational future are illuminating in this regard. Sanders and Rivers (1996; 2002) found that on average, two pupils who are both at the 50th percentile (i.e. at the median) in terms of achievements when they are eight-years-old will have an achievement gap of 50 percentage points develop between them by the time they are 11 as a result of differences in the quality of their teachers (Figure 5). In other words, the substantial impact of a teacher on pupils' achievements can be observed at least four years after the pupil left that teacher's class. The upper quintile of teachers (in terms of teaching quality) provides substantial improvements in pupils' achievements at all levels, regardless of ethnic background.

Figure 5

The Effect of Teacher Quality on Student Achievement



* Among the top 20% of teachers.

** Among the bottom 20% of teachers.

Sources: Sanders and Rivers (1996 and 2002), McKinsey (2007).

4. *Educational Expenditures*

The provision of high quality education and the reduction of educational disparities depend not only on the allocation of existing resources but also on their availability in sufficient amounts. The key question in this context is what constitutes "sufficient" levels of education expenditure? This question can be addressed using a comparative approach at two levels: Israeli expenditures in comparison with other countries and in comparison with the past. Expenditure levels will also be compared to

achievement levels to attain a better understanding of what can be achieved with different levels of spending.

How do Israel's education expenditures look from an international perspective and in comparison to the past? The share of gross domestic product (GDP) that is spent on public education in Israel is greater than in any other country in the world. Expenditure to GDP ratios are commonly used in international comparisons of education spending across countries. In Israel's case, however, this measure is a bit more problematic because of the high percentage of pupils in the Israeli population compared with most Western countries. With relatively more children per capita, it is only natural that the country spends a greater share of its total output on education.

For this reason, a more relevant international comparison in Israel's case would be to focus on expenditure per pupil in each country. While there are few disagreements within Israel that comparisons of expenditures per pupil are preferable to comparisons of expenditure-GDP ratios, there are differences of opinion as to how to continue the international comparisons from this point on. Many in Israel are content to divide education expenditures per pupil by purchasing power parity (PPP) as a way of translating expenditures into U.S. dollars and facilitating comparison with other countries. Such a translation of shekel-denominated expenditures to dollars using PPP is preferable to the use of official exchange rates (which are subject to volatility due to speculation and other activities), but it does not take into account differences in living standards across countries.

Some of the public debate in Israel during recent years has revolved around misunderstandings of the difference between comparisons using purchasing power parity and those using GDP per capita – which reflect living standards. A numerical example can be useful in highlighting these differences in measurement. Say a book costs NIS 100 in Israel and $40 in Australia. Suppose, too, that the official exchange rate between the Australian dollar and the Israeli shekel is 3 shekels per dollar while the purchasing power parity equals 4 shekels per dollar. In this case, the price

of the book according to the exchange rate will be $33 and its price according to purchasing power parity is $25 – with the latter considered the more accurate reflection of the price in Australian dollars. However, the more relevant question here is not the dollar price of the book, but the quantity of books that the average citizen can buy in each country. If GDP per capita in Israel equals NIS 10,000 while GDP per capita in Australia equals $3,600, then the average Israeli can buy 100 books while the average Australian can buy only 90.

This is how Israel's expenditure per pupil should be compared to other countries. In light of the fact that (a) the lion's share of education expenditure in all countries is spent on salaries; and (b) the level of wages in each country is strongly related to the country's standard of living, then it is problematic to compare education expenditures across countries without adjusting for differences in living standards.[2] In other words, it is insufficient to adjust education expenditures for exchange rate differences, as is done using purchasing power parities. The normalization of education expenditures across countries needs to account for differences in living standards.

For example, average public expenditure per Israeli primary school pupil in 2006, adjusted by purchasing power parity, was $5,006. Expenditure per pupil in Australia that same year was $5,686 (also adjusted by PPP). Had this been the only comparative measure used, then educational expenditure per pupil in Australia is higher than in Israel. However, in 2006, the PPP-adjusted GDP per capita in Israel was $24,756, while in Australia GDP per capita was $35,666. Hence, the standard of living in Australia was 44.1 percent higher than in Israel, while expenditure per pupil there was 13.6 percent higher.

A comparison of education expenditures that takes into account differences in living standards – that is, dividing expenditures per pupil in each country by GDP per capita – indicates that this normalized

[2] As shown in Ben-David (2003), the correlation coefficient between educational expenditure per pupil and GDP per capita across 40 countries is 0.93 in primary schools and 0.95 in secondary schools.

expenditure per Australian pupil equals 15.9 percent of the annual per capita income in Australia. In Israel, however, the educational expenditure per pupil represents 20.2 percent of the average income. In other words, Israel spent more of its per capita income on education per primary school pupil than did Australia.

There is ostensibly an alternative method for comparing educational expenditures across countries. It involves using the ratio of public expenditure on education (*E*) to GDP (*Y*) which, as noted, is generally agreed on as an insufficient measure for comparison because Israel has more pupils (*P*) per capita (*N*) than in most other developed countries. To normalize the expenditure to GDP ratio (*E/Y*) and make it comparable across countries, it is possible to divide this measure by the number of pupils per capita (*P/N*). Note that this normalization, represented by the division of (*E/Y*) by (*P/N*), is algebraically equivalent to the normalization of expenditure per pupil represented by the division of (*E/P*) by GDP per capita (*Y/N*).[3] Both forms of normalization lead to the same outcome, and this – rather than the simple use of purchasing power parities – is the most accurate way to compare educational expenditures across countries.

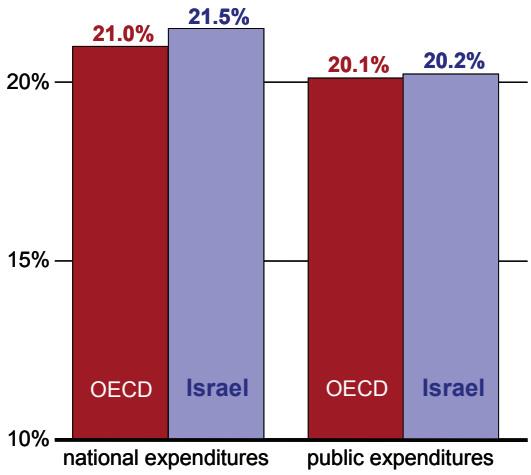
Figure 6 compares educational expenditures per primary school pupil – after normalization by GDP per capita – in Israel and in 24 OECD countries in 2006. It turns out that primary educational expenditures in Israel are very similar to the OECD average. National educational expenditure per pupil is 21.5 percent of GDP per capita in Israel, compared to 21.0 percent in OECD countries, while public education expenditure per pupil is 20.2 percent of GDP per capita and 20.1 percent in the OECD.

[3] A more complete analysis appears in Ben-David (2003).

Figure 6

Expenditures – Primary Education

per pupil, as a share of GDP per capita, 2006



Source: Dan Ben-David, Taub Center and Tel-Aviv University. Data: OECD.

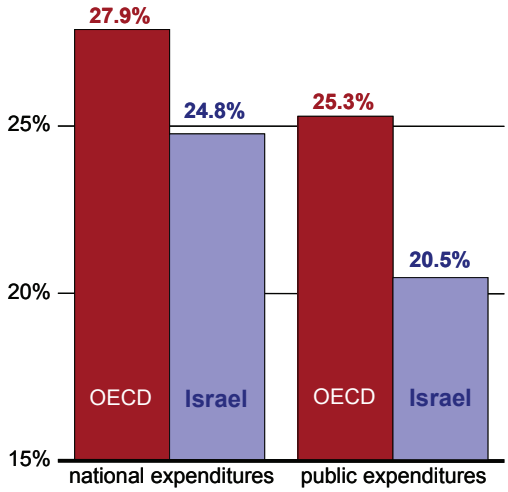
National educational expenditure per secondary school pupil in Israel was 24.8 percent of GDP per capita in 2006, reaching 27.9 percent of GDP per capita in the OECD (Figure 7). Differences favoring the OECD were even greater in the realm of public expenditures, with secondary education expenditures per pupil in Israel reaching 20.5 percent of GDP per capita while in the OECD it was 25.3 percent of GDP per capita – that is, 23 percent greater expenditures in the OECD. These differences in educational spending are considerably different than those in the 1990s. They are the product of ongoing cutbacks in educational budgets throughout this decade.[4]

[4] It is important to note that the high rate of immigration into Israel had a strong impact on the education system. Achievements among immigrant children are initially usually lower than those of the native-born while substantial expenditures need to be made to facilitate their integration.

Figure 7

Expenditures – Secondary Education

per pupil, as a share of GDP per capita, 2006

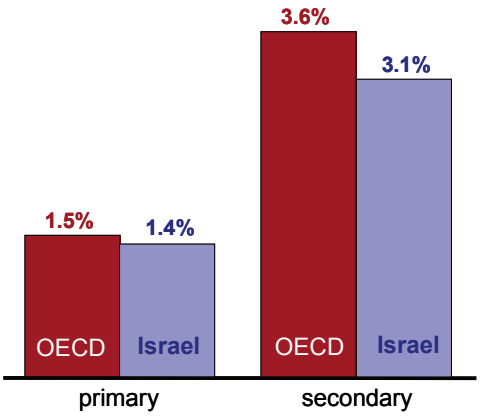


Source: Dan Ben-David, Taub Center and Tel-Aviv University. Data: OECD.

Household spending on primary education (Figure 8) shows many similarities between Israel and OECD countries, namely 1.4 percent of GDP per capita is spent in Israel compared to 1.5 percent in the OECD. For secondary schools, household spending is more than double that of primary schools: 3.1 percent of GDP per capita in Israel and 3.6 percent in the OECD.

Figure 8

Household Expenditures
Primary and Secondary Education
per pupil, as a share of GDP per capita, 2006



Source: Dan Ben-David, Taub Center and Tel-Aviv University.
Data: OECD.

Figure 9 summarizes the changes in public expenditure on education between 1999 and 2006. For pre-primary education, expenditure per pupil – normalized by GDP per capita – grew by 14 percent in OECD countries and by 26 percent in Israel. This is a process of closing gaps, as spending per student in Israel rose to 13 percent of GDP per capita, compared with 14 percent in the OECD. Household expenditures in Israel and in the OECD for pre-primary education are similar, at about 3 percent of GDP per capita. These expenditures have changed little since 1999.

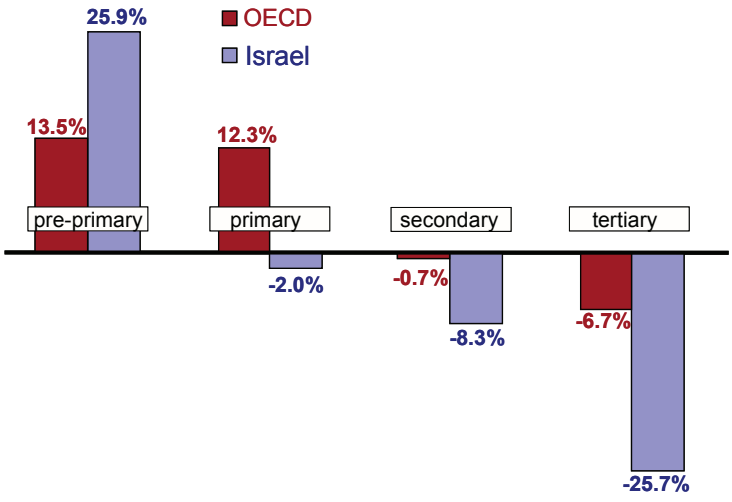
In primary education, public expenditures rose 12 percent in OECD countries compared with a decline of two percent in Israel. This pincer movement reduced gaps between the two, although expenditures per pupil in Israel remain higher. Secondary education expenditure in Israel has declined much more sharply than primary education expenditure,

while in the OECD, expenditures exhibited very little change. Consequently, a gap was created between the OECD's relatively higher public expenditure on secondary education and Israel's.

Figure 9

Percent Change in Public Expenditures, 1999-2006

per pupil, as a share of GDP per capita



Source: Dan Ben-David, Taub Center and Tel-Aviv University.
Data: OECD.

The problem with the international comparison is that the data ends in 2006, which was a turning point in Israel's education expenditures. The chapter "Public Expenditures" reviews Israel's budgetary allocations over the past several decades, including a focus on the government's education expenditures. The chapter illustrates not only changes in education expenditures in recent years, but also shows these changes within a long run perspective that makes it possible to distinguish between annual and short run changes on the one hand, and multi-year trends and changes in trends on the other. The budgetary changes that have taken place since

2006 have manifested themselves primarily in a substantial increase in the primary education budget (full details in the chapter "Public Expenditures"). Pre-primary education expenditures per pupil were less than half the primary school expenditures per pupil and were stable (in real terms) from 2000 to 2009, after having steadily risen from the mid-1980s to the late 1990s.

The behavior of secondary education expenditures has been much more complex over the years. Expenditures per pupil for secondary education in the mid-1980s were double that of primary education and 4.7 times that of pre-primary schools. However, these differences in education spending at various educational levels narrowed considerably by 2009. Secondary education expenditures per pupil in 2009 were only eight percent higher than primary school expenditures and 2.7 times higher than those of pre-primary schools.

The reduction in spending gaps over the past 25 years was the result of a larger increase in expenditures per pupil for primary education (182 percent) and pre-primary education (160 percent) than in secondary education (52 percent). This is not just an issue of greater growth in primary and pre-primary education spending. Since 1997, while education expenditures per pupil rose by 35 percent in primary schools and by 14 percent in pre-primary schools, they fell by nearly eight percent in secondary schools – this, despite a six percent increase in secondary school spending over the past three years.

Spotlight: A Glance at Higher Education

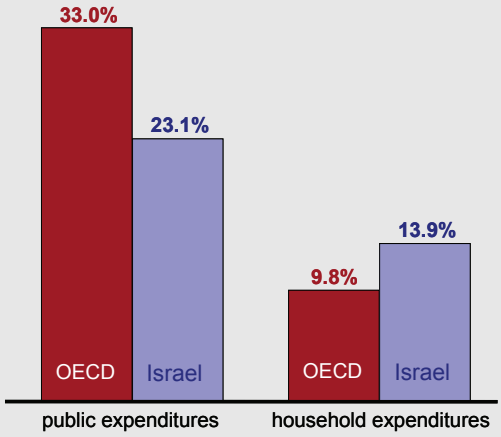
The steepest decline in education expenditure between 1999 and 2006 occurred in higher education (Figure 9), both in Israel and among the OECD countries. Public expenditure per student (as a percentage of GDP per capita) in the OECD fell by seven percent and in Israel by 26 percent of GDP per capita.

Expenditure per student in Israel, which reached 31 percent of GDP per capita in 1999, was lower than the OECD average of 35 percent. Since then, expenditure per student in Israel fell to 23 percent of GDP per capita (Figure 10), a level 30 percent lower than that of the OECD countries. In fact, Israel's public higher education expenditure per student in 2006 was lower than that of 21 of the 24 OECD countries, for which comparable data are available.

Figure 10

Expenditures – Tertiary Education

per student, as a share of GDP per capita, 2006



Source: Dan Ben-David, Taub Center and Tel-Aviv University. Data: OECD.

Conversely, household expenditure per student in Israel was higher compared to 16 out of 21 OECD countries for which data are available. This expenditure, amounting to 13.9 percent of GDP per capita, is 42 percent higher than the corresponding expenditure in the OECD, which stands at 9.8 percent of GDP per capita.

The various problems plaguing the Israeli higher education system are reflected in – among others things – an academic brain drain that is unparalleled in the Western world (Ben-David, 2008a). The severe crisis that recently befell the American economy affected many leading American universities, providing Israel with an exceptional opportunity to bring back many researchers who, but for the crisis, might have remained in the United States.

A more extensive overview of the changes in Israeli higher education and in its research universities, in the number of academic staff positions and in budgets, as well as a focus on the academic brain drain, can be found in Ben-David (2008a and 2008b).

5. *Education Outcomes Versus Expenditures*

When Israel is compared to the five leading countries – in term of their children's educational achievements – in the recent 2006 PISA tests (Figure 11), there are only slight differences in education spending, but much greater differences in achievements.[5] Average achievements of Finnish children were 24 percent higher than those of Israel's children, while achievement gaps between Finnish children – expressed in standard deviations in these tests – are 27 percent below the Israeli gaps (data on the gaps appear in Table 2). While Finland had considerably higher achievements and much smaller gaps than Israel, its expenditures per pupil, normalized by GDP per capita, were just four percent higher than

[5] In the absence of education expenditure data for Canada, the country is not included here even though its children's achievements would have allowed it.

Israel's – while Finnish primary school expenditures per pupil were actually two percent lower than Israel's.

In the other four countries whose pupils scored highest in the international tests, achievement gaps between the countries and Israel ranged from 17 percent (in Australia) to 22 percent (in South Korea). On the other hand, achievement gaps within these countries were 10-12 percent smaller than in Israel. The OECD achievement leaders accomplished these outcomes with secondary education budgets per pupil (adjusted to standards of living) no greater than four percent above the Israeli budgets. In fact, primary education expenditures in these countries were even lower than Israel's.

Figure 11

Educational Achievement and Public Expenditure

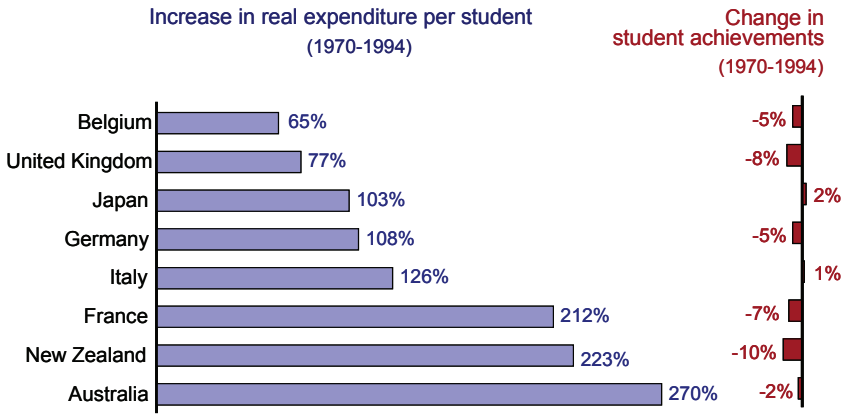
Israel and the top five scoring countries in PISA, 2006

Source: Dan Ben-David, Taub Center and Tel-Aviv University.
Data: OECD.

There is plenty of evidence on the lack of a relationship between expenditures and outcomes in education. Figure 12 shows results from McKinsey and Company (2007) on the lack of a relationship between real changes in expenditures per pupil and changes in achievements in eight Western countries over 25 years. Similar results arise when the focus is on 23 OECD countries and Israel between 2000 and 2006. The lack of a relationship between changes in secondary education expenditures per pupil in secondary schools (normalized by GDP per capita) and changes in PISA test achievements is reflected in a correlation coefficient of -0.29. This result also aligns with the Hanushek and Kimko (2000) finding of a non-significant relationship between the ratio of educational expenditures to GDP and economic growth. Increasing education budgets without also prioritizing and specifying methods that have been shown to produce educational improvements is tantamount to wasting limited and valuable resources.

Figure 12

Education Spending and Outcomes in the OECD



Source: McKinsey, 2007.
Data: McKinsey, 2007; UNESCO, 2005; Pritchett, 2004; Woessmann, 2002.

6. *Policy Proposal: Comprehensive Educational Reform*

Given the centrality of education as a key component in Israel's primary infrastructures, and taking into account that the State of Israel is situated on socioeconomic trajectories that are unsustainable in the long run (see the chapter "A Macro Perspective of Israel's Society and Economy"), it is imperative that the country formulate and implement a comprehensive and systemic reform in its educational system. There are no magic solutions nor is there a consensus regarding the necessary policy.

A number of major proposals were made over the past decade for a systemic reform in Israeli education. The E.L.A. Commission (2003) and the National Taskforce for the Advancement of Education in Israel (more popularly known as the Dovrat Commission) in 2004 were the earliest and most comprehensive. Other reform proposals came from teachers' unions and the Ministry of Education. In addition, a Presidential Task Force in cooperation with the Minister of Social Affairs and Social Services and the Taub Center presented a report recommending reforms in the education system (Taub Center, 2008).

With the exception of large increases in the education budget in recent years – including an increment of NIS 3.4 billion in the government's 2006-2009 primary and secondary education budgets, which in fact reflects a net budgetary expansion of NIS 2.6 billion (after adjusting for growth in the pupil population) – no systemic reform was implemented. In the absence of such a reform, there is no reason to expect dramatic changes in the educational achievements of Israeli children, with all the implications that this has on future rates of poverty and income inequality and on the country's average living standards and economic growth rates.

The Taub Center recently published *"A Comprehensive Program for Reducing Inequality and Poverty and Increasing Economic Growth in Israel"* (Taub Center, 2009), which provides a general strategic perspective and guidelines for systemic reform in the country's education system. This program is based on recommendations by the E.L.A.

Commission (of which this author was a member), the Dovrat Commission and those of the Taub Center. There are three fundamental legs in this strategic program: teachers, curricula, and management and organization on all levels.

6.A. *Teachers*

- A substantial increase in teachers' salaries to make them comparable to Western levels (relative to GDP per capita) alongside a significant improvement in the quality of the teaching workforce and in the professional requirements of teachers.
- Professional training requiring attainment of at least a BA degree from a university or general college with similar admission requirements, as well as a teaching certificate.
- The number of work hours per day and work weeks per year for full-time teachers should be similar to the norm in other sectors of the economy.
- There needs to be more flexibility in the employment of teachers and in the determination of their salaries to provide appropriate financial incentives for achievement. Every attempt should be made to complete this transition in cooperation with the unions representing the teachers.
- Each teacher should have an individual workspace in the school.

6.B. *Curricula*

- Establishment of a professional and non-partisan National Education Authority with a mandate to determine the credo of the education system and its core curriculum. The authority should comprise a staff of 20-25 professionals and a limited number of administrative staff.

- Implementation of a core curriculum that is binding in all the education systems. In order to receive a license, each school in Israel must adopt and implement the core curriculum.
- The core curriculum must be uniform in content and in quality if the future economic playing field is to be level.
- While Israeli society is characterized by numerous lifestyles, each of which demands an education that reflects its distinct social and religious perspective, there is only one economic market in which all the country's citizens must compete and thrive without becoming a burden on society. Therefore, a country that wants an egalitarian – and not just a successful – society must ensure that the enhanced "toolbox" be provided at equal levels in all its education systems, in all its towns and neighborhoods, in all parts of the country. The various education systems can emphasize additional areas above and beyond the core curriculum.

6.C. *Management and organization on all levels*

- Financial resources should be provided to the schools on the basis of transparent and equal budgetary criteria, with supplementary funding that takes into consideration the socioeconomic status of the student population and incentive programs. This requires a shift from budgeting per class to budgeting per child for all levels of schools. Funding should be in monetary terms and not based on teaching hours.
- Special budgets should be provided to individual schools as an incentive for rewarding school achievement.
- The State of Israel must provide free education – in practice and not just on paper – to every child from age three through the end of grade 12. This budget should enable schools to implement a comprehensive study program, including both the core curriculum and the elective curriculum. The balance between the core curriculum and the elective curriculum should be determined by the National Education

Authority. Only a national education system with a systemic perspective can reduce regional, ethnic and religious gaps. This is the role of the State.

- The school principal – who should have professional management training – will prepare the work plans and allocate resources. The principal will be responsible for implementing the work plans, achieving the goals, adhering to the budget, and for recruiting and dismissing teachers (subject to labor agreements).
- A school board (similar to a firm's board of directors) should be established for each school. The board's main duties will be: supervising the work of the principal; approving the school's work plans and budgets; and approving the appointment and dismissal of teachers. The school board will include representatives of four groups: the Ministry of Education, the local authority, parents, and teachers – with a majority of representatives from the Ministry of Education and the local authority.
- Activation of an education department in the local authority.
- The education department will set educational targets – beyond the national core curriculum – adapted to local community preferences, which will be implemented in the framework of elective studies and/or extracurricular frameworks.
- Members of the education department will represent local interests on each of the school boards within its jurisdiction, thereby enabling the municipality to have an input on the choice of principal, the school's educational targets, and also the approval of the principal's work plan.
- For the reasons specified above, the core and elective curriculums should be funded entirely by the Ministry of Education. The local authority and the parents will be able to augment these budgets in order to implement local educational priorities.

6.D. *Conclusion*

Improvements in one of these elements without consideration for the remaining two will not be successful and will lead to a waste of resources. Talented teachers who are carefully chosen and properly compensated must be able to work with substantially upgraded curricula that are much more focused on core subjects (reading, writing, mathematics, science, English, and so on). Yet even this is not enough. The education system must make the connection between personal accountability and personal authority and must utilize positive and negative incentives, as needed, to get people engaged in education to do their best.

A systemic reform in education will not be cheap and will require additional resources. With the exception of defense, however, there is no more important or more justified investment in the future of the State of Israel.

Sources

Hebrew

Ben-David, D. (2003). "A Socio-Economic Perspective of Israel's Educational System in an Era of Globalization". *Israel Quarterly Journal of Economics*, 47-72.

Blass, N. (2010). Have the Achievements of the Educational System in Israel Declined in the Past Few Years? Draft for Discussion. The Taub Center for Policy Studies in Israel.

Blass, N. and Adler, C. (2009). Inequality in Education: Israel 2009 – The Way It Is. Jerusalem: The Taub Center for Social Policy Studies in Israel.

Central Bureau of Statistics (CBS). *Statistical Abstract of Israel*, Various years.

E.L.A. Commission (H. Bodinger, T. Barak, D. Ben-David, E. Ohayon, D. Prashker, S. Shavit, T. Tsameret and H. Wahrman) (2003). "A Proposal for Structural Reform of Israel's Educational System".

National Task Force for the Advancement of the Educational System – The Dovrat Commission (2005). A National Program for Education – "Because Every Child Deserves More…". cms.education.gov.il/EducationCMS/Units/.../DochSofi.htm

Taub Center for Policy Studies in Israel (2008). *Strategies for Reducing Socio-Economical Gaps in Israel*. Report of the Taub Center Task Force presented to the President of Israel and the Minister of Social Affairs and Social Services.

English

Barro, R. J. (1991). "Economic Growth in a Cross-Section of Countries". *Quarterly Journal of Economics*, May, 106, 407-443.

Barro, R. J. and Lee, J. W. (1993). "International Comparisons of Educational Attainment". *Journal of Monetary Economics*, 32, 363-94.

Ben-David, D. (2008a). "Brain Drained". CEPR Discussion Paper No. 6717 (February).

— (2008b). "Soaring Minds: The Flight of Israel's Economists". *Contemporary Economic Policy*, 27, 3, 363-379 (July).

Hanushek, E. A. and Kimko D.D. (2000). "Schooling, Labor-Force Quality, and the Growth of Nations". *American Economic Review*, 90, 1184-1208.

Hanushek, E.A., and Woessmann, L. (2009). "Do Better Schools Lead To More Growth? Cognitive Skills, Economic Outcomes, and Causation". *National Bureau of Economic Research (NBER)*. Cambridge (January).

Kimhi, A. (2009). "Male Income, Female Income, and Household Income Inequality in Israel: A Decomposition Analysis". *Journal of Income Distribution,* 18 (3-4), 34-48.

Lucas, R. E., Jr. (1988). "On the Mechanics of Economic Development". *Journal of Monetary Economics*, 22, 3-42.

Mankiw, N. G., Romer, D. and Weil, D. N. (1992). "A Contribution to the Empirics of Economic Growth". *Quarterly Journal of Economics*, 107: 407-37.

McKinsey and Company (2007). *How the World's Best-Performing School Systems Come Out on Top.*

OECD Stat Extracts. http://stats.oecd.org/index.aspx?r=172013.

— *Education at a Glance* (various editions).

— (2000). *The PISA 2000 Assessment of Reading, Mathematical and Scientific Literacy, Education and Skills*.

— (2004). *Learning for Tomorrow's World First: Results from PISA 2003*.

— (2007). *Science Competencies for Tomorrow's World PISA 2006*. Volume 1 and 2.

Rivers, J. C., and Sanders, W. L. (2002). "Teacher Quality and Equity in Educational Opportunity: Findings and Policy Implications". In *Teacher Quality*. Lance T. Izumi and Williamson M. Evers (Eds.). Palo Alto, CA: Hoover Institution.

Sanders, W. L., and Rivers, J. C. (1996). "Cumulative and Residual Effects of Teachers on Future Student Academic Achievement". Research Progress Report. Knoxville, TN: University of Tennessee Value-Added Research and Assessment Center.

Shavit, Y. and Blank, C. (2009). "School Discipline and Achievement in Israel", unpublished working paper.

Taub Center for Social Policy Studies in Israel (2009). *A Comprehensive Program for Reducing Inequality and Poverty and Increasing Economic Growth in Israel*, D. Ben-David (Ed.)

The International Association for the Evaluation of Educational Achievement (2004). *TIMSS 2003 International Mathematics and Science Report*. TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College.

— (2008). *TIMSS 2007 International Mathematics and Science Report*. TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College.

— (2000). *TIMSS 1999 International Mathematics and Science Report*. TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College.