# Education, Cognitive Development, and Poverty: Implications for School Finance Policy


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ABSRACT

Child poverty is a growing problem that adversely affects both future society and the poor children themselves. This paper's purpose is to investigate the intergenerational links between education and poverty. Israel serves as an interesting case study because it has exhibited an incremental trend in child poverty between 1980 and 2010 (from 5% to 35%). Regression analyses were conducted to measure the effect of the current generation's features (i.e., education, income, and household investment in education) and of the state's school finance policy on the next generation's cognitive development. These analyses reveal that at the upper secondary school level, the education level, the income level, and the extent of household investment in education of the current generation of students in Hebrew-speaking schools have a high and positive effect on the next generation's cognitive development in terms of high school matriculation eligibility. At the lower secondary level, school finance policy and the education level of the current generation both have a high positive effect on the next generation's cognitive development in terms of academic achievement measured by math scores. In addition, the findings for the Arabic-speaking schools reveal that, at the upper secondary level, the income of the current generation has a high positive effect on the next generation's cognitive development; at the lower secondary school level, the extent of household investment in education of the current generation has a high and positive effect on the next generation's cognitive development. Policy implications are discussed, and a school finance policy reform is suggested as a strategy of breaking through the intergenerational cycle of poverty.

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## INTRODUCTION

Poverty and education are reciprocally linked. Within the current generation, this link is positive, as a higher level of education is a primary means of obtaining higher income, and is therefore a means of reducing the poverty rate and breaking through the poverty cycle. It stands to reason that the education and socioeconomic status of the current generation will have an effect on the next generation. Those born into poverty face a liquidity trap: Primary and secondary education are acquired at the early stages of life, when an individual's financial resources are limited and depend on his or her family, as well as the state's policy of school finance.

This paper explores the intergenerational links between education and poverty. Israel is used as an interesting case study, as it exhibits an incremental trend of child poverty. At the beginning of the 1980s, child poverty was some 5%, compared to 35% in 2010. This incremental trend may be explained to a certain degree by demography (higher average number of children per family in low-SES households). However, the argument in this paper is that, although demography certainly contributes to this trend, it doesn't account for it all.

Furthermore, it is argued that the incremental trend of child poverty is an outcome of policy. Poverty may be reduced using a policy of in-kind payments (i.e., payment in educational services instead of money) or a policy of cash transfer payments (i.e., tax money that the government redistributes directly to the poor). An in-kind payments policy for poverty reduction operates through the educational institutions within a country and the resource allocation mechanisms by which the governance allocates funds to the educational system. In this case, increased funds per student and needs-based allocation mechanisms can potentially help to overcome the demographic issue and to reduce the incremental trend of child poverty. The use of cash transfer payments also has the potential to reduce the incremental trend of child poverty by allocating larger child allowances to needy families (welfare payments). However, when both policies are neglected, it is argued that a high incremental trend of child poverty is expected, such as in the case of Israel.

Within the last decade, child poverty in Israel has increased, to the extent that currently every third child is poor. Compared to Western countries, the percentage of children living in poverty in Israel is high. For example, in 2008, 35% of the children in Israel lived in poverty, in comparison to 9.8%, 11.5%, 17.5%, and 27.5% in the Netherlands, France, Germany, and the United States, respectively. The poverty rate among children in Israel has increased by 50% since the beginning of the decade. In absolute terms, there are 420,100 poor families in Israel, which comprise 1,651,300 individuals, of whom 783,600 are children (National Insurance Institute of Israel 2008).

The increase in child poverty in Israel between 1980 and 2010 coincided with—and may have been the result of—a trend of reduction in both in-kind payments and cash-transfer payments. In addition to the decrease in per-student allocation during that time period, the allocation principle was reformed in 2009 from the original needs-based allocation mechanism to an equal (yet not equitable) allocation mechanism. Moreover, child allowances were reduced by half between the 1980s and the year 2010.

As a policy aimed at the reduction of child poverty, cash transfer payments involve an inherent challenge. On the one hand, cash transfers provide families with improved living conditions that may reduce child poverty in the short run. On the other hand, they may produce an adverse demographic effect (e.g., by providing a monetary incentive for low-income families to have more children, thus increasing the percentage of children in poverty).

In-kind payments as a policy aimed at the reduction of child poverty also have their shortcomings. This type of policy has an inherent "time-gap" effect that is unappealing to policymakers. Allocating larger resources per student to the educational system has a demonstrated positive effect in the long run, reducing child poverty through returns for education. However, the politicians who formulate the school finance policies prefer benefits that can be seen and demonstrated in the short run, in order to improve their chances of being re-elected.

Nonetheless, the in-kind payments policy has the crucial advantage of providing children with the skills they need to break through the poverty trap. Accordingly, a well-designed school finance policy could prove to be a necessary strategy in battling the incremental trend in child poverty.

There are many variables that affect, directly and indirectly, the interrelationship between education and poverty. One major variant that can be controlled for is school finance policy—that is, the method by which a state allocates resources to its schooling system. I argue that a school finance policy can and should be designed with the goal of breaking the poverty trap. Unfortunately, Israel has reformed its former (relatively) equitable school finance policy in 2009, omitting many of the compensating elements from its funding formula.

The design of a school finance policy affects the intergenerational relationship between cognitive development and poverty (Baker and Welner 2011). In Israel, where this study was conducted, the concept underlying the school finance policy is currently allocating *sufficient* (as determined by the state) *equal resources to all* (Ministry of Education 2007). The idea is that such allocation is fair and will improve, or at least not worsen, the cognitive development of the next generation (Ministry of Education 2011). Yet Israel suffers from a growing poverty rate and the largest education gap among the countries in the Organisation for Economic Co-operation and Development (OECD).

This seeming contradiction raised the questions underlying this study:

1. To what extent, if at all, do the current generation's features (i.e., education, income, and household investment in education) and the governmental school finance policy affect the cognitive development of the next generation?
2. If relationships between these variables exist, are they positive or negative?
3. If they are positive, which school finance policy design could we use to address this issue, in order to break the cycle of poverty and improve the cognitive development of the next generation?

## THE CURRENT ISRAELI SCHOOL FINANCE POLICY: PERPETUATING THE CYCLE OF POVERTY

This section addresses school finance in Israel from three dimensions: (1) the per-student allocation from an international comparative perspective, (2) the policy of allocation, and (3) the dynamics between the different actors in Israeli school finance.

In general, there are four actors that are allocating financial resources to the schooling system in Israel. The most salient one is the state. Additional funds are allocated by the local authorities, individual households (parents), and the third sector (i.e., nonprofit organizations and nongovernmental organizations). The three latter actors allocate additional resources regressively according to students' background characteristics. (Larger resources are allocated to students of high SES.) The state's allocation is perceived as a mechanism to reverse this trend, but the state recently reformed its former progressive allocation mechanism toward a less progressive allocation. Before addressing these two dimensions (the policy and the actors), this section describes the per-student allocation from an international comparative perspective.

In Israel, compared to the OECD, the average investment per student is low. Although the national education expenditure as part of the GDP seems high when compared to the OECD average (8.3% and 6.2%, respectively), the Israeli per-student investment is actually rather low given the relatively high proportion of school-aged children in Israel. This gap in favor of the OECD's countries limits Israel's ability to compete in the global market.

Specifically, the average investment per student in primary schools in Israel in 2008 was $5,060, compared to $6,741 in the OECD's countries (in terms of purchasing power parity [PPP]). At the post-primary level, it was $5,741 in Israel, compared to $8,267 in average in the OECD's countries. Furthermore, in the last decade, the gap in investment per student between Israel and the

OECD has increased. Israel increased its national investment in education by 5%, while OECD countries have increased their investment by 38% on average. These relatively small allocations toward education are diminishing the ability to reduce poverty in Israel.

Although the average educational investment per student is a commonly used indicator, it is not an optimal one in the Israeli case, given the reality of unequal allocation and increasing gaps. Further examination of the school finance policy is needed in order to understand how the "cake" is divided among students and to investigate the existence and the extent of *affirmative action* for promoting disadvantaged students.

Currently, the per-student budget in primary education is actually allocated in accordance with ethnicity. Specifically, the Bedouin and Arab students (usually of low SES) are entitled to three-quarters of the Jewish students' entitlements (when controlling for SES factors) (Blass, Zussman, and Tsur 2010). Furthermore, the current school finance policy is regressive (BenDavid-Hadar and Ziderman 2011) and in need of reform (Central Bank of Israel 2008, 2010; OECD 2010; State Comptroller 2008).

The former progressive school finance policy was based on the equitable principle of "compensation related to the depth of the need." According to this principle, the lower the student's starting point, the higher his or her entitlement (in terms of greater monetary resources allocated by the government). The design of the new school finance policy is based on allocating adequate, equal resources without considering the student's starting point. Furthermore, compensatory allocation at the primary school level (which already was insufficient) was reduced dramatically to 5% of the total allocation (BenDavid-Hadar 2009).

In addition to the size of allocation and to the school finance policy reform, the government's current quasi-market policy enables other actors' regressive funding, which previously was less prominent. During the last two decades (1980–2000), the ratio of public investment to private investment in education was 80:20; in the last decade (2000–2010), this ratio changed to 75:25 (OECD 2010).

Households' investment in education is regressively allocated to schools across levels of income. Specifically, low-income parents invest about $20 a month in their children's education in comparison to the $450 invested by high-income parents (Ben-Bassat and Dahan 2009). These differences also contribute to increasing the inequality in financial resource allocation and thereby to the achievement gaps between the students from high- and low-SES families.

In addition to this trend in parental educational investment, a similarly regressive trend is exhibited by the local authorities' educational allocation. Specifically, a high-SES local authority allocates, on average, more than $1,000

per student per year, compared with the average $15 of a low-SES local authority. Unsurprisingly, the percentage of students meeting the minimum requirements for universities in high-SES localities is 69.2%, in comparison to 24.7% in low-SES localities.

More educational choices are left to the market forces than two decades ago. The question is then, what can be done by the state in order to weaken or regulate the relationship between poverty and education? Berliner (in press) argues that targeted economic and social policies have more potential to improve schools and cognitive development than educational reforms that are focused on teachers, curriculum, testing programs, and administration. Similarly, this paper argues that school finance policy reform can assist in achieving the goal of breaking through the poverty cycle.

## LITERATURE REVIEW

### *Child Poverty*

Growing up in poverty can be damaging to children's physical, emotional, and spiritual development. Poverty in childhood can cause lifelong cognitive and physical impairment, leading to a disadvantaged adulthood. This, in turn, perpetuates the cycle of poverty across generations. Investing in children is therefore critical for achieving equitable and sustainable human development (Kurukulasuriya and Engilbertsdóttir 2012).

Ortiz, Daniels, and Engilbertsdóttir (2012) claimed that helping families move out of poverty means moving beyond solely increasing incomes, toward aiming for greater social investment in general, as well as monitoring of progress and impact. Their analysis has also indicated that highly disparate rates of child poverty across countries can be explained by varied investments and policies that benefit children.

Mulford et al. (2008) have argued for school education as such a transformative instrument. Investment in education is one of the best ways a society has available to do something about improving the situation of people living in areas of growing poverty and contributing to social mobility.

### *Extending the Definition of Poverty*

Alexander and Salmon (2007) stated that, "any discussion of poverty . . . must first define poverty and indicate how it must be measured" (p. 207). Amartya Sen, a Nobel laureate in economics, defines poverty using the capabilities approach (Sen 2005). Capability, according to Sen, is the ability to achieve. Alexander and Salmon (2007, p. 208) point out that, "Presumably, Sen would

say that government should attend to the basic needs of people to acquire the capability to exist in society."

Children's education in these terms is therefore a means of broadening their ability to achieve (or their capability, to use Sen's words). Using this paper's terminology, the current investment in the education of the next generation should increase their ability to achieve; therefore, low levels of cognitive development (measured by math scores or by high school matriculation eligibility rate, as defined earlier) might be perceived (within the capabilities approach) as poverty of the next generation.

In contrast with the capabilities approach, Israel's definition of poverty, although relative rather than absolute, is based on income. In this paper, I argue that the economic definition of poverty should be broadened to account also for dimensions of education, as education is the infrastructure for breaking through the cycle of poverty.

### *Poverty and Education in the Current Generation*

There is a positive relationship between education and income. Specifically, education (measured in years of schooling) explains the variance in income and thus explains poverty in terms of relatively low income. The reasoning behind this is that the knowledge-based economy has increased the demand for highly educated workers and decreased the demand for uneducated workers. The impact of education on earnings and thus on poverty works largely through the labor market. In the labor market, higher wages for better educated people may result from higher productivity. It may also be that an individual's level of education acts as a signal of ability to employers, enabling the better educated to obtain more lucrative jobs.

From the 1950s until quite recently, economists of education believed that returns for education (the quantified benefits of investing in education) were highest at the primary school level (Psacharopoulos and Patrinos 2004). This belief provided a strong case for expanding investment in the primary rather than higher levels of education. However, new evidence seems more mixed in nature. Although some studies continue to show higher returns for primary education, there is now also much evidence that investment in education at the secondary or even tertiary level may bring even higher returns in some countries. This could indicate that returns for education vary with factors such as the level of development, the supply of educated workers, and shifts in the demand for such workers in the development process. It is well known that the demand for more educated labor rises as a country develops (Murphy and Welch 1994). This increase in demand for highly skilled workers requires educational output

to adjust accordingly, raising the relative returns for higher levels of education (Goldin and Katz 1999).

### *Education and Poverty in the Next Generation*

Poverty is strongly correlated with a range of background variables, including parental education, which also influence children's educational outcomes. Thus, it may be difficult to separate these influences and to know the extent to which the education of poor children is being limited by lack of financial resources rather than by other domestic background factors (van der Berg 2008).

### *Cognitive Development and Background Factors of Needy Students*

Cognitive development (in terms of the academic achievement of a student) is strongly correlated with a range of student background characteristics (e.g., parental education). Murnane (1981) reported on a positive relationship between the current generation's education attainment and the next generation's cognitive development in low-income households. He concluded that there is "clear evidence that the number of years of schooling completed by mothers is positively related to the achievement of their children" (p. 248). Angrist and Lavy (1996) report that the cognitive development of children of teen mothers is low compared to that of other children.

In addition, Finnie and Mueller (2008), using Canadian data, found that parental income is positively related to the attainment of higher education, but this effect is greatly diminished once parental education is included in the estimation. Reardon (2011) examined the relationship between socioeconomic family characteristics and academic achievement during the last 50 years. He found that the relationship between parental education and children's achievement has remained relatively stable during the last 50 years, whereas the relationship between income and achievement has grown sharply. Reardon then concluded that family income is now nearly as strong as parental education in predicting children's achievement. However, evidence from China demonstrates no significant effects of household educational expenditure on the test scores of children (Shi 2013).

### *Financial Resource Allocation and the Cognitive Development of Needy Students*

During the 1960s, researchers (e.g., Coleman et al. 1966) claimed that there is no statistically consistent link between the resources allocated to the educational system and students' cognitive development. However, more recent studies indicate that there is a statistically positive correlation between additional

resources and improvement in cognitive development, especially in the case of needy students (Grissmer, Flanagan, and Williamson 1998; Guryan 2001; Hedges, Laine, and Greenwald 1994; Papke 2005).

Card and Payne (2002) examined the impact of additional resources allocated to disadvantaged areas, pointing out these resources' positive contribution to reducing student achievement gaps and to the annulment of the influence of socioeconomic background variables on cognitive development. This study and other studies conducted in the United States indicate that additional resources allocated toward needy students yield higher individual and societal economic returns compared to other types of investment in students (e.g., Levin, Belfield, Muennig, and Rouse 2007; OECD 2010).

Many researchers point out the high returns for investment in early childhood. In his study on the cost of poverty in Canada, Laurie (2008) found that in disadvantaged areas, an investment of $1 in early childhood care centers yields about $9 in savings on future investment in social services. Lee and Burkham (2002) indicated that $1 of investment in early childhood programs produces an economic return of three to nine times the cost.

Poor schools often suffer from having fewer resources, either due to budget limits or to inequitable resource allocation among schools. Additional resources are important, but it is also important to ensure that they are available in the right combinations and that school and classroom organization adjusts to use these resources well (van der Berg 2008).

Additional funds for needy students, therefore, should not be perceived as expenditure but rather as an investment in national infrastructure. In line with this conclusion, the World Bank (2010) recently presented a new strategy for global educational systems, to be finalized in 2020, stating that education policy should strive to reduce poverty.

## METHODOLOGY

To measure the *extent* or the *strength* of relationships between poverty and education, I first measured the correlations between the current generation features (income, education, and household investment in education) and the next generation's cognitive development (Table 1).

Second, I estimated four regression models, taking into account two schooling levels and the type of school according to language of teaching. Model I and Model II included a school finance policy variable in addition to the current generation features, and measured their effect on the next generation's cognitive development at the lower secondary school level (for Hebrew-speaking and Arabic-speaking schools, respectively). The school finance policy variable was

*Table 1.* Pearson Correlations of Cognitive Development of the Next Generation, and the Current Generation Education, Income, and Household Investment in Education

| Cognitive Development of the Next Generation | | Correlations with Current Generation | | |
|---|---|---|---|---|
| | | Education | Income | Household Investment |
| Upper secondary[a] | H[c] | .79*** | .69*** | .73*** |
| | A[d] | .36*** | .35*** | .31*** |
| Lower secondary[b] | H | .64*** | .56*** | .52*** |
| | A | .83*** | .77** | .78** |

[a] Eligibility for matriculation diploma
[b] Math scores
[c] H = Hebrew speaking
[d] A = Arabic speaking
*p < 0.05, **p < 0.01, ***p < 0.001

measured by the per-student instruction hours between the years 2001–2009, when the school finance policy was relatively progressive compared with the current policy.

Model I and Model II (again, respectively for Hebrew-speaking and Arabic-speaking schools) included the current generation features and measured their effect on the next generation's cognitive development at the upper secondary school level (Table 2).

## *Conceptual Model*

The four models are illustrated as a conceptual model in Figure 1. The solid-line arrows in the conceptual model represent the beta coefficients of the regression analyses mentioned previously. These analyses provide direct measures of the contribution of each explanatory variable to variation in the cognitive development of the next generation. The dashed box in Figure 1 represents the school finance variable, which is included solely in the equations of Model I and of Model II.

The beta coefficients for each of the current generation's features (i.e., education, income, and household investment in the education of the next generation) and school finance policy are used to identify the extent of their contribution to the explanation of variation in the next generation's cognitive development.

## *Data*

The data sets were obtained from two main sources: the Israeli Central Bureau of Statistics (ICBS) and the Israeli Ministry of Education. The unit of analysis is the school. The sample size is 130 schools for the upper secondary school level and 60 schools for the lower secondary school level.

*Table 2.* Regression Analysis: Current Generation's Variables and Cognitive Development of the Next Generation

| | Cognitive Development of the Next Generation | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Upper Secondary School Level (Eligibility for Matriculation Diploma) | | | | | | Lower Secondary School Level (Math Scores) | | | | | |
| Current Generation | Model I Hebrew-Speaking | | | Model II Arabic-Speaking | | | Model III Hebrew-Speaking | | | Model IV Arabic-Speaking | | |
| | *b* | *β* | *t* | *b* | *β* | *t* | *b* | *β* | *t* | *B* | *β* | *t* |
| Education | 1.04 | 0.82 | 7.38** | 0.26 | 0.31 | 1.32 | 1.11 | 1.84 | 3.81** | 0.32 | 0.53 | 0.78 |
| Income | 0.01 | 0.52 | 3.62** | 14.91 | 0.79 | 1.83* | 0.01 | 0.04 | 0.09 | 0.01 | 1.11 | 1.79 |
| Household investment | 0.02 | 0.55 | 3.66** | 17.13 | 0.73 | 1.67 | 0.01 | 0.55 | 1.27 | 0.01 | 0.95 | 2.41* |
| School finance | | | | | | | 29.12 | 0.80 | 3.15* | 12.02 | 0.12 | 0.61 |
| $R^2$ | .77 | | | .15 | | | .53 | | | .63 | | |
| F | F(3,126)=141.18** | | | F(3,84)=11.9** | | | F(4,35)=9.7** | | | F(4,22)=9.3** | | |

*p < 0.05, **p < 0.01

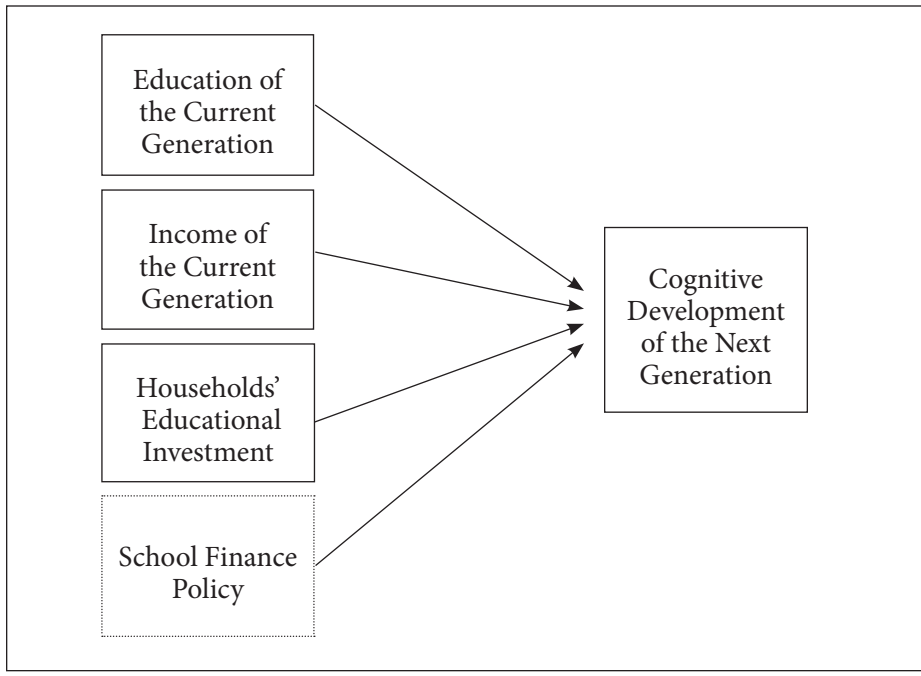


*Figure 1.* The Conceptual Model

*Note:* The dashed box is included in the models only at the lower secondary school level (for reasons of data availability).

Specifically, the data encompass three components and a total of eight variables. The first component relates to the current (parental) generation, and comprises three variables: (1) the average parental attainments (measured by years of schooling), (2) households' monthly net income, and (3) households' monthly investment in education. The second component is the school finance policy, comprised of one variable that is determined by the actual per-student allocation of resources in terms of instruction hours at the primary school level. The third component is the next generation's (children) cognitive development. It is comprised of four variables: (1) high school matriculation certificate eligibility rate of the Hebrew-speaking students, (2) high school matriculation certificate eligibility rate of the Arabic-speaking students, (3) eighth-grade average math scores in national examinations of the Hebrew-speaking students, and (4) eighth-grade average math scores in national examinations of the Arabic-speaking students. Note that the data do not include these children's future income.

### *Variables*

The description of the variables is presented in next two subsections (and presented in Table 3).

***Dependent Variables.*** The dependent variables relate to the cognitive development of the next generation. Two main types of cognitive development

*Table 3.* List of Variables

| **Dependent Variables Cognitive Development** | **Independent Variables** |
|---|---|
| **Lower secondary school level (math scores):** The average score of the external eighth-grade mathematics exam for each family income decile, between the years 2004 and 2010<br>**Upper secondary school level (eligibility for matriculation diploma):** The average matriculation certificate eligibility rate at each decile of parental income between the years 1998 and 2010 | **Education:** The percentage of persons obtaining more than compulsory 16 years of schooling at each decile of income between the years 1998 and 2010<br>**Income:** The natural logarithm of the average net monthly income at each decile of income (in NIS, adjusted using the 1998 price index as baseline)<br>**Household investment in education:** The natural logarithm of the average monthly investment in education at each income decile (in NIS, adjusted using the 1998 price index as baseline)<br>**School finance:** Per student monetary allocation (in terms of instruction hours) at the primary school level |

data are used, one relating to cognitive development at the lower secondary school level and one at the upper secondary school level. Cognitive development is represented by the average score of the external eighth-grade mathematics exam between the years 2004 and 2010, and by the matriculation certificate eligibility rate between the years 1998 and 2010, both of which are presented per each decile of parental income. The reason for the differences in the years analyzed is the availability of the data, as matriculation certificate eligibility rates are only available for the years from 1998 onwards, and the external eighth-grade examination was only initiated in Israel in 2004.

***Independent Variables.*** Four independent variables are used, of which three are features of the current generation (education, income, and household investment in education) and one is a school finance policy variable. Education of the current generation is measured by the percentage of the highly educated (i.e., those obtaining 16 or more years of schooling) at each decile of income between the years 1998 and 2010. Income is measured by the natural logarithm of the average net monthly income in New Israeli Shekels (NIS). The data on average income are adjusted using the price index of 1998 as a baseline. Household investment in education is measured by the natural logarithm of the average monthly investment in education in NIS at each income decile (using the same adjustment to the 1998 constant price). School finance policy data are available only at the primary school level and are determined by the actual instruction hours allocated to each student according to the level of his or her background characteristics. Due to data unavailability for other schooling levels, the school finance variable is included solely in the models pertaining to the lower secondary school level (indicated by the dashed box in Figure 1).

### *Descriptive Statistics*

The descriptive statistics for these variables are summarized in Table 4, followed by the descriptive statistics of the gaps along the investigated years that are presented in Table 5 and Table 6.

The average percentage of highly educated people is 53.6%. At the lowest decile of income, this percentage is 33.8%; at the upper decile of income, it is more than twice as large, amounting to 79.4%. The adjusted average income is 11,784 NIS, with the average income of the highest decile amounting to more than five times as much as that of the lowest (23,050 NIS and 4,290 NIS, respectively). The current generation's household investment in the education of the next generation is an average of 1,711.70 per month (adjusted). At the lowest decile of income, this average is low, whereas at the upper decile it is high (802 NIS and 2,848 NIS, respectively).

*Table 4.* Descriptive Statistics of the Variables

| Variables | | Lowest Decile | Highest Decile | Mean | Median | S.D. |
|---|---|---|---|---|---|---|
| **Current Generation (1998–2010)** | | | | | | |
| Education (%) | | 33.8 | 79.4 | 53.6 | 50.7 | 16.4 |
| Income | | 4,290.30 | 23,050.10 | 11,784.10 | 9,835.70 | 7,653.70 |
| Ln income | | 8.7 | 10.0 | 9.2 | 9.2 | 0.6 |
| Household investment in education | | 802.00 | 2,848.50 | 1,711.70 | 1,584.60 | 777.10 |
| Ln household investment in education | | 6.70 | 8.00 | 7.30 | 7.40 | 0.50 |
| School finance (2004–2009) | Hebrew | 2.25 | 1.56 | 1.93 | 1.94 | 0.25 |
| | Arabic | 1.69 | 1.46 | 1.57 | 1.53 | 0.10 |
| **Next Generation's Cognitive Development** | | | | | | |
| Lower secondary (math scores), 2004–2010 | Hebrew | 40.6 | 66.5 | 53.6 | 53.3 | 9.3 |
| | Arabic | 35.3 | 58.8 | 46.0 | 44.8 | 8.7 |
| Upper secondary (eligibility for matriculation diploma), 1998–2010 | Hebrew | 11.1 | 72.5 | 49.9 | 55.7 | 20.4 |
| | Arabic | 38.2 | 58.5 | 47.9 | 49.1 | 9.5 |

*Table 5.* Descriptive Statistics of the Gaps

| Year | | Income[a] | Education[b] | Household investment[c] | Cognitive Development[d] |
|---|---|---|---|---|---|
| 1998 | Highest decile | 17,546.00 | 79.6 | 2,148.00 | 66.2 |
| | Lowest decile | 2,349.00 | 41.8 | 571.00 | 29.2 |
| 2010 | Highest decile | 41,368.82 | 84.6 | 3,855.14 | 77.6 |
| | Lowest decile | 4,827.15 | 30.4 | 1,167.99 | 9.4 |
| 1998 | Gap | 7.47 | 1.9 | 3.76 | 2.27 |
| 2010 | Gap | 8.57 | 2.78 | 3.3 | 8.25 |

[a] Average net income (in NIS, adjusted using the 1998 price index as a baseline)
[b] Percentage of highly educated persons
[c] Investment in education
[d] High school matriculation certificate eligibility rate

*Table 6.* Gini Coefficients

| Year | Income[a] | Education[b] | Household investment[c] | Eligibility for Matriculation Diploma (Hebrew-Speaking) | Eligibility for Matriculation Diploma (Arabic-Speaking)[d] |
|---|---|---|---|---|---|
| 1998 | .352 | .159 | .224 | .167 | .173 |
| 2009 | .389 | .166 | .235 | .257 | .060 |

[a] Average net income (in NIS, adjusted using the 1998 price index as a baseline)
[b] Percentage of highly educated persons
[c] Investment in education
[d] High school matriculation certificate eligibility rate

The average cognitive development of the next generation is relatively low (i.e., under the passing grade of 60 points out of 100) and displays educational gaps in favor of students attending Hebrew-speaking schools over those attending Arabic-speaking schools. At the lower secondary school level, it is measured by the average score of the external mathematics exam administered in the eighth grade (average math scores of 53.3 and 44.8 for students attending Hebrew-speaking and Arabic-speaking schools, respectively). Additionally, the average gaps between the highest and lowest deciles are smaller for students in Arabic-speaking schools than they are for students in Hebrew-speaking schools (gaps of 23.5 and 25.9 points, respectively), which may be explained by the former students' lower overall achievement

At the upper secondary school level, the average high school matriculation certificate eligibility rate, used as a measure of cognitive development, is low (less than 50%). The high school matriculation certificate eligibility rate at this schooling level is also characterized by a large gap between the lowest and the highest income deciles (11.1% and 72.5%, respectively) and between students in Hebrew- and Arabic-speaking schools (49.9% and 47.9%, respectively).

A longitudinal analysis of the data indicates a trend of widening gaps along the years studied. These gaps are evident for each of the variables defined. For example, along the years 1998–2010, the gap between the lower decile's and the higher decile's average incomes has increased from 7.47 to 8.57 (Table 5). Similarly, the Gini coefficient of the net income has increased from .352 in 1998 to .389 in 2010 (Table 6), which indicates an incremental trend in the net income inequality (after redistribution acts such as taxation and transfer payments).

Careful examination of the data reveals that this incremental trend of inequality also translates to household spending on education. The relative gap between the highest decile's average household investment in education and the lowest decile's has decreased from almost 4 to 3 (Table 5). The upper decile has almost doubled its investment in education between 1998 and 2012 (going from 2,148 NIS to 3,855.14 NIS) and the lower decile more than doubled its own (from 571 NIS in 1998 to 1,167.99 NIS in 2010). However, the inequality between highest and lowest deciles in terms of households investment in education measured by the Gini coefficient has increased from .224 in 1998 to .235 in 2010 (Table 6).

Additionally, the gap between the percentage of highly educated persons within the highest decile and within the lowest decile was 1.9 in 1998, and increased to 2.78 in 2010 (Table 5). Furthermore, the education gap between the highest and the lowest deciles in the next generation, in terms of the matriculation certificate eligibility rate, has increased from 2.27 in 1998 to 8.25 in 2010.

A more dramatic trend characterizes the inequality of cognitive development at the next generation, at least for Hebrew-speaking schools, for which the Gini coefficient has increased from .167 in 1998 to .257 in 2010. At the Arabic-speaking schools, however, the Gini coefficient is on the decline (Table 6).

## RESULTS

This section presents the results of the analysis on the extent of the links between poverty and education and emphasizes their intergenerational nature.

### *Current Generation Features and the Next Generation's Cognitive Development*

There are high, positive, and statistically significant correlations between the current generation's variables (i.e., education, income, and household investment in education) and the cognitive development of the next generation. At the Hebrew-speaking schools, these correlations are higher at the upper secondary level compared to the lower secondary level (Table 1). At the Arabic-speaking schools, there is an opposite trend, in which the positive correlations are higher at the lower secondary level compared to the upper secondary level.

The extent of the relationships between current generation features and the next generation's cognitive development are further analyzed using a regression analysis that estimates the links presented in the theoretical model outlined in Figure 1.

Table 2 presents the results of the statistical model. As mentioned before, four models were formulated, one for each schooling level (lower secondary and upper secondary), and one for each teaching language (Hebrew-speaking and Arabic-speaking schools).

Model I, estimated for upper secondary Hebrew-speaking schools, includes only the current generation features as independent variables, due to unavailability of equivalent per-school data regarding school finance policy. The definition of cognitive development as the dependent variable for this schooling level focused on matriculation certificate eligibility rates. The results of Model I indicate that the current generation's education, income, and household investment in education are positively correlated with and statistically significant in explaining the variation in the next generation's high school matriculation certificate eligibility rate ($\beta = .82^{**}$, $\beta = .52^{**}$, and $\beta = .55^{**}$, respectively). That is, Hebrew-speaking students from households of high income and/or students whose parents are highly educated and/or invest considerably in their children's education are more likely to be eligible for high school matriculation diploma.

Model II used the same variables as Model I, focusing instead on Arabic-speaking upper secondary schools. The results of Model II indicate that, out of the three current generation features included in the model, only the income of the current generation was found to be a significant predictor (β= .79**) of the next generation's high school matriculation certificate eligibility rate. That is, Arabic-speaking students from high income households are more likely to be eligible for high school matriculation diploma.

One explanation for the result that only income was found statistically significant at the Arabic-speaking schools might be the low extent of households' investment in education and the low variance in parental education levels at these schools, compared with the Hebrew-speaking schools.

The variance explained by Model I and Model II is high for Hebrew-speaking schools and low for Arabic-speaking ones (R square = .77 and .15, respectively).

### *Current Generation Features, School Finance Policy, and the Next Generation's Cognitive Development*

The extent of the relationship between education and cognitive development is further analyzed, including a school finance policy variable in the regression analysis.

Model III, estimated for the lower secondary Hebrew-speaking schools, includes current generation features (education, income, and household investments) and school finance policy as explaining the variation in the next generation's math scores. The results for Model III reveal that the education level of the current generation (β=1.84**) and the school finance policy (β=.80**) are both statistically significant in predicting the next generation's cognitive development (in terms of math scores) within this population. That is, the higher the current generation's education level, the higher the scores of their children at the lower secondary level. In addition, allocating larger resources at the lower secondary level has a positive effect on student performance.

Model IV, focused on lower secondary Arabic-speaking schools, includes the same variables, but yielded different results: only the household investment in education was found to be statistically significant (β=.95**) in explaining the variation in the next generation's math scores.

One explanation for this result (that school finance policy was not found statistically significant in explaining the variation in Arabic-speaking students' performance at the lower secondary school level) is the small variation of the school finance variable in these schools. Almost all the Arabic-speaking schools are entitled to larger resources, due to the low background characteristics (e.g., low level of parental education) of the majority of their students.

Altogether, the Model III and Model IV variables explain most of the variance in the math scores (R square = .53 and .63, respectively).

## DISCUSSION AND CONCLUSIONS

This paper focuses on the intergenerational links between current generation features and the next generation's cognitive development. Specifically, it adds to the literature on the intergenerational links between poverty and education, and demonstrates that school finance policy can have a strong and positive effect on the cognitive development (measured in academic achievement) of the next generation.

A comparison between the findings regarding Models I and III is problematic, given that they were estimated for different age groups and using different definitions of the dependent variable. Nevertheless, a tentative conclusion based on such a comparison may be that including the variable school finance policy in the equation that explains cognitive development (as in Model III) diminishes the explanatory effect of parental features (parental income and the household's monetary investment in education). The only parental feature that remains positively correlated and statistically significant with cognitive development (in terms of academic achievement) in this model is the parental level of education. Conversely, when the school finance variable is not included in the equation (as in Model I, due to the unavailability of the data), the current generation features are positively correlated with and statistically significant in explaining the next generation's cognitive development. The positive high coefficients between current generation features (i.e., education and income) and the cognitive development of the next generation align with other empirical results in the literature (e.g., Angrist and Lavy 1996; Finnie and Mueller 2008; Murnane 1981; Reardon 2011).

Additionally, the findings of this research reveal that households' investment in education also has a positive effect on the next generation's cognitive development (both at the Arabic-speaking lower secondary schools and at the Hebrew-speaking upper secondary schools).

The results of the models pertaining to Arabic-speaking schools (Models II and IV) and those pertaining to Hebrew-speaking schools (Models I and III) reveal different trends within these populations. For example, in lower-secondary Arabic-speaking schools, school finance policy was not found to be a significant predictor of cognitive development, unlike in Hebrew-speaking schools. Furthermore, only one current generation feature (parental income) is significant in explaining the variance in the next generation's cognitive development, in contrast with the significance of all three in the equivalent model for Hebrew-speaking schools.

For the parental education variable, a potential explanation for this difference could be the low average level of parental education at the Arabic-speaking schools (10 years, compared to 14 for Hebrew-speaking schools). Likewise, the household expenditure on education in the case of parents of students in Arabic-speaking schools is relatively low ($27, compared to $70 in Hebrew-speaking schools, in average). These relatively low levels might not be high enough to create a significant effect. Further study is required to support or negate this potential explanation, and to present a clearer picture of the differences between Hebrew-speaking schools and Arabic-speaking schools as regards the link between poverty and education.

Nevertheless, this paper's findings demonstrate a significant impact of at least some of the current generation's features on the next generation's cognitive development. These findings have implications for the next generation's future socioeconomic status, as evidenced by a wide body of literature on the link between the cognitive development and future income (or poverty) *within* a generation.

McMahon (2002a), for example, explored the link between education and poverty within the same generation across time, and found it to be positive and statistically significant. His findings reveal that increases in both primary and secondary enrollments after 20-year lag are both associated with the reduction of rural and urban poverty. He further analyzed the links between education and income inequality and found that "the expansion of secondary education after a 20-year lag makes a significant net additional contribution to the reduction of inequality" (p. 121).

Furthermore, income inequality was found to be explained (to a certain extent) by educational inequality. Psacharopoulos (1977) conducted an international study of 49 countries to measure the link between access to education and inequality in income. In his findings, income inequality (measured by Gini coefficient) is explained by educational inequality (measured by the coefficient of variation of enrolments by school level). He concludes, "The implication of this finding is that a policy of more equal access to education (i.e., by flattening the educational pyramid) might have the desired impact of making income distribution more equal" (p. 388).

It would seem then that poverty in the current generation may lead to low cognitive development in the next generation, which in turn lowers the chances of the next generation to escape the poverty trap in the future. Poverty thus perpetuates itself, and increases at an alarming rate. Within the last decade, child poverty in the Western world has increased to the extent that currently every fourth child is poor. In the European Union (EU), 25 million children are at risk of poverty (Committee on Social Affairs, Health and Sustainable

Development 2014). The report "Report Card 10" (UNICEF Innocenti Research Centre 2012) shows roughly 30 million children across 35 countries with developed economies are living in poverty. The United States was ranked second highest among all measured countries, with 23.1% of children living in poverty (UNICEF Innocenti Research Centre 2012). Israel's child poverty shows a similar (yet more dramatic) trend, with some 34% of its children living in poverty, and a children poverty rate that has increased by 50% since the beginning of the decade (National Insurance Institute of Israel 2008).

"Poverty is a stubborn enemy . . . Is education the key to solving the problem of poverty, or is education part of the problem?" (Jones 2006, p. 3). Although inequality in access to education and in cognitive development contributes to future economic inequality and the persistence of poverty, McMahon (2002a) found that education has the potential to break through the poverty cycle.

Indirectly affecting the next generation's cognitive development by reducing the current generation's level of poverty (e.g., through redistribution mechanisms) is one strategy of reducing inequalities. Accordingly, revealing relationships between poverty and education similar to those shown for Model I in this study but based on U.S. data (Berliner 2006) demonstrated that small reductions in family poverty lead to increases in positive school behavior and better academic performance of the next generation.

Inequalities may also be reduced in a more direct way, by enacting targeted policies, as concluded by McMahon (2002a) and also suggested by Stiglitz (2012), based on his analysis of the current state of affairs in the United States. The findings of this paper support this strategy by demonstrating potential of the state's investment in education to improve the cognitive development of its future generation (and, by doing that, to reduce poverty after a time lag). Specifically, the findings for Model III in this paper show that school finance policy can diminish the effect of the current generation factors of income and household investment in education on the next generation's cognitive development, thereby breaking some of the intergenerational links between education and poverty and giving poor children a better chance of breaking through the cycle of poverty.

In light of all of this, it may be beneficial to design a poverty-targeted school finance policy to affect the next generation's education, giving them a better chance of breaking through the cycle of poverty.

### *Policy Implications: What Can the State Do?*

The importance and potential benefits of designing a poverty-targeted school finance policy were demonstrated in the previous section. However, what form should such policy take?

One type of school finance policies currently enacted targets poverty by allocating larger resources to students from a poor background. In some states in the United States, as described by Verstegen and Jordan (2009), "additional poverty-based funding is determined by the percentage of students in the district that are eligible to receive funding for federal-free and reduced-price lunch" (p. 216). Similarly, McMahon (2002b) analyzed education funding methods in Indonesia and developed a method of allocation of governmental resources to the schooling system that includes a poverty-reduction component.

Another type of school finance policy is based on the concept that the state has a responsibility and an interest in providing a minimum level of education, or a "foundation" (Owings and Kaplan 2013, p. 208). School finance policies in most states in the United States use some type of foundation plan (e.g., Strayer-Haig formula) that determines the minimal amount of state investment per student. Verstegen and Jordan (2009), in a comprehensive 50-state survey of state-level finance policies and programs, revealed that foundation formulas in the past supported a minimum, basic education; however, they concluded that this may be changing in favor of adequacy-based allocation, at least in some of the states. Moreover, several such formulas encompass poverty reduction components (Gordon 2004).

In Israel, a component aimed at reducing poverty is currently missing from the school resource allocation mechanisms and funding formulas. The Israeli school finance structure compared with that of the United States is more centralized, as most of the resources allocated to schools are governmental. Israel's school finance structure resembles that of Hawaii, yet only to a certain extent. The concept underlying Israeli school finance is that the state is the major responsible entity in the provision and funding of education; however, in contrast with the Hawaiian structure, in Israel additional resources from localities and other actors are permitted.

It is argued that, similar to other states, a poverty-reducing component should be included in the Israeli school finance policy. However, more work is needed to adjust this component to fit the complex trend of increasing child poverty in Israel. For example, the poverty-reducing component might be designed in a manner that accounts for students' (1) *poverty depth* (i.e., the distance between the definition of poverty and the child's actual poverty); (2) *poverty duration* (i.e., the time interval of living in poverty); (3) *relative achievement gap* (the academic achievement of the student relative to that of the median student); and (4) *student background characteristics* (especially their parental education). These variables are potentially significant and yet remain for the most part unaddressed in funding formulas. More work in needed to explore the impact of

these variables on cognitive development and to design a component that would effectively reduce child poverty.

The inclusion of a poverty-reducing component in a school finance policy has additional effects on society. A school finance policy that favors students in poverty affects redistribution and might challenge the elite group in society. However, it would better comply with the notion of equal opportunity, because it has the potential to reduce the correlations between SES and cognitive development.

In addition, fruitful implementation of poverty-targeted policies would require inter-ministerial coordination and collaboration, with the view that education, economics, and society operate together as the infrastructure for the advancement of national strength and national security.

Furthermore, poverty-targeted school finance policies might be of interest to other countries that are struggling to reduce child poverty by breaking the intergenerational links between poverty and education, and at the same time are struggling to sustain their competitive ability in the global economy. Enacting a policy that reduces child poverty via a redistribution mechanism might damage the state's competitiveness, as increased funding will be diverted to the families of poor students at the expense of striving for overall high achievement. In contrast, reducing child poverty via a targeted school finance policy is likely to increase the state's future competitiveness, for two main reasons. First, it will ensure that the additional funding provided to compensate poor students will be directed to their education, thereby developing the state's human capital. Second, such a policy is likely increase the social cohesiveness of the state by reducing socioeconomic gaps, promoting the social conditions required for increasing state competitiveness (Stiglitz 2012).

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