

Early Childhood Education in Israel and Academic Achievement

**Noam Zontag, Yael Navon, Dana Vaknin, Liora Bowers,
Carmel Blank, and Yossi Shavit**

This research was generously supported by the Beracha Foundation, the
Bernard van Leer Foundation, and Yad Hanadiv

Taub Center Early Childhood Research Series

Research Paper No. 4, Jerusalem, November 2020

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.

This paper, like all Center publications, represents the views of its authors only, and they alone are responsible for its contents. Nothing stated in this paper creates an obligation on the part of the Center, its Board of Directors, its employees, other affiliated persons, or those who support its activities.

Initiative on Early Childhood Development and Inequality

The Taub Center's "Initiative on Early Childhood Development and Inequality" is tasked with examining the effects of the young child's environment on future achievements and disseminating the latest research on this subject. The Initiative's goal is to assist in the advancement of effective policy to improve the environmental conditions of children in Israel during their early years of life, in order to improve their outcomes and reduce disparities due to socioeconomic background. The researchers involved in this initiative draft up-to-date research reports, literature surveys, position papers, and policy papers. As part of its effort to disseminate the latest available knowledge, the Initiative holds an academic seminar to provide a multidisciplinary basis — both theoretical and empirical — for the investigation of early childhood. The activity of the Initiative is guided by an International Advisory Council consisting of leading academics, policy makers and members of civil society organizations who are committed to the advancement and implementation of effective policy in the area of early childhood in Israel. The activities of the Initiative are supported by the Bernard van Leer Foundation, the Beracha Foundation, and Yad Hanadiv. The Initiative is headed by Prof. Yossi Shavit, Principal Researcher, Taub Center for Social Policy Studies in Israel; Professor Emeritus, Tel Aviv University.

Research staff: Dr. Carmel Blank, Liora Bowers, Dr. Yael Navon, Dana Vaknin, Noam Zontag.

Research assistant: Hai Vaknin.

Advisory Council: Prof. Esti Adi-Japha, Daniella Ben-Attar, Efrat Degani-Toperoff, Prof. Isaac Friedman, Prof. John Gal, Dr. Shoshi Goldberg, Prof. Reuven Gronau, Sima Hadad, Dr. Tzipi Horowitz-Kraus, Fatma Kassem, Orit Levin, Varda Malka, Michal Mankas, Dr. Tali Yariv Mishal, Dr. Naomi Moreno, Prof. Frank Oberklaid, Ehud (Udi) Praver, Prof. Sigal Sadetsky, Prof. Manual Trajtenberg, Dr. Maya Yaari

Early Childhood Education in Israel and Academic Achievement

Noam Zontag, Yael Navon, Dana Vaknin, Liora Bowers, Carmel Blank, and Yossi Shavit

Abstract

Studies carried out in other countries indicate that enrollment in high-quality early childhood educational settings advances the cognitive and academic development of children. In Israel, the rate of enrollment in early childhood education and care (ECEC) frameworks is particularly high; however, the quality measures indicate that these settings are, overall, of a relatively poor quality. This is reflected in the child-staff ratio, the low level of training among the support staff on average, and the lack of supervision over many of the frameworks that service children in the 0–3 age group. The question arises as to whether attending an ECEC framework improves academic achievement in spite of the low aggregate measures of quality.

This research analyzes three databases that include information on enrollment in ECEC settings and of academic achievement in primary school, in middle school, and at the beginning of high school. The data also include various control variables that are used in the analysis. Each of these databases has advantages and disadvantages, but analyzing them together makes it possible to arrive at some important insights. First, the findings indicate that in Israel, as in other countries, there is a higher rate of enrollment in ECEC among sectors that are better educated and better-off financially.

* Noam Zontag, Researcher, Taub Center for Social Policy Studies in Israel. Dr. Yael Navon, Researcher, Taub Center. Dana Vaknin, Researcher, Taub Center; Doctoral student, Department of Sociology and Anthropology, Tel Aviv University. Liora Bowers, Chief Financial and Operating Officer, Taub Center. Dr. Carmel Blank, Researcher, Taub Center; Lecturer, Department for Behavioral Sciences, Ruppin Academic Center. Professor Yossi Shavit, Chair, Early Childhood Initiative, Taub Center; Weinberg Professor of Sociology, Tel Aviv University. We wish to thank Professor Esther Adi-Yaffa for referring us to the 2004 Social Survey, Professor Alex Weinreb for his comments with regard to a causal analysis, and the CBS for making data available and its support for our work in the Research Room. We also wish to thank the Van Leer Foundation, the Beracha Foundation and Yad Hanadiv for their generous support of this research.

The gap is particularly large between the Jewish and Arab Israeli populations. Second, it was found that among individuals who were young children during the 2000s, the more years spent by a child (boy or girl) in an ECEC framework, the higher their achievements in school. Third, among Jewish children, while attending preschool or public daycare facilities contributes to these achievements, it appears that home daycare or care by a nanny — which are usually not supervised — does not contribute to later achievement relative to care by a parent or some other relative. Fourth, it may be that starting in ECEC during the first or the second year of life does not contribute to later achievement, and this appears to be the case for Arab Israeli children in particular. And fifth, there are indications that the positive effect of number of years in early childhood education is stronger among children of mothers without an academic education than among children of mothers with an academic education.

Introduction

This study examines the relationship between the enrollment of Israeli children in early childhood education and care (ECEC) and academic achievement in primary, middle and early high school. In Israel, the rate of ECEC enrollment is high, among both the birth to three age group and the three to six age group.¹ Studies in other countries indicate that enrollment in high-quality ECEC frameworks advances children's cognitive and educational development. However, the quality metrics for early childhood education in Israel indicate poor quality, as reflected in the high child-staff ratio, the support staff's low level of education on average, and the lack of supervision for most of the frameworks that serve children ages three and younger. In view of this situation, we examine whether enrollment in ECEC in Israel indeed advances children's cognitive development. Furthermore, we look at the relationship between a child's socioeconomic background and enrollment in early childhood education. Studies in other countries indicate that children from stronger socioeconomic backgrounds tend to be enrolled in ECEC at a younger age and spend more years there. We sought to further understand this pattern, which is also characteristic of Israel.

1 In this study, we differentiate between two age groups: 0–3 and 3–6. The former group relates to children who have not yet turned three while the latter relates to children who are at least three years old but have not yet entered Grade 1.

As part of the research, we analyzed three sources of data on young children and their parents: the Central Bureau of Statistics (CBS) Social Survey 2004, which was merged with scores on the Meitzav tests conducted in Grade 5 and 8; the PIRLS test administered in 2016; and the PISA tests administered in 2018.² The three datasets relate to birth cohorts that were young children in 2004, 2006 to 2012, and 2002 to 2008, respectively, and they are described in detail below. It is important to note that these cohorts attended ECEC prior to the inclusion of three to four-year-olds under the Free Compulsory Education Law in 2012, following the recommendations of the Trajtenberg Committee. Our findings confirm the important contribution made by the Free Compulsory Education Law to children at these ages.

The contribution of high-quality early childhood education to child development

Early childhood is an important period during which a variety of developmental processes are at their peak, including physiological, cognitive, linguistic, emotional, social, and perceptual processes (Courage, Edison & Howe, 2004; Gogtay et al., 2004; Kouider et al., 2013). This is a critical period in a child's development. If the young child is not exposed to a supportive, stimulating, and enriching environment, his development is liable to be negatively affected (Bailey, Bruer, Symons & Lichtman, 2001). Furthermore, lags in development that are created in early childhood tend to accumulate over time and into adulthood (Phillips & Shonkoff, 2000; Feinsten, 2003; Cunha & Heckman, 2007). Although learning is also possible at later ages, the acquisition of skills is at its peak during early childhood, thanks to the plasticity of the brain during this period. Eliminating those lags later in life is more difficult and requires a significant investment of effort and resources (Huttenlocher, 2002; Hensch, 2005; for a survey, see Shavit, Friedman, Gal & Vaknin, 2018). Therefore, educational intervention and investment during the early years of life produce high returns in terms of educational, economic, social, and health outcomes,

-
- 2 *Meitzav*: the Hebrew acronym for Measurement of School Growth and Efficiency. A series of standardized tests administered in Grades 5 and 8 throughout Israel.
PIRLS: Progress in International Reading Literacy Study. Surveys and standardized tests conducted in Grade 4 by the International Association for the Evaluation of Educational Achievement (IEA).
PISA: Programme for International Student Assessment. Conducted among 15-year-olds by the OECD.

particularly in the case of children from weaker socioeconomic backgrounds (NICHD & Duncan, 2003; Schweinhart et al., 2005; Heckman, 2006, 2011; Cunha & Heckman, 2007).

Investment in early childhood education can significantly improve both the cognitive and non-cognitive skills of children and in the long run improve their educational and employment opportunities (Barnett, 1995; Heckman, 2006; Yoshikawa et al., 2013). Children from weaker socioeconomic backgrounds who have benefited from focused and high-quality educational intervention in the early years of life tend to achieve higher scores in school, earn more in adulthood, are characterized by lower levels of crime and unemployment, and are less dependent on welfare services, relative to children who did not benefit from such intervention (Burger, 2010; Barnett 2011). Research carried out in the US indicates that the earlier that intervention occurs (from birth up to age five) and to the extent that it is focused on weaker families, there is a greater return on the investment of resources (Duncan, Yeung, Brooks-Gunn & Smith, 1998; Heckman, 2008).

Since the early years of life form the basis for development and skills acquisition (Phillips & Shonkoff, 2000), the quality of ECEC settings is of great importance. Attending a high-quality ECEC framework can contribute to the development of a child's skills and abilities, both cognitive and non-cognitive, and as a result can improve their educational, economic, and health outcomes in the future, particularly in the case of children from weaker socioeconomic backgrounds (Barnett, 1995; NICHD & Duncan, 2003; Sylva, Melhuish, Sammons, Siraj-Blatchford & Taggart, 2010; Blossfeld, Kulic, Skopek & Triventi, 2017; Cebolla-Boado, Radl & Salazar, 2017; Kulic, Skopek, Triventi & Blossfeld, 2019). The quality of early childhood education is to a large extent a function of the child-staff ratio, the staff's level of education and training, and the educational process quality (Blossfeld et al., 2017). Children enrolled in a high-quality ECEC framework achieve better results on average on a variety of cognitive and social tests (Howes, Phillips & Whitebook, 1992; Howes, 1997; Sylva et al., 2010). In a study conducted in a number of developed countries that examined the connection between the quality of ECEC and later achievement, a positive relationship was found between enrollment in early childhood education and reading ability in primary school and high school. This connection was found to be particularly strong in countries where the quality of ECEC is high (Dämmrich & Esping-Andersen, 2017). There is a high positive return on attending a high-quality ECEC setting both for the children themselves and for society as a

whole. High-quality ECEC can advance children's social and emotional skills and can increase their chances of acquiring an academic education and being employed in the future, and it contributes to reducing social pathologies such as crime, poverty, and illness (Barnett 1985, 1996; Schweinhart et al., 2005; Heckman, Moon, Pinto, Savellyev & Yavitz, 2010; Heckman, 2013). Moreover, high-quality early childhood education for weak populations is likely to break the intergenerational cycle of poverty and reduce inequality in achievement between children (Heckman & Karapakula, 2019).

Studies indicate that not only does ECEC enrollment have an effect on later achievement, but the number of years spent in ECEC settings also has significance. The longer that children are in an ECEC framework, the greater the likelihood of their having higher educational achievement as adults, even after controlling for their family's socioeconomic background. For example, the data from the PIRLS test indicate that for every additional year that children are in an ECEC setting, they show an increase of about 7 percent of a standard deviation in their reading skills (Cebolla-Boado et al., 2017). The age at which children begin their early childhood education also has a significant effect on later educational achievement. Overall, research shows that starting in ECEC at an earlier age is positively related to cognitive development (Kulic, Skopek, Triventi & Blossfeld, 2017; OECD, 2017). Nonetheless, other studies show that overly intensive investment at early ages, such as being in an ECEC framework for long hours each day, is liable to hinder the development of future cognitive and social skills (Vandell & Corasaniti, 1990; Gupta & Simonsen, 2010; DeCicca & Smith, 2013).

Enrollment patterns in ECEC vary systematically with socioeconomic level and they also have a differential effect on achievements. The socioeconomic-cultural characteristics of a family have a major influence on the type of early childhood education framework chosen, the accessibility of high-quality settings, the age of entry, and the length of time spent in those settings (Fuller, Holloway & Liang, 1996; Early & Burchinal, 2001; Blossfeld et al., 2017; Cebolla-Boado et al., 2017). The rates of enrollment among children of well-educated parents are higher than among children of parents with little education (Kim & Fram, 2009), and children from strong socioeconomic backgrounds enter ECEC at earlier ages and, on average, spend more time in those settings (Early & Burchinal, 2001; Wolfe & Scrivner, 2004; Blossfeld et al., 2017; Cebolla-Boado et al., 2017). Children from stronger socioeconomic backgrounds also tend to participate in higher quality settings (Early & Burchinal, 2001; Del Boca,

Piazzalunga & Pronzato, 2014; Del Boca, 2015; Blossfeld et al., 2017, 2019; Kulic et al., 2017). It is interesting that children from weaker socioeconomic backgrounds are likely to benefit more, in terms of cognitive development, from enrollment in ECEC, since it can provide them with positive stimuli they would not likely be exposed to at home (Esping-Andersen et al., 2012; Blossfeld et al., 2017); however, as mentioned, the rate of enrollment in high-quality ECEC frameworks among children from weaker socioeconomic backgrounds is relatively low.

Early Childhood Education and Care in Israel: quantity and quality

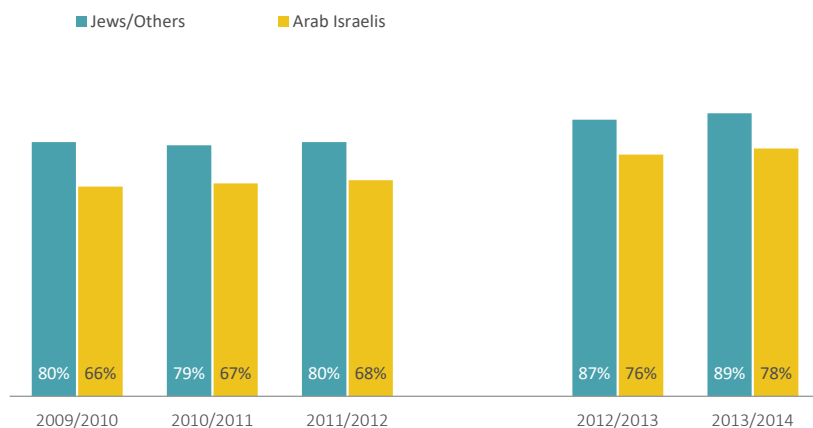
Israel is a unique case when it comes to early childhood (Vaknin, 2020). The share of young children out of the whole Israeli population is twice that in the OECD countries. The birthrate in Israel is the highest among the OECD countries: in 2017, the average number of children per woman in Israel (according to the total fertility rate index) was 3.1, as opposed to 1.6 on average in the OECD countries. In view of the large number of young children in Israel, there has been a significant increase in recent years in the demand for education services and childcare, both as a tool for advancing the employment of mothers and as a result of the application of the Free Compulsory Education Law from age three (Rabinovitz, 2015; OECD, 2017). As in other countries, the education services for young children have been expanded in Israel and, as a result, they are starting to attend ECEC frameworks at earlier ages than ever before (OECD, 2017; Kulic et al., 2019).³ In 2012, following the social protests of the previous year, the Trajtenberg Committee recommended that the government expand universal compulsory education to ages three to four. The implementation of

-
- 3 Terminology for early childhood education and care (ECEC) settings in Israel is unique and does not necessarily align with that commonly used in other countries. This study uses the following terms and definitions going forward:
Preschool (*"gan"*): Refers to larger-scale care settings, including kindergarten. Among those ages 3–6 years old, they are generally public.
Public daycare facility (*"maon"*): Larger-scale daycare centers for ages 3 months to three years; usually run by non-profit organizations, supervised by government and subsidized for individuals.
Nurseries (*"peuton"*): Smaller, generally private, daycare centers serving one to two year olds.
Home daycare (*"mishpachton"*): Daycare, generally private, run out of a private home.

the recommendations led to a sizable increase in the enrollment of children at those ages in public preschool education. Figure 1 presents the share of children ages 3 to 4 who were enrolled in public preschool education between 2009 and 2014. It shows an increase of about 8 percentage points between the year prior to the implementation of the recommendations (2011 to 2012) and the subsequent years. Among Arab Israelis, the enrollment rate rose from 68 percent to 78 percent while among Jews it rose from 80 to 89 percent.

Figure 1. Enrollment rates in ECEC frameworks, ages 3–4

Pre-kindergarten and public daycare facilities



Source: Zontag et al., Taub Center based on Shraberman and Blass, 2016, Figure 7

In 2017, the enrollment rate among children ages 3–6 in preschool in Israel (both public and private) was particularly high: 99 percent versus 87 percent on average in the OECD countries and in the EU. The enrollment rate in ECEC among children ages 0–3, who are not included under the Free Compulsory Education Law, is also particularly high in Israel: 56 percent versus 35 percent on average in the OECD countries (OECD, 2017). The high enrollment rate in Israel is closely related to the high employment rate among mothers of young children, which is about 70 percent versus 54 percent on average in the OECD countries (ibid.). Essentially, the employment rate among mothers of very young children in Israel is quite similar to that among women without children in that age group (Fuchs & Epstein, 2019).

Not only are enrollment rates in ECEC high in Israel, but also the number of hours each day spent by young children in ECEC is higher, on average, than in other countries. Children up to the age of three in Israel spend an average of about 30 to 40 hours per week in daycare facilities and home daycare (small group) settings, depending on the number of schooldays in a week (five or six) and the number of hours per day (full or half-day) (Vaknin, 2020).

Despite the high enrollment rates, only one-quarter of children up to the age of three in Israel are in state-supervised ECEC frameworks. About half a million children are in unsupervised private ECEC frameworks or they are cared for by their parents or relatives (Ministry of Labor, Social Affairs and Social Services, 2019). Furthermore, there is no single agency that is responsible for all of the services for young children; rather, there are four government ministries involved: the Ministry of Health, the Ministry of Economy, the Ministry of Education, and the Ministry of Labor, Social Affairs and Social Services. Thus, the main characteristic of policy in Israel is fragmentation and a lack of coordination between the government and public agencies that decide on the accessibility and quality of early childhood services and education (Rabinovitz, 2015).

Public expenditure on ECEC in Israel is among the lowest in the OECD and particularly low for children ages birth to three (OECD, 2017). Furthermore, the child-staff ratio in preschool frameworks in Israel — in both Arabic-speaking and Hebrew-speaking settings — is high relative to other countries. Thus, the average number of children per preschool framework in Israel is about 50 percent higher than in other developed countries. In contrast, the average number of staff in a preschool setting in Israel is 23 percent less than the average in other developed countries (RAMA, 2019). A high child-staff ratio, like Israel's, will likely make it difficult for the staff to focus on the individual needs of each and every child.

The findings of the Teaching and Learning International Survey (TALIS), which was carried out among preschool frameworks in Israel in 2018, indicates that the level of formal education of the staff is low relative to the other countries in the survey (Germany, Turkey, South Korea, Norway, and Chile). In Israel, 46 percent of the staff in preschool frameworks (teachers and assistants) have an academic education as compared to 52 percent in the other countries, while 39 percent of the staff in Israel have a high school education or less, which is twice the average for the other countries in the study. These gaps are primarily the result of the particularly low level of education among the

teaching assistants. Furthermore, it was found that the average years of experience of the staff in ECEC in Israel is low relative to the other countries in the survey (Ministry of Labor, Social Affairs and Social Services, 2019; RAMA, 2019). These findings are to a large extent due to the fact that most of the ECEC frameworks for children up to the age of three in Israel, most of which are not under State supervision, are not subject to uniform standards for the training of the staff. In other words, each ECEC framework can decide which standard—if any—to apply (Rabinovitz, 2019). In view of this situation, it can be assumed that the quality of ECEC is not very high in Israel, and the question then arises as to whether enrollment in ECEC nonetheless has a positive effect on later achievement, as was found in other countries.

Focused research questions

Based on a literature review, we arrived at a number of focused research questions regarding the relationship between socioeconomic background, the time spent in early childhood education, and later academic achievement in school among Israeli children. The first question is whether and to what extent the rates of participation in ECEC varies by socioeconomic background. Second, to what extent is there a relationship between academic achievement in school on the one hand and enrollment and the time spent in early childhood education on the other? Third, does the statistical relationship between the time spent in ECEC and academic achievement vary according to socioeconomic status? And fourth, does starting ECEC at a very early age harm later academic achievement, as claimed by DeCicca & Smith (2013) and others?

Methodology

There are few databases in Israel that include information on children's early years, and those that do exist are not rich in variables that relate to early childhood. In order to shed light on the relationship between ECEC and later academic achievement and obtain as complete a picture as possible, this study is based on three complementary database files: a file in which data from the Social Survey carried out by the CBS in 2004 is merged with the Meitzav test scores of children in Grade 5 and 8; the PIRLS data files from 2016; and the PISA test scores from 2018. Each of the files includes measurements for the time spent by the child in ECEC and their academic achievement in school, as

well as demographic and socioeconomic variables related to both the time spent in ECEC and achievement. The main analysis makes use of multivariate linear regressions of achievement on the time spent in ECEC, while including various control variables.

In the following sections, we present a more detailed description of the files, including their advantages and disadvantages, the results of the analysis and their contribution to our understanding of the issue. We end with a summary of the results and their policy implications, as well as directions for future research.

The Social Survey combined with the Meitzav data

The Social Survey carried out by the Central Bureau of Statistics (CBS) is an annual survey conducted over a large representative sample population in Israel. The survey is composed of two main parts: a fixed section, which includes a large number of questions on a variety of topics, such as health, housing, employment, education, economic situation, computer use, religion and observance, etc., and another section that is devoted each year to an in-depth examination of just one or two areas. In 2004, the survey focused on educational frameworks, including ECEC settings. Parents of young children were asked to answer a variety of questions related to their child's attendance in an ECEC framework, including the type of framework (kindergarten/preschool, public daycare facility, nursery, or home daycare setting), the considerations in choosing the framework, overall satisfaction, etc. In addition to the description of the educational framework, the Social Survey includes questions on the family's sociodemographic characteristics.

The Social Survey data for young children at the time of the survey were merged with their Meitzav exam scores a few years later. The Meitzav test (School Efficiency and Growth Index) is administered each year by RAMA (the National Authority for Measurement and Evaluation in Education) among students in Grade 5 and 8 in math, science, English (as a second language), and mother tongue (Hebrew or Arabic). The tests evaluate the level of the students' knowledge relative to the official curriculum of the Ministry of Education. Each year between a third and a half of schools take the tests — until 2015, in selected subjects and since then in all of them.

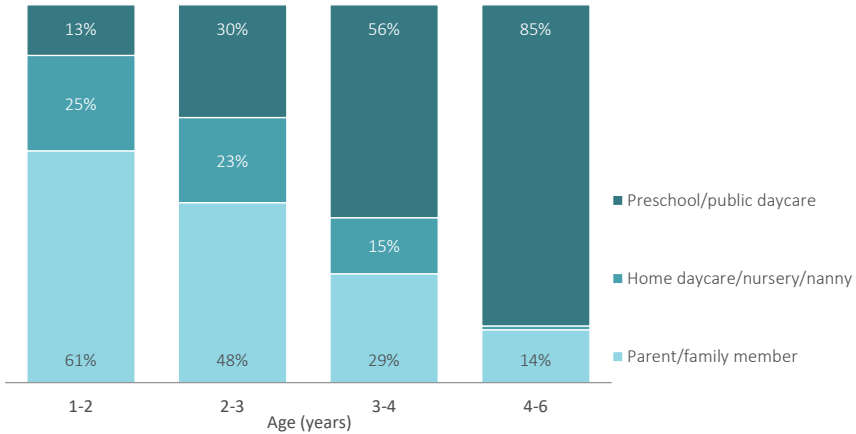
The merged database created is unique in that it includes measurements gathered from the parents when their children were young and measures of their children's achievement several years later. It is thus possible to examine

the relationships between the type of ECEC frameworks the children attended and their later achievement on the Meitzav test, while controlling for other variables. Nonetheless, the database also suffers from a major disadvantage, in that only for a fraction of the respondents is there full data for all of the variables (about 350 observations). The missing observations are due to two main factors. First, only a small share of the families that participated in the survey had young children in 2004 (24 percent). Second, not all of the children included in the sample were administered the Meitzav test while in Grade 5 and 8, since no more than half of Israeli schools participate in the test each year and, what is more, in the year that many respondents should have taken the exams (2013–2014), the Meitzav test was cancelled.

The research variables in the Social Survey and the Meitzav test

Parents were asked to indicate for each of their children up to the age of 6 the type of setting they were enrolled in at the time of the survey. We categorized the possible responses as follows: 1) childcare provided by one of the parents or a relative (usually a grandmother); 2) home daycare (*mishpachton*), nurseries (*peutonim*) or a paid nanny, which tend to care for a smaller number of children and are generally unregulated; and 3) kindergarten, preschool (*gan*) or public daycare facility (*maon*), which usually have a larger number of children than the other categories and are supervised in higher rates. Figure 2 presents the distribution of children according to type of ECEC framework at different ages between one and six years old.

As expected, the share of children cared for by a parent or relative without payment is high for the 0–2 age group and gradually declines up to the 4–6 age group. The share for home daycare or nannies similarly declines across the age groups. In contrast, the share of children enrolled in kindergarten, preschool or public daycare facilities rises to 85 percent in the 4–6 age group.

Figure 2. The distribution of children by ECEC frameworks and age

Source: Zontag et al., Taub Center | Data: CBS, *Social Survey 2004*

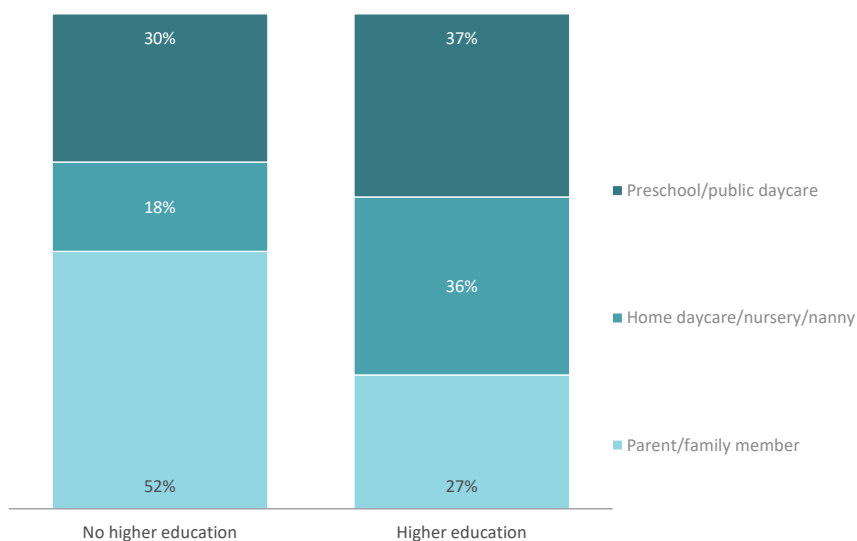
The main outcome variable according to which we evaluate the advantages of attending ECEC is academic achievement. In the merged Social Survey and Meitzav file, this variable is measured by the **standardized score on the Meitzav test in math or science** in Grade 5 and 8.⁴ For each grade and for each of the two subjects, we calculated the standardized score (in terms of standard deviation). For each grade (5 and 8), we calculated the student's standardized score in the subject in which he was tested (math or science). The control variables used in the analysis of this file were the mother's level of education, which appears as a dichotomous variable that differentiates between mothers with an academic education and the rest; gross monthly household income on a scale of one to five; a dichotomous variable that differentiates between children with young siblings and the rest; and a pair of dichotomous variables for gender (girl=1) and population sector (Arab Israeli = 1). Of the mothers surveyed, 29 percent had an academic education; 53 percent of the children were girls; and 58 percent of the children had young siblings. Of the respondents, 17 percent were Arab Israelis.

4 We wished to test the relationship between the achievements of the children in mother tongue test scores and the type of ECEC framework; however, this was not possible since full data for the necessary variables was available for only a few of the respondents.

Differences between the groups in enrollment rates in early childhood education (Social Survey 2004)

Figures 3 to 5 present the differences in enrollment rates in the various frameworks according to mother's education, family income, and population group, respectively. Since in the 5–6 age group a significant majority of the children attend kindergarten, the graphs focus on age 4 and below, for which there is variation in the type of framework. The rate of enrollment in ECEC outside the home is higher among children with mothers who have an academic education, among children from a strong socioeconomic background, and among Jews.⁵

Figure 3. Enrollment rates in ECEC frameworks for children ages 4 and under
By mother's education



Source: Zontag et al., Taub Center | Data: CBS, *Social Survey 2004*

5 It is important to note that the differences between groups according to socioeconomic status stand out even when controlling for mother's education, family income, population sector, and number of young children in the family. See Appendix Table 1.

Figure 4. Enrollment rates in ECEC frameworks for children ages 4 and under
By income quintiles

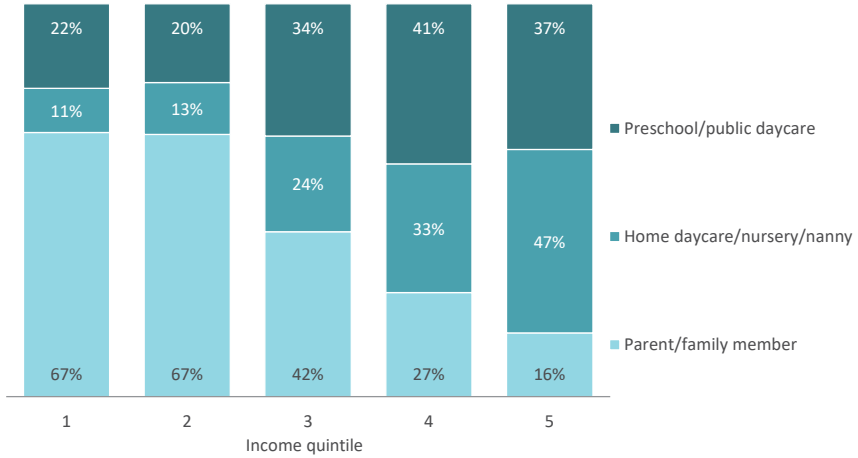
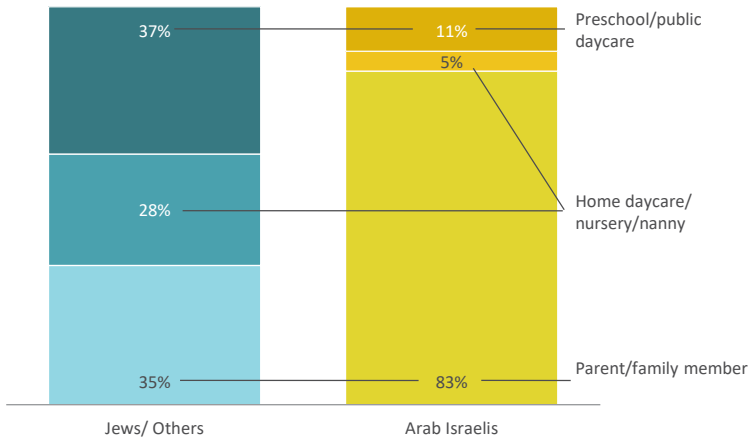


Figure 5. Enrollment rates in ECEC frameworks for children ages 4 and under
By population sector



Source for both figures: Zontag et al., Taub Center |
Data for both figures: CBS, *Social Survey 2004*

Enrollment in ECEC and academic achievement in Grade 5 and 8 (Social Survey 2004)

In the next stage of the analysis, we examine the effect of enrollment in early childhood education on academic achievement in Grade 5 and 8. The analysis is carried out using multivariate regression, as presented in Table 1. The analysis relates to Jewish children in the 2–4 age group in 2004.⁶ Arab Israelis were not included in the analysis since the number of Arab children enrolled in ECEC in the 2–4 age group was limited in the sample (the total number of Arab Israeli respondents overall was limited in the first place) and, therefore, it was not possible to arrive at reliable estimates in their case.

The dependent variable in the regression is the weighted standardized score of the students in math and science on the Meitzav test.⁷ While the 2004 Social Survey included the parents of 947 children ages 2–4, the number of observations in the regression was 140 for students tested in Grade 5 and 120 for those tested in Grade 8. As noted, the gap is due to the fact that the Meitzav exam is carried out only in some of the schools; in addition, Arab Israelis and ultra-Orthodox boys who are usually enrolled in separate educational frameworks were also removed from the sample.

6 We chose to focus on 2–4 year-olds for a number of reasons: First, the hypothesized effect of type of ECEC framework on future achievement is apparently dependent on the age at which the child was in that framework (see the analysis of the PISA data below). Therefore, it is important to estimate the effects of type of ECEC framework for defined age groups. However, among 4–6 year olds, 86 percent of the children were in kindergarten, preschool and daycare, which rules out the possibility of a reliable analysis of the effect of type of ECEC setting on achievement. Second, most of the respondents who were 1-year-old or younger at the time of the Social Survey did not participate in the Meitzav test in Grade 5 since in 2013–2014, the exam was cancelled. Third, only a small number (57) of respondents who were 1–2 years old at the time of the survey took the Meitzav exam.

7 In the case of the Meitzav test in Grade 5, some of the students were tested in math and the rest in science. In Grade 8, by contrast, some of the students were tested in both. The dependent variable in the regression is the standardized score of the student in the subject in which he was tested (math or science) or the standardized average score in the case that he was tested in both. Since there may be differences in the tests between different years, the standardized scores were calculated relative to the distribution of scores in the year in which the subject was tested.

Table 1. Multiple regression of standardized achievement scores on the Meitzav exams for students in Grades 5 and 8 who were ages 2 to 4 in 2004

Jews only

Independent variables	Grade 5	Grade 8
Home daycare/nursery/nanny	0.38 (0.26)	0.03 (0.25)
Preschool/public daycare	0.58** (0.23)	0.42* (0.23)
Mother's education (Higher education = 1)	0.18 (0.18)	0.58** (0.17)
Income level	0.17** (0.08)	0.22** (0.07)
Gender (Girl = 1)	0.04 (0.17)	0.08 (0.15)
Additional young siblings (Has siblings = 1)	0.03 (0.17)	-0.08 (0.15)
Constant	-1.06** (0.31)	-1.27** (0.30)
R ²	0.09	0.24
Number of observations	140	120

Note: Significance levels: * $p < 0.1$; ** $p < 0.05$.

Source: Zontag et al., Taub Center

The regression findings indicate a positive and statistically significant relationship between enrollment in a preschool or public daycare facility and the Meitzav scores in Grade 5 and 8. The children who were enrolled in preschool or public daycare facilities at age 2–4 had significantly higher achievements (42–58 percent of a standard deviation) relative to children who were cared for at home at that age, after controlling for the rest of the variables that appear in the regression. In contrast, there is no difference in later achievement between being in a small family style setting or with a nanny and being cared for by a family member.

While we do not have data on the quality of education in the two types of frameworks, it can be assumed that the category of preschool and public daycare facilities relates to more formalized frameworks that are to a large extent run by networks, such as WIZO and Na'amat, or by the local authorities, while settings that belong to the second category are more informal. The networks and local authorities supervise the activity in the frameworks under

their responsibility. This is perhaps reflected in their relatively high level of quality, which explains the positive effect of being enrolled in them on children's later achievements.

Although the regressions are based on only a small number of observations, it is interesting to note that there is no substantial difference in the coefficients of preschool and public daycare facilities in determining achievement between Grade 5 and 8. The literature reports a phenomenon of fadeout in which the effect of ECEC education diminishes over time. Studies have shown that programs such as Head Start (a national program in the US that provides education and care for young children) have a positive effect on a child's development, which is reflected in the initial years following participation in the program, but that this benefit fades out in subsequent years (Barnett, 2011). It is interesting to note that our data do not provide evidence of significant fadeout of the advantage of enrollment in preschool or public daycare facilities at the age of 2–4.⁸

Summary (Social Survey 2004)

In summary, we note that in Israel, like other countries, the enrollment rate in ECEC is higher among the more educated and the financially better-off. In 2004, the largest difference from this perspective was between Jews and Arab Israelis. Thus, the enrollment rate among Arab Israelis was up to one-quarter lower than among Jews. It is worth noting that studies based on more up-to-date aggregate data indicate that this gap is still large (Rabinovitz, 2019). Furthermore, we found that even though the measures of quality for ECEC are low in Israel, it appears that being enrolled in preschool or public daycare facilities at the age of 2–4 makes a positive and statistically significant contribution to achievements on the Meitzav exams in math and science, in both Grade 5 and Grade 8.

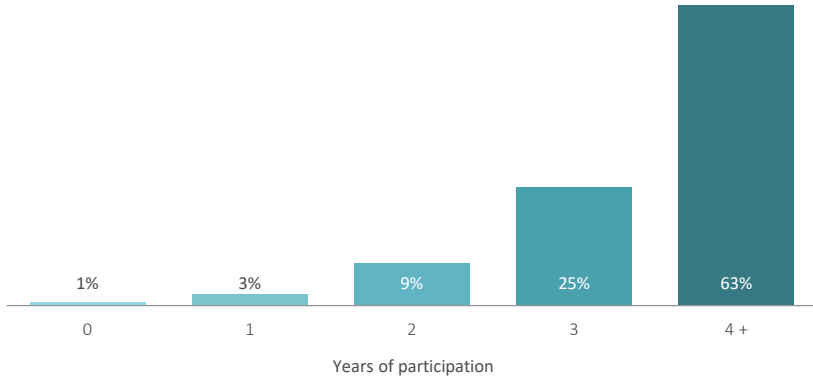
8 The statistical significance of the differences between the coefficients is estimated by a combined regression equation for achievement in Grade 5 and 8, which includes a dummy variable for Grade 8 (as opposed to Grade 5) and interactions between it and the rest of the variables in the equation. None of the interactions were statistically significant.

The PIRLS test 2016

The main limitation of the Social Survey data is the small number of subjects for which there is complete data. As a result, we were forced to limit the analysis to Jews only and not to include interactions between enrollment in early childhood education and socioeconomic background. In this section, we report on the analysis of data for Israel gathered as part of the PIRLS (Progress in International Reading Literacy Study) project in 2016. These data do not include information on the type of ECEC framework the young child was enrolled in, but they do make it possible to include Arab Israelis in the analysis and to examine the differences according to socioeconomic status in the statistical effect of enrollment on future achievement.

The PIRLS test, which measures reading literacy, is carried out by the International Association for the Evaluation of Educational Achievement (IEA). The test assesses the level of reading literacy of children in Grade 4 in a large number of countries. Additionally, the children, their parents, teachers and school principals are asked to answer various questionnaires. The parents are asked, among other things, about the number of years their child was in ECEC prior to Grade 1 and about the child's socioeconomic background, including the parents' education, their occupations, etc. In 2016, 4,041 native Israeli students from 159 State or State-religious schools took the test (independent schools in the ultra-Orthodox sector do not generally participate in the PIRLS test) (RAMA, 2020). The children tested were born in 2006, such that they were young children between 2006 and 2012.

The independent variable is the number of years in which the child was enrolled in ECEC (according to the parents' responses to the questionnaire). The variable was measured according to the following categories: was not enrolled in an ECEC framework, was enrolled for less than a year, was enrolled for a year, was enrolled for two years, was enrolled for three years, or was enrolled for four years or more. The parents' questionnaire did not provide the exact number of years for children who were enrolled for four years or more, such that all of the children belonging to that group were put into a single category. Therefore, it is not possible to examine differences between children who were in ECEC frameworks for four, five, or six years on the basis of the PIRLS data. Figure 6 presents the distribution of number of years of enrollment in ECEC frameworks. The smallest category is particularly small and includes anyone who was not enrolled in any ECEC framework or was enrolled for less than a year. A significant majority of children (63 percent) were enrolled for 4 years or more, one-quarter for 3 years and about 13 percent for 2 years or less.

Figure 6. The number of years of participation in ECEC frameworks

Source: Zontag et al., Taub Center | Data: [PIRLS 2916 International Database](#)

The means and standard deviations of the research variables based on the PIRLS data are presented in Table 2. Like the Social Survey data, population sector, gender, and mother's education were measured as dichotomous variables that represent Arab Israelis, girls, and an academic education, respectively. The variable representing Arab children is based on the exam language (Hebrew or Arabic). The father's occupation was measured on the basis of the parents' reporting as a dichotomous variable that represents administrative, professional and technical occupations (hereafter: prestigious occupations). The averages of the dichotomous variables show that about one-half of the subjects are girls, about one-half of the mothers have an academic education, about one-quarter of the subjects are Arab Israelis, and about one-half of the fathers are in prestigious occupations. The number of books at home was measured by means of five categories, from few to many, according to the child's responses. This variable is generally used in studies of educational processes since it represents the cultural capital of the family (see, for example, De Graaf, De Graaf & Kraaykamp, 2000). The last variable in the table is our main dependent variable in the analysis of the PIRLS data, namely a measure of reading literacy. Reading literacy is measured by a series of five

“plausible values” (PVs).⁹ The estimation of the statistical effect of the research variables on reading literacy was estimated by a designated package of Stata (PV), designed to estimate weighted average coefficients. Table 2 presents the average of these values’ averages and their average standard deviation.

Table 2. Means and standard deviations of the research variables, PIRLS 2016

Variable	Mean	Standard deviation
Years in ECEC frameworks	3.44	0.84
Gender (Girl = 1)	0.52	0.50
Mother’s education (Higher education = 1)	0.51	0.50
Student’s age	9.96	0.33
Population sector (Arab Israeli = 1)	0.25	0.44
Father’s occupation (Prestigious = 1)	0.50	0.50
Number of books in the home (1–5)	3.10	1.23
Average of reading plausible values	544.90	79.42

Source: Zontag et al., Taub Center

Enrollment in early childhood education frameworks and academic achievement in Grade 4 (PIRLS 2016)

Like the findings from the Social Survey data, the PIRLS data also show a connection between socioeconomic variables and number of years that a child was enrolled in ECEC frameworks. Appendix Table 2 shows that the number of years that a child is enrolled in an ECEC framework is high among children whose mothers have an academic education, among children whose fathers have prestigious occupations, and among Jews relative to Arab Israelis.

In order to investigate the relation between the enrollment time in ECEC frameworks and academic achievement, we estimated two regressions for the achievements of Grade 4 pupils. The regressions presented in Table 3 include

9 The term “plausible values” relates to a method for measuring characteristics, such as a pupil’s reading skills. In the case of PIRLS, the pupils are tested on the basis of a number of different test versions, each of which has a different set of questions. Then a number of values of the variables are imputed for each subject, based on their responses. These values correspond to distinct draws in the plausible distribution of abilities of these students.

the time spent in ECEC frameworks, while controlling for other variables.¹⁰ The first regression estimates the influence of number of years in an ECEC framework on the student achievement in Grade 4, while controlling for gender, mother's education, population sector, father's occupation, and number of books in the home. The findings indicate that the influence of years spent in early childhood education is positive and statistically significant. The coefficients of the rest of the variables in the regression are in line with the results presented in the literature: girls and children of mothers with an academic education achieve higher scores; father in a prestigious occupation and the number of books in the home have a positive effect; and the achievements of Arab Israeli students are much lower than those of Jewish students. It should be mentioned per the literature review above, we also examined the effect of number of years in ECEC squared, but we did not find it to be statistically significantly using the PIRLS data (although see below for the case of the PISA data).

As noted, 63 percent of students were enrolled in an ECEC framework for four years or more. Since the distribution of this variable is highly biased, we also estimated a regression in which it is defined as a dichotomous variable that distinguishes between four years or more in an ECEC framework and three years or less. The results of the second regression are presented in Table 3. This regression also includes an interaction between whether the mother has an academic education and the dichotomous variable that represents a period of four or more years in an ECEC framework. The interaction tests the difference between children of mothers with an academic education and children of less educated mothers on the effect of the length of time spent in an ECEC framework. The results indicate that among children of mothers with an academic education, the effect of being in an ECEC framework for four or more years is smaller than that for children of mothers without an academic education.

10 As mentioned, the PIRLS research makes use of the plausible values methodology. For each student, five values were calculated for reading ability and a regression was run on STATA by means of the designated procedure for estimating regression coefficients and standard errors that average the coefficients that would have been obtained if separate values had been estimated for each plausible value separately (PV command). The regression was estimated while taking into account the pupils' weights and replicate weights.

Table 3. Regression of the reading plausible values, PIRLS 2016

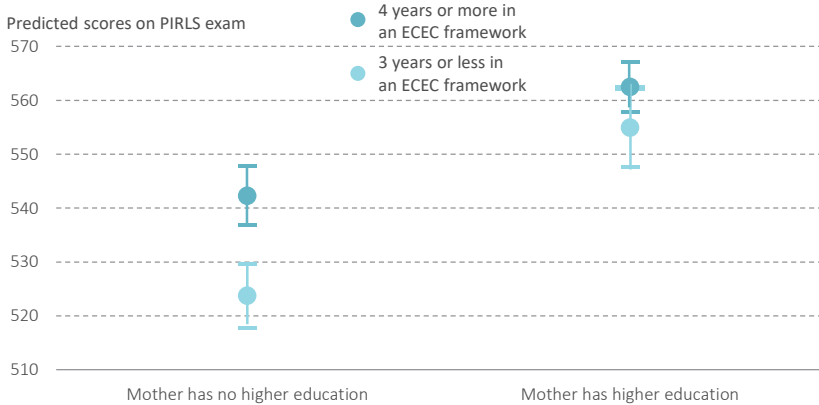
Independent variables	1	2
Years in ECEC frameworks	11.16** (2.76)	
Years in ECEC framework (4 years or more = 1)		18.56** (5.40)
Gender (Girl = 1)	12.65** (3.35)	12.07** (3.36)
Mother's education (Higher education = 1)	23.4** (3.95)	31.18** (5.10)
Student's age	9.15* (5.04)	9.57* (5.00)
Population sector (Arab Israeli = 1)	-53.99** (6.24)	-56.01** (6.18)
Father's occupation (Prestigious = 1)	20.64** (4.23)	21.18** (4.25)
Number of books in the home (1–5)	7.13** (1.35)	7.31** (1.38)
Interaction: Mother's education x 4 years and over		-11.00** (4.85)
Intercept	379.05** (51.32)	402.09** (50.26)
Number of observations	2,501	2,501
R ²	0.29	0.29

Note: Significance levels: *p < 0.1; ** p < 0.05.

Source: Zontag et al., Taub Center

In order to illustrate the interaction effect, Figure 7 presents the values predicted by the regression for one plausible value included in the file. Around each point that represents an average predicted value there is a 95 percent confidence interval. Among children of mothers with an academic education, the two points are close to each other and their confidence intervals overlap. This implies that being in an ECEC framework for four or more years does not have a statistically significant effect on achievement. In contrast, among children of mothers without an academic education, the difference between the two points is larger and statistically significant. In other words, a longer period spent in ECEC frameworks improves later achievements among children with a low socioeconomic status, as measured by the mother's education.

Figure 7. Predicted scores by mother’s education and the numbers of years in ECEC frameworks



Source: Zontag et al., Taub Center | Data: [PIRLS 2016 International Database](#)

Summary (PIRLS 2016)

As in the case of the findings from the analysis of the Social Survey data which were merged with the Meitzav data, and as in the case of findings reported by studies in other countries, the PIRLS data indicate that there are significant differences in enrollment of children in ECEC frameworks according to socioeconomic status. Children from strong socioeconomic backgrounds with respect to income and mother’s education start attending at an earlier age, and Arab Israeli children start attending at a significantly later age than Jewish children. A longer period in ECEC has a positive effect on later reading achievement, primarily among children with less educated mothers.¹¹

11 The main methodological question regarding the results we have so far presented is whether the relation between the length of time spent in an ECEC framework and achievement is causal or is the result of connections between both these variables and some other variable. For example, it may be that the relationship is due to the fact that parents with high educational awareness make sure to send their children to ECEC frameworks and also invest in their children’s cognitive development. In order to isolate explanations of this type, we estimated two models that at least partially deal with the selection bias of being included in a group that benefited from four or more years in an ECEC framework. The results are presented in the Appendix under the title “An additional analysis of the PIRLS data with respect to the causality of the relation between number of years in an ECEC framework and achievement” and in Appendix Table 3. A similar analysis for the PISA data (which appears below) is presented in Appendix Table 4.

The PISA 2018 test

The PISA (Programme for International Student Assessment) test, which is administered by the OECD, examines student skills at the age of 15 (Grade 9 or 10) in a large number of countries. The test focuses on three subjects: reading, math, and science. However, it does not look only at the level of knowledge accumulated by students according to the school curriculum, but also, and primarily, their ability to apply that knowledge to concrete life situations (Schleicher, 2018). In this study, we only present the analysis of the reading test, although we also analyzed the scores for math and science and obtained similar results.

Apart from the test itself, students are asked various questions related to their education and their way of life in general. Among other things, the students are asked about the age at which they started attending ECEC.¹² In the PISA 2018 exam, 6,259 pupils who were born in Israel from 174 schools were tested (RAMA, 2019). Omitted from the analysis were 745 pupils studying in ultra-Orthodox schools, as most students in the ultra-Orthodox sector did not take the PISA exam. In addition, students in grades other than 9 or 10 were also omitted. About 82 percent of the remaining sample answered the question regarding the age at which they began to attend ECEC. Therefore, the final sample used in the analysis included 4,046 pupils.

The students who participated in the PISA exam given in 2018 were born in 2002 and were young children between 2002 and 2008. Since they were asked retrospectively about their preschool frameworks, namely about a decade after entering Grade 1, and because 15-year-olds are not necessarily aware of the age at which they began to attend ECEC nor of the definitions of the various types of frameworks, their answers may not be particularly reliable and this variable should be treated with caution. This is the main drawback to this data. In contrast, the PISA data make it possible to determine whether there is a relationship between the age that a child began attending ECEC and later achievement than was measured with the two previous data files. Furthermore, and in contrast to the two previous databases, the PISA data make it possible to test the relationship between the start of attendance at a very early age (birth to two years) and later achievement.

12 In this survey, the students were asked specifically when they began attending “*gan*,” a larger early childhood education program, not including a subsidized daycare facility or home daycare. For simplicity, we refer to the terminology in the question as ECEC.

The means and standard deviations of the variables used in the analysis of the PISA file are presented in Table 4. The independent variable in the analysis of the PISA data is the age at which the child first entered ECEC. The average age according to the data is almost three-years-old (2.93). More than half of the sample are girls, the average age is 15.69, 28 percent are Arab Israelis (population sector was defined as the exam and survey language, i.e. Arabic or Hebrew), and one-half had mothers with an academic education. A large majority (85 percent) were tested in Grade 10 and the rest in Grade 9. About 9 percent of the respondents remained behind a year at some point between Grade 1 and the year of the survey. The average of the plausible values for reading is 480, with an average standard deviation of 118.

Table 4. Means and standard deviations of the research variables, PISA 2018

Variable	Mean	Standard deviation
Age of entry into ECEC frameworks	2.93	1.13
Gender (Girl = 1)	0.54	0.50
Age	15.69	0.29
Population sector (Arab Israeli = 1)	0.28	0.45
Mother's education (Higher education = 1)	0.51	0.50
Grade (10 th grade = 1)	0.85	0.36
Repeated a year in school	0.09	0.28
Average of reading plausible values	480.19	117.86

Source: Zontag et al., Taub Center

Enrollment age in an ECEC framework and academic achievement in Grade 9 and 10 (PISA 2018)

Table 5 presents regressions on the basis of ten plausible value measures of reading achievement from the PISA data. The regression to the left relates to those respondents tested in Hebrew and the right to those tested in Arabic. The two regressions include a linear component, a squared component for the effect of starting age in ECEC and an interaction between starting age and mother's education. This interaction coefficient is not statistically significant in the equation for Arab Israelis, but for the sake of comparing the two groups we nonetheless included it in the equation.

Before discussing the connection between starting age, mother's education, and reading achievement, we will briefly summarize the rest of the regression findings. These findings were similar to those found in the literature and they

validate the regression overall. The mother's education has a particularly strong and statistically significant effect on reading scores, girls have higher scores than boys, and, among Arab Israelis, the gap between boys and girls is especially large. The scores for Jews in Grade 10 were higher than for Jews in Grade 9. This finding is not surprising since students in Grade 10 have studied longer than those in Grade 9. Furthermore, it appears that the higher score of a Grade 10 student inversely may reflect the developmental lag of an individual who started school late. A not insignificant share of parents choose to delay the entry of their children into Grade 1 in order to give them more time to mature, whether physically or cognitively. Children whose entry into Grade 1 was delayed are aged 15 in Grade 9 rather than Grade 10 and it may be that their low achievement reflects a developmental lag related to their parents' decision to hold them back in school. Also those who were kept back a year have very low achievements, which may also be a reason they were kept back.

Table 5. Regressions of the reading scores on the basis of 10 plausible values, PISA 2018

	Jewish sector	Arab Israeli sector
Age at entry into ECEC frameworks	45.67** (9.63)	42.67** (12.64)
Age at entry squared	-7.42** (1.66)	-5.75** (1.64)
Mother's education (Higher education = 1)	57.63** (12.56)	27.42 (28.85)
Gender (Girl = 1)	24.91** (5.13)	47.56** (6.99)
Age	-10.62 (9.32)	-12.16 (9.55)
Grade (10 th grade = 1)	30.55** (6.06)	13.26 (12.24)
Repeated a year in school (Repeated a year = 1)	-97.81** (23.89)	-51.22** (6.55)
Age at entry x Mother's education	-6.93* (4.13)	1.03 (5.89)
Intercept	560.8** (144.7)	472.7** (149.5)
Number of observations	2,889	1,157
R ²	0.086	0.167

Note: Significance levels: * $p < t = 0.1$; ** $p < t = 0.05$.

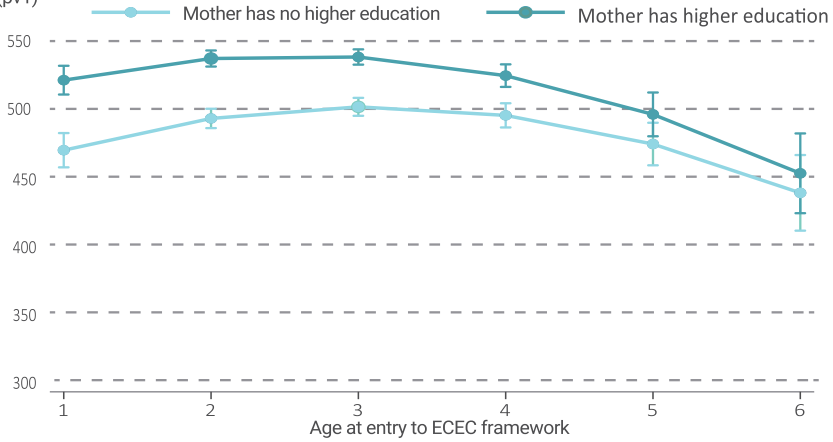
Source: Zontag et al., Taub Center

Figure 8 illustrates the three-way relationship between starting age, mother's education, and reading score. The figure is based on multivariate regressions for a single plausible value, although the patterns are very similar to those in Table 5. The upper figure relates to Jews and the lower to Arab Israelis. In both of them, the relationship between starting age in an ECEC framework and reading score is not linear: the score is low among those who started in an ECEC framework at an early age; it then rises to a peak (among Jews at age 2–3 and among Arab Israelis at age 3–4) and then falls among those who entered ECEC at a relatively late age. An examination of the confidence intervals around the various points in the graph shows several important insights. (1) Among Jewish children with academically educated mothers, the gap that results from entering an ECEC framework at a very early age (in terms of reading score) is not statistically significant, in contrast to the score for a child who entered an ECEC framework at age 2–3. (2) In contrast, among Jewish children of less-well educated mothers, starting to attend at the age of one involves a statistically significant gap relative to starting at the age of 3. (3) Among Jews from both groups (by mother's education), late entry into an ECEC framework (age 5–6) results in low scores with statistical significance relative to children who started at age 2–4. (4) Among Arab Israelis in both groups (by mother's education), early entry (at the age of one year) is related to a statistically significant gap relative to children who started at age 3–4. (5) However, the gap that results from late entry is not statistically significant. It is worth noting that some studies in other countries have found that overly intensive childcare in the very early years is in fact liable to hinder the development of cognitive and social skills (DeCicca & Smith, 2013; Gupta & Simonsen, 2010; Vandell & Corasaniti, 1990). This is to some extent in line with our finding that an early entry into ECEC correlates to relatively low achievement. This is particularly the case among Arab Israelis and children of mothers with a lower level of education. This result hints at the possibility that the low quality of ECEC frameworks that children from lower socioeconomic status in this age group attend is responsible for the lower achievement observed.

Figure 8. Predicted scores in reading by mother's education and age at entrance to ECEC frameworks, PISA 2018

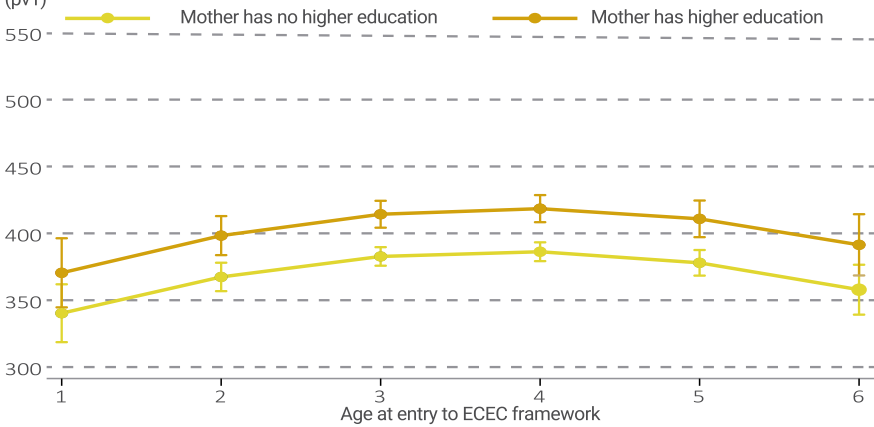
Jews

Predicted reading scores
(pV1)



Arab Israelis

Predicted reading scores
(pV1)



Source: Zontag et al., Taub Center | Data: [PISA database](#)

Conclusion

In this study, we have examined the connection between enrollment of Israeli children in ECEC and their level of achievement in primary and middle school. Studies in other countries indicate that attending a high-quality early childhood education and care framework can strengthen a child's cognitive skills. Israel is characterized by a very high level of enrollment in ECEC frameworks; however, various indicators show that they are of relatively poor quality. This is manifested in a relatively high child-staff ratio, a low level of education on average among the support staff, and a lack of supervision over many of the frameworks that serve very young children up to the age of three. Nonetheless, we found that enrollment in ECEC in Israel makes a significant contribution to academic achievement in Grade 4 to 8 and under certain conditions also to achievement at age 15.

As part of the study, we analyzed three databases: the data from the Social Survey carried out by the CBS in 2004 which was merged with data from the Meitzav exam, and the data for Israel on two international tests (PIRLS 2016 and PISA 2018). The three databases include measures of enrollment in ECEC settings, as well as academic achievement in primary school, middle school, or at the beginning of high school. Similarly, the data include various control variables which were used in the analysis. Each of the databases has advantages and disadvantages and analyzing them together makes it possible to arrive at number of important insights.

First, the rate of enrollment in ECEC frameworks in Israel, as in other countries, is higher among populations with higher levels of education and income. In Israel, there is a significant difference between Jews and Arab Israelis along this axis and also according to socioeconomic status, as defined by parents' education, father's occupation, and household income. Second, among individuals who were young children in the 2000s, the longer the child was in an ECEC framework, the higher their academic achievement in primary and middle school; this is also the case in Grade 9 and 10 for those children who did not begin attending an ECEC framework at a very young age. Third, among Jews, while attending preschool and public daycare facilities contributed to achievement, small home daycare settings or being cared for by a nanny — frameworks that are usually not supervised by the state — did not contribute to later achievement relative to being looked after by parents or by a relative. Fourth, it may be that starting to attend an ECEC framework at a very early age (before the age of two) does not make a statistically significant

contribution to later achievement, which is particularly the case among Arab Israeli children. And fifth, one of the analyses indicated the possibility that the positive effect of number of years in ECEC is stronger among children of mothers without an academic education than among children of mothers with an academic education.

An important policy implication based on these findings is that more formalized frameworks — preschool and public daycare facilities — contribute to a child’s cognitive development. It appears that the largest contribution is among populations with a relatively low socioeconomic status (as measured by the mother’s education), but that among these populations the level of enrollment in ECEC frameworks is relatively low. This is true for both Arab Israelis and Jews from less educated families and with relatively low incomes. Therefore, it is highly desirable to increase the rate of enrollment of children from these populations in ECEC frameworks, and particularly from age two onward. The reform proposed by the Trajtenberg Committee, which was implemented between 2012 and 2013 (after those in this survey had completed their early childhood education) is thus likely to have contributed significantly to improving achievement levels. First, it increased the level of enrollment of 3-4-year-olds in public education and second it encouraged parents to move their children from private ECEC frameworks to public ones, which are supervised and tend to be of higher quality. Our findings indicate that the next important step is to expand public education for 2-year-olds.

The finding based on the PISA data that enrolling at too early an age in ECEC (before the age of two) delays a child’s cognitive development, particularly among Arabic-speakers, calls for more in-depth research using appropriate databases. The appearance of this pattern among populations with a relatively weak socioeconomic status (Arab Israelis and children of mothers without an academic education) points to the possibility that the quality gaps of the ECEC frameworks for that age group is responsible for the negative relationship. This points to the importance of investing in the quality of ECEC frameworks and increasing the supervision over them. Alternatively, it may be that the finding is an indication that in the 0–2 age group, preference should be given to homecare, which would require longer parental leave to allow parents to focus on their children at this age.

It was noted several times that the contribution of ECEC to a child's development is dependent on its quality. Studies in other countries indicate that the quality of ECEC settings is determined by a variety of factors and in particular the child-staff ratio, the staff's level of training, and the quality of the educational processes. Our research produced some findings that we attributed to quality differences between ECEC frameworks, such as between preschool and home daycare settings, although we did not have measures of quality for those frameworks. It is important to carry out further research on this question by means of a more systematic gathering of sufficiently detailed data on the structural and process quality of ECEC frameworks and the long-term implications. We recommend that the Ministry of Labor, Social Affairs and Social Services, the Ministry of Education, and the Ministry of the Economy, as well as the CBS, initiate a long-term study of early childhood in Israel. This research should gather physiological, psychological, and social data on children starting from birth and during the various stages of their development and education, including data on their families and the various educational frameworks they attend. Such a study will serve as a barometer of the quality and efficiency of ECEC frameworks, as is the case of the Meitzav exam, which serves as a barometer of student achievement in primary and middle school.

It is important to mention that this study has focused only on the effect of enrollment in ECEC frameworks on academic achievement. The literature indicates that enrollment in high-quality ECEC frameworks has far-reaching positive effects on other variables that help shape the life trajectory of children in adulthood. Moreover, there is a high positive return for society as a whole to early childhood education, including a reduction in social pathologies such as crime, poverty, and illness. In future research to be carried out by the Initiative on Early Childhood Development and Inequality of the Taub Center, we intend to investigate the effects of enrollment in ECEC frameworks on similar phenomena among a sample of the Israeli population.

References

English

- Bailey, D. B., Jr., Bruer, J. T., Symons, F. J., & Lichtman, J. W. (Eds.). (2001). *Critical thinking about critical periods*. Baltimore: Paul H. Brookes Publishing.
- Barnett, W. S. (1985). Benefit-cost analysis of the Perry Preschool Program and its policy implications. *Educational Evaluation and Policy Analysis*, 7(4), 333–342.
- Barnett, W. S. (1995). Long-term effects of early childhood programs on cognitive and school outcomes. *The Future of Children*, 5(3), 25–50.
- Barnett, W. S. (1996). *Lives in the balance: Age-27 benefit–cost analysis of the High/Scope Perry Preschool Program*. High/Scope Educational Research Foundation Monograph no.11. Ypsilanti, MI: High/Scope Press.
- Barnett, W. S. (2011). Effectiveness of early educational intervention. *Science*, 333(6045), 975–978.
- Blossfeld, H. P., Kulic, N., Skopek, J., & Triventi, M. (Eds.). (2017). *Childcare, early education and social inequality: An international perspective*. Cheltenham, UK: Edward Elgar Publishing.
- Burger, K. (2010). How does early childhood care and education affect cognitive development? An international review of the effects of early interventions for children from different social backgrounds. *Early Childhood Research Quarterly*, 25(2), 140–165.
- Cebolla-Boado, H., Radl, J., & Salazar, L. (2017). Preschool education as the great equalizer? A cross-country study into the sources of inequality in reading competence. *Acta Sociologica*, 60(1), 41–60.
- Courage, M. L., Edison, S. C., & Howe, M. L. (2004). Variability in the early development of visual self-recognition. *Infant Behavior and Development*, 27(4), 509–532.
- Cunha, F., & Heckman, J. J. (2007). The technology of skill formation. *American Economic Review*, 97(2), 31–47.
- Dämmrich, J., & Esping-Andersen, G. (2017). Preschool and reading competencies: A cross-national analysis. In H. P. Blossfeld, N. Kulic, J. Skopek, & M. Triventi (Eds.), *Childcare, Early Education and Social Inequality: An international perspective* (pp. 133–151). Cheltenham, UK: Edward Elgar Publishing.
- De Graaf, N. D., De Graaf, P. M., & Kraaykamp, G. (2000). Parental cultural capital and educational attainment in the Netherlands: A refinement of the cultural capital perspective. *Sociology of Education*, 73, 92–111.
- DeCicca, P., and Smith, J. (2013). The long-run impacts of early childhood education: Evidence from a failed policy experiment. *Economics of Education Review*, 36(C), 41–59.

- Del Boca, D. (2015). Childcare choices and child development. *IZA World of Labor*, 134, 1–10.
- Del Boca, D., Piazzalunga, D., & Pronzato, C. (2014). *Early child care and child outcomes: The role of grandparents*. Discussion Paper No. 8565, IZA – Institute for the Study of Labor.
- Duncan, G. J., Yeung, W. J., Brooks-Gunn, J., & Smith, J. R. (1998). How much does childhood poverty affect the life chances of children? *American Sociological Review*, 63(3), 406–423.
- Early, D. M., & Burchinal, M. R. (2001). Early childhood care: Relations with family characteristics and preferred care characteristics. *Early Childhood Research Quarterly*, 16(4), 475–497.
- Esping-Andersen, G., Garfinkel, I., Han, W. J., Magnuson, K., Wagner, S., & Waldfogel, J. (2012). Child care and school performance in Denmark and the United States. *Children and Youth Services Review*, 34(3), 576–589.
- Feinstein, L. (2003). Inequality in the early cognitive development of British children in the 1970 cohort. *Economica*, 70(277), 73–97.
- Fuchs, H., & Epstein, G. (2019). [The labor market: An overview](#). In A. Weiss (Ed.) *State of the nation report: Policy, economy and policy in Israel 2019* (139–162). Jerusalem: Taub Center for Social Policy Studies in Israel.
- Fuller, B., Holloway, S. D., & Liang, X. (1996). Family selection of child-care centers: The influence of household support, ethnicity, and parental practices. *Child Development*, 67(6), 3320–3337.
- Gogtay, N., Giedd, J. N., Lusk, L., Hayashi, K. M., Greenstein, D., Vaituzis, A. C., ... Thompson, P. M. (2004). *Dynamic mapping of human cortical development during childhood through early adulthood*. Proceedings of the National Academy of Sciences, 101(21), 8174–8179.
- Gupta, N. D., and M. Simonsen (2010). Non-cognitive child outcomes and universal high quality child care. *Journal of Public Economics*, 94(1), 30–43.
- Heckman, J. J. (2006). Skill formation and the economics of investing in disadvantaged children. *Science*, 312(5782), 1900–1902.
- Heckman, J. J. (2008). Schools, skills, and synapses. *Economic Inquiry*, 46(3), 289–324.
- Heckman, J. J. (2011). The economics of inequality: The value of early childhood education. *American Educator*, 35(1), 31–35.
- Heckman, J. J. (2013). *Giving Kids a Fair Chance*. Cambridge, MA: MIT Press.
- Heckman, J. J., & Karapakula, G. (2019). *Intergenerational and intragenerational externalities of the Perry Preschool Project*. The Heckman Equation Project.
- Heckman, J. J., Moon, S. H., Pinto, R., Savelyev, P. A., & Yavitz, A. (2010). The rate of return to the High/Scope Perry Preschool Program. *Journal of Public Economics*, 94(1–2), 114–128.

- Hensch, T. K. (2005). Critical period plasticity in local cortical circuits. *Nature Reviews Neuroscience*, 6(11), 877–888.
- Howes, C. (1997). Children's experiences in center-based child care as a function of teacher background and adult: Child ratio. *Merrill Palmer Quarterly*, 43(3), 404–425.
- Howes, C., Phillips, D. A., & Whitebook, M. (1992). Thresholds of quality: Implications for the social development of children in center-based child care. *Child Development*, 63(2), 449–460.
- Huttenlocher, P. R. (2002). *Neural Plasticity: The effects of environment on the development of the cerebral cortex*. Cambridge, MA: Harvard University Press.
- Kim, J., & Fram, M. S. (2009). Profiles of choice: Parents' patterns of priority in child care decision-making. *Early Childhood Research Quarterly*, 24(1), 77–91.
- Kouider, S., Stahlhut, C., Gelskov, S. V., Barbosa, L. S., Dutat, M., De Gardelle, V., ... Dehaene-Lambertz, G. (2013). A neural marker of perceptual consciousness in infants. *Science*, 340(6130), 376–380.
- Kulic, N., Skopek, J., Triventi, M., & Blossfeld, H. P. (2017). Childcare, early education and social inequality: Perspectives for a cross-national and multidisciplinary study. In H. P. Blossfeld, N. Kulic, J. Skopek, & M. Triventi (Eds.), *Childcare, early education and social inequality: An international perspective* (pp. 3–28). Cheltenham, UK: Edward Elgar Publishing.
- Kulic, N., Skopek, J., Triventi, M., & Blossfeld, H. P. (2019). Social background and children's cognitive skills: The role of early childhood education and care in a cross-national perspective. *Annual Review of Sociology*, 14(6), 13.1–13.23.
- NICHD – National Institute of Child Health and Human Development Early Child Care Research Network, & Duncan, G. J. (2003). Modeling the impacts of child care quality on children's preschool cognitive development. *Child Development*, 74(5), 1454–1475.
- OECD (2017). [*Starting strong 2017: Key OECD indicators on early childhood education and care*](#). Paris: Starting Strong. Paris: OECD Publishing.
- Phillips, D. A., & Shonkoff, J. P. (Eds.). (2000). *From neurons to neighborhoods: The science of early childhood development*. Washington DC: National Academies Press.
- Rabinovitz, M. (2019). [*Early childhood education and care \(ECEC\) services – Abstract*](#). Jerusalem: Knesset Research and Information Center. (Complete report in [Hebrew](#).)
- Rosenbaum, P. R. (1984). The consequences of adjustment for a concomitant variable that has been affected by the treatment. *Journal of the Royal Statistical Society, Series A (General)*, 147(5), 656–666
- Schleicher, A. (2018). [*PISA 2018: Insights and interpretations*](#). Paris: OECD Publishing
- Schweinhart, L. J., Montie, J., Xiang, Z., Barnett, W. S., Belfield, C. R., & Nores, M. (2005). *Lifetime effects: The High/Scope Perry Preschool Study through age 40*. Ypsilanti, MI: High/Scope Press.

- Shavit, Y., Friedman, I., Gal, J., & Vaknin, D. (2018). *Emerging early childhood inequality: On the relationship between poverty, stress, sensory stimulation, and child development and achievements*. Jerusalem: Taub Center for Social Policy Studies in Israel.
- Shraberman, K., & Blass, N. (2016). *Household expenditure on preschools*. In A. Weiss (Ed.), *State of the nation report: Society, economy and policy in Israel 2016* (pp. 149–180). Jerusalem: Taub Center for Social Policy Studies in Israel.
- Sylva, K., Melhuish, E., Sammons, P., Siraj-Blatchford, I., & Taggart, B. (Eds.). (2010). *Early childhood matters: Evidence from the effective pre-school and primary education project*. London: Routledge.
- Vaknin, D. (2020). *Early childhood education and care in Israel compared to the OECD: Enrollment rates, employment rates of mothers, quality indices and future achievement*. Jerusalem: Taub Center for Social Policy Studies in Israel.
- Vandell, D. L., & Corasaniti, M. A. (1990). Variations in early child care: Do they predict subsequent social, emotional, and cognitive differences? *Early Childhood Research Quarterly*, 5(4), 555–572.
- Wolfe, B., & Scrivner, S. (2004). Child care use and parental desire to switch care type among a low-income population. *Journal of Family and Economic Issues*, 25(2), 139–162.
- Yoshikawa, H., Weiland, C., Brooks-Gunn, J., Burchinal, M. R., Espinosa, L. M., Gormley, W. T., ... Zaslow, M. J. (2013). *Investing in our future: The evidence base on preschool education*. Washington DC: Society for Research in Children and Foundation for Child Development.

Hebrew

- Almagor Lotan, O., & Schwartz, E. (2011). *Raising costs of daycare under the supervision of the Ministry of Economy*. Jerusalem: Knesset, Research and Information Center, Department of Budget Supervision.
- Rabinovitz, M. (2015). *Frameworks for very young children*. Jerusalem: Knesset, Research and Information Center.
- RAMA (2019). *TALIS in preschools 2018: International study for the evaluation of early childhood education frameworks*. Ramat Gan: National Authority for Measurement and Evaluation in Education.
- RAMA (2020). *PIRLS 2016: International research for evaluating reading literacy of 4th graders*. Ramat Gan: National Authority for Measurement and Evaluation in Education.

Appendix

Appendix Table 1 presents the differences according to mother's education, income, and population sector in patterns of enrollment in ECEC frameworks outside the home, based on a multivariate analysis. The table presents the estimates from a logistic multinomial regression of the relationship between these three background variables and the log of the probability of being enrolled in a for-payment ECEC framework as opposed to childcare at home (or by relatives and also not for payment). We chose to estimate the regression for children aged 2–4 at the time of the 2004 social survey for a number of reasons. First, the children in this age group are present in all types of ECEC frameworks, while in the case of children up to the age of two, the rate of enrollment in preschool and daycare was very low, particularly in the Arab Israeli sector. Second, most of the children ages four or older were enrolled in preschool frameworks and therefore in this age group the variance according to type of framework is very low. And third, we chose to focus on the age group that is comparable to that which was used in an examination of the effect of framework type on achievement. In addition to the three background variables, the regression also controls for the presence of other young siblings in the family. Since most of the frameworks for children under age four at the time of the study were private and unsubsidized, the economic burden of enrolling in those frameworks rises with the number of children in the family within that age group. Thus, the benefit from one parent staying home in order to take care of the young children in the family is likely to be greater and also likely to influence the decision to enroll children in ECEC frameworks. The results are similar to those presented in the descriptive graphs (Figure 3–5). The probability of enrollment in ECEC frameworks outside the home is higher for children with academically educated mothers (although only one of the two coefficients is statistically significant), for children in families with a higher level of income, and for Jews. It is interesting to note that the probability of enrolling in preschool or daycare in the 2–4 age group is higher for children with additional young siblings. This is in spite of the economic burden on a family in which a number of children are in ECEC settings. It can be assumed that this trend is influenced by the policy in Israel of subsidizing supervised ECEC settings in the case of families with several small children (Almajor Lotan & Schwartz, 2011; Rabinovitz, 2015).

Appendix Table 1. Multinomial logistic regression coefficients (and standard deviation) for type of ECEC framework for child at ages 2–4

Independent variable	Home daycare/ nursery/nanny	Preschool/ public daycare
Mother's education (Higher education = 1)	0.62** (0.29)	0.34 (0.26)
Income level	0.45** (0.11)	0.42** (0.09)
Population sector (Arab Israeli = 1)	-2.17** (0.34)	-2.04** (0.23)
Gender (Girl = 1)	-0.00 (0.24)	-0.16 (0.19)
Additional young siblings (Has siblings = 1)	-0.20 (0.24)	0.36* (0.21)
Constant	-1.21** (0.39)	-0.44 (0.32)
R ²		0.14
Number of observations		724

Note: Base category: the child is cared for by a parent or other family member without pay.

Significance level: * $p < 0.1$; ** $p < 0.05$.

Source: Zontag et al., Taub Center

Appendix Table 2 presents the estimates of an ordinal logistic regression of the number of years that a child is enrolled in an ECEC framework, by parents' report in the PIRLS dataset. Since the research is focused on ECEC education in Israel, the regression includes only native-born Israelis. Children born abroad ($n=149$) may have attended ECEC frameworks abroad and these may differ from those in Israel. The regression findings point to a positive and statistically significant correlation between mother's education, population sector, father's occupation, and number of books in the home on the one hand and the number of years spent in ECEC frameworks on the other. The independent variables in the regression were measured in Grade 4, but we assume that they represent the relative socioeconomic status of the family as it was when the children were younger.

Appendix Table 2. Ordinal logistic regression of the number of years the child was enrolled in ECEC frameworks

Variable	B
Mother's education (Higher education = 1)	0.474** (0.100)
Population sector (Arab Israeli = 1)	-1.977** (0.090)
Gender (Girl = 1)	-0.106 (0.078)
Father's occupation (Prestigious = 1)	0.497** (0.099)
Number of books in the home (1–5)	0.070* (0.035)
Intercept 1	-4.813 (0.198)
Intercept 2	-3.578 (0.151)
Intercept 3	-2.158 (0.132)
Intercept 4	-0.235 (0.122)
Pseudo R ²	0.14
Number of observations	2,995

Note: In an ordinal logistic regression, the coefficients of the independent variables represent their contribution to the log of the probability of belonging to each category of the dependent variable (number of years of enrollment in an ECEC framework) relative to the categories below it. Thus, for example, the statistically significant and positive coefficient of the mother's education indicates that children of academically educated mothers have a relatively higher probability of being enrolled in an ECEC framework for a longer time. In an ordinal logistic regression, the calculation of the log ratio of the probability of belonging to some category of the dependent variable (relative to the categories below it) is calculated as the difference between the intercept of j and the sum of the product of the value of the independent variables multiplied by their coefficients.

Significance level: * $p < 0.1$; ** $p < 0.05$.

Source: Zontag et al., Taub Center

An additional analysis of the PIRLS data with respect to the causality of the connection between number of years in an early childhood education framework and achievement

The main methodological question regarding the results that we have presented is whether the relation between the time spent in a ECEC frameworks and achievement is a causal one or is the result of the relationship between both of these variables and some other variable. For example, it may be that the relationship is due to the fact that parents with a high awareness of the importance of education make sure to send their children to ECEC frameworks and also invest in their cognitive development. In order to isolate relationships of this type, we estimated two models that take into account the selection bias in the probability of being included in the treatment group. The treatment in our case is enrollment in an ECEC framework for four or more years and the outcome of the treatment is the score on one of the reading tests in the PIRLS data. The model compares the score for treated subjects to that of untreated subjects (i.e. enrollment in an ECEC framework for three years or less or not at all) with an identical profile. In order to make the test more stringent, we compared identical subjects not only with respect to the research variables (mother's education, gender, population group, and father's occupation) but also reading ability in Grade 1 as reported by parents. In addition, we compared them according to a variable that represents the frequency with which the parents engaged in enrichment activity with the children prior to Grade 1. It certainly may be that the level of reading ability reported by the parents is the result of attending an ECEC framework for a longer period of time and therefore controlling for it is likely to control for the effect of enrollment on later achievement. If even after controlling in this manner there remains an effect of enrollment in an ECEC framework on reading scores in Grade 4, then it can be claimed with a reasonable amount of confidence that this is a causal relationship. Matching on variables that were measured after the treatment is acceptable when the goal is to represent unobservable variables prior to the treatment (Rosenbaum, 1984). Here we assume that reading ability upon starting Grade 1 represents cultural capital, ambition, and parents' values with respect to their children's education. A similar logic was used when choosing to compare the treated and untreated subjects according to the frequency of the parents' enrichment activity with their children prior to Grade 1.

Early reading ability was measured in the PIRLS test by means of six questions, such as “To what extent was your child able to carry out these activities when he started Grade 1: Identifying most of the letters of the alphabet...” We calculated the principal component of these questions and ranked the children into quintiles, from lowest to highest. The variable for enrichment activity was measured by means of 16 questions of the type: “Before your child started primary school, with what frequency did you or someone else in the home do the following activities with him/her: reading books...playing with toys that have numerals on them...” The variable that we created is the principal component score.

Appendix Table 3 presents the results for the analysis of the average treatment effect of the duration of ECEC participation on PIRLS performance. We used two different methods: a comparative analysis of similar subjects in terms of the control variables (“nearest neighbors”) and a propensity score matching analysis. For each, we calculated the average treatment effect for the entire population and for the treated subjects only (those who were actually in an ECEC framework for four or more years). The results show a statistically significant effect of 10–14 points on the scale of reading scores. Since the standard deviation of the scores is 79, the effect is in the vicinity of 15 percent of a standard deviation.¹³

13 It is important to note that the analyses of treatment effects of this type do not control for spurious correlations with variables not included as controls. In each analysis, it is possible that there are such omitted variables. For example, in the current analysis it can be assumed that the parent’s level of ambition for their child’s education affects both the decision to enroll them in a preschool framework and their academic achievement. Therefore, there are those who claim that the analysis of treatment effects does not make it possible to conclude that the correlation that remains (the average treatment effect) reflects a causal relationship. We accept this criticism but we would mention that the model that we estimated includes a control for achievement in Grade 1 which probably also implicitly includes the mediated effects of variables not included among the controls (such as the ambition of the parents for their children to obtain an academic education). Similarly, the variable that measures the enrichment activity of the parents with their children also apparently includes such mediating effects. Therefore, in our view, it is not unreasonable to attribute causality to the coefficients presented in Appendix Table 3.

Appendix Table 3. Average treatment effect (ATE) of being in ECEC frameworks for 4 years or more on reading achievement scores (PIRLS 2016)

Model	Treatment effect on overall population	Treatment effect on the treated	Number of matches to each treated case
Nearest neighbor, Mahalanobis	14.13*	13.33*	1–13
Propensity score matching	14.13*	10.20*	
Sample size	2,781		

Notes: Native-born Israelis only. The matching between each subject and his closest neighbor were defined as exact matching on gender, population group, mother's education, and father's occupation. Other correlations according to reading ability at the start of Grade 1 and enrichment activity of parents with their children prior to Grade 1. Correction for the size of the sample for continuous variables.

Significance level: * $p < 0.01$.

Source: Zontag et al., Taub Center

An additional analysis of the PIRLS data with respect to the causality of the relation between number of years in an ECEC framework and achievement

As in the analysis of the PIRLS data, we also estimated models to analyze the treatment effect (Appendix Table 4) for the PISA dataset. We defined two types of treatment: early enrollment in preschool (age 1–2) as opposed to enrollment only at age 3–4; and late enrollment in a preschool framework (age 5–6) as opposed to enrollment at age 3–4. We tested separately for the effect of the two treatments on achievement for one of the plausible values in reading. We used tests based on defining similarity between the treated and the untreated by means of propensity score matching. In the analysis of the two treatments, we matched the treated to the untreated according to five variables (mother's education, age, gender, being kept back a year, and the grade in which the student was tested, namely Grade 9 or 10). Here, again, some of the variables were measured after treatment (mother's education, being held back a year, and the grade in which the student was tested). We believe that these variables represent pre-treatment unobservable variables (for example, mother's education when the child was very young and developmental delays). We carried out the analysis separately for Arab Israelis and Jews. The results are presented in Appendix Table 4.

The results indicate that: (1) in the case of Arab Israelis, early enrollment in a preschool framework is linked to low achievement relative to enrollment at age 3–4; and (2) the opposite was observed among Jews: late enrollment is linked to low achievement relative to enrollment at age 3–4. These results validate the results shown in Figure 8.

Appendix Table 4. Average treatment effect (ATE) on entering an ECEC framework at ages 1–2 and ages 5–6 versus entering at ages 3–4 on achievement in reading

Propensity score matching method, PISA 2018, Israel-born only

Treatment versus entrance at ages 3–4	Treatment effects on overall population	Treatment effect on the treated	N	Number of matches to a treated case
Arab Israelis				
Entrance age 1–2	-27.44**	-24.22**	878	1–39
Entrance age 5–6	-6.40	-10.94	1,003	
Jews				
Entrance age 1–2	-4.52	-3.12	2,778	1–54
Entrance age 5–6	-43.97**	-39.91**	1,745	

Note: Significance level: * $p > 0.05 \geq 0.01$; ** $p < 0.01$.

Source: Zontag et al., Taub Center