# SOCIOECONOMIC APPROACHES TO LONG LASTING EFFECTS OF EARLY CHILHOOD EDUCATION

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Most of the academicians and professionals that study from different perspectives the effects of early childhood education coincide that it has a key and long lasting role on educational attainments and on life's opportunities and quality as well. However, evidences on this relationship are much less conclusive than convictions about it, perhaps because of the intrinsic difficulties to test social hypotheses. This is problematic both for the advancement of science and at the time of giving advice to educational practitioners either in schools or in governments. This paper aims to shed some light on this difficult question analyzing the contributions that arise from recent socioeconomic literature.

1. The social gradient and its mysteries

It is very clearly established in the literature the existence of a positive sloped social gradient in most of the relationships between socioeconomic status (SES) and, on the other hand, education and health outcomes. This means that at the time of analyzing the access of different human populations to most of the scarce goods the lower the children' SES, the lower will be, for instance, the quality of nutrition and stimulation received at early ages, the lesser their attendance to kindergarten and the lower the educational outcomes at early ages. Figures 1 and 2 show two clear examples referred to standardized test scores in primary school. The first one is from the U.S. and shows, additionally, that socioeconomic differences widen from 6 to 12 years old. Figure 2 is from Argentinean census-based standardized test scores at the age of twelve. The social gradient is very clear there but, at the same time, it's evident that the dispersion of the points resulting in a R^2 of just 0.50 is high enough to pose as many questions as answers. Figures 3 and 4 add some international perspective, the first one showing the countries' SES as determinants of the PISA standardized test scores and the second one reminds us that another kind of social gradient, although weaker, also exists and it is the one that positively associates educational outcomes and equity.
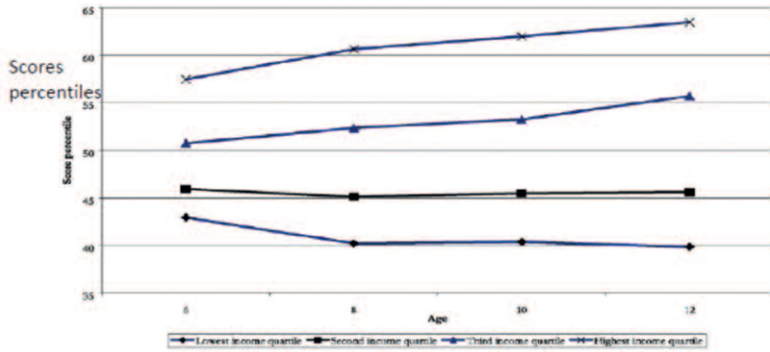
Figure 1. PIAT Math score by income quartile. Source: F. Cunha, J.J. Heckman, L.I. Lochner and D. V. Masterov (2006).
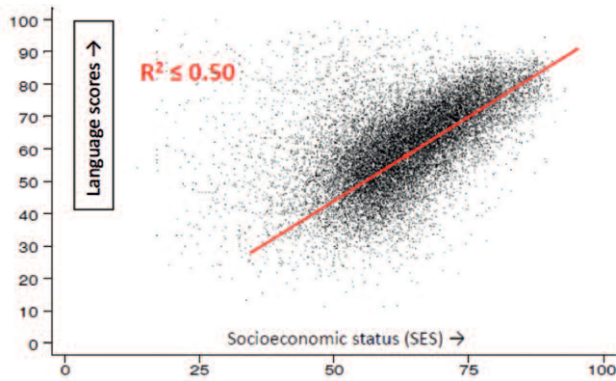
Figure 2. The gradient (I). Language scores and SES, 6th year primary school, Argentina. Source: J.J. Llach *et al*. (2006).
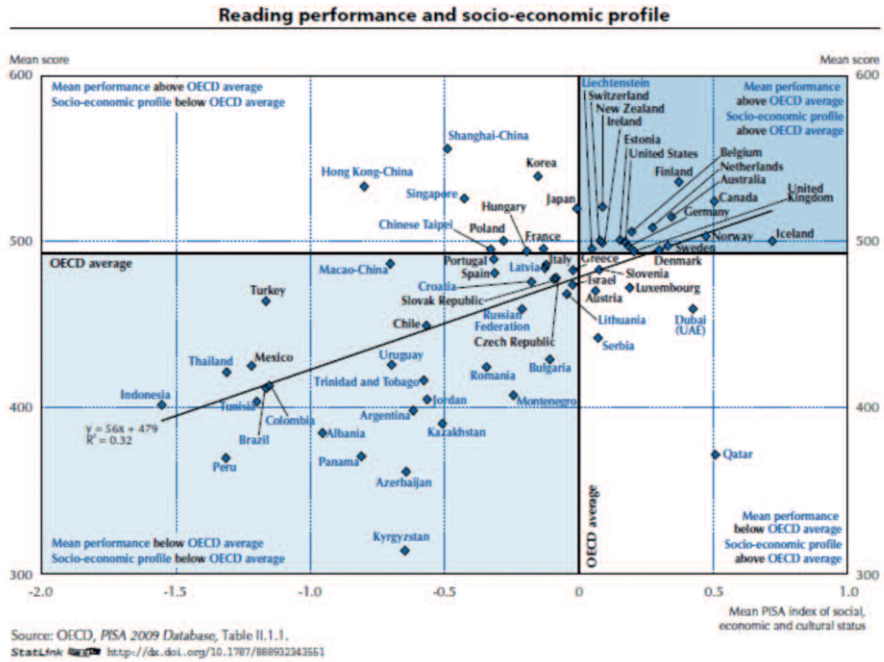
Figure 3. The gradient (II). PISA math performance and national averages of students' SES.
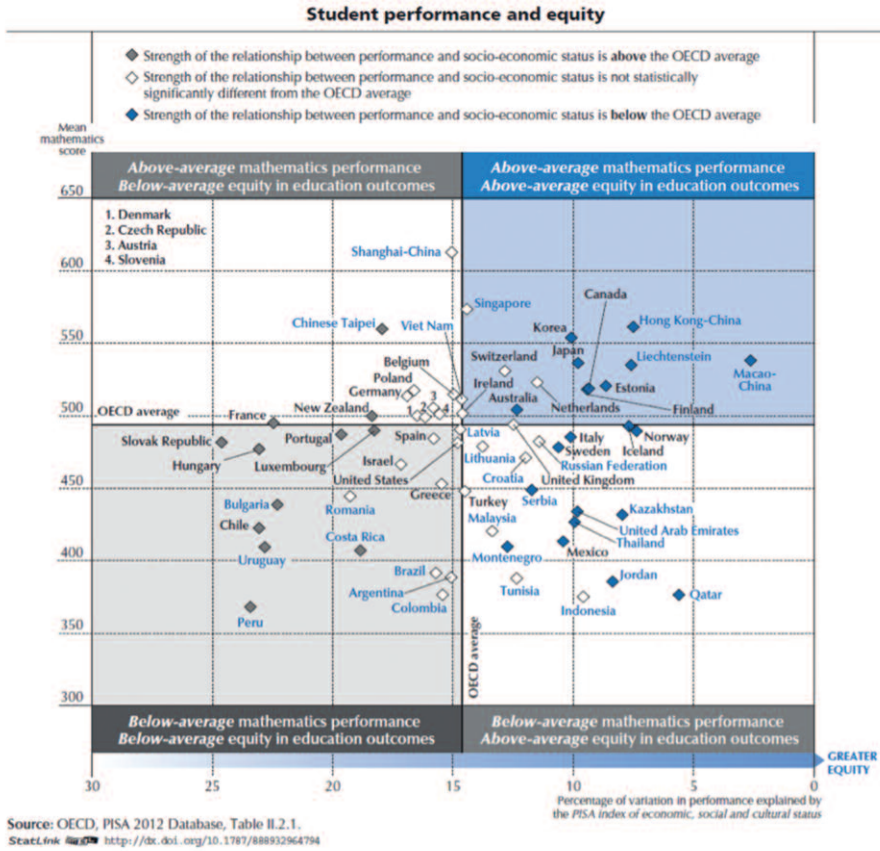
Student performance and equity

◆ Strength of the relationship between performance and socio-economic status is **above** the OECD average
◇ Strength of the relationship between performance and socio-economic status is not statistically significantly different from the OECD average
◆ Strength of the relationship between performance and socio-economic status is **below** the OECD average

Figure 4. Equity and high performance are not mutually exclusive.

Source: OECD, PISA 2012 Database, Table II.2.1.
StatLink ⬛◱◧ http://dx.doi.org/10.1787/888932964794

2. Economists' approaches

2.1. Heckman's neuroscience aware research program

James J. Heckman (Nobel Prize in economics) and his team are perhaps the social scientists that in the last ten years have given the most valuable and permanent contributions to the knowledge of the long-lasting effects of early childhood interventions and education.[1] Synthesizing the outcomes in the middle of the road Heckman presents the following stylized facts.

Nine stylized facts[2]

1) Abilities matter. Cognitive ability is a powerful determinant of wages, schooling, low crime participation and success in many aspects of social and economic life including health.

2) Abilities are multiple. Non-cognitive abilities like perseverance, motivation, time preference, risk aversion, self-esteem, self-control have direct effects on wages (controlling for schooling), schooling, teenage pregnancy, smoking, crime and achievement tests.

3) The nature versus nurture distinction is obsolete. Modern literature teaches that the sharp distinction between acquired skills and ability is not tenable. Behaviors and abilities have both a genetic and an acquired character.

4) Cognitive and non-cognitive ability gaps between individuals and across socioeconomic groups open up at early ages (Figure 1).

5) There is compelling evidence of critical periods in child development. Different types of abilities appear to be susceptible to manipulation at different ages. While IQ scores become stable by age 10, adolescent interventions can affect non-cognitive skills. The later remediation is given to a disadvantaged child, the less effective it is and, for many skills and human capabilities, later intervention for disadvantage may be possible, but it is much more costly than early remediation to achieve a given level of adult performance.

6) Interventions targeted toward disadvantaged adolescents have low returns but the contrary is true for remedial investments in young disadvantaged children, because of the dynamic complementarity and self-productivity mentioned below.

7) If early investment in disadvantaged children is not followed by later investment, its effect at later ages is lessened. Investments at different stages of the life cycle are complementary and require follow up to be effective.

8) The effects of resource/credit constraints on a child's adult outcomes depend on the age at which they bind for the child's family.

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[1] See https://www.heckmanequation.org/ and http://heckman.uchicago.edu/
[2] J.J. Heckman (2007).

9) Socio-emotional (non-cognitive) skills foster cognitive skills and are an important product of successful families and successful interventions in disadvantaged families.

Capabilities formation model[3]

These stylized facts come from an analysis framed in the main methodological approach of economists to early childhood and human development, i.e., the human capital (HC) model in which wages are a function of investments in HC that increase capabilities (C) and productivity. Both HC and innate abilities are inputs to human capital production function but the model has tended up to now to concentrate only on cognitive abilities. Cognitive (C) and non-cognitive (NC) capabilities plus the health stock are functions of nature, nurture and investments in HC. The technology to produce HC is multi-stage and flexible in such a way that inputs can vary. There are critical stages for interventions such as nutrition, stimulation or formal education. There are three other relevant traits of children' development technology.

1. Self-productivity: $C_t = (g)\ C_{t-1}$, meaning that current (time t) capabilities depend on capabilities acquired in the previous state (t-1). For instance, emotional assurance in t-1 can influence eagerness to explore and cognitive development in t.

2. Dynamic complementarity: current (t) capabilities can influence the productivity of investments I in HC performed in the following state (t+1), so $I_{t+1} = (j)\ C_t$.

3. Multiplier effects: meaning that self-productivity and dynamic complementarity interact in such a way that capabilities at time t-1 could influence productivity of investment performed at t+1 through their influence in capabilities at time t.

In other words, both HC accumulation and C development are dynamic processes in which skills got in t-1 affect initial conditions and learning technology at the following stage t. It is unfortunate that these dynamics give place to early and many times persistent abilities' gaps between individuals and between SES groups (gradients)

## Non-cognitive or socio-emotional capabilities

Hence to value schools, by length instead of quality, is a matchless absurdity. Arithmetic, grammar, and the other rudiments, as they are called, comprise but a small part of the teachings in a school. The rudiments of feeling are taught not less than the rudiments of thinking.

[3] F. Cunha, J.J. Heckman, L.I. Lochner and D.V. Masterov (2006).

> The sentiments and passions get more lessons than the intellect. Though
> their open recitations may be less, their secret rehearsals are more.
> Horace Mann (1867)

Although parents and educators have known since long ago the role of non–
cognitive or socio–emotional capabilities they have also been frequently for-
gotten.[4] Some social scientists, including Heckman and his team, have been
recently "rediscovering" their critical role for personal development. NC
capabilities include among others self–esteem, perseverance, planning ability,
motivation, pro–activity and ability to socialize. Heckman and his team em-
phasize that NCCs are negatively associated to behaviors like alcohol and
smoking addictions, adolescent pregnancy, crime, dependence on subsidies,
drop outs and unemployment or low–quality employment. They also find
that some current educational policies inspired by a biased idea of account-
ability could lead to perverse incentives like educating for the tests. In
addition, NCCs are frequently omitted in research and much more in ed-
ucational policies because of difficulties in measuring and dealing with them
and also because of the belief that they only depend on parents. However,
Figure 5 shows that college graduation increases students' stock of NCCs
while those with GED certificates have the same NCC stock as dropouts.
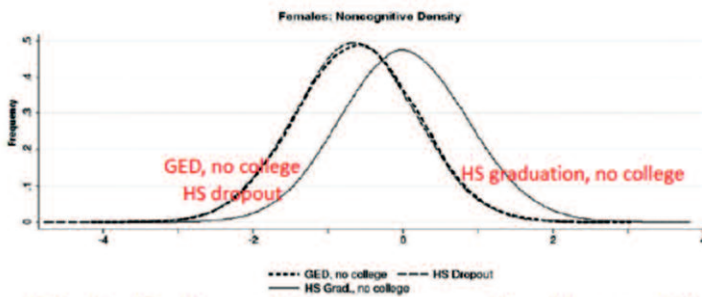
General Educational Development (GED) tests are a group of five subject tests which, when
passed, certify that the taker has American or Canadian high school-level academic skills.

Figure 5. Non-cognitive capabilities by educational status. No college sample, all ethnic groups.
Source: J. J. Heckman, J. E. Humphries and N. Mader (2010).

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[4] One of the reasons of the oblivion could be the sometimes unilateral insistence on
standardized tests that are not easily applicable to the study or non–cognitive capabilities.
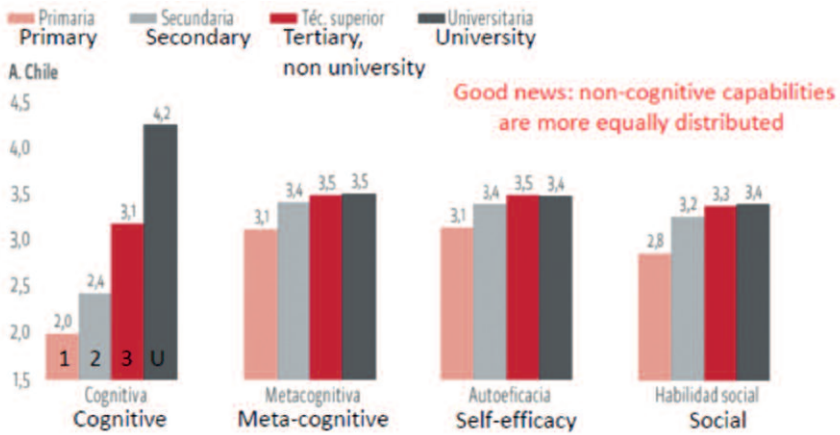
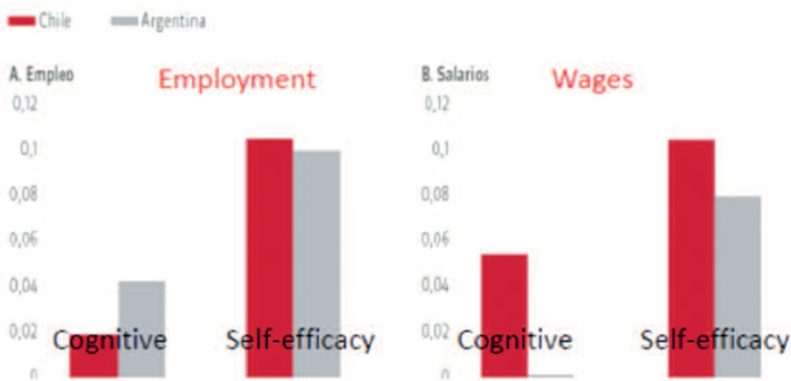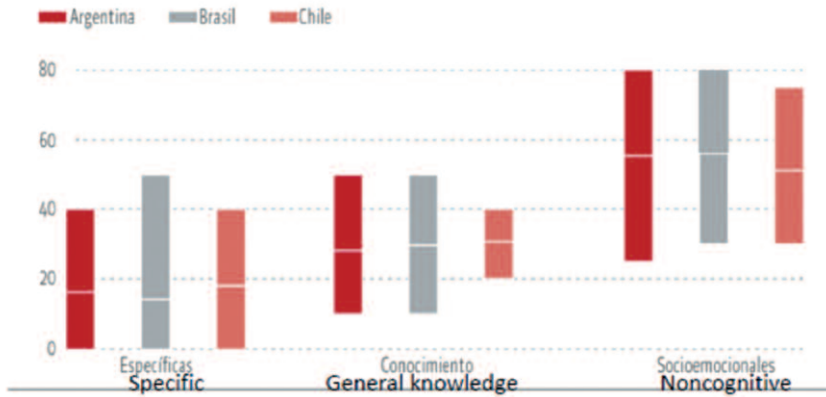**Figure 6.** NC capabilities in Chile according to education levels. Source: IDB (2012).
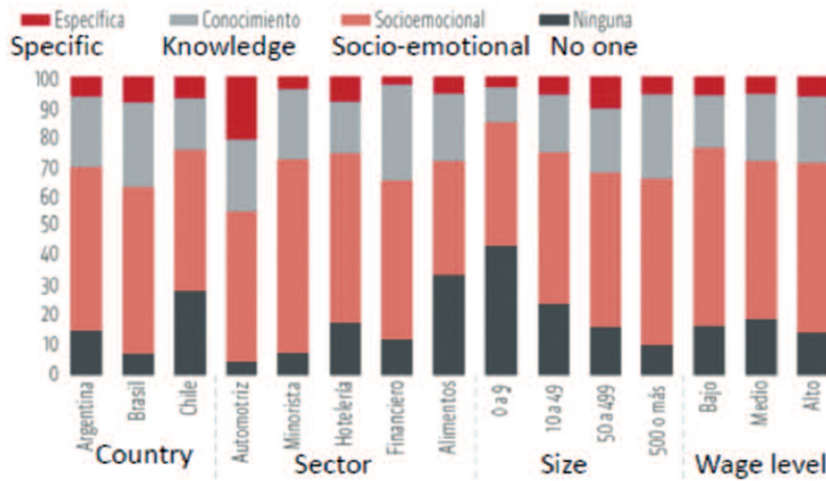

Figure 7. NC capabilities and labor market outcomes in Argentina and Chile. Source: IDB (2012).

Figure 8. C and NC capabilities in Argentina, Brazil and Chile as valued by employers. Source: IDB (2012).

Figure 9. Perceived scarcity of C and NC capabilities in Argentina, Brazil and Chile. Source: IDB (2012).

The good news shown in Figure 6 is that NCCs are more evenly distributed than cognitive ones. This is even more relevant if we take into account the relevant role of NCCs in labor market success (Figures 7 and 8). Figure 9 reminds us they are scarcer than CCs and, together with the previous ones, it conveys to us the message of the importance of incorporating the teaching of NCCs in the curriculums.

2.2. Empirical results of human capital theory and the education production function

The empirical evidence of human capital theory is solid as regards, first, the positive association between more years and degrees in education and, on the other hand, better employment, more income and more non pecuniary benefits. Secondly, there is also good evidence showing that more education leads to more economic growth, and vice versa.

Unfortunately, empirical results are less clear-cut as regards learning quality. Emerging countries have significantly increased investments in education and this has had positive effects on enrolments and graduation rates, but not many of them have increased learning quality too. At the time of explaining educational outcomes economists have mostly used the approach called "education production function" in which the outcome = f (SES, schools, teachers, peers, geography... and error). When the approach is applied to assess which factors are associated to learning levels, results can explain at most 50% of the variance. P.W. Glewwe *et al.* (2011) analyzed more than 9000 papers published between 1990 and 2010, in both education and economics literature, to investigate which specific school and teacher characteristics, if any, appear to have strong positive impacts on learning and time in school in developing countries. They finally choose the most methodologically accurate (first 79, then 43, including 13 random experiments) and found that most of the schools' and teachers' traits were not statistically significant as regards learning. Additionally, most of the variables that showed significant effects were self-evident and, for that reason, not very relevant as guidelines of renewed educational policies. Among those variables were the physical capital of schools and its maintenance –which frequently also captures the quality of school's management – teachers with greater knowledge of the subjects they teach, longer school days and tutoring, while the absence of teachers showed a clear negative effect on learning.

Figure 10 adds new information to Figure 2 as it emphasizes that there is not a sort of "gravity law" relating SES and educational outcomes but rather a big dispersion of results. Classrooms whose students have the same SES can get either 90 or 20 points in the test scores. This can be called "the
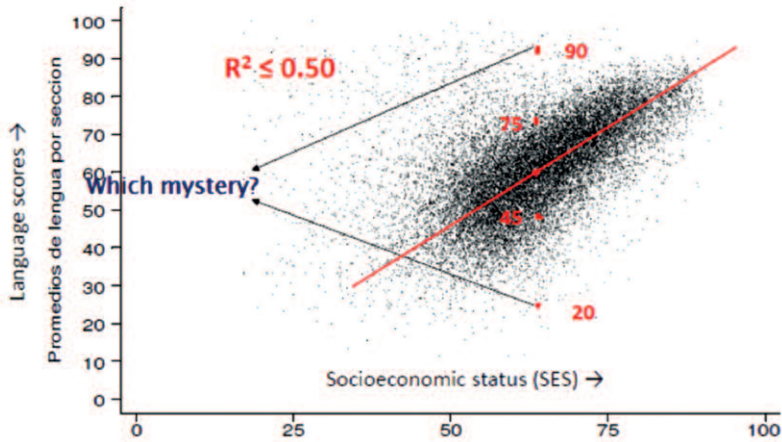
Figure 10. The gradient (III). Language scores and SES, 6th year primary school, Argentina. Source: Juan J. Llach *et al.* (2006).

classroom mystery" because in spite of the enormous quantity of studies our knowledge of the effects of educational practices or policies on student learning is poor. But the mystery is per se a very good piece of news because it gives room to the effectiveness of those practices and policies. Among them, some of the most explored in the very recent years have been school organization, incentives and accountability but no conclusive evidence has been obtained up to now. Of course, educational practices and policies compete with many other "candidates" aspiring to explain the mystery, such as non–cognitive capabilities or family and peer qualities other than the SES.

2.2.1. Natural and random experiments on early childhood [5]

In spite of the absence of conclusive evidence coming from the afore-mentioned studies it is useful to know the results obtained by the most rigorous studies.

2.2.1.1. Perry Preschool Project

An intensive preschool program applied to 53 Afro–American children from low–income families and IQs between 75 and 85 in five waves, between 1962 and 1967 (Ypsilanti, Michigan). The control group had 68 children

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[5] In J.J. Llach *et al.* (2009) there can be found both a revision of part of this literature and a large bibliography.
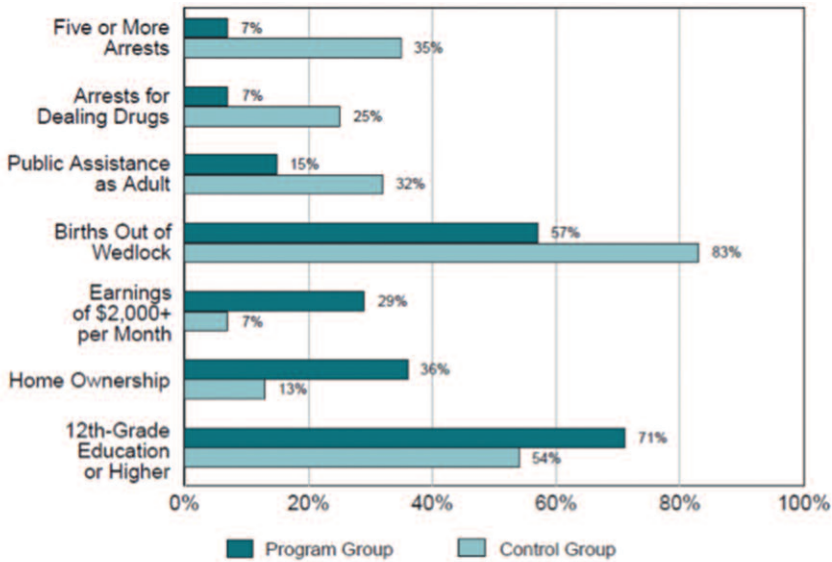
Figure 11. Major findings: Perry Preschool project's participants at 27 years.

and the treatment included extra classes plus ninety-minute visits to children's homes to include the mother in the process.

Measurements were taken up to when the children were 40 years old. In addition to the results shown in Figure 11 the policy had substantive impacts on intellectual development (not necessarily IQ), a 28% increase in HS graduation rate and employment quality. The economic benefit/cost analysis of the policy was also very positive, with a ratio of almost 5:1 and most of the benefits came from lower crime. Other sources were more fiscal income because of better employment, and lower court costs, losses of crime victims and costs of special education. Finally, the parents also improved both their education and labor status, which implies that the Perry Preschool Project had long-term effects on household welfare.

2.2.1.2. Other studies

Lowering the children/teachers ratios plus some parents' participation, the Chicago Child Parent Center (since 1967) found after twenty years similar

outcomes to those of Perry. The Abecedarian project (since 1972) was applied in primary schools to high-risk kids, also lowering pupil/teacher ratios and increasing parents' participation. At 21 years old it found a non-permanent IQ increase, permanent improvements in math and language, more youngsters studying in university and an increase in mothers' educational and income levels. J. Colombo and S. Lipina (2005) applied special preschool training to basic and non-basic needs kids, 3-5 years old, and leveled both groups' outcomes by the end of the experiment. S. Berlinski, S. Galiani and P. Gertrel (2006) found that one additional kindergarten year produced better learning performance and non-cognitive capabilities. Finally, the Lobería Project (Province of Buenos Aires, Argentina, 2002) performed local community training on child development that increased kids' intellectual and emotional abilities.

2.2.1.3. Synthesis of other natural experiments

As regards dependent variables, positive but modest[6] outcomes can be found from different educational policies – with some relevant exceptions. Results are stronger in "quantitative" variables like attendance, enrolment or graduation than in "qualitative" or labor variables like standardized test scores, income or wages. Regarding independent variables, i.e. those that include educational practices of policies, the strongest results have been found with better preschool quality and classroom size measured by pupil/student ratios, particularly in low SES students. Effects of other policies like conditional scholarships or cash transfers, work-oriented training, longer school days and some meals provision in the case of kindergarten are positive but weaker. At a third level of effectiveness appear more school buildings effect on attendance, provision of school uniforms, also on attendance and longer school years on tests and promotion. At the lowest level of effectiveness, although positive, appear the few studies performed on peer effects, schooling support and free delivery of learning materials. Finally, wholesome experiments like those applied to charter schools and integral reforms are up to now mostly inconclusive because of serious problems in statistically identifying independent variables.

3. Conclusions: Beginning with the youngest and the poorest, the safest way to educational justice

In spite of the advancement of research in educational practices and policies in the last couple of decades we are yet far from being sure which

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[6] Modest means improvement of less than 0.3 standard deviations, less than 0.5 educational years or less than a 10% increase in others dependent variables.

is the best advice to give to education practitioners and policymakers. To help them improve the academy has prior duties to perform. The most important of them is to get involved much more than in the past in interdisciplinary and applied studies. Literature coming from the neurosciences, educational sciences, sociology, psychology or economics is most of the time completely unconnected and tends to dodge applied approaches. A more collaborative and, in a way, closer to reality stance would probably have positive effects on enlightening the advice to give to practitioners in schools, governments and NGOs. An example of the cost of this isolation is that the new hope coming from the neurosciences is almost mostly unknown to practitioners, and educational systems are thus almost immune to the possibilities that the knowledge of brain plasticity has opened to educational outcomes in disadvantaged contexts, including the enhanced power to compensate up to around the age of 10 deficiencies in children that have not been appropriately stimulated or even nurtured.

Notwithstanding so many uncertainties on these issues broad consensus exists on some simple truths than can be summarized by saying that *beginning with the youngest and the poorest is the safest way to educational justice*. This could avoid or at least temper realities like the one told to the author by a director of a primary school in a very poor neighborhood of Rafael Calzada, in the Metropolitan Area of Buenos Aires: "Many kids sitting in first grade classrooms (at age 6) are really in the 4th year kindergarten room."

Walking the same pathways will also help reduce the persistent segregation or discrimination suffered by the poor regarding both school access and quality. Many laws mandate the allocation of resources giving priority to poor districts, but many if not most of the time it does not happen. And there is neither enough basic formation nor training to directors and teachers on how to attend children's special needs in disadvantaged socio-geographic contexts. These are very widespread problems, mostly in developing countries but also in some developed countries. Figure 14 reminds us that differences between schools explain an important proportion of the variance of math test results, in this case in PISA 2012. In practice, this means that if you are wealthy enough you or your children will have more chances – or many more, depending on the country in which you live – to attend a good school and, on the contrary, that it you are poor you will have the same chances only if you are lucky and very lucky.

A third truth that also sometimes comes from academic studies but much more frequently from educator practice can be learned from the sayings of Héctor Robles, former director of schools sited in places like "Ciudad Oculta" ("Hidden City") in Villa Lugano, Buenos Aires City, Argentina
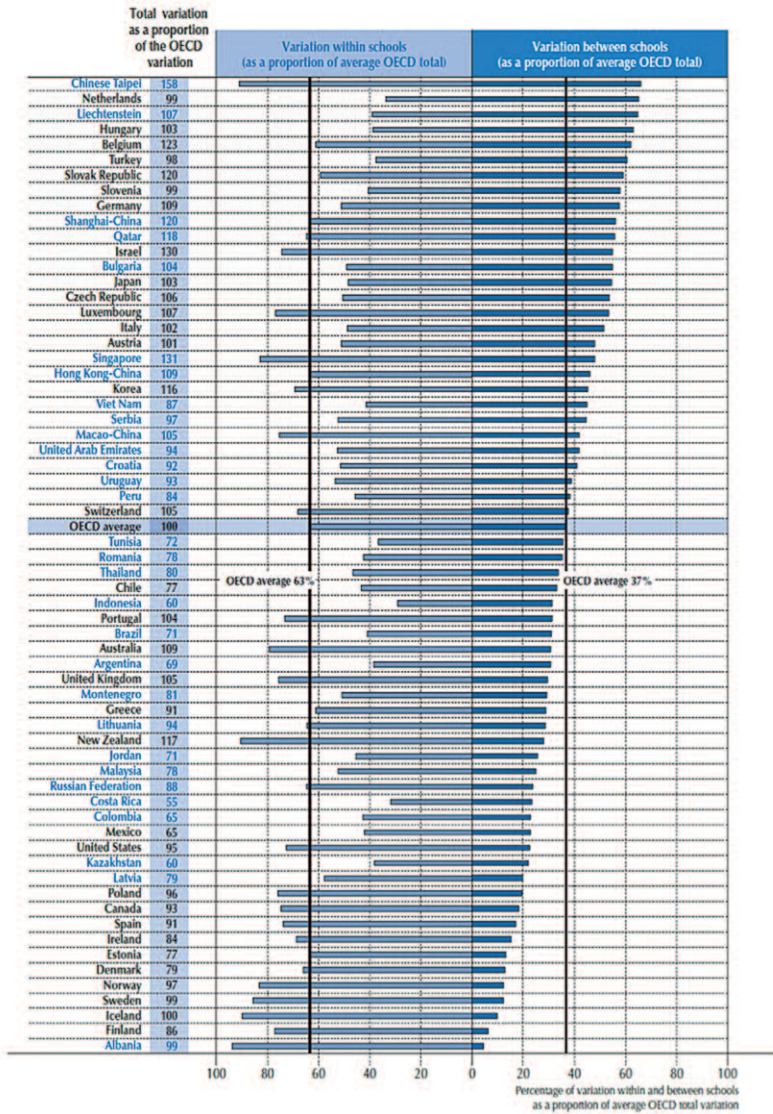
Figure 14. The other gradient (I): The worst schools, for the poor. Within and between schools explanation of test variance.

(Figure 12): "Our main goal is to demonstrate that this school's kids are intellectually able to perform as well as those of other social sectors… We demand from them maximum dedication to study, the best behavior and a careful look, and we get all that". It is worth knowing that Robles' sayings were not just words. In spite of being at the bottom of the social pyramid Robles' students were in the middle of the rankings in the test results of the city of Buenos Aires. His not so frequent sort of "Pygmalion approach" (R. Rosenthal and L. Jacobson, 1968) completely omitted self-fulfilling prophecies based on the wrong idea that children from marginalized contexts are less educable than their peers from other social strata.

It is very difficult to understand why these three simple and evident ideas of beginning with the youngest and the poorest and approaching them without stigmatizing prejudices about their incapacities to learn are however so seldom applied to the everyday practices in many, if not the majority, of the schools in developing countries and also in developed countries in schools, for instance, attended by children of immigrant origin. Perhaps one of the explanations of this sort of paradox is that the long-term nature of the effects of educational policies carries serious incentive problems for politicians. Educational and school reforms are many times problematic and even conflictive at the beginning while eventual positive results come after several years. But this is not an unavoidable conflict. It is the role of politicians to find the way out but it is the role of educational scientists to devote more effort to interdisciplinary and applied studies trying to shed lights brilliant enough as to convince and motivate politicians.

Figures 12. Images of Ciudad Oculta (Hidden City), Buenos Aires, Argentina.

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