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Understanding the Effect of Assessed Ability on School Choice and Investment in Schooling

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Abstract

Standard human capital theory predicts that, with no capital constraints, parents will tend to invest more in education when they think their child is abler than his peers. This paper tests this prediction using a large sample of kindergarten students, the ECLS-K study. As a measure of investment in education I propose a dichotomous variable for whether the school the child is in is chosen by the parent or assigned. I found a positive correlation between assessed ability and investment on education. As assessed ability might be in part a product of prekindergarten schooling decisions also correlated with kindergarten choice, I include these decisions as control variables to find that the correlation between assessed ability and choice remains significant. These results suggest that school choice programs are likely to favor high ability kids more than low ability kids (not only through the obvious ability-gap channel but also because parents of low ability children are less likely to exercise choice), a consequence worth considering when studying the impact and extension of these programs.

1. Introduction

In the last few decades a number of programs aimed at promoting school choice among disadvantage students have been put in place. The influence of scholars that pointed out the benefits of enhancing school choice boosted this trend[1]. The main argument for school choice programs is that by relaxing the financial constraints that force low income families to underinvest in human capital, gains in both equity and efficiency will be attained. Promoting school choice will provide low income families with the same opportunities that, either by acquiring private schooling or choosing among a variety of school districts, middle and especially high income families have had when choosing schools for their children.

For these benefits to be actually observed, the central assumption is that parents will search for high achieving schools, which will create a system of incentives that ultimately will improve the overall level of education. Although the initial believe that parents will search for schools that help children improve their academic achievement has being nuanced by evidence that suggests that other factors might matter too, there is important empirical support for the achievement-driven hypothesis. Other than academics, scholars have found that enjoyable environment and socioeconomic and race composition are also considered when parents are deciding which schools will they send their kids to.

These factors are usually regarded as 'tastes', in this context the efficiency gains obtained from extending school choice is often studied in the setting of the Tiebout model[2], where people with different tastes on education will decide where to live and this sorting will lead to an efficient equilibrium.

In a more systematic fashion, the human capital approach frames education decisions as a function of assessed ability and the human capital of the parent. In a way we can think of the human capital approach as a case of the Tiebout model, where the preferences are a function of the parameters that characterize the human capital model. As it imposes more structure, the human capital model gives clearer predictions than the Tiebout model. In particular, the human capital model predicts an increase in the level of ability will cause an increase in the level of investment, providing perfect capital markets. A specific prediction like this is difficult to derive from the Tiebout model, where choices are determined by 'tastes'.

This work studies assessed ability as a determinant of schooling decisions. Studying the impact of assessed ability on investment in education presents a number of theoretical and methodological challenges. First, while the human capital model gives a plain prediction for the effect of ability level where families face no financial constraint, the model is ambiguous when we consider imperfect capital markets, and further assumptions are needed in order to sketch specific predictions.

[1] See for example Milton Friedman's "Selling Schooling Like Groceries: The Voucher Idea" (1975).
[2] For a review see "The Tiebout Model", in Harvey Rosen, *Public Finance*, pp. 475-478.

Available data and the nature of it are also issues that need careful consideration. Information on assessment is not always available, and where is, economists are often reluctant to use it; as Manski (2004) explains, the main explanations for this skepticism towards the use of data on expectations are not supported by the data[3].

Another problem is how investment in human capital can be measured. Using school choice as the primary measure for investment in education is problematic if we consider the many forms that human capital 'outlays' can take. Time spent with children, for instance, is receiving increase attention in the literature. Using British longitudinal data on a birth cohort of 1958, Michael (2005) presents evidence of positive effects for "family caring" on children outcomes, even after controlling for socioeconomic level. Furthermore, the very measure of school choice is itself of complex metric. The investment that a parent implicitly makes when she moves to a given neighborhood because of the excellence of its school, is probably not comparable with the investment of a parent that search the best school within her school district, although in both cases parents are spending resources in schooling decisions.

Probably endogeneity is the most serious problem when trying to disentangle the effect of ability on investment in human capital. If, for instance, private schooling has positive effect on outcomes, and these outcomes are used to build assessments, then a regression of school choice on assessed ability will probably pick up the effect of schooling on assessment, rather than the effect we try to identify. Instrumental variables are particularly difficult to find in this context, as we need an exogenous variation on assessment not correlated with school choice; randomizations are also probably futile in this type of problems. As I explain later, our strategy involves the exploitation of the large set of covariates that the information set we use provides.

The rest of this work is organized as follows, in the next section we present previous work on parental valuation of schooling, specifically what drives school choice; in the third section I briefly review the human capital model of investment in education, focusing the attention in the role of ability; the fourth section presents the data used and the econometric framework, the fifth section presents the main results, the last section concludes.

2. Literature Review

Aside from the appealing idea that parents look for schools that improve the academic achievement of children, some empirical evidence suggests that additional to academic scores, other factors seem also important. It is worth mention that this is not a comprehensive analysis of the types of choices that families have in the US regarding schooling decisions (for such a review see Hoxby, 1998), or a summary of the main studies regarding the impact of school choice programs (for this see Carneiro and Heckman, 2003). I simply present some of the studies that had look at determinants of school choice for parents, especially in the context of low income families, where interventions are more easily performed.

[3] For instance, Manski studies whether questions about expectations are less likely to be answered than other types of questions, a concern often stated as a reason not to use this type of data. He finds that there is no supportive evidence for this argument.

The idea that parents search for high performing schools has found considerable support in the empirical literature. Studying prices of houses that differ only by the school associated to the house, Black (1999) finds that parents are willing to pay a premium correlated with the test scores of the schools. Studying school choice patterns in Massachusetts, Fossey (1994) finds that families send their kids to schools with higher test scores and lower drop out rates.

Jacob and Lefgren (2007) combine data from parents requests for specific teachers with principal's evaluations in a midsize school district, matching the requests of the parents to the specific characteristics that according to the principal each teacher has; the authors provide evidence that in low income schools parents are more concerned with the talent of the teachers to raise students' achievement, while in high income schools parents are more concerned with the level of satisfaction of the children, so parents actually ask for teachers that are capable of providing an enjoyable atmosphere in the classroom.

Aside academic achievement and agreeable environment, there is evidence that parents also take into account other factors when choosing schools, not strictly linked to (and probably in spite of) academic achievement. Studying search patterns in a website by parents in Washington, DC, Schneider and Buckley (2002) find that parents place an important weight on the race composition of the schools, specifically, that information related to the race composition of the schools is consulted *first* than data related to academic features of the schools.

It is important to notice that, while these results suggest that other factors independent from academic scores might matter, perhaps parents care for these variables because they realize that difficult environments will end up affecting their kids' performance. In this sense, a good atmosphere or racial composition of schools are not really obscure 'tastes', but fundamental inputs in the human capital production function that parents acknowledge when making schooling decisions.

When parents are choosing schools they face uncertainty on the quality of the schools they can choose from. Hastings, Van Weelden and Weinstein (2007) study the effect of providing direct information on test scores to low income families that are subject to a school choice program in a school district in North Carolina; they find that by reducing the cost of getting information on schools, parents end up choosing schools with higher scores than they would had otherwise.

There seems to be not much work regarding the impact of assessed ability on school choice, although a way that a related issue can be studied is the impact of kids' previous outcomes on school choice, because assessed ability and outcomes might be very correlated. Studying the effect of two experiments in the Charlotte-Mecklenburg Public School District that provided parents with accessible summarized statistics on schools so they will choose their preferred school for their children, Hastings and Weinstein (2008) find a positive correlation between previous scores and scores from first-choice schools.

In sum, the main determinants of school choice that have been studied are academic achievement, pleasant environment and race and socioeconomic composition. To our knowledge little has been done regarding the effect of different levels of assessed ability on school choice, despite the fact that, as the next section shows, assessed ability plays an important role in schooling decisions according to the human capital model.

3. Analytic Framing

To understand the possible implications of differences in assessed ability, I sketch a simplified version of the seminal human capital model by Gary Becker and Nigel Tomes[4], concentrating in the case where families have only one child. Parents maximize an indirect utility function subject to their earnings and the production function of human capital of the child (H_c), which is a function of the investment that the parent makes (y_c) and the ability of the child (A_c)[5]. Specifically, the production function of human capital of the child takes the form:

$$H_c = f(y_c, A_c)$$

$$f_Y > 0 \quad f_{YY} < 0 \quad f_A > 0 \quad f_{YA} > 0$$

The implications for different levels of ability are quite different if we consider perfect or imperfect capital markets. With perfect capital markets, an increase in the level of ability from A_0 to A_1 will unambiguously lead to an increase of the level of investment[6], as shown in Figure 1.

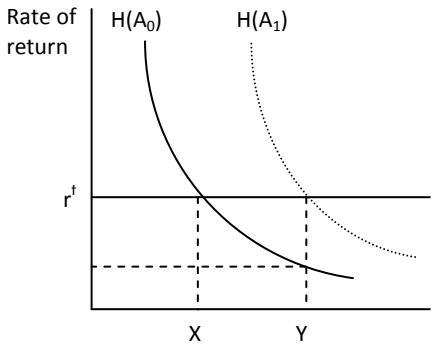

Figure 1. Ability with Perfect Capital Markets

As shown in Becker and Tomes (1986), perfect capital markets allow parents to separate their decision on y_c of their resources and any level of altruism they might have, so they invest in their kids up to the marginal return of y_c equalize the market interest rate (R_m):

$$rf_y = R_m$$

[4] Becker, G. and N. Tomes (1986). Human Capital and the Rise and Fall of Families. Journal of Labor Economics, Vol. 4, No. 3, pp. S1-S39.

[5] To focus on the implications of different levels of *A* we ignore the effect of different human capital stocks of the parent.

[6] The key assumption is complementarity between y_c and A_c ($f_{YA} > 0$).

where the parameter *r* scales human capital to earnings.

With imperfect capital markets, changing ability has ambiguous effects. In Panel (a) of Figure 2 the level of investment that parents will choose with a low ability child is X and increases to Y when the child has higher ability. However, contingent on the form of the indirect utility function and the human capital production function, we can also have cases where higher ability implies lower investment; as shown in Panel (b).

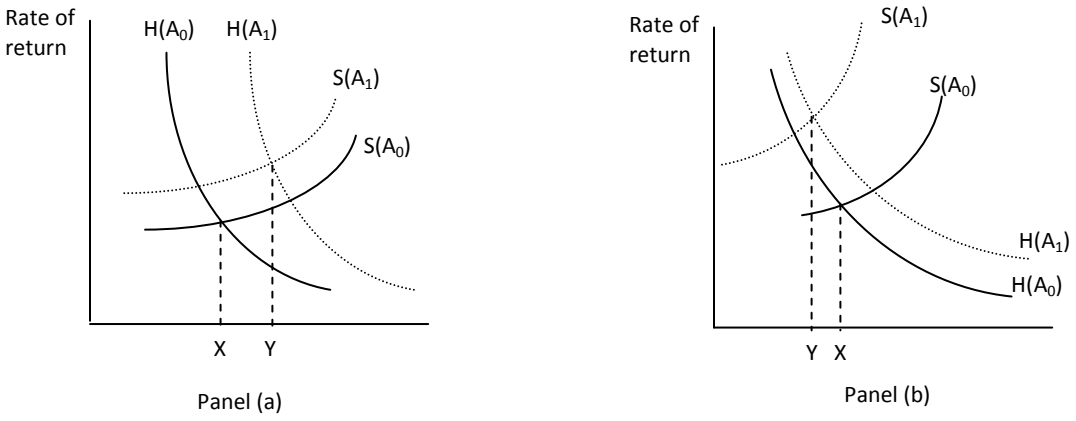

Figure 2. Overestimation of Ability with Capital Constraints

Without further assumptions, little can be said about the effect of higher ability on investment in human capital when there are imperfect capital markets. High income parents will be more likely to leave bequests (aside from the investment in human capital); in this case imperfect capital markets are not really setting an active constraint, and we can think that high ability will cause more investment.

Parents that wouldn't leave financial bequests, on the other hand, will equalize the marginal utility of their own consumption to the marginal utility of investing in their child's human capital. From the second order conditions (see Appendix 1) we get:

$$\frac{dy_c}{dA_c} > 0 \qquad iff \qquad \frac{f_{yA}}{r f_y f_A} > -\frac{V_c''}{V_c'}$$

Where V_c stands for the utility function of the child. When the marginal utility that the parent gets from the child's consumption decreases very quickly ($V_c^{''} << 0$), the parent will tend to invest *less* in education when they consider their child *abler* than his peers. The intuitive explanation for this is that greater ability not only makes more profitable to invest in human capital (a substitution effect), but also reduces the marginal utility that the parent derives from the utility of the kid, which incentivizes parents to increase their own consumption (an income effect). The effect of ability on investment is then, ambiguous, and it depends both on the shapes of the production function of human capital and the utility function.

When we consider families with more than one child (and subject to capital constraints), even if parents are neutral among their children there could be differences in the level of education investment on each child if there are differences in the assessed ability of each child. Becker (1993) explains how parents face a conflict between efficiency and equity among differently endowed children. If parents prioritized efficiency over equity, a greater investment would be made in the abler child, but if parents are more concerned about equality, less able children might end up receiving a higher investment in education.

In sum, the human capital model gives a specific prediction for the effect of assessed ability on investment when there are no capital constraints, which is probably the scenario that high income families face, but unless we impose some additional structure, is difficult to derive specific predictions when there are capital constraints.

To link this framework to observable data, we use school choice as a measure for investment in human capital. In particular, we look at the effect of ability on the probability that the school is chosen, which implies a high level of investment (at the very least, the search costs), as opposed to a school that is assigned, that indicates a low level of investment. Although this measure for human capital investment is probably an oversimplification of the multidimensionality inherent to the investment that parents make in education, the decision of the school is probably one of the most important aspect of this investment, at least outside the household.

4. Data and Empirical Approach

The Early Childhood Longitudinal Study - Kindergarten follows a representative cohort of US children at kindergarten, first, third, fifth and eight grades. The data is described in detail in U.S. Department of Education, NCES (2001). It has substantial information on parental investment in children's human capital in terms of financial and time resources, children's outcomes measured by standard tests and assessments of parents on their children. This information allows us to study the relationship between assessments and school choice.

The key parts of the survey for this work are parental assessments of children's ability and school choice at kindergarten. I use the base year file. It contains a sample of 21,260 child records, and information from two waves of data collection (fall and spring). The response rate for parent's questionnaire is 85.1, which is the main reason why the sample size is reduced for our results, summary statistics are presented using parent weights provided by the survey, which control for probability of being surveyed and non-response (for details see USDE, 2001).

ECLS-K provides a number of questions related to parental assessment on their children, including how independent, attentive, active and able to solve problems the child is; in this work the focus is on the question quoted below, which I consider closest to assessed ability, leaving the rest of the assessment questions, more related to 'soft' skills, for further research:

Does {CHILD} learn, think, and solve problems ...

Better than other children {his/her} age,
As well as other children,
Slightly less well than other children, or
Much less well than other children?
REFUSED
DON'T KNOW

Henceforth I refer to the four possible levels of ability available in the questionnaire as very low ability (*vl*), low ability (*l*), average or middle (*m*) and high ability (*h*). A particular assessment *a* is indicated by the variable $A_c \in \{vl, l, m, h\}$. Table 1 presents descriptive statistics for the kindergarten sample and parents' assessments on their children's ability.

Table 2 presents information on whether the school is assigned or chosen, according to the interviewed parents, by socioeconomic level. For the lowest socioeconomic quintile only 17 percent of the children go to a school chosen by their parents, while the equivalent figure for the highest quintile is 43 percent. Not surprisingly, the socioeconomic level of a child is informative of the probability that she goes to a school chosen by her parents or to an assigned school. A similar situation is described by the proportions of children going to private schools, showed at Table 3. On average the penetration of private schooling in the US is 15 percent.

Using whether the school was chosen or not as a measure for investment in education, or even willingness to choose a school, can be problematic, as the fact of being in a chosen school is the product of i) That the parent applies to schools different from the one the child is assigned; *and* ii) That the child is accepted in the school. Because we are interested in the parental decision ideally we would prefer to have data that show whether the parent applied to other schools, while the variable we will use combines this with the fact that the child was accepted. This could be considered as a measurement error problem in the endogenous variable, hence, the nature of the problem depends on what assumption we made regarding the relationship between the error in the endogenous variable and the covariates.

If the error is independent from the covariates, we face an efficiency problem, but usual regression techniques provide consistent estimators; if we, on the other hand, consider that the error is correlated with the covariates, we could get inconsistent estimators (Wooldridge, 2002). The latter is probably the case we face when using school choice as a measure for human capital investment. This raises a major problem for identification in this work. A negative correlation between ability and probability of being in a chosen school could be determined by the fact that the parent is less likely to invest if he assess the child as low ability, but it could also be that the parent invested (search and apply to a school different to the assigned one) but the child got rejected because of his low ability endowment. As Table 4 shows, this is especially worrying as admission requirements seem to be considerably more common in chosen schools than in assigned. Although the data we use in this work does not allow us to isolate the decision of the parent from the acceptance policy of each school, we present in the next section evidence that suggests that parental decision making process plays the major role in the selection process.

The ECLS-K provides a large set of characteristics, among which, previous to Kindergarten schooling decisions are of most importance to our analysis. Table 5 shows information on whether, the year before kindergarten, children attend a Head Start program, center based child care and/or non-parental care. It's apparent how the Head Start beneficiaries are concentrated in the lowest socioeconomic quintile, consistent with what one would expect given the nature of the program; while the majority of kids that attend a prekindergarten school belong to the higher socioeconomic quintiles. The ECLS-K also provides information on the nature of the center based child care, that is, if it was a day care center, a nursery school, a preschool or a prekindergarten, Magnuson et. al. (2004) discusses the main characteristics of these different types of child care arrangements.

By controlling for pre-K variables we aim to offset the bias that endogeneity between assessed ability and school choice brings when using standard regression analysis. Specifically, we propose a model for school choice at Kindergarten (S_k) depending on parental characteristics (earnings – w_p, education level - H_p) and assessed ability of the child (A_c):

$$S_k = f(w_p, H_p, A_c)$$

Importantly, the level of ability depends also on parental covariates, and previous schooling decisions:

$$A_c = g(w_p, H_p, S_{k-1})$$

Although the potential investment decisions are not independent of the process that assigns ability level, using the rich set of covariates ECLS-K provides, I assume that:

$$S_k^{vl}, S_k^{l}, S_k^{m}, S_k^{h} \coprod A_c \mid X \qquad (1)$$

Which is equivalent to say that controlling for observable characteristics, in particular previous schooling decisions, we can take the assessed level of ability as independent of potential kindergarten schooling decision. To relate this to the standard program evaluation literature, we can think of the assessed ability as the 'treatment' that the parent gets, while the schooling decision he takes corresponds to the outcome, hence the assumption stated is then the equivalent of the Conditional Independence Assumption (CIA). Importantly, I also assume that there is a unique response to a given level of ability for each individual, the so-called stable unit-treatment value assumption (Rubin, 1980).

When evaluating a single treatment compared to no-treatment, or two treatments $D \in \{1,0\}$, Rosenbaum and Rubin (1983) show how if CIA holds, and

$$0 < \Pr(D = 1 \mid \mathrm{x}) < 1$$

Then the difference between treated and control outcomes means is an unbiased estimator of the average treatment effect at any value of the propensity score. Given the fact that we are dealing with multiple 'treatments' (children assessed as very low ability, low ability, average and high ability), an extension from the bivariate treatment analysis is needed. We are interested in estimate the effect of assessing ability *a* instead of *a'* in the population that gets ability *a*, that is the treatment on the treated parameter defined by:

$$\begin{aligned}\Delta^{a,a'} &= E[S^a \mid A_c = a] - E[S^{a'} \mid A_c = a] \\ &= E[S^a \mid A_c = a] - \underset{x}{E}[E[S^{a'} \mid X, A_c = a'] \mid A_c = a]\end{aligned}$$

As Lechner (1999) shows[7], the CIA in equation (1) identifies $\Delta^{a,a'}$ providing that $P^a(x)P^{a'}(x)>0$, the usual common support condition already mentioned but now in a multivariate version. Furthermore, if (1) holds, Lechner derives a one-dimensional balancing score:

$$S_k^{a'} \coprod A_c \mid [X = x, A_c = a, a'], \forall x \in \chi \quad \rightarrow \quad S_k^{a'} \coprod A_c \mid [P^{a|a,a'}(X = x), A_c = a, a'], \forall x \in \chi$$

$$if \quad 0 < P^{a'|a,a'}(x) < 1$$

This means that if conditioning on X (on the subset of the two treatments we are comparing) randomizes the potential outcomes for $A_c = a'$ (a weaker assumption than (1)), then a conditional propensity score can also randomize treatment assignment, which reduces the estimation problem to a one dimension one.

This paper follows the general protocol Lechner (1999, 2002) provide for dealing with multitreatment evaluations (for details on the procedure used here see Appendix 2). In short, I estimate an ordered probit model to predict the probabilities for assessing the child as very low ability, low ability, average and high ability $[\hat{P}^{vl}(X), \hat{P}^{l}(X), \hat{P}^{m}(X), \hat{P}^{h}(X)]$ for each parent. The balancing score is a rescaling of these probabilities depending on which two treatments are being compared. As the majority of children are assessed average by their parents, I present the effect of being assessed very low ability, low ability, and high ability compared to average.

5. Results

Table 6 presents the main results from a Linear Probability Model of assessed ability and a large set of covariates on the variable for school choice. Parents that assessed their child as high ability are around 2 percent more likely to choose a school rather than to take the assigned one. The estimate for low ability is negative but not significant. The children that are assessed as very low ability are 7 percent less likely the school they attend was chosen by their parents. Including controls for previous schooling decisions affect little these estimates (second column). The results indicate that parents consider child's ability an input on their decision on whether

[7] See also Imbens (2000).

to choose a school or not, and that they will invest more if their kid is regarded as high ability and less if he is assessed very low ability.

As mentioned in the previous section, is difficult to determine whether these results are driven by parents choosing schools according to the ability of their children, or by schools segregating children through admission requirements. Column 3 presents regressions of assessed ability on school choice restricting the sample to children in schools with none of the admission requirements listed in Table 4. The signs of the coefficients of interest remain the same using this subsample. Although the coefficient for very low ability ceases to be significant at standard levels, its p-value doesn't change much (from 5 to 11 percent). It is difficult to say if these results are a consequence of reducing efficiency by restricting the sample, or if the process generating the data for children in schools with no admission requirements is different from the one of the whole sample. For now we will assume that denying admission is not playing a major role in the selection process, but clearly further research is needed in this front, and the use of other measures of human capital investment, such as tuition payments and time spent with child might improve the validity of the causal mechanism studied here.

To test whether the hypothetical income effect offsets the substitution effect associated to variation in ability, we include interactions of the levels of ability with income (third column). If there was any income effect we should see either: i) A negative value for the intercept for high ability and a positive value for its interaction with income, so low income households with high ability children invest less in them, but with the increase in income the financial constraints relax and high ability starts to be correlated with a greater probability of having the school chosen; or ii) A positive value for the intercept for low and/or very low ability, with a negative interaction of these terms with income. As the results show, none of the intercepts have the expected sign under the hypothesis that the income effect offsets the substitution effect, which suggests that the decision process is mainly driven by the substitution effect.

To study if having siblings affects how ability determines investment, I introduce interactions between the four levels of assessed ability and a dummy variable for having siblings. Because we lack information on siblings' assessed ability, is hard to make any sensible prediction regarding the interaction terms, so we focus on the not interacted parameters, which capture the effect of ability on children with no siblings. The estimate for high ability more than doubles, while the estimate for low ability is now significant and similar to the one we obtained for very low ability children in column 2. The increase in absolute value of both estimates was to be expected as the theoretical model gives clearer predictions when the household has one child than when it has two or more.

It is important to highlight that the regressions commented above are not weighted, because the weights provided by the ECLS-K control for nonresponse, this could compromise the use of such weights as their estimation uses information related to the schools (e.g. whether is catholic, private)which is endogenous to the variable I am trying to explain (school choice). Ideally first stage weights will be reweighted in order to control for nonresponse, but using only

information exogenous to school choice (e.g. race), so the results presented here should be taken as preliminary.

The results using semiparametric methods are relatively similar. Using the predicted probabilities from an ordered probit model in assessed ability, conditional propensity scores $\hat{P}^{a'|a,a'}(x)$ are derived[8]. At this point is important to consider to what extent the comparison group used (children assessed as average) is similar to each of the three different treatments. Figure 1 presents smoothed densities of conditional propensity scores for being assessed very low ability, low ability and high ability, compared to average. As the distribution of the comparison group overlaps completely the distribution of treated, there is no need for trimming the sample (Heckman, Ichimura and Todd, 1998).

Table 7 present Average Treatment on the Treated effects using three different conditional propensity scores, all effects are with respect to average assessed children. The first column uses the propensity score derived from bivariate probits. Very low ability assessed children are less likely to have their school chosen, the coefficient is significant and considerably larger in absolute value than the one obtained by OLS. The coefficient for low ability is also negative but not significant. High ability children obtained a similar estimate to the OLS result. The second column presents the results using the one-dimensional conditional propensity score derived from the ordered probit, the results are fairly similar. Finally the last column presents the results using the correspondent pair of propensity scores from the ordered probit (for the first row these will be the estimated probabilities to be assessed very low ability and average), matching across Mahalanobis distances; the coefficient for very low ability is lower in absolute value, but remains significant at standard levels.

According to these results parents consider the level of ability of their children when deciding to look and choose a school instead of accepting the assigned one. The results are consistent with the model presented in the third section for the case where there are no financial constraints. Clearly these results don't implicate that there are no financial constraints in this market, it could also simply be that the income effect is not large enough to offset the substitution effect associated to a greater expected utility from abler children.

The results presented in this section suggest that children at risk are not only at disadvantage because of their inherent ability endowment, they are facing also a lower investment in human capital linked to their lower endowment.

6. Discussion and final comments

[8] Following Lechner's approach, the estimator used for the conditional propensity scores is:

$$\hat{P}^{a'|a,a'}(x) = \frac{\hat{P}^{a'}(x)}{\hat{P}^{a'}(x) + \hat{P}^{a}(x)}$$

This work presents evidence on the effect of assessed ability on human capital investment. These results are consistent with a very simple idea embedded in the standard human capital model, a greater expected return generates a greater level of investment. This could seem contradictory to recent findings in early childhood education, where large returns had been observed in at risk children. Indeed, at risk children interventions had received great attention in the last few years (e. g. Garces, Thomas & Currie, 2002; Heckman, 2008). The Perry Preschool is the epitomic early childhood intervention, exhibiting high returns especially in crime reduction (Betfield et. al. 2006). The human capital model sketched above doesn't explicitly consider the effects on investment decisions on crime, and probably it shouldn't. If we aimed to model the parental decision processes is not clear that effects on crime patterns should be included in parental decisions because, with the important exception of the incarceration costs paid by hypothetical caught criminals or other psychological costs associated to a life of crime, the costs linked to crime are bear by individuals external to the criminal's household (e.g. the victims, the judiciary system, the penitentiary system).

In other words, although at risk children interventions might have high social returns, they probably have average or low private returns, which explains the low level of investment of (possibly altruistic) parents; this also justify the existence of government intervention in this type of programs, instead of simply hand out cash transfers to low income families as a redistributive policy.

It would be useful to analyze the effect of assessed ability on the probability of participating in early childhood interventions, if the results founded here for school choice persist in the context of these programs, analysts evaluating these interventions should incorporate the fact that parents tend to participate more if their child is assessed as high ability; otherwise, evaluations of high cost schooling options might confound the effect associated to the schooling option studied and the effect of the ability of the children that are selected on those options.

It is difficult to derive policy recommendations at this point. One obvious advice is to refine the selection and screening procedures to try to select children at risk accurately on early childhood interventions, so they get better schooling options that their parents, in a rational and efficient decision process, provide.

The other implication of the evidence shown in this work is that it questions the validity of extending school choice as a strategy to improve the quality of the education system, specifically concerning at risk children. Policymakers should probably focus on alternative ways to increase the quality of education, rather than entrusting completely on parents to take a decision which effects are not completely internalized by them.

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Table 1: Summary Statistics

	Parent's Assessment: Does Child learn, think and solve problems…			
	much less	*slightly less*	*as well as*	*better than other*
Socioecon Quintile 1 (lowest)	0.45	0.34	0.20	0.14
SES2	0.19	0.24	0.22	0.16
SES3	0.11	0.20	0.21	0.18
SES4	0.18	0.13	0.19	0.22
SES5	0.07	0.10	0.17	0.29
Child's Characteristics				
Age	5.82	5.62	5.58	5.59
Female	0.31	0.36	0.49	0.52
Race				
White	0.49	0.50	0.56	0.61
Black	0.26	0.22	0.16	0.13
Hispanic	0.15	0.21	0.20	0.18
Other	0.10	0.07	0.07	0.08
School Choice				
Chosen*	0.19	0.25	0.28	0.34
Private	0.08	0.08	0.14	0.18
Number of Observations**	186	1284	10384	6075

*Includes assigned school was school of choice cases.
**In 144 cases parents answer the questionnaire but for this particular question chose not to answer, this accounts for only 0.8 percent of the surveyed parents.

Table 2: School Choice

frequency
row percentage

Assigned or Chosen School – Kindergarten

	Assigned	Chosen	Assigned is Chosen	Total
Socioecon Quintile 1 (lowest)	2,921	468	131	3,520
	83.0	13.3	3.7	100.0
SES2	2,743	688	175	3,607
	76.1	19.1	4.9	100.0
SES3	2,553	903	177	3,633
	70.3	24.9	4.9	100.0
SES4	2,314	1,126	132	3,571
	64.8	31.5	3.7	100.0
SES5 (highest)	2,051	1,410	161	3,622
	56.6	38.9	4.4	100.0
Total	12,582	4,595	776	17,953
	70.1	25.6	4.3	100.0

Table 3: Private or Public

frequency
row percentage

Private or Public School - Kindergarten

	Public	Private	Total
Socioecon Quintile 1 (lowest)	3,450	70	3,520
	98.0	2.0	100.0
SES2	3,362	244	3,607
	93.2	6.8	100.0
SES3	3,159	475	3,633
	86.9	13.1	100.0
SES4	2,829	743	3,571
	79.2	20.8	100.0
SES5 (highest)	2,510	1,112	3,622
	69.3	30.7	100.0
Total	15,309	2,644	17,953
	85.3	14.7	100.0

Table 4. Percentage of Children at Schools with Admission Requirements

	Total Children N=15,428	Children at Chosen School N=5,523
Admission test	5.70	15.17
Standardized achievement test	6.66	16.18
Special student needs	8.43	10.27
Special student aptitudes	3.35	5.24
Personal interview	13.09	36.03
Recommendations	7.56	19.10
Academic record	12.49	26.91
Religious affiliation	3.71	11.99
Lottery	5.31	8.11
Total	23.33	46.38

Note: Statistics using children-level weights for sampling and non-response

Table 5: Prekindergarten Schooling

frequency *column percentage*	Schooling Decisions Previous to Kindergarten			
	Head Start	Center Based CC	Non-Parental CC	Out of
Socioecon Quintile 1 (lowest)	1,278	964	274	3,520
	39.9	9.7	10.1	19.6
SES2	940	1,553	476	3,607
	29.3	15.6	17.5	20.1
SES3	600	2,062	581	3,633
	18.7	20.7	21.3	20.2
SES4	282	2,446	631	3,571
	8.8	24.6	23.2	19.9
SES5 (highest)	106	2,915	762	3,622
	3.3	29.3	28.0	20.2
Total	3,207	9,940	2,724	17,953
	100.0	100.0	100.0	100.0

Table 6. LPM of Assessed Ability on Probability of attend to a Chosen School

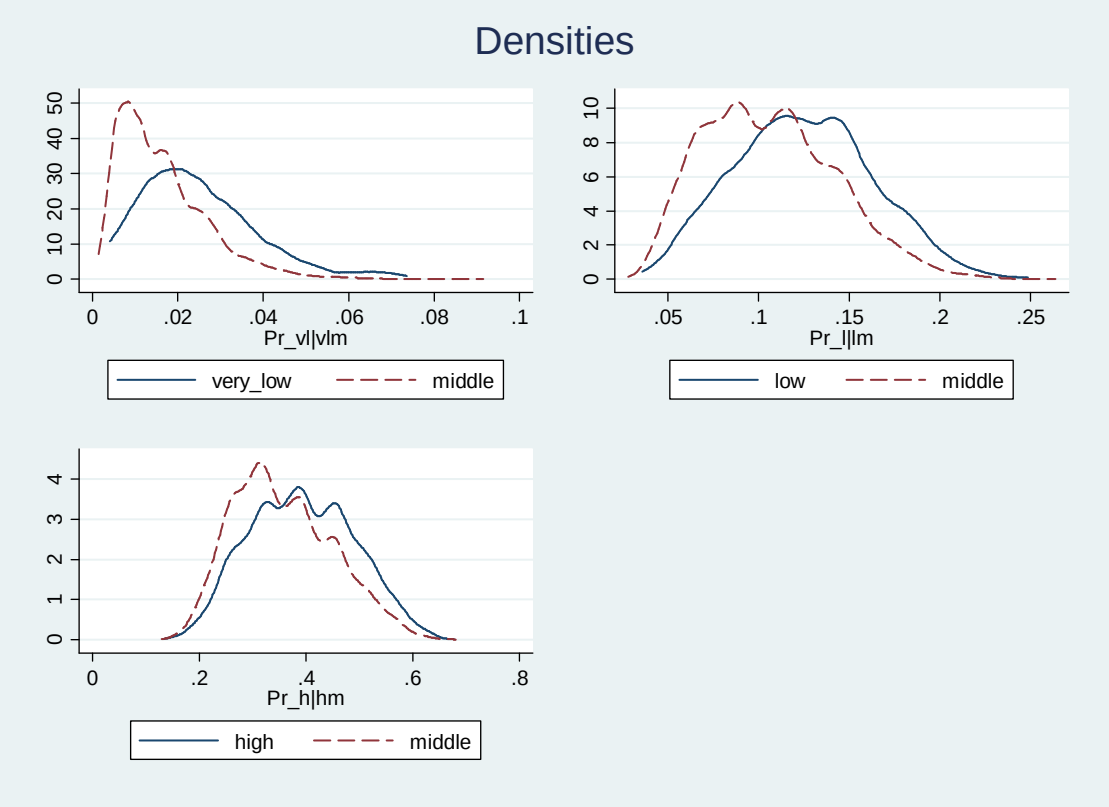
	Full Sample		No Requirement	Ability x Income	Ability x Sibling
High Ability	0.0214***	0.0189**	0.0222***	0.0452	0.0500***
	(0.01)	(0.01)	(0.01)	(0.08)	(0.02)
Low Ability	-0.0108	-0.00564	-0.00758	-0.0117	-0.0742**
	(0.01)	(0.01)	(0.01)	(0.13)	(0.03)
Very Low	-0.0691**	-0.0613**	-0.0498	-0.101	-0.0478
	(0.03)	(0.03)	(0.03)	(0.35)	(0.10)
Black	(0.01)	-0.00312	0.0082	-0.00307	-0.00124
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Hispanic	0.0109	0.0209*	0.0254**	0.0208*	0.0205*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Other	-0.0245**	-0.0144	-0.0122	-0.0144	-0.0126
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Female	0.00547	0.00581	-0.00301	0.00579	0.00603
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Head Start		-0.00161	0.0205*	-0.00155	0.000429
		(0.01)	(0.01)	(0.01)	(0.01)
Center Based Child Care Ever		0.0169	0.0166	0.017	0.0156
		(0.01)	(0.01)	(0.01)	(0.01)
Child Care Year Before K					
Day Care		0.0375**	0.0559***	0.0375**	0.0355**
		(0.02)	(0.02)	(0.02)	(0.02)
Nursery		-0.0701***	-0.0242	-0.0701***	-0.0700***
		(0.03)	(0.03)	(0.03)	(0.03)
Preschool		0.0645***	0.0328**	0.0645***	0.0636***
		(0.01)	(0.01)	(0.01)	(0.01)
Prekinder		0.109***	0.0426***	0.108***	0.107***
		(0.01)	(0.02)	(0.01)	(0.01)
Non Relative Care (Not Center Based)		0.0138	0.0382***	0.0138	0.0127
		(0.01)	(0.01)	(0.01)	(0.01)
Interactions with having sibling(s)					
High Ability					-0.0957***
					(0.02)
Middle Ability					-0.0571***
					(0.02)
Low Ability					0.0258
					(0.04)
Very Low					-0.0697
					(0.11)
Observations	17949	17843	13034	17843	17843
R-squared	0.07	0.08	0.03	0.08	0.08

*** p<0.01, ** p<0.05, * p<0.1

Robust standard errors in parentheses

Note: Includes nine dummies for parental education, one for having two parents and another for 'Other' family structure, and dummies for one, two and more than two siblings, three dummies for urban area, four dummies for census region and a fourth degree polynomial on the logarithm of income. The ability excluded is middle, the race excluded is white.

Figure 1: Kernel densities of Conditional Propensity scores.



Note: Conditional propensity scores calculated using $\hat{P}^{a'|a,a'}(x) = \hat{P}^{a'}(x) / (\hat{P}^{a'}(x) + \hat{P}^{a}(x))$. The Kernel function used is Epanechnikov, bandwidth 0.06.

Table 6. Matching Estimates on Probability of attend to a Chosen School (%)

	(1) Probit Models		(2) Ordered Probit Pr(a|a,a')		(3) Ordered Probit Pr(a), Pr(a')	
	Mean	(s.e.)	Mean	(s.e.)	Mean	(s.e.)
Very Low	-12.43	(3.01)	-12.76	(3.07)	-6.81	(3.12)
Low	-1.93	(1.36)	-2.13	(1.37)	-0.85	(1.38)
High	2.58	(0.80)	2.66	(0.80)	2.31	(0.81)

Note: Matching using Kernel functions. Kernel function used is Epanechnikov, bandwidth 0.06.

APPENDIX I

When parents don't consider leaving bequests, they maximize their indirect utility function:

$$\max_{\{c_p, y_c\}} V(w_p) = u\left(c_p\right) + aV(E_c = rf\,(y_c, A_c))$$

$$s.t. \qquad w_p = c_p + y_c$$

$f_Y > 0$, $f_A > 0$, $f_{YY} < 0$, $f_{YY} < 0$

First Order Conditions

$$\frac{\partial L}{\partial c_p} = u' - \lambda = 0$$

$$\frac{\partial L}{\partial y_c} = aV'rf_y - \lambda = 0$$

$$\frac{\partial L}{\partial \lambda} = w_p - c_p - y_c = 0$$

Combining first two FOC and differentiating with respect to A_c we get:

$$u''\frac{dc_p}{dA_c} = ar\left[V''(r(f_y\frac{dy_c}{dA_c} + f_A)f_y + V'(f_{yy}\frac{dy_c}{dA_c} + f_{yA})\right]$$

Differentiating third FOC and replacing:

$$-u''\frac{dy_c}{dA_c} - ar(V''rf_y{}^2 + V'f_{yy})\frac{dy_c}{dA_c} = ar(V''rf_A f_y + V'f_{yA})$$

This leads to:

$$\frac{dy_c}{dA_c} = -\frac{ar(V''rf_A f_y + V'f_{yA})}{u'' + ar(V''rf_y{}^2 + V'f_{yy})}$$

We can see that the denominator of this expression is strictly negative providing standard concavity assumptions, so the term as a whole will only be positive if:

$V''rf_A f_y + V'f_{yA} > 0$ Or: $\frac{f_{yA}}{f_A rf_y} > -\frac{V''}{V'}$

APPENDIX II – Participation Model

The most basic specification for ability assessment will include simply a measure for the ability of the parent, I use a set of nine dummies for parental education. A fourth degree polynomial of the logarithm of income is evaluated to control for flexibility to choose a school, as income level might also be correlated with assessed ability. Standard demographic characteristics such as gender, race, urban status and census region were also evaluated. Finally variables regarding previous to Kindergarten schooling decisions were also analyzed.

To select the covariates on the ordered probit model first I studied which set of variables provided the best prediction on each bivariate probits, and then include in the ordered probit each of the variables of the 'best' models for each probit. Following Heckman et. al. (1998) I iteratively included each variable and keep those that were significant at 5% level and improved the prediction power of the model. Data on successfully predicted outcomes of the 'best' models are provided in Table A1. The results on each probit model are available upon request. The results of the ordered probit are provided in Table A2.

Table A1: Performance of Selected specifications for probit models

	Prediction Percentage	
	Treatment	Comparison
Very Low Ability	71.6	63.9
Low Ability	64.5	57.5
High Ability	57.2	58.4

Table A2: Ordered Probit on Assessed Ability

	Coef.	(se)
Parent education Level		
9th to 12th grade	-0.1414	(0.06)
High School /Eq	-0.0279	(0.06)
Voc/Tech Program	0.0234	(0.06)
Some College	0.1842	(0.06)
Bachelor	0.3539	(0.06)
Grad/Prof School-No Degree	0.4786	(0.08)
Master	0.5259	(0.07)
Doc or Professional Degree	0.6087	(0.07)
Race		
Black	-0.0647	(0.03)
Hispanic	0.0114	(0.03)
Other	-0.0096	(0.03)
Female	0.1667	(0.02)
Income (Log)	0.0366	(0.01)
Family Structure		
2 Parents plus Siblings	0.1800	(0.06)
2 Parents no Siblings	0.3100	(0.07)
1 Parent plus Siblings	0.1847	(0.07)
1 Parents no Siblings	0.3280	(0.07)
Two Siblings	-0.0415	(0.02)
Three or more Siblings	-0.0706	(0.03)
Urban Status		
Central City	0.0464	(0.02)
Urban Fringe and Large Town	0.0167	(0.03)
Census Region		
Northeast	-0.1222	(0.03)
Midwest	-0.1230	(0.03)
South	-0.0972	(0.03)
PreK Schooling		
Head Start	-0.1245	(0.03)
Child Care	0.0416	(0.02)
Threshold 1	-1.6606	(0.14)
Threshold 2	-0.6941	(0.14)
Threshold 3	1.1954	(0.14)

Notes: The level of parental education excluded is 8th grade or below, the race excluded is white, the family structure excluded is 'Other', the urban status excluded is 'Rural and Small Town', the census region excluded is West.