TAUB CENTER
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Policy Program Paper

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Policy Paper No. 2016.02

Jerusalem, July 2016

TAUB CENTER
for Social Policy Studies in Israel

The Taub Center was established in 1982 under the leadership and vision of Herbert M. Singer, Henry Taub, and the American Jewish Joint Distribution Committee. The Center is funded by a permanent endowment created by the Henry and Marilyn Taub Foundation, the Herbert M. and Nell Singer Foundation, Jane and John Colman, the Kolker-Saxon-Hallock Family Foundation, the Milton A. and Roslyn Z. Wolf Family Foundation, and the American Jewish Joint Distribution Committee.

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International Exams and Their Importance to Israel's Education System

Nachum Blass *

Abstract

The international exams administered by Israel's education system, and the international rankings of pupil performance on these exams, have attracted considerable attention in Israel, particularly in recent years. This policy paper addresses two main questions: why do education policy makers and opinion-shapers (in Israel and elsewhere) attach such importance to the international exams, and especially to their country's place in the average score rankings? And: is this attributed importance justified? A comprehensive, multi-variable comparison between Israel and the OECD countries indicates that, given Israel's relatively low level of investment in education, there is no reason to expect higher achievements on the international exams. The paper also presents a variety of data attesting to the fact that high scores on international exams do not necessarily predict a better economic future for the country in question. The findings indicate that the importance attached to the exam results is excessive and stems from causes that are actually of little practical relevance; greater weight should be given to other measures for assessing the education system.

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Table of Contents

Introduction

International comparisons of educational achievements are a politically and socially fraught issue, one that sparks bitter public debate in many countries.[1] The scope and intensity of disagreement increase the lower the country is on the international achievement scale. At the same time, none of the countries that participate in the various international exams is satisfied with their pupils' achievements – not even those that top the list (Atkin and Black, 1997). The main goal of this paper is to determine whether the great importance that education professionals and the general public attach to the international exams is justified.

The paper's first section will present a concise overview of the most widely-administered international exams. The second section analyzes what appear to be the reasons behind the importance ascribed to these tests. The main reasons will be explored at length in subsections entitled "Pride and Prejudice" and "If There Is No Flour, There Is No Torah." The subsection on "Pride and Prejudice" looks at Israel's sense of national pride, and its unrealistic assessment of the conditions under which the country's education system operates. The subsection entitled "No Flour, No Torah" discusses a simplistic prevailing view of the connections between the education system and the economic system; it presents data attesting to the fact that high achievements on international exams do not necessarily predict a better economic future for the country as a whole. The third section will discuss the response to Israel's TIMSS-2011 results, and will look at possible explanations for the great improvement in Israeli pupil performance on these exams relative to previous TIMSS series, administered in 2007.

[1] Not long ago a letter signed by over 100 major figures in the education sphere called for skipping the 2015 PISA cycle, due to what they identified as highly negative impacts of the exams on the participating national education systems, *The Guardian*, 2014 http://www.theguardian.com/education/2014/may/06/oecd-pisa-tests-damaging-education-academics).

1. International Exams: Background and Discussion

Since 1960, dozens of large-scale international exams have been administered by the world's education systems, with a number of new tests planned for the near future. Over 70 countries have participated in at least one of the major exams implemented over the past decade. The following is a list of the prominent international exams in which Israel has participated:

A. **TIMSS** (Trends in International Mathematics and Science Study): the oldest international study aimed at assessing mathematics and science knowledge. The first TIMSS exams were administered in the 1960s. TIMSS exams are taken by pupils in Grades 4, 8 and 12; Israel has participated in all of the exams administered to eighth graders. In terms of cross-country comparison, Israel's TIMSS scores should be looked at only from 1999 on, as the exams before that year were plagued by school sampling problems.[2] The TIMSS was most recently administered in 2011.

B. **PIRLS** (Progress in International Reading Literacy Study): assessed 4th graders' reading comprehension in 2000, 2006 and 2011.

C. **PISA** (Programme for International Student Assessment): evaluated knowledge in mathematics, reading comprehension and science among 15-year-olds in 2000, 2003, 2006, 2009 and 2012. PISA exams differ among themselves in terms of focus. The 2000 exams emphasized reading comprehension; 2003 emphasized mathematics; in 2006, the focus was on science, while the 2009 exam again assessed reading comprehension. The focus in 2012 was on mathematics.[3]

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[2] According to Zuzovsky (2001). The 2003 exam also had problems, though of another kind, as shown in a presentation on the RAMA website that discusses Israel's TIMSS results: http://cms.education.gov.il/EducationCMS/Units/Rama/MivchanimBenLeumiyim/TIMMS_2007_1.htm.

[3] Israel participated in all of the exams, except for 2003. The PISA-2000 was administered in Israel in 2002.

D. **HBSC** (Health Behaviour in School-Aged Children) studies: addressed health, emotional and social well-being, and at-risk behaviors. Israel participated in five of the studies, which were conducted in 1985, 1994, 1999, 2002 and 2006. These studies, in addition to assessing youth behavior in a selection of health-related spheres, also compared behaviors associated with school violence.

E. **IEA Civic Education Study**: Israel participated in two comparison studies in the sphere of civic education – one in the 1970s and the other in the late 1990s. The Ministry of Education decided that Israel would not participate in the 2009 study.

F. **SITES** (Second International Technology in Education Study): assesses the integration of information and communication technologies in education. The SITES-2006 study, the third in the series, was based on findings from the two preceding studies, conducted in 1998 and 2003.[4]

Besides the questionnaires administered in the specific subjects under assessment, each of these test frameworks collected a great deal of additional data with regard to pupil socioeconomic variables, teacher and principal educational backgrounds, pupil, teacher and principal attitudes toward instruction in the various subject areas, and certain aspects of behavior in the school setting, such as absences and lateness.

The first two studies listed (TIMSS and PIRLS) are initiatives of the International Association for the Evaluation of Educational Achievement (IEA). The objective is for the test results to serve the heads of participating-country education systems on several levels (Loxley, 1990):

1. Assess the impact of curriculum selection in specific subject areas
2. Monitor the quality of the learning process
3. Identify effective schools and ways of improving the education system
4. Improve understanding of the learning process

[4] There are also, of course, additional international exams in the sphere of education, such as those that look at middle-school teacher attitudes (TALIS), adult education levels (PIAAC), and more. Israel did not take part in the first round of these two studies, but will participate in the next round.

The PISA study was an initiative of the OECD beginning in 2000. Participants include several countries that take part in the IEA exams, as well as other countries.[5] The aims of the OECD tests are for the most part similar to those of the IEA (TIMSS and PIRLS), namely:

1. Assess the degree to which pupils approaching the end of compulsory schooling are acquiring skills essential for full participation in the knowledge society
2. Provide policymakers with useful insights, by developing improved methods for monitoring pupil achievements as they move from primary to post-primary education
3. More closely compare teaching methods with a view to improving educational outcomes
4. Implement computer-based assessment in a wide range of disciplines
5. Implement computer-based assessment in a wide range of disciplines

It is important to stress that, in the framework of these studies, much additional data was collected regarding the background of the test-takers and their attitudes toward the subjects in which they were tested, and regarding various aspects of the education system, such as the degree of autonomy enjoyed by educational institutions and teacher educational backgrounds. Thus, beyond the information on pupil knowledge levels in the subject areas of each specific test, this data base confers considerable added value on the international exams.

The international exams' rapid rate of development, and the ever-increasing number of countries that participate in them, raise quite a few questions: Is it at all possible to compare the educational achievements of pupils studying in different education systems? Does the fact that

[5] According to Labaree (2013), a leading education researcher, TIMSS assesses theoretical knowledge that does not serve the individual in his/her everyday life – like the tests used in the American NCLB (No Child Left Behind) framework. By contrast, the PISA authors declared an emphasis on knowledge not studied in class, i.e., questions of understanding and applied knowledge, rather than on scholastic content. However, there has yet to be an examination of the claim that the skills tested by PISA are indeed those currently required of pupils, or that will be required of them in the future. Hopmann et al. (2007) review the findings of five other researchers and arrive at a conclusion that decisively negates the assumption that the knowledge measured by PISA is of future real-life use:

different countries have different value systems, different curricula and distinct education-system structures automatically invalidate any comparison? And, despite the "uniformity" of mathematics, English and the natural sciences, is it actually appropriate to require all pupils as such to demonstrate a basic level of knowledge? And perhaps the differences between the systems could help researchers identify the reasons why one system outperforms another in terms of preparing its pupils for superior educational performance? What conclusions may be drawn from a country's relative standing in the outcomes of an international study regarding the quality of its education system, its potential competitiveness on the international economic plane, or the social/cultural/economic horizons open to its graduates? These and other questions understandably preoccupy educators, education system administrators, public figures, and parents.

Given the many methodological problems involved in comparing the achievements of pupils who themselves are products of education systems that differ in character, mode of operation, and the principles that underlie their social and educational history, several questions automatically arise: Why does the public at large attach such great importance to international exams, and why are so many education systems felt to be in crisis due to the average scores of their pupils on these exams, which place them at unflattering positions on the international achievement scale? And how is that so many people, both highly and less-highly educated, are willing to regard success on international exams as the sole – or at least as the central – criterion by which to judge their country's education system? And what can or should be done to ensure that international-exam performance data will in future be regarded as just one criterion among many, and as one of multiple sources of information regarding the state of education in a given country?

International Exams in Israel

Are Israel's attainments on the international exams inferior to those of other countries?

Since 1999, and even before, Israel has ranked among the lowest-performing countries in the TIMSS, PISA and PIRLS studies – both in terms of average scores for all pupils, and in relation to scores for strongest and weakest pupils. That is, the share of outstanding pupils

among all Israeli pupils is one of the world's lowest, the share of weak pupils is one of the world's highest, and the gaps between them are among the widest. These data are well-known and have been extensively documented, both in the international-exam research reports produced by those responsible for Israel's participation in these exams,[6] and in a number of other works (Blass, 2011; Ben-David, 2010, 2012).

Have Israeli pupil achievements declined since 1999?

The widespread belief is that there has been a deterioration in pupil performance since the end of the late 1990s and that Israel's ranking is taken as unequivocal support for that assumption. However, the assumption ignores the fact that the country composition of the rankings, and number of countries included, changes from test to test. If we closely compare the achievements of Israeli pupils with those of pupils in all countries that took part in all exams, we find an entirely different picture, as is clearly shown in Appendix Tables 1-5. Of the 21 countries that have participated in each of the Grade 8 TIMSS exams since 1999, Israel is the only one that has improved its average score to an impressive degree. Israel's place in the ranking has also risen dramatically.[7]

Similarly, of the 26 countries that have participated in all PISA exams, Israel ranks ninth on the parameter of improvement in the rankings; on improved pupil scores it ranks fourth. The United States, despite major efforts invested in its NCLB program (No Child Left Behind, 2001), dropped by 12 points and four places in the rankings, while Finland declined by 17 points, though it managed to retain its place in the rankings. The picture regarding PIRLS is the same: Israel ranks fifth of 22 countries in terms of score improvement, and fourth for improved rank. Moreover, Israel has succeeded in significantly reducing its share of pupils classified as low-achieving on PISA (now ranked eighth on this reduction parameter), thereby significantly increasing the share of pupils at the higher achievement levels (fifth in the rankings).

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[6] Zuzovsky (2001) wrote about TIMSS-2003, TIMSS-1999, and jointly with Prof. Nachmias prepared the report on TIMSS-2007; RAMA researchers published the reports on PISA-2006, 2009, 2012; Mevarech and Kramarsky (2004) published the PISA-2000 report; Zuzovsky and Ullstein published the reports on PIRLS-2001 and 2006; and RAMA researchers published the report on PIRLS-2011.

[7] It is important to stress that these data are based largely on the change that emerged in 2011, to be discussed later in this paper.

Thus, contrary to the superficial picture, Israeli pupils' achievements, which were low at the start of the millennium compared with those of their peers in the comparison countries, have not worsened, but in fact have improved.

2. Why Are the International Exams So Important?

In the estimation of this policy paper, there are two main sources for the sense of crisis that permeates public discourse in those countries where pupil achievements do not meet expectations:

1. ***Pride and prejudice***: national pride, a competitive worldview and (in the case of Israel) a gap between public perceptions and reality with regard to pupil skills, knowledge levels, and the education system.

2. ***No flour, no Torah***: a one-dimensional view of the relationship between a country's current level of education quality and its future ability to cope within the global economic framework.

This section will analyze each of these sources in depth.

Pride and Prejudice: Is Pride in Israel's Education System Justified?

One deeply-rooted cause behind the emotional response to international exam results is the fact that they play upon the sense of national pride and ethnic/tribal identity that we all experience. The response to the exam results can be compared to the reaction elicited by a victory in the Olympics or Eurovision song contest. A country that allocates less than one percent of its budget to sports and culture goes wild when one of its young men or women wins a medal in a minor Olympic event, makes a movie that garners an international award, or writes a book that is translated into dozens of languages. In a country where higher education budgets are being slashed, political leaders compete to see who can more loudly praise the country's Nobel laureates – despite the fact that those laureates left the country long ago and are pursuing their academic and professional lives elsewhere. Euphoria sweeps an entire country when a local soccer team wins the Euro Cup, though the victory mainly reflects the team owner's ability to buy first-rate foreign players at a good price. In each of these situations, the individual becomes symbol of the entire

tribe. The state and its citizens are pleased and proud to appropriate the achievements of individuals or of small, select groups, though the collective has almost no bearing on their successes.

The gap between the image and the reality

Another major factor, besides the sense of national pride noted above, that contributes to the atmosphere of crisis surrounding Israel's low ranking on all international exams is the stark contrast between how the Israeli public perceives its pupils' attributes and skills compared with those of other countries' pupils, its awareness of the conditions in which Israeli pupils are expected to succeed academically compared with those provided by other countries, and the prevailing reality. The Jewish-Israeli national myth is predicated on the concept of the "People of the Book" and its associated qualities of learnedness, studiousness, originality, and wisdom. Another myth is that education is a sphere to which Jewish society attaches supreme importance, and that Israel, accordingly, invests more in education than do other countries. Both of these myths need to be examined in light of two main questions:

1. Does Israel's collective self-image regarding Israeli pupil skills reflect reality?

2. Is Israel's collective self-image regarding the conditions in which its education system operates, compared with the prevailing conditions in countries with which Israel aspires to compare itself, a realistic one?

The attempt to answer these two questions provides an opportunity for serious and appropriate discussion of a larger issue: does Israel's place on the educational achievement scale for developed countries decisively prove the failure of the country's education system, or is that "failure" merely the logical conclusion considering the conditions in which the system operates?

Israeli public discourse tends to focus on comparisons with countries like the United States, which Israelis often look to as a model, and Japan, whose high achievements make it a country to emulate. However, major differences between Israel and these two countries – in size, in the funds available for education, and in cultural/ideological environment – actually warrant comparison with other countries, those of Europe in particular. In the context of cross-country comparison, the present document will follow the lead of the late Professor Ruth Klinov in her surveys for the National Authority for Measurement and Evaluation in Education

(referred to hereinafter by its Hebrew acronym, RAMA), themselves based on the OECD series *Education at a Glance* (Klinov, 2011), and will focus its comparisons on Australia, Denmark, Finland, New Zealand, Korea, Spain, Poland, and the United States (hereinafter: "the comparison countries"). Several of these countries are included due to their participation in the three major scholastic performance studies: the United States – because it is the country that Israeli citizens tend to idealize; New Zealand and Australia – due to the interesting education system reforms that they have implemented over the past decade; and Poland because of its recent major strides in pupil achievement. Southeast Asian countries are not included because their cultural, political and social differences from Israel would seem to make them irrelevant for comparison in the education sphere.

Are Israeli pupils more gifted than those of other countries?

Several recent studies have used the international exam achievement data of selected countries as a basis for assessing the average cognitive skill levels of those countries' pupils. One such study examined the cognitive skills of pupils in 194 countries; on this study scale, the abilities of pupils in approximately 40 countries were higher than Israeli pupils' (Rinderman, 2007). Lynn and Meisenberg (2010), who looked at 108 countries, obtained similar results.

In this paper the tendency is to refrain from identifying outcomes on "paper and pencil exams" with intelligence. It appears that, given equivalent background data over time, no major differences would be found in the abilities of pupils from different countries.[8] My skeptical approach to the findings of the aforementioned researchers is supported by Israel's scientific and cultural achievements as compared with those of other countries, and by the disproportionately large presence of Israelis among winners of prestigious prizes in the arts and sciences, as well as the success seen by Israeli writers, dancers, musicians and film directors in the international arena. Moreover, in the technology sphere, Israel's international performance is impressive; not for nothing is it referred to as the Start-up Nation. To the argument that individual attainments tell us nothing about the collective, we can respond that Israeli citizens perform

[8] This would seem to reflect a societal world view rather than one grounded in scientific-based data; yet the same is true of those who believe in racial and national supremacy.

impressively in a range of fields, despite the fact that Israel's best pupils (by definition a minority) reach significantly lower achievements on international exams than do those of countries such as Japan, Korea and Finland, both in terms of actual scores and in terms of the percentage of high performers within the entire pupil population. Moreover, in order for a high-achieving minority to exist, there has to be a broad infrastructure.

Conditions in the Israeli Education System Relative to Those of Other Countries

Given the premise that Israeli pupils are essentially no different in terms of ability from their non-Israeli peers, a key question regarding Israel's place in the international exam rankings is whether the conditions under which the Israeli education system operates are inferior to those in countries with which Israel aspires to parity.

The answer to this question is complex. For many years, Israel's education system has been operating in a reality that qualitatively differs from that in which most education systems in the developed world operate – a major difference being constant security tension and the environment that it creates. What direction does the security impact take, and what weight should be attributed to it in determining pupil achievements – these are the questions to be explored at length in the section dealing with the relationship between the economic system and education system. For now, we will simply note a starting assumption: the immediate impact of the security situation is a difficulty in the allocation of resources commensurate with civilian needs generally, and with educational needs in particular. The following is a description of Israel's status relative to other countries in terms of background conditions that educational literature commonly identifies as having an impact on educational performance.[9]

[9] Other important and influential variables could, of course, have been chosen, or added to those that were selected. The possibilities are many and varied, but the variables presented are ones whose importance most people would not question.

The education level of the population

Table 1 clearly shows that the rate of higher education in Israel's population as a whole, and especially among the Jewish population, is one of the highest of all countries included in the comparison. Israel ranks second after Canada in the percentage of those with higher education, at a level comparable to that of Australia. However, it is important to note the differences that exist between different age groups (Table 2). All of the comparison countries display a steep rise in higher education rates as age levels decline. By contrast, Israel has a clear advantage over all of the other countries in terms of the education level of its 55-64-year-olds; this advantage declines sharply in the 30-34-year-old age range, though Israel still outranks many other countries, including the United States, Australia and Finland. In the older age groups, the share of those with academic and post-primary educational backgrounds together is 23 percent higher than the OECD average, while among 30-34-year-olds the share is only 11 percent higher than the OECD average.[10] What the data mean is that, assuming that the 35-54-year-old age group, and especially the 35-44 age group, consists of parents of children who are taking the present-day PISA and TIMSS exams, then the advantage enjoyed by Israeli children due to their parents' educational level still exists – but is declining.

[10] The 30-34-year-old age group was chosen in order to avoid data bias in the 25-34-year-old age group resulting from the impact of military service, which is unique to Israel.

Table 1. **Distribution for ages 25-64 by education level, 2012**
Percent

Country	Share of individuals with this level of education			
	Middle school	High school	Higher education*	Academic
OECD average	**24.3**	**43.9**	**No data**	**32.6**
Australia	23.6	30.0	5.2	41.3
United States	10.7	46.3	No data	43.1
Denmark	20.8	43.1	No data	34.8
Israel	**15.5**	**38.1**	**No data**	**46.4**
New Zealand	19.0	22.5	11.0	40.6
Spain	45.4	22.2	No data	32.3
Finland	15.2	44.3	0.9	39.7
Poland	10.4	61.4	3.7	24.5
Canada	10.9	25.0	11.5	52.6
Korea	17.6	40.7	No data	41.7

Source: Nachum Blass, Taub Center.
Data: *Education at a Glance* (2014).

Table 2. **Share of those with academic higher education,* 2012**
Percent, by age group

Country	25-64	30-34	35-44	45-54	55-64
OECD average	**32**	**40**	**35**	**29**	**24**
Australia	41	49	45	37	33
United States	43	45	46	41	42
Denmark	35	43	39	32	29
Israel	**46**	**51**	**50**	**45**	**47**
New Zealand	41	48	42	38	35
Spain	32	40	39	28	19
Poland	25	39	26	16	13
Finland	40	46	47	41	31
Korea	42	66	52	29	14
Canada	53	58	59	50	44

* Vocational training without an academic degree.
Source: Nachum Blass, Taub Center.
Data: *Education at a Glance* (2014).

Demographic composition

One factor that strongly influences all aspects of education systems, including pupil achievements, is the percentage of children in the population as a whole. The larger the share of children, the greater the economic burden of education borne by the nation's economy. Table 3 clearly shows that the share of younger people in the Israeli population is much higher than the corresponding share in the comparison countries. This population composition is greatly affected by high rates of natural increase, especially in the past, in Israel's Arab sector. However, the composition of Israel's Jewish sector is also younger than the OECD average. Clearly the high percentage of school-aged children, combined with a lower GDP than the comparison countries (as will be shown at a later point), made it difficult to allocate sufficient financial resources to ensure optimal educational achievement.

Table 3. **Age group distribution in the overall population***
Percent, 2012 data for Israel, 2010 data for all other countries

Country	**Age groups (percent of overall population)**				
	0-14	15-24	25-54	55-64	65+
OECD average	**17.5**	**25.4**	**28.7**	**12.8**	**15.6**
Australia	18.2	13.5	42.2	11.8	14.4
United States	20.0	13.8	40.6	12.1	13.5
Denmark	17.4	12.8	39.6	12.6	17.6
Israel	**27.5**	**15.7**	**37.7**	**8.8**	**10.3**
Israel - Jews	26.2	14.3	35.4	10.5	11.5
Israel - Arab Israelis	36.8	19.1	37.2	4.6	4.0
New Zealand	20.1	67.3	No data	No data	11.9
Spain	15.3	9.9	46.5	11.1	17.3
Poland	14.8	No data	No data	No data	13.6
Finland	15.9	12.4	38.5	14.7	18.5
Korea	15.1	13.6	48.3	11.2	11.9

Source: Nachum Blass, Taub Center.
Data: CBS (2014); http://populationpyramid.net/.

Share of immigrants in the population

A common explanation for the low achievements of Israeli pupils on international exams is the fact that Israel is an immigrant country. Since children of immigrants face more difficulties than do native-born Israelis, it is thought to be unsurprising that the country's global ranking is relatively low. However, Israel's situation in recent years has actually been quite similar to that of several of the comparison countries. According to 2013 data, 96 percent of Israelis aged 0-19 were born in Israel, and 77 percent of them were born to Israeli-born fathers (Central Bureau of Statistics, 2014).

These data are further supported by those of TIMSS-2011 regarding the percentage of eighth graders who speak the exam language at home. Of Israeli children, 93 percent speak the exam language – Hebrew or Arabic – at home most of the day. In Australia, New Zealand and the United States, the percentage is lower.

The percentage of Israeli pupils who took part in PISA-2012 and who spoke at home a language other than the test language was 8 percent. Ten comparison countries had higher percentages of pupils whose home language differed from the test language, including Canada (14 percent), New Zealand (13 percent), the United States (12 percent), Switzerland (12 percent), and Austria (10 percent). The percentage of Sweden's pupils whose home language differs from the test language is identical to Israel's (8 percent), while Australia's percentage is lower (7 percent). The mean reading attainment in each of the aforementioned countries was higher than that of Israel (*Education at a Glance*, 2011). Moreover, PIRLS-2011 asked school principals what language was spoken in the homes of their schools' first graders. In Israel, it was reported that for 97 percent of the children the home language was the same as the exam language, versus an overall average of just 92 percent.

It thus appears that mass immigration and its effects, once so unique to Israel, are declining – while growing more widespread in other countries. Moreover, while an absolute majority of Israeli immigrants are Jewish – a fact that makes immigration, including its linguistic side, easier – most immigrants to other countries are of diverse national origin and rooted in entirely different cultures.

Immigrant and absorption policies of other countries are also important considerations. Some countries, like Australia and New Zealand, have selective immigration policies and admit immigrants whose educational and economic levels are relatively high. By contrast,

the policies of European countries are guided by immediate needs for cheap labor, with predictable results: large-scale immigration of economically and educationally weak populations. In Israel, however, most immigration over the last few decades has been from countries whose education systems are not inferior to Israel's, and possibly superior. Thus, the immigrant absorption parameter can no longer explain low achievement – in fact, the opposite is the case.

Class size

Table 4 shows that the number of pupils in Israel's primary school classes is significantly higher than in the comparison countries. For middle schools, only Korea has a larger number of pupils per class. Much has been written about the problematic relationship between class size and educational achievement. Even if a link has not been proven unequivocally, there can be no doubt that larger classes are harder on teachers, and that that they lower the quality of the educational climate for pupils.

Table 4. **Number of pupils per class in public schools, 2012**
By level of education, countries are arranged by class size in primary education

Country	Number of pupils per class	
	Primary school	Middle school
OECD average	**21.3**	**23.6**
Australia	23.1	22.7
United States	21.5	27.6
Denmark	21.1	21.4
Israel	**27.9**	**29.3**
Spain	20.3	24.1
Finland	19.4	20.2
Poland	18.8	22.7
Korea	25.1	33.6

Source: Nachum Blass, Taub Center.
Data: *Education at a Glance* (2014).

Teacher-pupil ratio

One measure of instructional quality used in the educational literature is the number of pupils per teacher. This criterion has often been linked with that of the average number of pupils per class ("class size"). However, despite the two parameters' relatedness, they are in fact separate and there is a qualitative difference between them. Average class size denotes the average number of pupils registered as being in a given class. [11] By contrast, the teacher-pupil ratio is determined by dividing the number of pupils by the number of full-time teacher positions. [12]

Thus, for example, in a system where a class has forty instructional hours per week, a teacher position also entails 40 weekly hours of instruction, there are 40 pupils in the class, and the same teacher teaches all the hours. The "class size" is 40 pupils and the "teacher-pupil ratio" is 1 to 40. However, if in the same system it is common to have two teachers in the classroom at the same time, the average class size will still be 40, but the teacher-pupil ratio will be 1 to 20.

If a full-time teacher position is 20 hours per week, then two teachers will be needed to teach the same class all of the required instructional hours, and four teachers if the practice of having two teachers in the classroom is maintained; but in the first instance the teacher-pupil ratio will be 1 to 40, while in the second instance it will be 1 to 20. In the third instance, it will be 1 to 10. In all cases, the average class size will remain 40 pupils.

As noted, the pupil-teacher ratio is calculated arithmetically by dividing the number of pupils by the number of full-time teacher positions in the system. The number of full-time positions required by the system is determined by:

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[11] The term "class" generally denotes a school-based framework that, in Israel, is commonly referred to as kitat em, or "homeroom." In Israel, "class size" is determined by dividing the total number of pupils by the number of homerooms. The number of homerooms is determined by dividing the number of pupils in a grade by 40, the maximum number of pupils per class as specified by Ministry of Education regulations. That is, if a particular grade has 100 pupils, the average class size will be 33.3 – even if, in reality, the school has decided on two classes of 40 and one class of 20.

[12] A full-time teacher position is determined by labor agreements with the teacher unions. Because in Israel most teachers work part-time, the number of teachers is much greater than the number of full-time teacher positions.

1. **The teacher job definition as full- or part-time employment**: in a country where the employment entails more hours, the pupil-teacher ratio will be higher.
2. **Normative class size**: the larger the normative class size, the higher the pupil-teacher ratio.
3. **Number of pupil instructional hours**: the more hours pupils study, the lower the pupil-teacher ratio.
4. **The way the education system is organized**: legitimizing separate and special education systems increases the demand for teachers and helps lower the pupil-teacher ratio.
5. **Geographic distribution**: significant dispersion of pupils leads to smaller class sizes and thus to a lower pupil-teacher ratio.

As shown in Table 5, Israel's pupil-teacher ratio at the primary and middle school levels is very similar to the OECD average, while at the high school level it is significantly lower – 11 pupils per teacher versus 13.8 pupils per teacher in the OECD states. Only in the primary schools of Poland, Spain and Finland is the pupil-teacher ratio lower than Israel's; at the middle school level, Denmark joins, while at the high school level, only Poland and Spain have lower ratios, though the gap is very small.

Table 5. **Pupils per teacher, 2012***
By level of education

Country	**Number of pupils per teacher**		
	Primary school	Middle school	High school
OECD average	**15.3**	**13.5**	**13.8**
Australia	15.5	--	--
United States	15.3	15.3	15.3
Denmark	--	11.9	--
Israel	**15.2**	**13.6**	**11.0**
New Zealand	16.4	16.4	13.7
Spain	13.4	10.6	9.9
Poland	11.0	9.9	10.9
Finland	13.6	8.9	16./1
Korea	18.4	18.1	15.4
Canada	--	15.8	14.1

* Blank cells indicate a lack of comparable data.
Source: Nachum Blass, Taub Center.
Data: *Education at a Glance* (2014).

Teacher salaries and work conditions

A majority of education professionals now feel that teacher quality is the school-based factor that most significantly affects pupil achievements.[13] It stands to reason that teacher work conditions would affect the quality of the manpower entering the teaching field. These conditions[14] differ radically from country to country, and sometimes within the same country. Still, there are a few characteristics common to most of the countries chosen for comparison purposes in this paper: (1) Seniority – the main path for advancement is that of teacher seniority in the field; (2) Education – the impact of education on salary is critical; thus teacher salaries at the post-primary level were found to be higher, though this trend is weakening.[15]

Salary in relation to seniority and educational achievements

One of the arguments most commonly articulated by education professionals is that there is a direct correlation between teachers' salaries and their professional caliber and ability to elicit high achievements from their pupils (Dolton and Gutierrez, 2009). However, two facts call into question the relationship between salary and the number and quality of those who enter the teaching field:

- Despite teacher salary increases of the mid-1990s under the Rabin administration, there was no upsurge in prospective teacher numbers during the relevant period before it ended with the signing of new wage agreements. By contrast, the new wage agreements, which did not merely change salaries but also altered the work structure (in parallel with the economic crisis of the late 2000s), did bring about a change, albeit a small one – and today there are more candidates for teaching jobs.

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[13] Although home-based factors have the greatest impact, they do not fall into the school-based category.

[14] Conditions include number of working hours that teachers are required to teach or be present in the school per day, week and/or year; pay scale and rate of advancement; benefits not included in the base salary; and advancement criteria.

[15] There is a fair amount of evidence that contrary to prevailing attitudes, the impact of a master's degree or more than 15 years' seniority has only a negligible effect on the quality of teaching.

- The fact that there is interest in the teaching field, despite the fact that those with educational backgrounds and abilities similar to those of teachers earn more in other occupations, appears to indicate that there are, indeed, compensating factors that attract people to teaching (IES, 1996).

Other studies have presented findings along these lines. Hanushek et al. (1999), for instance, maintain that:

> *The pattern of results is perplexing, but the overall analysis suggests that as currently employed, salary policies do not appear to offer much promise for improvement in student performance. Factors other than salaries appear to play a much more important role in determining the desirability of specific districts* (p 47).

Even if wage has no direct impact on educational achievements, it is still one of the most influential factors in terms of recruiting outstanding teaching manpower and keeping it stable. Israeli teacher starting salaries are substantially lower than the OECD average, but increase with seniority. In this context, it should be noted that primary school teachers are actually better off than those in post-primary education, though we may assume that when the most recent wage agreement with the post-primary teachers union (Oz L'Tmura) is fully implemented, the salaries of the latter will improve as well.

The difference between Israeli teacher starting salaries and the salaries of teachers at the highest level of seniority is on an order of more than double – compared with an average OECD ratio of 1.6, and 1.5 in other countries (Table 6). This indicates that Israeli wage policy attaches much greater importance to seniority than do the wage policies of other countries. Only in Korea does seniority have a greater impact on salary than in Israel. In several countries, such as Australia, Denmark and New Zealand, after ten years seniority is no longer a salary increase factor. This situation is consistent with long-recognized findings to the effect that most improvement in the quality of teachers' work takes place during their first five years of employment, and almost entirely ceases after 10 to 15 years.

Table 6. **Teacher starting salaries and highest salaries,* 2012**
By level of education taught, in PPP dollars

Country	Primary school		Middle school		High school	
	Starting salary	Highest salary	Starting salary	Highest salary	Starting salary	Highest salary
Australia	37,221	51,662	37,259	52,214	37,259	52,214
Canada	37,145	58,495	37,145	58,495	37,294	58,728
Denmark	44,131	51,122	44,131	51,122	45,504	59,368
Finland	32,148	41,811	34,720	45,157	36,817	48,745
Israel	**19,680**	**41,318**	**19,790**	**37,676**	**18,973**	**37,266**
Korea	28,591	79,631	28,485	79,526	28,485	79,526
New Zealand	28,961	43,050	29,279	44,710	29,160	45,469
Poland	11,388	18,925	12,824	21,576	14,497	24,693
Spain	36,268	51,341	39,726	55,989	40,766	57,580
United States	36,333	58,793	36,993	56,938	38,433	56,937
OECD average	**29,411**	**46,909**	**30,735**	**48,938**	**32,255**	**51,658**
Ratio between OECD average and Israel	**0.67**	**0.88**	**0.64**	**0.77**	**0.59**	**0.72**

* For teachers with a BA degree.
Source: Nachum Blass, Taub Center.
Data: *Education at a Glance* (2014).

Teacher salaries compared to salaries in other occupations

Table 7 shows that the salaries of full-time Israeli teachers compared with those of academic degree holders in other occupations is slightly higher than the OECD average at the primary education level, and slightly lower at the post-primary level. However, in most of the comparison countries (except for the United States) the situation is similar to, or better than, the situation for Israeli teachers.

Table 7. **Ratio of teacher's salary to salaries in other occupations, 2012**
For full-time position with an academic education, by level of education taught

Country	Ratio of teacher's salary to salaries in other occupations requiring same education level		
	Primary school	Middle school	High school
OECD average	**0.85**	**0.88**	**0.92**
United States	0.67	0.68	0.70
Denmark	0.92	0.92	1.06
Israel	**0.87**	**0.85**	**0.88**
New Zealand	1.04	1.06	1.09
Spain	1.20	1.32	1.35
Poland	0.82	0.83	0.82
Finland	0.89	0.97	1.09
Korea	1.36	1.36	1.36
Canada	1.05	1.05	1.06

Source: Nachum Blass, Taub Center.
Data: *Education at a Glance* (2014).

Changes in teacher wage between 2000 and 2012

Table 8 presents the changes in teacher salaries at the various educational levels during the period 2000-2012 (2005 is the base year). Compared with 2000, Israeli teachers improved their wage situation at a much faster rate than did their peers in the comparison countries and relative to the OECD average; in some cases the situation of teachers in the comparison countries worsened. Israel's improvement is more pronounced at the primary school level, subsequent to the implementation of the Ofek Hadash wage agreement, but will also be reflected at the post-primary level in the coming years once Oz L'Tmura is implemented.

Table 8. **Basic annual salary changes for public school teachers, 2012**

For teachers with at least 15 years of seniority and a BA degree,* by level of education taught, Index year: 2005=100

Country	Primary school		Middle school		High school	
	2000	2012	2000	2012	2000	2012
Australia	92	104	92	105	92	105
Denmark	94	114	94	114	90	108
Finland	86	100	92	100	91	101
Israel	**100**	**143**	**100**	**117**	**101**	**114**
Korea	80	95	80	96	80	96
New Zealand	97	104	97	109	97	110
Poland	--	123	--	121	--	120
Spain	95	97	92	95	96	95
United States	96	97	95	98	102	104
OECD	**88**	**103**	**90**	**102**	**89**	**101**

* Without any special additions.

Source: Nachum Blass, Taub Center.

Data: *Education at a Glance* (2014).

Time allocated for instruction

The number of instructional hours allocated for a particular subject is a major component of pupil achievement. Although studies of school year/day extensions' impact on achievements are not in complete agreement, there is a consensus that high performance cannot be expected without an investment of time resources. The number of study days per year and instructional hours per day are usually determined in a centralized manner by the heads of the education system, while the way in which the time allocated is used depends on other variables, such as the educational institutions' level and mode of management.

Number of instructional hours

It is important to understand the difference between "weekly instructional hour allocation per class" or even "weekly instructional hours per pupil," as commonly referred to in discussions of the Israeli education system, and the number of hours that pupils actually spend in class. The "weekly instructional hour allocation per class" is primarily a budgetary term, largely specific to Israel due to the budgetary method employed, which notes the number of teaching hours needed to implement the curriculum, per existing pedagogical and administrative guidelines and teacher labor agreements. The "number of hours that pupils/classes spend learning" variable refers to the number of actual instructional hours of the pupil or class (it should be emphasized that in international comparisons this does not refer to class periods, whose duration differs between countries, but rather to full 60-minute hours). Situations can arise in which a class is allocated 60 instructional hours per week, but individual pupils spend only 30 or even 20 hours per week actually learning – for example, if a class is divided into two or three groups, with each group assigned its own teacher. Thus, the number of hours allocated per class should not be taken as the sole measure of the number of hours that pupils are being taught. Still, the way in which the hours allocated per class are used tells us something about the preferences of school administrations and education authorities. For example, some administrations prefer to increase the number of instructional hours for all pupils, while others prefer to split classes or, alternatively, to provide classes with remedial frameworks such as individual instruction or teacher advisors.

Table 9 clearly shows that the number of instructional hours allocated to Israeli pupils, at both the primary and middle school levels,[16] is greater than the OECD average. Among the comparison countries, only three allocate more hours to these grade levels: Australia, the United States and Spain. A study that examined the data on primary education only (Blass, Zussman and Tsur, 2012) found that most Israeli primary school pupils are allocated more than the minimum number of hours required. One cannot, however, necessarily conclude from this that Israeli pupils are actually receiving more hours of instruction. This is because the Ministry of Education does not really know how the schools are using the hours allocated to them, how many of these hours are actually used for

[16] No appropriate data were found for Israeli high schools.

instruction, and how many are being wasted due to school day cancellations, tardiness and absences.[17]

Table 9. **Annual class hours,* 2014**
By level of education taught

Country	Primary education		Lower secondary		Upper secondary	
	Required study program	**Advised** study program	**Required** study program	**Advised** study program	**Required** study program	**Advised** study program
Australia	6,060	--	4,060	--	10,120	--
Canada	5,515	5,515	2,764	2,772	8,279	8,287
Denmark	5,280	5,280	2,790	2,790	8,070	8,070
Finland	3,794	3,965	2,533	2,704	6,327	6,669
Israel	**5,741**	**5,741**	**3,011**	**3,011**	**8,752**	**8,752**
Korea	3,885	3,885	2,525	2,525	6,410	6,410
OECD average	**4,553**	**--**	**2,922**	**--**	**7,475**	**--**
Poland	3,807	4,155	2,430	2,623	6,237	6,778
Spain	4,725	4,725	4,245	4,245	8,969	8,969
United States	5,802	--	3,033	--	8,835	--

* One teaching hour is 60 minutes.
Source: Nachum Blass, Taub Center.
Data: *Education at a Glance* (2014).

[17] The phenomena of class cancellations and absences are not unique to Israel. One Dutch study found that post-primary pupils spent just 87 percent of the time allocated by the schools learning, and that the amount of time designated for instruction was less than the amount allocated to the institutions. In the primary schools, pupils received instruction during only 81 percent of the time allocated by the schools; here as well the amount of time that the schools allocated for the purpose was less than their original allocation (*EAG*, 2007). Similar assessments have been carried out for other countries (Ben Avot, 2004; Miller, 2008; Smith, 2002).

Instructional hours by subject

Distribution of instructional hours by subject is an important issue that can shed light on the claim that there is a relationship between low Israeli pupil achievements in the sciences and reading comprehension and the relatively small number of instructional hours devoted to those subjects.[18] Table 10 compares Israel and the other countries with regard to the number of instructional hours allocated to the subjects taught in Grade 8 and included in the TIMSS exams, and to the subjects taught in Grade 9 and included in the PISA study.[19] The table data clearly show that Israel allocates a larger share of hours to Grade 8 subjects than the OECD average. Because Israeli pupils also spend more hours in the classroom, as shown in Table 10, it is clear that the number of instructional hours allocated to Israeli pupils in this age group is greater than that allocated by the OECD states. In Grade 10, pupils are divided into educational tracks and the picture changes: the share of hours devoted to reading, writing and mathematics is larger than in the OECD countries, while the amount of time allocated to the sciences is much smaller.

[18] See Professor Dan Ben-David's remarks in *Calcalist*: "One can look at how many of the total study hours are devoted to mathematics, reading and science. We provide more teaching hours than nearly all of the OECD countries, yet we still devote fewer hours to the important subjects than the OECD countries do" (*Calcalist*, 2011).

[19] Eighth graders are tested in the TIMSS framework, while tenth graders take the PISA exam.

Table 10. **Teaching hours in reading, mathematics and sciences, 2014**
As a percentage of all teaching hours, in 8th and 10th grade

Country	8th grade			10th grade		
	Reading, writing, literature	Mathematics	Sciences	Reading, writing, literature	Mathematics	Sciences
Denmark	21	14	17	19	13	16
Israel	**18**	**15**	**15**	**11**	**14**	**4**
OECD average	**14**	**12**	**12**	**12**	**10**	**10**
Spain	16	12	10	15	12	15
Poland	14	12	12	14	12	12
Finland	12	12	16	12	12	16
Korea	13	11	19	7	7	7

Source: Nachum Blass, Taub Center.
Data: *Education at a Glance* (2014).

Regarding the relation between the number of instructional hours in the various subjects and PISA attainments, the findings are surprising indeed. Contrary to expectation, the correlations between the share of mathematics out of the total number of instructional hours and the number of instructional hours in math and pupil math achievements in the PISA exams were negative (-0.10 and -0.33, respectively). In contrast, the correlations between the percentage of instructional hours out of all school hours and the number of instructional hours allocated to art/physical education and math achievements were actually positive (Table 11). It is important to stress that we are not referring to actual instructional hours but rather to compulsory instructional hours according to the curriculum. Also, because preferential treatment is given to the "basic subjects" – in Israel, at least, but probably in other countries as well – the required number of hours, as noted in the official figures, is the lower limit for instructional hours in these subjects.

Education professionals explain the results by completely inverting cause and effect, arguing that the reason for the negative correlation is that weak students receive remedial support from the outset, which is reflected in a greater number of hours (an explanation similar to that used regarding class size findings that contradicted starting assumptions –

namely that weaker pupils in any case study in smaller classes). But in the present case, the argument cannot be accepted, since we are not talking about actual instructional hours but rather about the minimum required hours allocated to all pupils in the system.[20]

Table 11. **The correlation between hours allotted to a subject or the share of teaching hours for a given subject and achievements in mathematics**
2012 PISA exams, by level of education

Age cohort	Reading	Mathematics	Sciences	Arts	Physical education
10th grade					
Correlation between achievements and the subject's share of all teaching hours	-0.10	-0.33	0.26	0.44	0.01
Correlation between achievements and number of teaching hours	-0.17	-0.45	0.18	0.37	-0.04
Secondary education					
Correlation between achievements and the subject's share of all teaching hours	-0.05	-0.31	-0.39	0.19	0.20
Correlation between achievements and number of teaching hours	-0.18	-0.44	-0.46	0.11	0.08
Primary education					
Correlation between achievements and the subject's share of all teaching hours	0.03	-0.25	-0.43	0.34	0.19
Correlation between achievements and number of teaching hours	-0.07	-0.27	-0.41	0.26	0.11

Source: Nachum Blass, Taub Center.
Data: *Education at a Glance* (2014).

[20] In a private letter to the author of this paper, Professor Ruth Klinov hypothesized that it is actually those countries that formerly showed low achievements in these subjects that added instructional hours.

Financial investment in education

Table 12 presents data on GDP per capita and on public expenditures per pupil at the various education levels. Israel's GDP per capita is the lowest of all the countries examined except for Poland and Korea, with similar outcomes for educational expenditure per pupil at both the pre-primary and post-primary levels. In terms of expenditure per pupil as a percentage of GDP, Israel also places low relative to the comparison countries.[21] Only in primary education, due to the Ofek Hadash wage agreement, is Israel's per pupil expenditure similar to that of most of the comparison countries (Table 13).

In US dollars purchasing power parity (PPP) terms and educational resources, New Zealand allocates nearly three times more than Israel to the various education levels – $11,000 per pupil at the pre-primary level versus $4,000, respectively. The importance that New Zealand attaches to pre-primary education is also greater than that attached by Israel, as reflected in the allocation of 35 percent of GDP per capita per pupil to pre-primary education, compared with just 13 percent for Israel. Denmark, Poland and Korea are also notable for their large share of pre-primary education expenditure as a percentage of GDP per capita. Although Poland's GDP per capita is nearly a third lower than Israel's, its expenditure per primary and post-primary pupil is similar, the logical explanation being that Poland simply attaches greater importance to education than does Israel.[22]

[21] In this context, remember that the number of children in Israel is greater than what is generally found in the OECD countries.

[22] Of course, Israel's relatively low investment in this area is due to the large expenditures on security and debt servicing in the state budget.

Table 12. **Per capita GDP and per pupil public expenditure, 2011**
Current prices, by level of education

Country	Per capita GDP	Expenditure for preschool	Expenditure for primary school	Expenditure for post-primary school
Australia	43,208	10,734	8,671	10,354
Denmark	41,843	14,148	9,434	10,937
Israel	**30,168**	**4,058**	**6,823**	**5,712**
OECD average	**--**	**10,010**	**10,958**	**12,731**
New Zealand	31,487	11,088	8,084	9,312
Spain	32,157	6,725	7,288	9,615
Poland	21,753	6,409	6,233	5,870
Finland	38,611	5,700	8,159	9,792
Korea	29,035	6,861	6,976	8,199
Canada	37,480	No data	9,232	No data

Source: Nachum Blass, Taub Center.
Data: *Education at a Glance (*2014).

In examining the data over time and by education level, most OECD countries exhibit an expenditure increase at all levels of education relative to GDP per capita, while Israel shows a decline in spending at the pre-primary and post-primary levels, and a slight increase at the primary level (Table 13). This would seem to indicate that Israeli society attaches little importance to education compared with the degree of importance attached by the comparison countries,[23] given that Israel is the only OECD country whose public and private expenditure per pupil as a percentage of per capita GDP declined during the period in question, while its GDP showed the largest rate of increase.

[23] It should be emphasized that these data are valid as of 2011. The past few years have witnessed a real change in Israeli educational investment, in the wake of the new wage agreements and the decision to quickly implement the Compulsory Education Law for ages 3-4. Again, as noted, it is important to remember the heavy security burden borne by Israel, as well as the OECD countries' relatively high debt servicing rate.

Table 13. **Trends in per pupil expenditure relative to per capita GDP**
By level of education, percent

Year	Preschool (from 3)		Primary school		Post-primary	
	Israel	OECD	Israel	OECD	Israel	OECD
2000	15	17	21	19	24	25
2005	16	18	21	21	24	26
2011	31	12	23	23	19	62

Source: Nachum Blass, Taub Center.
Data: *Education at a Glance* (2014).

A comparison of the change in educational investment between 2000 and 2011 paints an interesting picture (Table 14). Of the countries included in the comparison (except for Korea), Israel made the most substantial increase in its educational investment, but because Israel had an exceptionally large increase in its pupil population, things look different from a per-pupil expenditure perspective. During the period 2005 to 2011, Israel's expenditure increase was the third-highest (Poland and Korea increased their expenditure per pupil during those years to a higher degree than did Israel), and if we look at the entire period, we find that most of the countries invested more than Israel.[24]

[24] The number of children in Poland in 2011 was 34 percent lower than in 1995; in Korea – 18 percent lower.

Table 14. **Changes in overall investment in education,* in the number of pupils and the per pupil investment as a percent of the per capita GDP**
2000 versus 2011, Index year: 2005=100

Country	Overall investment in education		Change in the number of pupils		Investment per pupil as percent of per capita GDP	
	2000	2011	2000	2011	2000	2011
Poland	89	121	110	80	81	151
Korea	69	127	102	90	68	142
Israel	95	144	94	111	101	130
Australia	83	130	93	103	89	126
Canada	86	117	99	97	87	121
OECD	85	112	101	97	85	117
Finland	81	113	95	99	85	114
Spain	93	116	107	107	87	109
United States	86	107	98	100	88	108
Denmark	86	99	95	111	91	89

* Including public and private expenditure.
Source: Nachum Blass, Taub Center.
Data: *Education at a Glance* (2014).

Over the last few years, three studies have addressed the question of whether Israel's international exam achievement ranking reflects objective data or the base data of its education system. These studies point to a clear link between certain socioeconomic figures and Israel's place on the achievement scale. Yogev, Feniger and Livne (2009), relying on PISA-2002, assert that Israeli pupils' low attainments are largely to be expected and reflect, more or less exactly, the scores that might be predicted for them based on Israel's economic and demographic characteristics. Feniger and Shavit (2010) call attention to an inverse relationship between educational achievement and the factors of family size, fertility rate and class size, noting that, given Israel's high numbers for those variables compared with the OECD countries, Israel's low

ranking on the achievement scale is not surprising. Cahan et al. (2013) explain Israeli pupils' low international exam achievements compared to those of their peers abroad as a function of the country's relatively high percentage of children living under the poverty line.

If There Is No Flour, There Is No Torah – The Relationship Between International Exam Results and Economic Performance

"If there is no flour, there is no Torah" embodies another main reason for the supreme importance that is attached to the international exam results. The prevailing assumption is that there is a significant and direct connection between the academic achievements of pupils in the education system at present and the country's economic performance in the future. However, this is not at all clear, and any possible relationship needs to be examined both theoretically and empirically.

The world's economic, educational and political leaderships, including those of Israel, fear that the outcome of low achievements on international exams in the present will mean slower economic growth, a decelerated rise in the standard of living, a loss of competitiveness in the international marketplace, and impaired ability to face security and social challenges in the future. Those who hold this view base their arguments on a competition-oriented worldview on the one hand and on empirical findings on the other. However, both of these approaches can be countered with other options.

Is there a practical alternative to the competitive worldview?

The competitive worldview sees the international educational arena as an inseparable part of the global economic system. This means that, like the economic system, the education system is characterized by a "zero-sum game" situation in which the improved performance of a given country's pupils will upgrade that country's human capital[25] and competitiveness, and will always necessarily come, one way or another, at the expense of other countries' future economic development.

However, despite the simplicity and the "basic truth" of this approach, its soundness is by no means self-evident. Why, in fact, should the improved educational attainments of Polish pupils threaten Israel in any

[25] This, of course, also applies to the individual and to smaller spatial units.

way? What exactly does a rise from 29th to 14th place indicate?[26] Why is it so crucial to be ranked first, or at least among the very highest scorers? And if the effort to reach a high international-exam ranking entails a lowering of achievements in other important areas, is it really important to invest effort in improving that ranking?

In light of these and other questions, it is both possible and desirable to look at the issue of international exam performance from an opposite perspective, in which importance is attached not to the relative ranking of an individual or a given society, but to the ability of all participants to reach a higher social, cultural and economic level. Duncan Arne, the US Secretary of Education under the Obama administration, delineated such an approach:

> *For too long, policymakers, lawmakers and voters have treated competitiveness as a zero-sum game, in which another nation's gain is necessarily the United States' loss. In fact, enhancing educational achievement and economic viability – at home and abroad – is more a win-win game, one with enormous benefits for the world and for the United States. (Duncan, 2010)*[27]

Education scholar Ben Wildavsky, quoted by Duncan (2010), also stresses that the important thing is not necessarily a country's relative status among other countries, but rather the ability of all nations to improve their education systems, creating a situation where, so long as a given country's pupil attainments are not declining in absolute terms, it need not fear other countries' more rapid improvements in educational achievements.

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[26] Often, discussions of a country's international exam scores segue into discussions of that country's exam score ranking, rather than sticking to the issue of the scores themselves. For example, a few points' difference in score, causing a country to be ranked fifth rather than first, is perceived – despite being statistically insignificant in and of itself – as more important than a difference of tens of points that causes a country to be ranked tenth rather than sixth.

[27] It should be noted that, in the same article, he also expresses the opposite view: "In practical terms, globalization means that U.S. students will have to compete throughout their careers with their peers in South Korea, Canada, China, European countries, India, and other rapidly developing states […] President Obama has repeatedly warned that 'the nation that out-educates us today is going to out-compete us tomorrow.'"

Thus, as an alternative to the competitive worldview, we might consider adopting a more cooperative outlook that views one country's progress in the educational sphere as a contribution to its neighbors' progress as well. A country whose education system is lagging behind and which is mired in poverty or crisis does not necessarily give its neighbor an advantage. Often the opposite is the case. A neighboring country in economic distress will often adopt import quotas and encourage labor migration, thereby driving wages downward and sparking economic and political instability. Moreover, a neighboring country's educational and scientific achievements can help improve the quality of life, welfare and health status of humanity as a whole. Larry Summers, who served as US Secretary of the Treasury under President Bill Clinton, gave clear expression to this approach in a speech at the 2011 Herzliya Conference, noting that the United States had lost nothing due to the flourishing of Japan and Germany, just as the residents of Boston had nothing to lose by the economic prosperity of Florida or South Carolina.

Indeed, it appears that improved manpower quality in Poland or in any other country, though increasing that country's competitiveness relative to Israel, could also contribute – thanks to an overall upgrade of economic status – to increased demand for Israeli goods, while Israel, for its part, could benefit from economic developments originating in Poland. The ultimate outcome, in terms of profit and loss, is altogether unclear.

The relationship between education system quality and economic performance – empirical findings

Most of those who attach great economic importance to the achievements of their country's pupils on international tests base their arguments on a well-established research finding – but the conclusion that they draw from that finding is much less well established. Economic research does indeed prove an unequivocal relationship between individual education level and major quality-of-life and standard-of-living variables – especially income, probability of being employed, health, social involvement, avoidance of criminal behavior, and more.[28] However, a

[28] In the relevant studies, the "education level" variable is usually expressed in terms of number of years of schooling or most recent academic degree – but this is actually a proxy for the hard-to-measure variable "human capital." Human capital is not identical to education level, as it also encompasses many additional variables, such as work experience, value systems and worldviews.

link between the variables on the individual level does not prove the existence of a link between education system quality and a given society's future economic performance – an issue on which opinions are sharply divided (Tienken, 2008; Baker, 2011; Levin, 2012).

Researchers who see a close relationship between the performance of national education systems – as reflected in international exam rankings – and social and economic phenomena such as growth, poverty and socioeconomic disparity, hold that economic research has already proven, with a high degree of certainty, that human capital has a major impact on national growth rates. Human capital is created, for the most part, by formal education systems, and the outcomes of these systems' activity are reflected in pupil achievements on the international exams. Thus, countries whose pupils perform poorly, and which do not strive vigorously to improve their pupils' achievements, are doomed to economic difficulty and to non-competitiveness in the global economy.

Eric Hanushek and Ludger Wößmann are the most prominant researchers who support the view that the achievements of a given country's pupils on international exams strongly correlate with its economic performance. In one of their many articles on the topic they write:

> *A modest goal of having all OECD countries boost their average PISA scores by 25 points over the next 20 years – which is less than the most rapidly improving education system in the OECD, Poland, achieved between 2000 and 2006 alone – implies an aggregate gain of OECD GDP of USD 115 trillion over the lifetime of the generation born in 2010 (as evaluated at the start of reform in terms of real present value of future improvements in GDP). Bringing all countries up to the average performance of Finland, OECD's best performing education system in PISA, would result in gains in the order of USD 260 trillion. The report also shows that it is the quality of learning outcomes, not the length of schooling, which makes the difference. Other aggressive goals, such as bringing all students to a level of minimal proficiency for the OECD (i.e., reaching a PISA score of 400), would imply aggregate GDP increases of close to USD 200 trillion according to historical growth relationships (Hanushek and* Wößmann, *2009).*

This approach also has a fair number of Israeli supporters, who view the education system as a whole, and pupil achievements on international exams in particular, as reliable indicators of any country's ability to compete in the economic and security spheres. The approach lay behind the creation of a national task force – the Dovrat Commission (Blass, 2011). The first sentence of the Commission's letter of appointment explicitly states that "The State of Israel needs an education system that will rank among the world's top in terms of achievement" (Ministry of Education, 2005, p. 233).

This statement also reflects the importance of the "national pride" element, as described previously. On the importance of the economic element, in the summary of the Dovrat Report's chapter "a study of the education system" the authors write:

> *An analysis of the various findings (international attainments, MEITZAV results and IDF conscription data) points to low achievements on the part of Israeli pupils and to a continuing decline in those achievements […] The problematic state of Israeli pupils' current educational achievements raises a fundamental question regarding the quality of the human capital that is developing in the country, and its future ability to compete with the world's developed and emerging countries (Ibid, p. 45).*

An in-depth examination of this line of argument raises some difficult questions.

Defining the education system's quality in terms of achievements on international exams

On the face of it, before trying to answer the question of whether pupil achievements on international exams are linked to education system quality, we should first ask how "education system quality" is defined. This complex question will not be addressed within the confines of the present paper, as our focus here is on the relationship between education and the economy. We will simply define "education system quality" as the system's ability to increase the human capital of the society that it serves or, put another way: as the ability to ensure that its graduates integrate optimally into the country's economic system, in terms of earning ability and avoidance of unemployment.

As a rule, the two basic approaches to measuring an education system's contribution to human capital creation are:

A. The first approach is that of taking an average of the years of schooling of the country's entire adult population. This approach, which was used primarily in the early works of Barro and Lee (2010), thinks of a society's human capital as the entire body of formal knowledge that that society has amassed.[29] The main criticism leveled at this approach is that it does not regard human capital in countries with a long tradition of highly-developed education systems as equivalent to human capital represented by the same number of years of schooling in much less developed countries. The critics also argue that this method entirely ignores the education system's other contributions to human capital, those that are not necessarily related to academic knowledge or to the number of years of formal schooling – as Heckman, a Nobel laureate in economics, has shown in his many illuminating studies (e.g., Heckman and Kautz, 2013).

B. The other approach is exemplified by the work of Eric Hanushek and Ludger Wößmann, who view pupil achievements on international exams as an adequate representation of education system quality and of the human capital produced by the system. In order to overcome the problem of arbitrariness that arises from selection of a given test, they take an average of the scores of pupils from each country on all of the international exams in which the country participates, and "calibrate" it relative United States data on the 12 NAEP exams,[30] since the US is the only country that has participated in all of the international exams and has also administered its own calibrated national tests throughout the period in question. The mean score obtained by this method represents, in the view of these researchers, the quality of the education system. To support their position they point to stability in

[29] Recently Barro (2014) published an article in which he approaches the position of Hanushek who also attaches importance to "quality" of education, as reflected in achievements on international exams. But he seems to have accepted too readily Hanushek's assumption that the international exams reflect educational "quality."

[30] These exams are annual national tests based on a sample of pupils in several "core" subjects. The test results are calibrated to allow changing knowledge levels for each subject to be monitored. According to this line of argument, if a particular country's performance has changed over time in a manner different from that of the US, this would testify to real change.

the outcomes of the various exams over time, a high correlation between scores in different subjects and the great similarity between exams administered by the IEA (TIMSS and PIRLS) and PISA studies conducted on behalf of the OECD.

Even if, for the moment, we set aside the issue of how educational achievements and economic performance are linked, it still appears, at least on the surface, that assigning a single score to countries that have been participating in a large number of exams since the 1960s (when the FIMS test was administered) as well as to the many countries that have been taking part in these studies only in recent years,[31] poses severe methodological problems. Moreover, when the results of the many and varied studies across a selection of time periods are integrated, we face inherent problems rooted in the very attempt to draw conclusions about education system quality from these tests:

A. **Exams relate to specific points in time, and do not test everything**: The mere assumption that a paper-and-pencil test given at a specific point in time can reflect the entire body of knowledge in the subject area under examination is, logically, unrealistic. What any test does is to assess the test-taker's level of knowledge at the time the test was administered; the exam questions refer to the relevant corpus of subject knowledge, but most of that knowledge – or at least, a significant portion of it – is not tested.

B. **The prioritizing of knowledge is dependent on the cultural context and on an array of other contexts**: Who is authorized to answer the question of whether the knowledge being assessed is the "important" knowledge? Clearly, the answer will be based on an entire system of culturally-dependent variables and on the relevant worldview. The PISA authors confine themselves to maintaining that the study is meant to reflect the knowledge that a 15-year-old today will need in order to function under the employment and economic conditions of the coming decades. Labaree (2013) and many others reject this approach unequivocally:

The psychometricians posit that the skill set they test for is essential for the modern workplace in advanced economies, but

[31] PISA was launched in 2000, and large-scale participation in TIMSS began in 1999.

they provide little basis for justifying that this toolkit is indeed just what the economy needs - other than by repeated statements about the relevance of what they are testing to "real world issues" and "real-life challenges."

Hopmann et al. (2007) also take issue with the way in which the PISA authors prioritize knowledge according to criteria of their own devising; they emphasize that there is no research to support the importance that the PISA authors attach to their chosen information types, in terms of integration in tomorrow's workforce. In essence, Hopmann et al. maintain that the only thing that can be said with certainty about the knowledge tested by PISA is that any additional knowledge is always good, and that it is always best to know more: "Since they can't compare schools systems based on what they teach, they invent a skill set that no one teaches and then uses mastery of it as the measure of effective schools."

C. **When composing a uniform test for everyone, one must relate to the curriculum components that are common in each country**: Composing a test based on a kernel of shared knowledge is an exceedingly difficult, if not an impossible, task, one that entails excluding major portions of each individual country's curriculum from the exam.[32] Moreover, even if the exam authors manage to create a uniform body of knowledge that is acceptable to all as the curriculum to be taught, we can hardly assume that all of the material can be included on the exam, as the amount of time that can be devoted to test-taking is limited. In this instance we would have to decide which portions to make mandatory, and which to omit. The outcome, of course, would be an exam that is incapable of representing the entire corpus of the test-takers' knowledge in a uniform manner.

D. **The assumption that one can create tests that "are not culture-dependent" is problematic**: A pupil who has never seen a train in his life, who lives in a country that hardly has any roads or that suffers from a severe water shortage, will relate differently to questions on

[32] One consequence of the international exams is that countries are driven to adopt uniform curricula. For example, Israel's mathematics curricula for Grades 7 and 8 were recently changed in order to foster success on the last TIMSS exam.

water supply or transportation than a pupil who lives in a country that has a highway system and no water shortage.

E. **The choice of subjects to be covered by the international exams is itself a controversial matter**: No study has yet proven that mathematical knowledge is more useful in life than knowledge of civics, history or art and should therefore be the focus of instruction.[33] Beyond the ideological statement embodied in the priorities for curriculum subjects, it is by no means self-evident that emphasizing one specific subject will bring about the desired outcomes (Table 11).

F. **International exams attach importance solely to academic knowledge that is acquired in the school setting**: These tests, by definition, do not cover the entire array of values and skills that are acquired in school. A fair number of researchers, first and foremost Heckman (2013), regard this complementary skill set as no less important in determining the future of the individual or of society as a whole, and they therefore caution against disregarding it. A PIIAC survey was recently conducted to assess adult language and thinking skills relevant to workplace functioning in 20 countries. One of the survey's most significant findings was that the main contributors to continued improvement in cognitive skills after completion of formal schooling are on-the-job learning, in-service training, experience, and functioning in the family framework. The survey also found that the more time that passes from the end of formal study – and thus, in effect, from the period in which a given international exam was administered – the lower the correlation between the knowledge demonstrated on the exam in the school setting and that demonstrated on the PIIAC survey. Table 15 shows the fact that a country's place on the achievement scales of PISA-2000 and the SIMS[34] 1985 exam is not necessarily determined by its place on the PIIAC scale.

[33] Studies have shown that those who study scientific subjects (including, of course, math) earn more than those who study subjects in the humanities (e.g., Kimhi and Horowitz, 2015). However, this does not necessarily indicate that scientific disciplines have an advantage, and certainly not for people whose natural or social inclinations point them in other directions.

[34] SIMS is the Second International Mathematics Study.

Table 15. **Ranking of countries participating in PIIAC, PISA-200 and SIMS-1985***

Country	PIIAC ranking for countries participating in PISA-2000	PISA-2000 ranking		PIIAC ranking for countries participating in SIMS-1985	SIMS ranking
		Reading	Math		
Japan	1	1	1	1	1
Finland	2	3	3	6	2
Belgium	3	12	7	4	5
Sweden	4	9	12	9	4
Korea	5	14	2	--	--
Norway	6	4	13	--	--
Australia	7	2	5	--	--
Czech Republic	8	19	14	--	--
Canada	9	10	4	5	7
Denmark	10	5	11	--	--
Germany	11	8	16	--	--
England	12	6	6	7	6
Austria	13	18	9	--	--
France	14	17	8	3	9
Poland	15	13	18	--	--
Ireland	16	16	10	--	--
United States	17	7	15	8	8
Spain	18	11	17	--	--
Italy	19	15	19	--	--

* The ranking applies only to countries that have participated in two or three of the exams.
Source: Nachum Blass, Taub Center.
Data: PISA; PIIAC; SIMS.

Beyond these important issues, there are of course technical problems having to do with control of the sampling in each country, policy regarding pupil preparation for the exams, pupil attitudes toward the exams – especially when, from their point of view, the tests are unimportant - the relative weight of a given subject in each exam, and so on. Blasius and Thiessen (2013)[35] cast considerable doubt on the tests' reliability, and point out that for some countries there is serious concern that what is reported bears little relation to the truth. Another special problem, stemming more from attitudes toward exam results than to exam format, is that of uncertainty surrounding the country rankings. In many cases, a statistically-insignificant change of a few score points can radically alter a given country's place in the rankings. The accompanying statistical provisos and disclaimers do little to placate politicians whose countries ranked lower than expected for this reason.

To conclude, due to methodological reasons there is no good way of comparing education system "quality" between countries by means of international exams. The exams can only serve as indicators of the participating countries' ability to reach certain targets that pertain to their pupils' mastery of specific spheres of academic knowledge. Pupil knowledge levels are indeed an important goal, but the excellence of a country's pupils in one, several or even all subject areas cannot completely or reliably reflect the education system's ability to prepare pupils to meet the full array of goals demanded by society, including complete and optimal integration in a future economic system.

The intention here is not to undervalue, in any way, the importance of the international exams or their vast potential for informing us about the national education systems of participating countries or the possible relationships between a diverse array of variables, academic achievement, and school realities. The quantity and variety of the data gathered make it possible for any interested professional to learn from other people's experience with methods different from those currently being used. Sensitive and differential adaptation of methods to local conditions in those places where expectations are not being met, can go a long way toward expanding the range of options available to educators, and may even improve educational outcomes.

[35] Unpublished study. Quoted in: "Assessment – Fresh PISA claims shake trust in influential study: news," *TES Magazine*, 15 November, 2013.

Problems with an alternative evaluation method for the education system

The more important and central a social system is, the greater the need to evaluate its performance and the stronger the temptation to use a sole indicator for that purpose. The advantages of a single indicator when assessing complex social systems are simplicity, clarity, convenience of use in public discourse and when discussing changes to, or applications of, organizational processes. A single, commonly-accepted indicator makes it easier to define problems, generate public interest, mobilize political support, formulate organizational solutions, and recruit people in the field for focused activity. Education systems, of course, are no different from this perspective, and the instrument chosen for evaluation purposes is often that of pupil educational achievements, as reflected in national or international exams.[36] However, beyond the difficulties raised by these tests, as discussed previously, there are three other major problems related to their use as a reliable instrument for education system assessment.

The first problem has to do with the complexity of education systems, which are diverse, have multiple and sometimes contradictory objectives, and whose individual components differ greatly. The idea that an education system can be evaluated by means of a single test – however good – is not logical. A specific test might be able to identify progress regarding some of the system's goals, but without a broader picture there is no way of knowing how that progress is affecting the achievement of other objectives.

The second problem is that a given outcome could be perceived by one group as success and by another as failure. For example, intensified national identity and reduced empathy for ethnic or religious minorities might be perceived by some sectors of society as failure and degeneration, while other sectors might feel that they reflect the successful transmission of patriotic values. Support for trade union struggles might be perceived by some as a manifestation of social solidarity, while others might regard it as the relic of an outmoded collectivism.

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[36] Notwithstanding the tendency to use a single indicator, we should not ignore other indicators, such as inequality or violence. As an example, see the attempt of *Measuring Sustainability and Linking Capital to Human Well-Being Agenda*, September 7-8, 2014, to develop a model, as presented at a seminar conducted in Jerusalem on the initiative of the OECD.

The third problem is that the outcomes of education system interventions are usually evident only after relatively long periods, and the more time that passes, the harder it is to make a direct link between interventions and outcomes. Can we connect pupil achievements in the 1980s with economic performance in the 2000s? Can a link be established between religious and national radicalization in the education systems of the 1970s and geopolitical developments in our region today? Some would say that the link is clear, while others would ascribe greater impact to other processes that took place over the intervening years.

Education system evaluation is a function of the goals that society has set for it. Only when the goals are shared – and they often are not – can criteria be formulated for determining how close the actual situation is to the stated objectives, and to what degree the system is advancing toward (or retreating from) attainment of the goals defined for it. In the case of Israel, the state has repeatedly defined the education system's goals in the State Education Law. The most recent version was enacted by the Knesset in 2000, but a set of criteria has yet to be drawn up for assessing the degree to which its goals are being achieved, and to measure the system's quality in light of those criteria. A recent study aspired to formulate criteria to determine the extent to which the education system is achieving each of the goals set for it; it also looked at how each goal is reflected in budgetary emphases (Blass, Avner and Berkowitz, 2013).

Beyond the question of the exams' validity, attention should be paid to the empirical question: Do countries whose pupils succeeded on the international exams in past years display better economic performance today than do countries whose pupils performed less well?

PISA: Pupils who participated in PISA-2000 – now 29-years-old – have been economically active for at most a decade, and in Israel for less time, due to military service. The impact of these test-takers on their countries' economic performance is marginal compared to that of older workers. The group in question will have a discernible impact on their countries' economies only in another 15-20 years, a time period during which any number of scenarios might have significant, even dramatic, consequences for the economic performance in each of the relevant countries. Thus, we would be hard put to ascribe a satisfactory level of validity to any assessment of future economic performance based on the results of those exams.

IEA: The International Association for the Evaluation of Education Achievement studies were initiated in the late 1960s. In those countries that participated in the FIMS exam, which the IEA administered in 1964, a high correlation was not found between pupil achievements and later economic performance. American researchers (Baker, 2011; Zhao, 2012) have even demonstrated the existence of a negative correlation (-0.48) between pupil achievements on that exam in an array of countries and GDP per capita in 2002, when the test-takers were 38-years-old. The growth rate of the more successful countries was lower than that of the United States, which ranked near the bottom of the scale on these tests. The correlation between test performance and growth was found to be 0.24. Not only that, but no correlation was found between achievement level and productivity or quality of life metrics. The present paper looked at the correlation between the attainments of those countries whose pupils participated in the SIMS test in 1985 and two variables commonly accepted as indicators of economic performance – GDP per capita and GDP per work hour. As Table 16 clearly shows, the correlation between the test scores and the economic indicators is negligible.[37]

[37] It must be stressed that what is at issue here is not a causal relationship but a correlation. Accordingly, this should not be taken as proof that knowledge and educational achievement have no bearing on GDP per capita or on productivity. However, the finding shows that, if there is such a relation, then there are certainly many other variables acting on the economic variables. These variables can act in an inverse direction or support the positive correlation – if and when it exists – between formal education and human capital.

Table 16. **Score on SIMS-1985 and GDP per capita and per work hour, 1985 versus 2010**
PPP dollars

Country	SIMS-1985 score	GDP per capita			GDP per work hour		
		1985	2010	Change	1985	2010	Change
Japan	60.3	25,673	36,765	1.43	24.0	42.0	1.75
Netherlands	59.3	27,638	43,977	1.59	44.9	61.0	1.36
Belgium	58.0	26,174	41,118	1.57	41.9	61.2	1.46
Canada	58.0	30,210	42,855	1.42	36.8	49.3	1.34
France	57.7	25,731	35,606	1.38	39.0	58.2	1.49
Hungary	56.8	14,983	19,054	1.27	15.2	23.9	1.57
Hong Kong	55.1	19,200	45,144	2.35	17.6	39.6	2.26
United States	51.4	33,893	50,605	1.49	42.3	65.8	1.55
Israel	**49.9**	**18,752**	**31,062**	**1.66**	**27.5**	**36.8**	**1.34**
England	49.2	23,292	39,545	1.70	29.9	51.8	1.73
New Zealand	45.6	23,118	31,949	1.38	25.7	35.4	1.38
Finland	45.5	23,689	38,007	1.60	26.3	48.0	1.83
Correlation between SIMS test score and country GDP		**0.04**	**-0.04**	**-0.09**	**0.14**	**0.07**	**-0.05**

Source: Nachum Blass, Taub Center.
Data: The Conference Board Total Economy database.

Table 17 presents the country ranking by pupil scores on SIMS-1985 versus the UN's annually-published quality of life index. Although a certain correlation is found between the score rankings and the index data across four sequential points in time spanning three decades, here, as well, the correlation is very low.[38] It must be emphasized that the disparities in the total score between the countries, except for Thailand, are quite small, and that advancement is very slow. Here, too, Israel is

[38] In this context it is important to remember that, although Israel is near the bottom of the scale on all international exams in which it participates, it nevertheless consistently ranks in the lower portion of the second-highest group of ten (out of over 200 countries) on the UN's Human Development Index, which measures a combination of economic, health and education factors.

comfortably positioned in the middle, slightly above its test-score ranking.

Table 17. **SIMS-1985 score and ranking on UN Quality of Life Index**

Country	**SIMS-1985 score**	**UN Quality of Life Index**					
		1980	1990	2000	2010	Difference between 1980 and 2010	Ratio of 1980 to 2010
Japan	60.3	0.77	0.81	0.86	0.88	11	1.14
Netherlands	59.3	0.78	0.82	0.87	0.89	11	1.14
Belgium	58.0	0.74	0.80	0.86	0.87	13	1.18
Canada	58.0	0.79	0.84	0.87	0.89	10	1.13
France	57.7	0.71	0.77	0.83	0.87	16	1.23
Hungary	56.8	0.69	0.69	0.77	0.80	11	1.16
Hong Kong	55.1	0.69	0.77	0.80	0.86	17	1.25
United States	51.4	0.81	0.86	0.89	0.90	9	1.11
Israel	**49.9**	**0.75**	**0.79**	**0.84**	**0.87**	**12**	**1.16**
England	49.2	0.74	0.77	0.82	0.85	11	1.15
New Zealand	45.6	0.79	0.81	0.87	0.91	12	1.15
Finland	45.5	0.74	0.78	0.83	0.87	13	1.18
Thailand	43.1	0.48	0.55	0.60	0.65	17	1.35
Sweden	40.6	0.77	0.80	0.89	0.88	11	1.14
Correlation between score and Quality of Life Index		**0.27**	**0.32**	**0.26**	**0.29**	**-0.11**	**-0.24**

Source: Nachum Blass, Taub Center.
Data: HDI (UN Human Development Index).

One criterion for assessing education system quality is the system's ability to cultivate innovation and creativity among its pupils. As an indication of Israel's standing on this metric compared with other countries, use was made in this study of patent data: the number of

patents issued to graduates of Israel's education system compared with those of other selected countries. Patents are an especially important topic for discussion, as one of the main arguments supporting a link between education and economic performance is that education's contribution to the economy is reflected first and foremost in increased innovation and creativity. That is, quality education systems produce the creators of leading innovations in their fields, who in turn drive the economies of the future. If this argument is indeed well-founded, then graduates of education systems in countries that excel on the international exams should head the list of innovators and inventors. However, as Table 18 shows clearly, many countries whose pupils scored highest on SIMS rank far below Israel in terms of number of patents per billion dollars of GDP. Israel's patent rate has increased since 1985 much more quickly even than that of Japan, the only country with a higher patent rate in 2008, and Sweden, which is similar to Israel from this perspective.

Table 18. **Number of patents per country relative to billion dollars of GDP***

Country	1985	1995	2005	2006	2007	2008
Japan	1.97	2.77	3.59	3.56	3.59	3.53
Sweden	2.30	3.42	2.52	2.52	2.62	2.60
Israel	**0.78**	**1.39**	**2.56**	**2.83**	**2.77**	**2.58**
Finland	0.59	2.83	2.13	2.10	1.98	1.90
Netherlands	1.67	1.72	1.81	1.83	1.76	1.72
OECD average	**1.13**	**1.33**	**1.36**	**1.34**	**1.32**	**1.28**
France	1.24	1.32	1.29	1.29	1.27	1.24
Belgium	0.77	1.37	1.23	1.20	1.19	1.15
United States	1.14	1.34	1.22	1.18	1.16	1.12
United Kingdom	1.10	1.07	0.84	0.84	0.81	0.79
Canada	0.33	0.48	0.64	0.58	0.56	0.53
New Zealand	0.26	0.29	0.55	0.54	0.48	0.42
Hungary	0.37	0.22	0.23	0.25	0.26	0.27

* In 2005 PPP dollars.

Source: Nachum Blass, Taub Center.

Data: OECD Patent Database.

The conclusion to be drawn from this is that educational achievements at a given point in the present do not necessarily predict future economic or other attainments in the future. The empirical findings show that there is almost no correlation between success on the international exams (SIMS, in this instance) and rates of increase in GDP or improved standing on the UN's Human Development Index – two indicators of success. Moreover, should we decide to use other indices for education system evaluation, even a system that, on the surface, seems excellent at present does not promise rapid economic development during the near or medium term, for two main reasons: (1) Present graduates of the education system will need at least 15-20 years to take their place within the economic system and influence it; (2) Within that timeframe any number of developments, whether economic or in other areas of life, may reduce or intensify the education system's impact on the economic system. Thus, the attempt to draw conclusions from today's education system performance regarding a country's level of human capital a few years from now is problematic.

Ultimately, even if there is a causal relationship between the education system, human-social capital and economic performance, at any point in time this relationship is between the accumulated totality of social capital, which encompasses formal academic knowledge, values, attitudes, skills, and experience – all of which, together, are the product of education system activity – and the other social, economic and political systems over the course of recent decades. By contrast, at any given point in the present the education system influences economic system performance primarily as an object of economic system activity. In other words: transferring resources to the system is a short-term expense and a long-term investment, but the economic feasibility of that investment in the long term depends only partly on the activity of the education system.

3. *Israel's Attitude Toward Pupil Achievement on International Exams: TIMSS-2011 as a Test Case*

The issue of pupil achievements comes up for discussion in Israel whenever the results of international exams in which Israel participated are published. We might even say that dissatisfaction with Israeli pupil performance on these tests was a major factor behind the creation of a national task force (the Dovrat Commission), as discussed previously.

As noted, TIMSS is the oldest and most established of the international exams. Between 1999 and 2007, a period in which TIMSS math tests were administered three times, Israel's standing relative to the other participating countries did not change, and was generally in the lower range of the performance scale. However, between 2007 and 2011, Israel's achievements improved dramatically, both in terms of ranking and in terms of mean test score. When the TIMSS-2011 results were published, a bitter disagreement ensued over what had caused the jump in Israeli pupils' scores and international ranking. The debate was particularly intense due to the timing of the results' publication – shortly before Knesset elections – and because of the exceptional nature of Israel's improved performance. Based on the experience amassed by various countries that participate in international exams, score improvements from one test to the next are generally on the order of a few points, while rank changes are very limited. Large upswings in score and ranking are exceedingly rare, and often not repeated on the next exam.

This section will look at outcome improvement factors: can improvements be attributed to those in charge of the system, to changes in Education Ministry policy – or to completely extraneous factors that have nothing to do with ongoing educational activities?

In 2009, when a new government took office in Israel, the Ministry of Education embarked on a series of measures aimed at improving Israel's standing on international exams. Many instructional hours were added in those subjects covered by the exams, and curricula were adapted to ensure that the relevant grade levels studied the material that is the basis of the exams. Hebrew translations of exam questions were meticulously checked, in-service training was provided to teachers, and all those involved were made aware of the importance that the Ministry attaches to success on the exams. The results, on the surface at least, were not long in coming: Israeli pupils improved their math achievements by 53 points (more than half of a standard deviation), and Israel moved up 17 places in the ranking (among the 63 participating countries). In science, the gain was 48 points and 12 places. Israel's Minister of Education and the Director-General of the National Authority for Measurement and Evaluation in Education (RAMA) lost little time in publicizing the outstanding achievements of Israel's pupils; but the embarrassing fact that the IEA (the international organization in charge of the exams) was unwilling to compare Israel's 2011 performance with that of 2007 was

suppressed (Shishim v'Achat, 2012). Professor Michal Beller, the RAMA Director-General, responded as follows:

> *RAMA was made responsible for translating the exam. We had found problems with the earlier translations, and the international organizations agreed that we should rectify them […] They decided that they couldn't talk about trends. We felt that that decision was incorrect. There is a psychometric exam and there is a means of comparison, but they weren't willing to do it, and so they weren't willing to link the 2011 data to trends. If there was a mistake – it had to do with the earlier test. We looked like underachievers, because the test-takers didn't understand the questions correctly. We should have scored higher. This year's data are correct – pure and simple.*[39]

The contradiction between the IEA's reservations and the RAMA Director-General's statement poses four logical possibilities:

A. The 2007 and 2011 data are correct, meaning that the achievements can be credited to Israel's pupils, its education system and the minister in charge. This is the explanation that is most flattering to the Ministry administration, which calls attention to the education system's outstanding accomplishments during the four-year period 2007-2011, when the Ministry was headed by Yuli Tamir and Gideon Sa'ar. RAMA's response to the IEA's unwillingness to compare the 2007 and 2011 data, as reported in Haaretz on December 16, 2012, is formulated accordingly:

> *The organization [the IEA] did not in any way assess the impact of the actual change in translation, but rather chose a declarative, a priori and conservative policy according to which, once there has been a change in the translation, comparison is theoretically impossible. Our professional opinion is different, after having subjected the matter to in-depth statistical examination. By the way, the organization itself is still publishing Israel's 2007 results as completely valid and on the same score scale […] The vast majority of the data presented are based on analyses that we*

[39] The RAMA Director-General's statement was made to the author and appears in the transcript of a talk with her for the Internet publication that appears in Footnote 62.

conducted. Likewise, the question of whether the change in translation on several items had an effect was examined by RAMA, which has all the professional capabilities necessary to do so.

However, the IEA's statement clearly indicates that the changes at issue were not minor linguistic corrections, as Professor Beller claims, but rather fundamental alterations to the text of the anchor questions that were included in both exams. If Israeli pupil achievements as noted in the 2007 report indeed reflect reality, despite the fact that such major changes had to be made to the translation, and on the assumption that the 2011 results also reflect reality, as Professor Beller emphasizes – then it becomes necessary to explain the huge leap in detail, the burden of proof being on the Ministry of Education and RAMA.

B. The 2007 and 2011 data are both incorrect, such that that no meaning or importance may be attached to the international exam outcomes. According to this argument, Israeli pupils' performance on international exams lacks significance due to a variety of reasons, from the anomalous nature of the pupils' achievements to unreliable sampling.

Those in support of this argument must prove that the situation applies solely to Israel. Decision makers who feel that this is indeed the case must then recommend one of two options: Israel's complete withdrawal from participation in international exams, or better quality control for exams administered in Israel. All of the criticism of what goes on in Israel before and during the exams notwithstanding, there is no reason to doubt the integrity of the Israeli researchers responsible for the country's participation in these studies, or to ascribe to them deliberate actions aimed at skewing the test results. Most likely, the situation in Israel is not much different from the situation in other countries that attach importance to their pupils' exam performance.

C. The 2007 findings are correct, while the 2011 findings are skewed upward. According to this possibility, the TIMSS-2011 data are skewed upward, meaning that there was no real change, or that the change was much smaller than announced – in terms of the education system and its ranking relative to the comparison countries. Those who hold this view give the following rationale:

- **The high percentage of pupils not included in the tests.** In 2011, pupils studying in Haredi institutions, as well as another 6.1 percent of Israeli pupils, were not included in the exams. However,

in 2007, Haredi pupils also did not participate in the exams, and the percentage of pupils who were not tested was even higher – 8.7 percent. Excluding Haredi pupils from the exams appears to be justified, these pupils do not study math; moreover, Haredi curriculum decisions, rather than lying within the Education Ministry's sphere of control, are a political matter.[40]

- **The curricula and topics studied each year have been adjusted to accord with those covered by international exams.** The response to this explanation is that, as long as there is pedagogical justification and as long as the curricula are well-substantiated, there is nothing wrong with, for example, moving geometry studies up to Grade 8 and delaying instruction of another subject to Grade 9. On the contrary: if this can help pupils succeed on the exams, and if it does not negatively affect their math skills – it is actually a desirable measure.
- **Steps were taken that border on fraud.** Weaker pupils were told not to take the exam; schools selected for exam participation knew about it in advance, and their pupils were extensively drilled; the school sample chosen is not representative and is skewed upward, both in terms of pupil attainments and socioeconomically. Increasingly, media reports substantiate the occurrence of such incidents – but as yet there is no indication of their scope, or the degree to which they affected the pupils' performance on the exam.

The Ministry of Education and RAMA can counter these arguments by showing that the relevant years also witnessed improved performance on the GEMS tests, although in math there was a slight decline. We might add that PISA-2012 also showed real improvement in outcomes.[41]

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[40] The issues here are very similar to those pertaining to matriculation certificate eligibility rates. The State of Israel and Israeli society as a whole are responsible for enabling all pupils to learn the skills necessary for their future integration in society. However, the Ministry of Education should not be held responsible for the fact that pupils do not want to participate in the matriculation, GEMS or international exams, nor should the education system be accountable for Haredi non-participation in the exams, inasmuch as this is a general political-social matter.

[41] The cause of the decline in the GEMS scores in 2012 needs to be investigated carefully. Three possible reasons: termination of additional instructional hours, since the next international exams were scheduled only for 2015 and

To sum up, there appears to be no reason to doubt the improved achievements of Israel's education system in recent years, as reflected in exam outcomes and educational achievement.[42] The results of TIMSS-2011 showed a 48 point increase between 1999 and 2011, while the study's overall average dropped by 5 points; PIRLS-2012 showed a 33 point increase for Israel and a 2 point decline in the overall average, compared with PISA-2000; Israel improved by 32 points on PIRLS-2011 compared with PIRLS-2000, while the average for the other countries participating in both exams dropped by one point. This could well be the result of a large financial investment in increased instructional hours and teacher training in subject areas covered by international exams. Such an investment is legitimate, so long as it does not come at the expense of other things that are no less important.

D. The recent results are correct, while Israel's outcomes on the 2007 exam were skewed downward. This option assumes that Israel's situation was not that bad in the past, and that it has improved – but that the improvement is smaller, to some degree or other, than what was publicized.

In response to this argument, we may say that Israel's low ranking on the international exams was not confined solely to TIMSS-2007 and PIRLS-2006. Israel's poor performance were also reflected in the PISA tests – which do not relate to specific curricula but rather to pupils' understanding of the subjects taught – and in earlier exams that were also conducted under the auspices of the IEA. By contrast, we cannot discount the RAMA Director-General's statement regarding the possibility that Israeli pupils' outcomes on the earlier exams, or at least those organized by the IEA, were skewed downward.

To sum up, so long as there is no hard evidence of the unreliability of the 2011 results, or of some possible degree of anomaly in 2007 due to faulty translation of the questions and the inclusion of topics that were not taught in the schools, the conclusions that we may arrive at are:

2016; more stringent oversight of testing practices; and random, one-time fluctuation.

[42] It must be strongly emphasized that the disparities persisting within the system itself – between Jewish and Arab Israeli pupils, and between socioeconomic levels – are among the largest in the Western world. Beyond this there are other, exceedingly problematic, issues to be addressed, such as racism and a devaluing of education altogether.

- Israeli pupils' improved achievements on international exams are real. We may assume that this improvement, at least for Grade 8, was achieved largely thanks to the switch to a new teacher position structure subsequent to the Ofek Hadash agreement, to major teacher training efforts, and to a large investment in instructional hours.
- Despite what was noted in Sections A and B, the degree of improvement seems highly anomalous compared with what is known about changes in education. Thus, even if the exceptional outcomes on GEMS and international exams do paint a true picture, and are not based on measures of dubious legitimacy, the Ministry of Education needs to make a convincing case, at least to the general public.
- Israeli pupil achievements on the exams administered by the IEA in earlier years appear to have been skewed downward.

To conclude: there has indeed been an improvement, though slower than reported; however, the past situation was better than reports would have it.

4. Conclusion

The importance attached to international exams is a major issue in today's educational discourse, due to the impact that the exam outcomes have on policy set by the heads of education systems in Israel and abroad. The fact that those participating in the discussion detach the conditions in which the education system operates from Israel's international exam performance ranking creates the impression that the Israeli education system is in a state of perpetual crisis. This impression is deepened by the link that some economists make between performance on the exams and economic growth.

This study tends toward a different conclusion. Although Israeli pupil achievements are indeed inferior to those of pupils in most of the other developed countries that participate in the exams, and perhaps even lower than might be expected given the resources invested in the country's education system – this does not constitute proof that the Israeli education system contributes less to the fund of human capital available to the Israeli economy than do the education systems of other developed countries. We cannot dissociate Israeli achievements in a broad range of fields (patents, international awards in the cultural sphere, accomplishments in the high-tech sector, etc.), from the education system's contribution. Beyond this, the paper calls attention to the fact that the relationship between international exam performance and the rate of economic growth or other quality of life variables is at best weak, and usually weakens even more the farther one is from the exam date. Thus, while it may be appropriate to treat with respect concerns that a low place in the achievement rankings will translate into poor economic performance later on, these concerns should not be accorded an excessive amount of weight.

International exam outcomes should be approached with caution; we should not get too excited over one-time positive results or, conversely, be devastated by a poor showing. It bears remembering that in all other spheres, research information is amassed over the long term, slowly and diligently, and coalesces into a real body of knowledge on the basis of life experience and a comprehensive view. All of these things lead to the conclusion that, although the Israeli education system may not be among the world's finest, the achievements of Israeli society as a whole (as described above) indicate that the system nevertheless produces results of which we can be proud.

It should be recalled that achievement rankings based on international exam outcomes are not necessarily indicators of education system quality, which is a much broader concept. We need to prove causal links (if any) between one-time exam scores in a specific subject and general knowledge in that subject, or between knowledge and mastery of a single discipline and mastery of other disciplines. Also subject to proof is the link between academic knowledge and human capital, and between human capital and economic growth and quality of life. Each of these relationships is a research topic in its own right, and studies are indeed proliferating. The knowledge amassed to date is insufficient to support unequivocal conclusions regarding many of these questions and issues. However, it does unquestionably allow us to affirm that economic, political, organizational, and ideological factors have a strong impact on economic and social performance, perhaps an even stronger one than that of the education system. We, therefore, need to look very closely at the international exam results, study them, internalize their lessons and attach to them an appropriate degree of importance – but no more.

Appendices

The Relationship Between Economic Investment in Education and Scholastic/Educational Outcomes

The findings of studies on the relationship between educational investment and scholastic achievements – both those conducted in individual countries and those based on international exams – indicate that significant increases in real educational expenditure, accompanied by minimal improvements, if any, in educational achievement, are a common characteristic of developed countries' education systems in recent years. Economists studying the phenomenon have even discerned, at times, a decline in educational productivity (Hanushek, 2003; Gundlach et al., 2000; 2001).

On the face of it, the phenomenon seems illogical; it even contradicts human experience in other areas of life. However, the situation is much more complicated than it appears on the surface (López et al., 1999; Pritchett, 2000).[43] To generalize, we can say that statistically, above a certain threshold, the correlation between countries' levels of wealth, their economic development and educational investment, and high educational achievement virtually disappears. For example, an article by OECD researchers explicitly determined that the close relation between GDP per capita and scholastic performance characterizes countries whose per capita GDP is up to $20,000 (in PPP terms), and weakens to the point of disappearance in countries with higher levels of GDP per capita. Thus, pupils in countries such as Luxembourg and Norway that spend $100,000 per pupil over the course of a child's schooling from age 6 to 15 reach educational achievements similar to those of pupils in countries that spend less than half that amount, such as Estonia, Hungary and Poland (OECD, 2012).

The statistical correlation found between countries' economic variables and the achievements of their pupils was examined, for purposes of this study, in relation to PISA-2012.[44] The findings appear in

[43] His data were also included in the famous McKinsey report on the countries that performed well on the PISA exams.

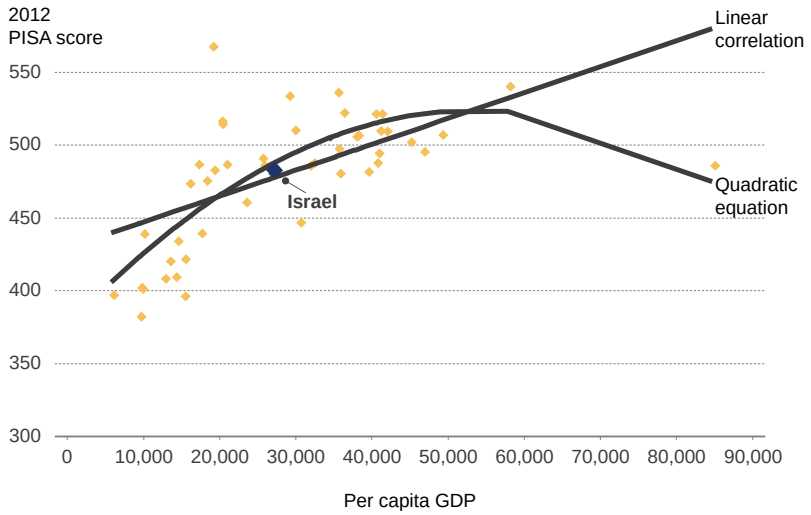
[44] A similar presentation can be found in an OECD publication that looks at reading performance on the 2009 exams and in another OECD publication that addresses PISA-2012 and math achievements. Israel's place relative to other countries will be determined largely on the basis of decisions made by

the two following diagrams. Appendix Figure 1 presents the linear and quadratic relationship between GDP per capita and math achievements on PISA-2012. We can see that the impact of GDP is stronger in countries whose GDP per capita is low, and that the impact weakens in countries with higher GDP per capita. Israeli pupil performance is at the level indicated by the aforementioned correlation.[45]

Appendix Figure 1

Relation between 2012 PISA score and GDP per capita

2011 PPP dollars, OECD countries and Israel



Source: Nachum Blass and Kyrill Shraberman, Taub Center.
Data: PISA-2012.

the presenter about how "weak" and "strong" countries are to be defined. As noted, OECD staff decided, for example, on a cutoff of $35,000 as per-pupil expenditure for ages 6 to 15, and on $20,000 GDP per capita.

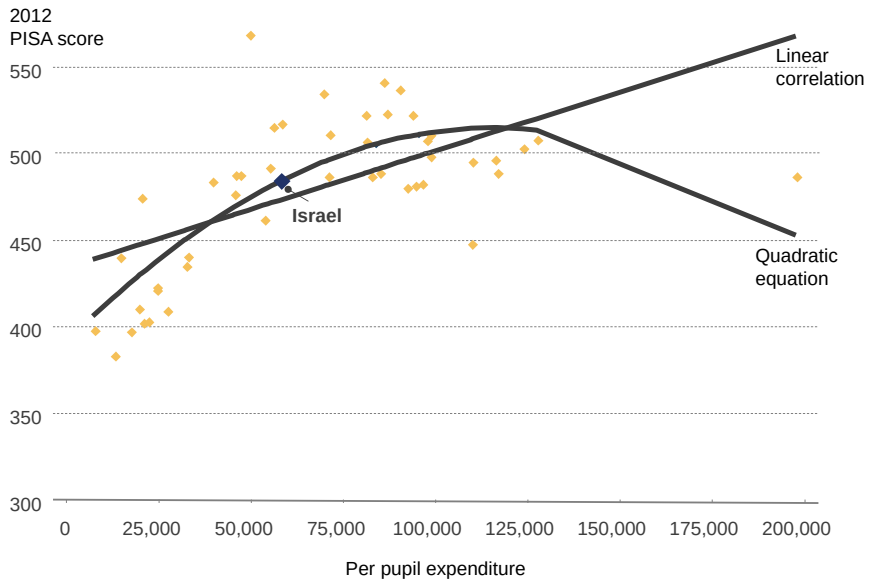
[45] The linear correlation (the red line) is 0.58, while the quadratic relationship (the curved line) is 0.37.

Appendix Figure 2 shows the correlation between cumulative educational expenditure (ages 6-15) and PISA-2012 achievements in math. As we can see, the results are astonishingly similar.

Appendix Figure 2

Relation between 2012 PISA score and GDP per pupil expenditure

2011 PPP dollars, OECD countries and Israel



Source: Nachum Blass and Kyrill Shraberman, Taub Center.
Data: PISA-2012.

This position paper also looked at teacher salary levels in relation to GDP per capita, on the assumption that this metric reflects the degree of importance that society attaches to the teaching profession, and that it can explain, if partially, differences in educational achievement. On the whole, no correlation was found at the middle school level between teacher salaries and educational achievement, while the findings regarding teacher wages at the high school level are very similar.

Finally, an effort was made to answer the question of whether the size of educational achievement gaps affects the achievements themselves. The correlation was found to be exceedingly weak. Appendix Table 1 shows the degree to which the correlation between educational

investment and educational output is complex and sometimes unexpected. For example, Finland and Australia significantly increased their educational expenditure, but their pupils' achievements declined; by contrast, Israel, which only slightly increased its investment, is ranked second for improved performance after Poland – which invested nearly three times as much in education as did Israel in order to reach its excellent outcome.

Appendix Table 1. **The change in the overall expenditure per pupil and the change in achievements on the TIMSS exam in math and the PISA exam in reading***

Country	**Index of per pupil expenditure (at all levels of education)**				**Change in per pupil expenditure 2010 vs 1995**	**Change in TIMSS score* (in points)**	**Change in PISA score** (in points)**
	1995	2000	2005	2010			
Poland	50	78	100	153	3.1	--	39
Israel	**94**	**101**	**100**	**120**	**1.3**	**50**	**34**
Korea	--	68	100	135	2.0***	10	11
Denmark	79	91	100	102	1.3	--	-1
Spain	73	87	100	113	1.5	--	-5
United States	74	89	100	113	1.5	6	-7
Australia	73	88	100	131	1.8	--	-16
Finland	81	85	100	112	1.4	--	-22
OECD average	**73**	**84**	**100**	**117**	**1.6**	**--**	**--**

* TIMSS: comparison between exams in 1999 and exams in 2011. ** PISA: comparison between exams in 200 and exams in 2012. *** Comparison year is 2000.

Source: Nachum Blass, Taub Center.

Data: *Education at a Glance* (2014).

In light of the findings presented above, more attention should be devoted to the question of whether a direct and immediate connection should be expected between financial investment in education and educational achievement. To answer this question, we need to determine first in which cases adding educational input is likely to bring about a rise

in output, and in which instances it will not lead to a rise in achievements.[46] The answer is that so long as there are no other dominant factors working in the opposite direction, adding inputs can bring about an increase in output. In an education context, one can think of several factors working in the opposite direction:

A. A dramatic decline in pupil quality, i.e., a significant deterioration in the scholastic abilities and skills of all pupils, on average.

B. A dramatic decline in teacher quality.

So long as factors such as these are not at play, we may expect that improved performance will follow an increase in resources even in the short term, and all the more so in the intermediate and long term.

Pupil quality

To the best of our knowledge, there is no reason to suppose that children attending school today are, by nature, any less capable than their counterparts in the 1990s, the 1980s, the 1970s or even the 1920s, assuming similar [socioeconomic] conditions.[47] We may therefore conclude that the pupil quality issue should be examined in the light of several different developments – recognized as being linked to educational achievement – that have contradictory effects.

A number of these developments, which are rooted first and foremost in democratization trends within the education system, and at least some of which are commonly regarded as socially positive, are themselves associated with emerging problems that the education systems of developed countries – including Israel – have to face. The most significant of these is the inclusion of large numbers of children who formerly would not have been served by the education system, whether due to economic or intellectual inability, or because of handicap or disease. Moreover, in many countries there has been a rapid influx of populations whose language and culture differ from those of the majority. These populations make it very hard to achieve a statistical improvement

[46] It bears emphasizing that educational outputs are too often thought of merely in terms of educational achievement, when in fact the education system has other important forms of output.

[47] Although some point to a Flynn Effect – a rise in measured intelligence over the past few decades – the emphasis in this sentence should be on "similar [socioeconomic] conditions."

in educational achievement. These are two facts that "lower" pupil "quality."

On the other hand, most of today's children are being raised in families that are better educated and smaller than those of past decades, and that enjoy a higher standard of living. Assuming that environmental conditions affect learning ability, these are two contradictory impacts whose relative weight is uncertain. According to Zussman and Tsur (2008):

> *To illustrate the contradictory effects in Israel, we can note the increased weight of Haredi and Arab Israeli educational streams, which have moderated the rise in achievements over the years; by contrast, an improvement in pupils' socioeconomic attributes (such as a rise in parental educational levels) within the various educational streams has promoted improved performance. On the whole, there has been a considerable improvement in performance on the matriculation exams (without adjusting for their level of difficulty).*

Hanushek (2003), by contrast, has written "It is difficult to know precisely how these factors net out in their overall effect on students. The best estimates available, while surrounded by uncertainty, suggest that the net effect of these factors is, if anything, positive (p. 24)." The net effect of changes in the pupil population's demographic composition thus remains an issue in need of further investigation.

Teacher quality

The education system's expansion in terms of pupil numbers, as well as the improved conditions in which teachers work – reflected in a reduced number of instructional hours per position, and increased investment in per-pupil work hours – have dramatically increased the demand for teachers.[48] However, additional and even more attractive occupations have opened up for the most talented potential teachers, the majority of whom are women. As documented in many studies (e.g., Dolton and Gutierrez, 2009), the outcome of these two concurrent processes has been

[48] These data refer mainly to Israel. In the OECD countries the more common situation is one of reduced pupil numbers. This phenomenon is offset by reduced class size, improved teacher working conditions, and greater assistance provision to weak populations.

a decline in the number and quality of those entering the teaching profession, and early, large-scale abandonment of the field by those whose first occupational choice was teaching.

Beyond this, other important and positive developments have contributed to a rise in educational expenditure, pupil quality of life and teacher working conditions, but without causing a concomitant rise in pupil achievements. First and foremost among these developments are:

A. A rise in teacher salaries in the framework of the existing wage agreements, due to demographic changes and creeping salary increases. In recent years, demographic processes and the policies of Israel's Ministry of Education and the counterpart ministries in other countries have led to a rise both in the average age of teachers and in their level of formal education. Both have caused an increase in expenditure on teacher salaries and conditions.

B. A rise in teacher wages due to general changes in the economy. Higher salaries in other occupations that compete for academically-trained manpower have made it necessary to raise teacher salaries as well. [49]

C. Quality of life improvements in the school setting. Schools have benefited from the overall rise in quality of life: air conditioning, water coolers and other amenities entail costs to the system, but do not directly contribute to improved educational achievement.

Given these trends, greater investment is needed simply to maintain pupil performance at its current level; in many countries the investment required is much greater.

[49] Economists refer to this phenomenon as the Baumol Effect.

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