Equal opportunity in education: Lessons from the *kibbutz*[*]

Moshe Justman

Ben Gurion University
justman@bgu.ac.il

Yaakov Gilboa

Sapir Academic College
yaakovg@bgu.ac.il

Abstract

We use the unique circumstances of education in Israeli *kibbutzim*—communal villages—to derive two related findings. First, by regressing kibbutz members' test scores on parental education we obtain an egalitarian standard of equal opportunity in education, measured as origin-independence, to which the degree of equal opportunity in other education systems can be compared. Second, by comparing this effect to its counterpart for the general Israeli population we can quantitatively decompose the parental effect on test scores (in the general population) so as to distinguish between what money can and cannot buy.

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1. Introduction

In this paper we use the unique circumstances of education in Israeli *kibbutzim*—rural communal villages[1]—to derive two related findings that bear on the implementation of equal opportunity in education. First, we derive an egalitarian standard of equal opportunity in education to which other systems can be compared. Then, by comparing this effect to its counterpart for the general Israeli population, we are able to decompose the parental effect on test scores in the general population into two parts: its effect through what money can and cannot buy.

Previous studies of equal opportunity in education have demonstrated the conceptual difficulties inherent in deriving *a priori* standards of equal opportunity by deduction from first principles (Jencks, 1988; Roemer, 1998). We circumvent this problem by taking the level of "origin-independence" achieved in the kibbutz as an *attainable egalitarian standard of equal opportunity*: the extent in which the test scores of young kibbutz members are statistically independent of their parents' social background, proxied by their education.[2] The level of origin-independence achieved in other education systems can then be compared to the kibbutz standard to obtain a quantitative measure of where they stand in relation to this specific egalitarian ideal.[3]

This measure of origin-independence in the kibbutz then enables us to decompose the effect of parents' education on test results in the general population. Schooling in the kibbutz is communal, and while kibbutz families have varied social

[1] A brief overview of education in kibbutzim is provided in an appendix.

[2] The test is a national psychometric test comprising three parts: (Hebrew) verbal ability, quantitative analysis and English comprehension. It is taken between high school and university, often after military service, and is generally required for university admissions. Our empirical results follow Gilboa (2004).

[3] The vast majority of systems are less egalitarian than the kibbutz, and for them the kibbutz standard is a lower bound for the desired degree of origin-dependence.

backgrounds, they have similar access to material resources. All children in the kibbutz thus have similar access to material education inputs in every relevant respect, including nutrition, health care, housing, books, computers, remedial lessons, and so on. Consequently, any correlation between their learning achievements and their parents' education must be attributed to factors "money can't buy" that are correlated with parents' education (Mayer, 1997), such as inherited learning skills, the example their parents set, the time their parents spend encouraging them to learn, their parents' effectiveness in helping them learn, and so on. Subtracting the measure of origin dependence in the kibbutz from the (larger) corresponding measure for the general population allows us to distinguish between the parental inputs that money can't buy and other factors, which money can buy, that are associated with parents' education through the higher income that more educated parents earn. Our empirical findings indicate that, at least in Israel, non-monetary factors play a much larger role in the intergenerational transmission of human capital than purchasable inputs.

This decomposition is distinct from the approach taken in previous studies that sought to separate the influence of genetic factors on educational outcomes from the effect of the home environment by analyzing differences between identical twins separated at birth or by comparing adopted and biological siblings.[4] The decomposition presented here groups these effects differently, *placing genetics and the home environment on one side and private material investment in education on the other side*. We maintain that this is the more relevant decomposition for designing policies aimed at promoting equal opportunity in education. Advantages that (private) money can buy are more likely to be popularly perceived as appropriate policy targets

[4] See, e.g., Ashenfelter and Rouse (1998), Behrman, Rosenzweig and Taubman (1994), and Behrman and Taubman (1989), on twins, and Scarr and Yee (1980) on adopted siblings, among many other studies.

for redress through public spending than non-material advantages of the home environment. And they offer realistic policy target: it stands to reason that what money can do, it can undo.

The rest of the paper is organized as follows: section 2 provides a brief conceptual discussion of equal opportunity in education; section 3 develops a simple formal model; sections 4 and 5 presents the data and our empirical findings; and section 6 concludes.

2. Equal opportunity in education

There is generally strong support for the principle of equal opportunity in education but changing and conflicting views on the standards that should guide such policies in practice. Education finance reforms that followed *Serrano v. Priest* aimed at eliminating large disparities in the *distribution* of *resources*. More recent initiatives, notably No Child Left Behind, focus primarily on ensuring *adequacy* of *outcomes* for all. Yet a third approach, which informed *Williams v. State of California*, sought to hold the State to a standard of *adequacy* of *resources*, and was resolved in the plaintiffs favor out of court, essentially in the political arena. These changing approaches to defining equal opportunity in education reflect shifting legal interpretation of States' obligations in this respect, which are themselves reflections of changes in public opinion.

The approach we adopt here follows Roemer (1998) in focusing on the *distribution* of *outcomes* as a measure of equal opportunity in education, measuring it as "origin-independence"[5]—the degree in which students' educational outcomes are statistically independent of their parents' education. The use of origin-independence

[5] See Shorrocks (1978) for an early formalization.

to gauge social mobility is well-established in economics and sociology. In its most common application in the economics literature, intergenerational relative income mobility is measured by regressing the logarithm of individual income on the logarithm of parental income and taking the estimated coefficient of parental income as a measure of mobility (Solon, 2002, among many others): a smaller coefficient of parental income indicates greater equality of economic opportunity.[6] In this paper we regress the individual test scores of young adults on their parents' education, which serves us as a proxy for their socio-economic status (cf. Betts and Roemer, 2005; Checchi et al., 1999). The coefficient of parental education is then our measure of equal educational opportunity, a smaller coefficient indicating greater opportunity.[7]

This raises the question, what is a reasonable standard to which specific measured levels of origin independence might be compared? The highest conceivable level of equal opportunity in this regard is full origin-independence. However, this is not a realistic standard. Applying it to education would imply a differential investment of resources that compensated children from disadvantaged socio-economic circumstances to an extent that rendered educational achievement statistically independent of the socio-economic status of the home—though not of the effort children invest in their studies (Roemer, 1998). This raises difficulties of three kinds. First, it is conceptually difficult to separate circumstances from effort, as

[6] Of course, other summary statistics can be used to characterize the extent in which income is independent of parental income, e.g., one minus the trace of the transition matrix.

[7] Another proxy for socio-economic circumstances recently used to compare equal opportunity across countries is the number of books in the house, which was found to correlate significantly with PISA test scores (Schütz et al., 2006).

circumstances often shape effort, a point vividly illustrated by Jencks (1988).[8] Second, as Betts and Roemer's (2005) calculations indicate, full origin-independence of circumstances, if it is at all possible to achieve, is likely to be extremely costly to implement—apparently much beyond what society is willing to pay.[9] Third, as Calsamiglia (2004) points out, full compensation in education may undermine global equality of opportunity, if similar compensating investment are not made in other areas to offset other inherited differences (better health, a more attractive appearance, athletic, artistic or musical skill, and so on).

The standard we propose instead is the degree of origin-independence achieved in the kibbutz. It has the advantage of being evidently possible to implement while representing a standard of origin-independence that reflects a strong revealed commitment to an egalitarian ethos. It is the level of equal opportunity achieved by removing differences in the circumstances of the child that derive from differences in parents' *material* capacity to help, but not other factors that cause the children of well-educated parents to do statistically better at school than other children. This corresponds to an education policy aimed at compensating socially disadvantaged children for material deprivation: compensating them for what money can buy, but not for what it cannot buy. This seems both a reasonable and practical distinction:

[8]Indeed, Jencks (1988) is led to conclude that it may not be possible to formulate explicitly a consistent, implementable, *intermediate* definition of equal opportunity in education, derived from first principles and requiring less than full origin-independence.

[9] Betts and Roemer's (2005) quantitative analysis indicates that in the United States eliminating the statistical link between parents' socio-economic status—as indicated by race and education—and the economic outcomes of their children would require at least a nine-fold disparity between the educational resources invested in children whose parents are at opposite ends of the socio-economic distribution. As they note, "Implementing such reforms, which allocate more money to disadvantaged types than to advantaged ones, is a remote possibility in a society that has not yet fully implemented the more moderate 'equal resource' policy" (p. 24). In related work, Roemer et al. (2003) measures the extent in which fiscal regimes of different countries equalize economic opportunity.

spending more on the schooling of disadvantaged children to compensate for their material deprivation is easier to justify and more likely to succeed than compensating them for advantages that money cannot buy. Comparing the kibbutz standard to the degree of origin-independence in the general population allows us to quantify the relative importance of these two types of advantages of having more educated parents.

3. Investment in education in general and in the kibbutz

We present a simple model of parent's investment in their children's human capital—first in the general population, then in kibbutzim—which we will use to interpret the empirical results in the next section. The modeling approach generally follows Becker and Tomes (1986) as extended in Gilboa (2004). We assume in the model, for simplicity, that each family has one child and one parent.

3.1 The general population

Each parent has an endowment of e_i units of human capital and one unit of time. Parents' earnings are $A\,(1-t)\,\omega\, e_i$, where ω is the proportion of time spent working, t is a proportional tax rate that finances public spending on education, p, and A is a constant of proportionality. We assume that ω, t and p are externally determined, and that the choice of units that measure e_i is such that $A(1-t)\omega = 1$. After-tax income is allocated among consumption, c_i, and private education spending s_i ; and time spent not working is divided between personal leisure, k_i, and time spent helping one's child learn, q_i. The human capital of the child, h_j, is an increasing function of traits, a_i, that are costlessly passed on from parent to child; of the time parents spend helping their children learn, q_i ; of private education spending, s_i ; and of public education spending

per child, p:[10]

$$h_i = a_i^{\alpha} q_i^{\beta} (s_i + p)^{\gamma} \qquad (1)$$

We assume a positive correlation between a parent's human capital and her child's inherited ability (cf. Rosen, 1977, among many others):

$$\ln a_i = b_a \ln e_i + u_{ai}$$

where $b_a > 0$ and u_{ai} is an i.i.d disturbance term with zero mean and variance σ_a^2

Parents derive utility from consumption, from personal leisure, and from their children's human capital. To fix ideas, we posit a logarithmic functional form which allows for differences among parents in the value they place on leisure, or equivalently the disutility of helping their children study. It is captured by the positive household parameter ϕ_i :

$$U_i = \ln (c_i) + \phi_i \ln(k_i) + \eta \ln(h_i) \qquad (2)$$

where h_i is given by (1), and $\eta > 0$ is a common parameter. We assume a negative correlation between the direct disutility a parent experiences from helping her child study and her own human capital (that is a negative correlation between the value she places on personal leisure and her own human capital):

$$\ln\phi_i = b_\phi \ln e_i + u_{\eta i}$$

where $b_\phi < 0$ and $u_{\phi i}$ is an i.i.d disturbance term with zero mean and variance σ_ϕ^2

Households maximize U_i subject to equation (1) and the budget and time constraints:

$$c_i + s_i = e_i$$

$$\omega + k_i + q_i = 1$$

Solving for optimal values of s_i and q_i we obtain

$$q_i = (1 - \omega) \beta \eta / (\beta \eta + \phi_i) \qquad (3)$$

[10] We assume for simplicity that private and public education spending are perfect substitutes.

and

$$s_i = \max\{(\gamma \eta e_i - p) / (1 + \gamma \eta), 0) \quad (4)$$

If the (non-kibbutz) parent's human capital is high enough, specifically if $e_i > p/\gamma\eta$, then she tops up public education spending from her private resources, and the human capital of her child equals

$$\ln h_{ci} = \beta\ln(1-\omega) + \alpha \ln a_i + \beta \ln[\beta\eta /(\beta\eta + \phi_i)] + \gamma \ln[\gamma\eta /(\gamma \eta+1)] + \gamma \ln(e_i + p) \quad (5)$$

Otherwise, if $e_i < p/\gamma\eta$ then $s_i = 0$ and

$$\ln h_{ci} = \ln(1-\omega) + \alpha \ln a_i + \beta \ln[\beta\eta /(\beta\eta +\phi_i)] + \gamma \ln p$$

3.2 Kibbutz families

Kibbutz parents have the same preferences as the general population. The difference in the kibbutz is that additional investment in education, *s*, is determined communally so that consumption is equal among all members. Denoting the average human capital of a kibbutz parent by ε, the utility of a kibbutz member is:

$$U_i = \ln (c) + \phi_i \ln(k_i) + \eta \ln(h_i)$$

Where $c = \varepsilon - s$, $\omega + k_i + q_i = 1$, and $h_i = a_i^{\alpha} q_i^{\beta} (s + p)^{\gamma}$

We assume that kibbutz members first vote on the fraction of disposable income to be spent on augmenting public spending on education and then each kibbutz member decides individually how to allocate her free time between personal leisure and time spent helping her child study.

Solving the model recursively, we take the derivative of U_i with respect to *s* after substitution, and obtain the preferred value of *s* for household *i*:

$$s_i^* = \max \{(\gamma \eta \varepsilon - p) / (1 + \gamma \eta) , 0\} \quad (6)$$

which is uniform for all kibbutz households. Hence there exists a unanimous political equilibrium, and as, in fact, all kibbutzim add substantially to public (i.e., national)

spending on education we assume that this chosen value of s is positive. Denoting the chosen value of s by s^* we have:

$$s^* = (\gamma \eta \varepsilon - p) / (1 + \gamma \eta) \quad (7)$$

Each kibbutz member then individually decides how to allocate her time between leisure and investment in her child's education. In our simple formulation this is no different than in the general population and we obtain

$$q_i = (1 - \omega) \beta \eta / (\beta \eta + \phi_i) \quad (8)$$

Substituting these results in (1) we obtain the human capital of a kibbutz child:

$$\ln h_{ki} = \beta \ln(1-\omega) + \alpha \ln a_i + \beta \ln[\beta\eta / (\beta\eta + \phi_i)] + \gamma \ln[\gamma\eta / (\gamma\eta + 1)] + \gamma \ln(\varepsilon + p) \quad (9)$$

3.3 Test scores

Test scores, our measure of education achievement, are taken to equal the logarithm of human capital plus an i.i.d. random disturbance term u_{Ti}

$$T_i = \ln h_i + u_{Ti}$$

where u_{Ti} has zero mean and variance σ_T^2 (We assume it follows the same distribution for all children). Then from (5), a non-kibbutz child with ability a_i, parental preference η_i and parental income e_i such that the parent invests supplementary private resources in the child's education, has a test score of:

$$\ln T_{ci} = \beta \ln(1-\omega) + \alpha \ln a_i + \beta \ln[\beta\eta / (\beta\eta + \phi_i)] + \gamma \ln[\gamma\eta / (\gamma\eta + 1)] + \gamma \ln(e_i + p) + u_{Ti}$$

$$= K_c + \alpha \ln a_i + \beta \ln[\beta\eta / (\beta\eta + \phi_i)] + \gamma \ln(e_i + p) + u_{Ti}$$

where K_c is a constant term. And from (9), a kibbutz child with the same ability and parental preference has a test score of

$$\ln T_{ki} = \beta \ln(1-\omega) + \alpha \ln a_i + \beta \ln[\beta\eta / (\beta\eta + \phi_i)] + \gamma \ln[\gamma\eta / (\gamma\eta + 1)] + \gamma \ln(\varepsilon + p) + u_{Ti}$$

$$= K_k + \alpha \ln a_i + \beta \ln[\beta\eta / (\beta\eta + \phi_i)] + u_{Ti}$$

where K_k is a constant.

3.4 Statistical relation of test scores to parents' education

As none of the individual explanatory variables in the model are directly observable we regress test scores on parents' education z_i separately for the general population and the kibbutzim. The expected value of the coefficient of z_i obtained in the general regression, which we denote B_c, is then (Johnston, 1971, pp. 168-9)

$$E\,B_c = \alpha B_{1c} + \beta B_{2c} + \gamma B_{3c}$$

where B_{1c} , B_{2c} and B_{3c} are the coefficients obtained by respectively regressing $\ln a_i$, $\ln[\beta\eta/(\beta\eta+\phi_i)]$, and $\ln(e_i + p)$ on z_i , and it follows from the preceding analysis that all three are positive.[11] Thus B_c estimates the full effect of parent's education on test scores, through three channels: through hereditary ability, through time spent helping the child and through its effect on parental income and private spending on education. Similarly, the expected value of the coefficient of z_i obtained in the kibbutz regression, which we denote B_k, is

$$E\,B_k = \alpha B_{1k} + \beta B_{2k}$$

where B_{1k} and B_{2k} are the coefficients obtained by respectively regressing $\ln a_i$ and $\ln[\beta\eta/(\beta\eta+\phi_i)]$ on z_i . The expected value of the difference between the general population and kibbutz coefficients, $E\,(B_c - B_k)$, is then γB_{3c} the marginal effect of education on test scores in the general population *through its effect on parental income and private spending on education*. The estimates presented in the following section separate this effect, present only in the non-kibbutz population, from the other two channels, which are present in the entire population, kibbutz and non-kibbutz.

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[11]The three parameters α, β, γ are positive from the construction of the model. Parent's schooling z_i is positively correlated with their human capital e_i so B_{3c} is positive; B_{1c} is positive because we assume that the child's innate ability $\ln a_i$ is positively correlated with the parent's human capital, e_i ; and B_{2c} is positive because $\ln[\beta\eta/(\beta\eta+\phi_i)]$ varies inversely with ϕ_i, and we assume a negative correlation between parents' valuation of leisure, ϕ_i and their human capital, e_i.

4. Data

We estimate the model using data from psychometric test results of the National Institute for Testing and Evaluation in Israel for the years 1992-1996.[12] It is a voluntary test, so the possibility of selection bias exists, however Avrahami (1997) concludes that kibbutz children take the psychometric test for much the same reasons as non-kibbutz children: the vast majority of kibbutz children do not intend to stay on the kibbutz, or at least recognize that there is a good chance they will want to leave in the near future, and even those who plan on continuing to live on the kibbutz realize they may have to work outside it. Hence, the value kibbutz children place on higher education for their future success is similar to the general population.

We limited our sample to native-born Jewish Israelis who took the test at age 31 or less. It includes all 4,726 test-takers who were educated on a kibbutz, and a random sample of 8,779 test-takers from the general, non-kibbutz population.[13] The data include: test scores (overall and broken down by category); age; mother's and father's years of schooling (seven categories); and mother's and father's country of birth.

Table 1 provides basic descriptive statistics on the two samples: test-takers educated in kibbutzim and those from the general, non-kibbutz population. The average score of kibbutz examinees is 0.25 of a standard deviation higher than the average score of the general population and the standard deviation of kibbutz examinees is about 8% smaller. The statistics on parents' schooling were derived by transforming the seven categorical variables for each parent into a single numerical

[12] Universities in Israel use this test for screening applicants. The test is similar to the SAT exams used in the United States. For further details see Beller (1994).

[13] As kibbutzim account for less than 2% of the population, we refer to the non-kibbutz population as the general population.

value, by taking a midpoint value for each category. (In the regressions we use the original categorical variables.) As Table 1 shows, mothers and fathers of kibbutz test-takers have slightly more education than their non-kibbutz counterparts.

Table 1. Descriptive statistics

		Total score	Verbal Score	Math score	English score	Mother's education (yrs)	Father's education (yrs)
Average	General population	552.7	108.4	109.9	109.4	13.04	13.21
	Kibbutz	578.8	116.9	110.6	113.9	13.87	13.94
Median	General population	553	109	110	110	12	12
	Kibbutz	582	118	111	116	14	14
Standard deviation	General population	97.02	18.59	18.79	22.06	3.11	3.36
	Kibbutz	90.15	17.22	18.32	20.75	2.51	2.67
Number of observations: General population 8,779 ; kibbutz 4,726							

Table 2 presents the frequency of parent schooling by category for examinees in the general population and those from kibbutzim. Again one sees that kibbutz parents have slightly more education than the general population, and native-born parents have more education than immigrant parents, on average.

Table 2.

Distribution of parents' education in the general population and the kibbutz (%)

Full sample	General population		Kibbutz	
	Mother	Father	Mother	Father
Less than 8 years	0.96	0.87	0.54	0.34
Full primary (8 years)	5.07	6.13	1.03	1.47
9-11 years	15.99	18.12	6.63	8.44
Full secondary (12 years)	31.54	26.66	27.04	26.73
Post-secondary	20.41	17.76	36.22	29.81
Bachelor's degree	16.67	16.84	20.68	22.93
Graduate studies	9.36	13.60	7.86	10.28
Native-born parents	General population		Kibbutz	
	Mother	Father	Mother	Father
Less than 8 years	0.26	0.26	0.09	0.09
Full primary (8 years)	2.34	3.30	0.37	0.70
9-11 years	11.38	14.90	3.12	5.86
Full secondary (12 years)	31.95	27.39	26.00	25.63
Post-secondary	22.39	18.38	40.05	31.30
Bachelor's degree	21.16	21.42	21.26	24.88
Graduate studies	10.53	14.34	9.12	11.53

Table 3 presents simple correlation coefficients between the variables for the two samples. The values for the general population are above the main diagonal, the values for kibbutzim are below the diagonal. The correlation between test scores and mother's years of schooling is about twice as high in the general population as in kibbutzim, and their correlation with father's years of schooling is about 1.5 times higher in the general population. These differences reflect the added channel of higher income through which parents' education affects test scores in the general population but not in the kibbutz.

Table 3. Correlation coefficients: general population above the diagonal, kibbutzim below

	Total score	Verbal	Math	English	Mother's education	Father's education
Total score	1	0.914	0.890	0.824	**0.365**	**0.355**
Verbal	0.905	1	0.682	0.699	0.324	0.298
Math	0.876	0.651	1	0.599	0.296	0.296
English	0.780	0.656	0.509	1	0.366	0.370
Mother's education	**0.187**	0.171	0.157	0.155	1	0.646
Father's education	**0.209**	0.183	0.172	0.191	0.423	1

5. Estimation

We estimated the effect of parent's education on test scores using the specification reported in Table 4 in which test scores are regressed on age, age squared, a gender dummy, categorical schooling variables for each parent, an interactive term indicating whether both parents have a bachelor's degree, and a set of categorical variables indicating where each parent was born. The (omitted) reference category for education is full secondary education; the reference category for parent's country of birth is "Israeli-born". The first two columns report the regression coefficients and standard errors for the kibbutz population; the second two for the general, non-kibbutz population.

5.1 The kibbutz standard of equal opportunity in education

Consider first the regression results for the kibbutz population. The coefficients of father's education and mother's education in these regressions provide an egalitarian

standard of origin-independence. For both parents the coefficients for the education categories "post-secondary", "bachelor's degree" and "graduate studies" are large and statistically highly significant—each is about five times the size of its standard error—and the interaction term is also large and highly significant.[14]

Table 4. OLS regression of total score on parents' education and place of birth

	Kibbutz		General population	
	Coefficient	Standard error	Coefficient	Standard error
Constant	519.81	69.43	363.20	44.33
Age	11.91	6.11	20.99	4.18
Age^2	-0.39	0.13	-0.55	0.098
Female	-54.50	2.84	-46.32	2.03
Father: less than 8 years	-40.76	23.86	-5.65	11.87
Father: 8 years of schooling	1.99	12.03	-6.70	5.02
Father: partial secondary	-2.42	5.41	-3.58	3.20
Father: post-secondary	24.80	4.97	22.02	3.77
Father: bachelor's degree	32.34	5.30	40.92	4.16
Father: graduate studies	44.97	6.21	47.94	4.63
Mother: less than 8 years	25.11	19.34	-54.05	11.46
Mother: 8 years of schooling	15.91	14.28	-13.86	5.39
Mother: partial secondary	-4.70	6.10	-7.37	3.30
Mother: post-secondary	23.87	4.74	22.9	3.81
Mother: bachelor's degree	26.77	5.32	36.89	4.35
Mother: graduate studies	44.65	6.51	59.37	5.02
Both parents have a degree	-18.39	5.94	-9.34	4.87
Father: North Africa, Asia	-19.37	5.11	-9.94	2.97
Father: Western Europe	-10.37	5.43	-6.55	4.40
Father: Eastern Europe	-17.04	4.85	-7.63	3.23
Father: US: Canada	-8.22	10.32	3.80	10.73
Father: Latin America	-17.65	6.82	4.91	9.00
Father: S Africa, Australia	-10.88	16.58	-27.43	17.24
Father: other foreign born	-34.35	11.06	-27.71	6.74
Mother: North Africa, Asia	-17.40	5.73	-5.54	3.08
Mother: Western Europe	-1.24	5.56	-5.28	4.43
Mother: Eastern Europe	1.00	5.66	-6.80	3.38
Mother: US, Canada	9.37	7.38	1.83	10.06
Mother: Latin America	-1.92	6.78	2.92	9.08
Mother: South Africa, Australia	5.48	15.21	3.06	17.22
Mother: other foreign born	-30.97	11.82	-17.75	7.06
R^2	0.159		0.234	
Number of observations	4,086		7,498	

[14] As Table 2 indicates, the coefficients for 8 years schooling or less in the kibbutz are based on a very small number of observations, especially for the mother, and can be ignored.

These results indicate a substantial degree of origin-dependence in the kibbutz, despite its strong ideological commitment to egalitarian principles. To illustrate this, consider two kibbutz members, one whose parents have full secondary educations and the other whose parents both have college degrees. The predicted difference between their expected test scores is 40.7 points, or about 40% of a standard deviation, other things equal.[15] This is the kibbutz standard of equal-opportunity in education.

5.2 Decomposition of the parental effect

Now consider the effect of parents' education in the general population. Again, for both parents, the coefficients of "post-secondary", "bachelor's degree" and "graduate studies" are large and measured with yet greater precision than in the kibbutz. The coefficients for secondary education are about the same size as in the kibbutz, but those for bachelor's degree and graduate studies are larger.[16] Comparing two test-takers with similar differences in parental schooling as above—the parents of one having full secondary educations and the parents of the other having college degrees—we find a predicted difference in their expected test scores of 68.5 points. There is more equal opportunity in the kibbutz—greater origin-independence—because differences in parental education in the kibbutz are not translated into income differences.

To measure the relative importance of what money can and cannot buy with

[15] We calculate: 32.34 + 26.77 - 18.39 = 40.72. The test scores are normalized so that each 100 points equals one standard deviation.

[16] Dar (1994) compared the educational achievements of eighth and ninth-grade children from cities with those from kibbutzim and similarly found in kibbutz-educated children a smaller correlation between parents' socio-economic status and their children's test scores.

regard to the influence of parents' education on their children's test scores we subtract the effect of parents' education in the kibbutz from its effect in the general population. We attribute the difference of 27.8 points to the *material* advantages of having more educated parents who, on average, earn more. Comparing this difference to the measured effect in the kibbutz, 40.7 points, which we attribute to what money can't buy, we find that the effect of what money can't buy is about 50% larger than the effect of what money can buy.

5.3 Further remarks

A surprising, incidental result observed in Table 4 is the strong effect of parents' ethnic origin on children's scores in the kibbutzim, which highlights the importance of cultural factors from a different perspective. Although the examinees themselves are all native-born, and despite the egalitarian investment of education resources in the kibbutz, we find that the coefficient of parent's country of birth is significant in many cases and often larger than in the general population. Similarly, the relative disadvantage of women in the kibbutz is 8 points greater than in the general population, and this difference is statistically significant at the 1% level,[17] despite the kibbutz movement's ideological commitment to the equality of women and men.

In light of the strong effect of parents' place of birth, we also ran similar regressions on a restricted sample including only those whose parents are native-born Israelis. The results are presented in Table 5. Again, for both parents, the coefficients

[17]Women generally do less well in psychometric tests (cf. Bridgman, McMaley-Jenkins and Ervin, 2000, and Young, 2001, on gender differences in SAT scores in the United States), but it is surprising that the gap should be significantly greater in the kibbutz. The order is reversed with regard to matriculation from high school. In Israel, Dahan et al. (2002) found that women have a higher probability of matriculating than men, other factors held constant.

of "post-secondary", "bachelor's degree" and "graduate studies" are large and highly significant. Making the same comparison as before among the kibbutz population, between one whose parents both have full secondary education and one whose parents both have a bachelor's degree, we find an expected difference in test scores of 45.2 points, only slightly higher than our previous estimate of 40.7.

Making the same comparison in the general population, we find an expected difference of 76.7 points, also slightly higher than in the full sample. Again, we attribute the difference of 31.5 points to what money can buy. As before, we find that the effect of parental education through what money can't buy is about 50% larger than its effect through what money can buy.

Table 5. OLS, restricted sample. Dependent variable: Total score.

	Kibbutz		General population	
	Coefficient	Standard error	Coefficient	Standard error
Constant	428.12	103.40	444.27	92.64
Age	20.02	9.28	11.94	9.04
Age^2	-0.57	0.21	-0.32	0.22
Female	-55.47	3.93	-41.63	3.47
Father: less than 8 years	-68.77	58.98	16.88	33.27
Father: 8 years of schooling	-22.30	24.55	-6.79	10.76
Father: partial secondary	2.32	8.73	-7.14	5.69
Father: post-secondary	29.36	7.15	24.30	6.49
Father: bachelor's degree	39.28	7.56	45.56	6.84
Father: graduate studies	52.72	8.70	52.81	7.61
Mother: less than 8 years	-8.19	58.94	-143.42	33.56
Mother: 8 years of schooling	0.60	33.34	-47.82	12.20
Mother: partial secondary	-5.25	11.58	-7.59	6.22
Mother: post-secondary	26.46	6.75	31.42	6.26
Mother: bachelor's degree	32.65	7.50	40.97	6.85
Mother: graduate studies	46.07	8.76	62.91	7.99
Both parents have a degree	-26.70	8.55	-9.80	8.05
R^2	0.134		0.225	
Number of observations	2,150		2,698	

6. Conclusions

In this paper we used the unique experience of communal education in Israeli kibbutzim, where all children have similar access to material resources, to derive two results that bear centrally on the general implementation of equal opportunity in education.

First, we measured the degree of origin-dependence, on parental education, of psychometric test scores in the kibbutz. This provides an empirically-based quantitative egalitarian standard of equal opportunity in education to which other education systems can be compared. Despite the kibbutz's commitment to an egalitarian ethos, we found a substantial degree of origin-dependence in test scores. For example, the difference in expected test scores between the child of parents with a full secondary education and the child of parents with a bachelor degree is about two fifths of a standard deviation.

Then, we measured the degree of origin dependence in the general population and found it was indeed larger than in the kibbutz, reflecting the greater degree of inter-generational mobility it offers. In the kibbutz, parents' education affects their children's achievement only through non-monetary factors whereas generally, outside the kibbutz, the children of more educated parents also have access to greater material resources, on average. Subtracting the kibbutz coefficient from the general coefficient enables us to compare the parental effect on test scores through what money can and cannot buy. We find that its effect through what money can't buy is 50% greater.

Two lessons can be drawn from this analysis. The smaller degree of parental influence among kibbutz-educated children indicates that there is scope for achieving more equal opportunity in education in the general population by allocating a greater share of public resources to the education of children from low-income families. The

significant correlation between test scores and parental education even on the kibbutz indicates that full origin-independence in education is a policy objective to which even the most egalitarian societies do not approach in practice.

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Appendix: Education on the *kibbutz*

Kibbutzim are small, rural communal villages. In 2005 there were 266 kibbutzim in Israel with an average population of about 450 each, or 118,000 in all, accounting for 1.7% of the total population of Israel. In principle, all property and income in the kibbutz belong to the collective, which provides for all members' needs on an equal basis: from each according to his or her abilities, to each according to his or her needs. However, recent years have seen some market-oriented departures from this principle, though it is unlikely that this will have had a significant effect on our sample. Communal decisions are made democratically, either in the kibbutz plenum or in committees, among which is the education committee for education. Kibbutz children attend nursery and then kindergarten from an early age, and like all children in Israel, begin first grade at age six. They study at regional schools, where children from several nearby kibbutzim learn together, mostly following the same national curriculum as other schools Israel. Kibbutz schools, like other schools in Israel, are nationally funded, and like other local authorities can supplement these funds from their own resources. These decisions are made collectively, and *ex ante* investment in every child is the same. Compulsory schooling ends at grade ten, but most children continue to the twelfth grade, when over half take a nationwide matriculation exam required for admission to most university programs. This is followed by compulsory military service, after which those who wish to continue their education take a psychometric test required for admission to most university programs. For some time now, the large majority of kibbutz children have been leaving the kibbutz soon after military service.