Determinants of Parents' Education Expectations for Children in Low-Income Communities in Ontario

by

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An essay submitted to the Department of Economics in partial fulfillment of the requirements for the degree of Master of Arts

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Kingston, Ontario, Canada

September 2012

Acknowledgements

I am grateful to Professor Steven Lehrer for his supervision and encouragement, and to Rachel Ferreira for her ready support.

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1 Introduction

Parents play a significant role in determining their children's academic outcomes, through a combination of direct and indirect inputs into the child's "education production function". Past studies in economics have looked at parent education and family income as key components among these inputs (e.g. Le and Miller 2005, Frenette 2007). Authors in other disciplines hold the view that parents' expectations of children's ultimate education attainment represent another important input, and many have found a positive and significant effect of expectations on student achievement even after controlling for other parental inputs (e.g. Davis-Kean 2005, Englund 2004). Analysis of expectations in economics has to date been very limited, and typically focused on the expectations or aspirations of students themselves (e.g. Christofides 2008, Jacob and Wilder 2010) This paper therefore seeks to better understand the formation and revision of parent expectations as they relate to the education production function, by estimating an ordered probit model of expectations as a function of child and family characteristics.

To conduct our analysis, we introduce a new data set collected as part of the provincially-funded "Better Beginnings, Better Futures" program in Ontario, which follows children from junior kindergarten to age 18 in low-income neighbourhoods starting in the early 1990s. Using this data, we find that the influence of children's academic ability on parent expectations increases over time, while that of income decreases. However, while ability is highly significant for both boys and girls by age 18, income's significance at early grade levels is primarily driven by its effect on expectations for boys. This income effect remains even after controlling for parent education, though the effect of parent education rises while that of income falls over subsequent grade levels. For girls, parent education is found to predict expectations in junior kindergarten but not afterwards, with income never appearing to have a significant effect. Overall, average expectations are higher for girls than those for boys, and are less sensitive to changes in covariates over time.

Understanding this process is of particular interest when expectations are modelled as a function of parents' underlying preferences for children's education, preferences which are otherwise unobservable by researchers. Identifying the factors that predict expectations may suggest ways in which schools and policy-makers may influence or compensate for parent preferences, in order to improve children's schooling outcomes.

This paper is organized as follows. Section 2 summarizes a selection of previous studies that consider parent expectations in the education production function. Section 3 introduces the economic and econometric models used to analyze the Ontario data, described in Section 4. Section 5 reports and discusses the estimation results, and Section 6 concludes.

2 Background on parent expectations

The relationships between various inputs to the education production function have been extensively examined by studies in psychology and child development. Table 1 provides a very brief overview of some such studies which analyze parents' ideas about their children's ultimate education attainment. Note the distinction between parents' aspirations and expectations, both of which are used in the listed studies: while the former reflect the educational outcomes that parents would like to occur, the latter indicate those that they believe will actually occur. Jacob (2010) finds that aspirations are on average higher than expectations, and less likely to vary with new information. The levels of the two are nevertheless positively related to each other, and similarly related to other variables. For example, sending a child to a school that emphasizes academic achievement is likely to increase both hopes and beliefs that the child will proceed to higher education in the future. As a result, studies on either expectations or aspirations often treat the variables similarly, and both provide useful insights on parents' role in the education production function.

A large proportion of studies in this area have found that expectations are positively and significantly related to student achievement (e.g. Englund et al 2004, Davis-Kean 2005). Channels through which this relationship occurs may be inferred by testing whether the results are robust to the inclusion of additional covariates. For example, Hao and Bonstead-Bruns (1998) find that the positive relationship of parent and child expectations disappeared after controlling for parent-child interactions, suggesting that expectations were related only indirectly through their common relationship with these interactions. However, even when the relationship remains significant, this does not necessarily indicate a direct causal effect between parent expectations and covariates, but rather that expectations reflect relevant variables that are unobserved by the researcher. For example, Benner and Mistry (2007) find that maternal aspirations affect student scores more than teachers' aspirations do. While this may to some extent suggest the greater influence of parents than teachers on student behaviour, it may also reflect that parents observe more information about the child (effort, time spent on homework, etc.) than do teachers, and account for this when forming their beliefs about the child's future, such that maternal aspirations are better aligned with student performance.

Despite these relationships found between expectations and other schooling inputs, Jacob and Wilder (2010) find that covariates have become less predictive of student expectations over time as the average level of expectations has risen. Though student characteristics, particularly socioeconomic status, remain significant factors, it appears that a portion of the variation in expectations is due to general economic or social trends rather than individual characteristics. Foley (2011) models these as components of parent aspirations, characterized as "altruism" (reflecting the returns to education given a child's particular characteristics) and education as a "merit good" (where education is valued for its own sake, independent of the child's ability or preferences). The ability to model the expectation updating thus depends on the extent to which expectations depend on individuals' characteristics rather than trends shared across cohorts.

For policy-makers, analyzing factors relevant to schooling is of particular interest in the context of poverty. Zhang (2011) finds that high maternal expectations are positively related to student enrolment in low-income, rural villages in China. This effect is greatest among low-income families, however, expectations themselves tend to be lower in these households. De Civita et al (2004) reach similar conclusions in their student of maternal aspirations and student scores in Quebec. This suggests that while parent beliefs may offset the negative effect of poverty in the exceptional households where expectations are high despite poverty, this does not significantly improve academic outcomes overall in such environments.

The above studies rely on survey data provided by individuals about their beliefs. There has traditionally been scepticism in the economics literature of the reliability of self-reported data for variables such as parents' education expectations, since subjective answers may not be comparable across respondents and may even be misreported. However, Manski (2004) argues that this scepticism is not necessarily justified. In particular, he argues that the use of subjective expectations avoids the need to make restrictive assumptions about the relationships between individuals' beliefs and actions, as would be required to instead infer beliefs from data on observed behaviour. Estimation based on self-reported data may therefore be very informative in evaluating the relationship between parent expectations and relevant characteristics affecting child academic performance, as long as the limitations are considered in the final interpretation of the results.

3 Modelling Parent Expectations

Children's scholastic achievement may be modelled as the outcome of an education production function in which the characteristics of a child, family, school, and community contribute to the child's academic performance and ultimate education attainment. Parents are able to control many of these factors either directly, such as by helping the child with homework, or indirectly, such as by sending the child to a school which offers particular programs or resources. We assume that parents' exercise of this control is motivated by altruism, where they choose a combination of factors to maximize the child's welfare subject to time constraints, monetary costs, and the child's intrinsic ability. We further assume that that children cannot respond to parent inputs, at least within a given period, to avoid potentially offsetting effects of child behaviours.

While parents' investment choices may be observed by researchers, the function by which parents relate them to expected welfare depends on their underlying preferences. For example, if their own parents emphasized the importance of a university degree, they make take it as given that more education is better than less, and so may aim for a higher level of education for their child than another parent facing the same set of inputs. Since researchers cannot observe these underlying preferences, their measurement of the utility function used by parents to relate education outcomes to child welfare depends on parents' "revealed preferences", as represented by their investment decisions. Given the degree of control parents have over the factors that determine children's

Table 1: Overview of selected studies of parent beliefs about students' education achievement

Paper	Data	Analysis	Findings
Benner and Mistry (2007)	low-income children aged 9-16 in Wisconsin, 1994-97	Path analysis comparing the effect of maternal and teacher expectations on children's academic performance.	Students' academic outcomes and own expectations are positively associated with maternal expectations, while there is no significant relationship with teacher expectations.
Davis-Kean (2005)	8-12 year olds in the US, 1997	Structural equation models relating parent education, income, and race to child achievement, through channels including parent expectations.	Expectations account for a significant share of the effect of parent education on child achievement, for both European- and African-American families.
De Civita et al (2004)	K - gr. 6 students in Quebec, 1986-92	Hierarchical logistic and multiple regressions of the extent to which maternal aspirations mediate the negative effect on of poverty on children's academic outcomes	Poverty is associated with lower maternal aspirations and higher rates of children's academic failure, though the likelihood of failure is almost 50% lower in high-aspiration than low-aspiration households.
Englund et al (2004)	low-income children in Minnesota, from infancy to gr. 3	Path analysis of the relationships between parent and child characteristics and children's academic performance in grades 1 and 3	There is a positive relationship between parental involvement in school activities and child's achievement in both grades 1 and 3, which holds for grade 3 even after controlling for grade 1 achievement.
Foley (2011)	US National Education Longitudinal Study of gr. 8 students, 1988 (NELS:88)	Reduced form models of how parents' and children's expectations evolve over time and relate to each other.	Children whose parents have low expectations are more likely to have low expectations for themselves, and to revise them downward as they get older. Parent expectations depend on both parents' underlying values of education as well as the perceived returns to schooling for the child, given the child's evolving academic performance.
Fortin et al (2011)	US Monitoring the Future surveys of youth gr. 8 - 12, 1976 - 2009	Linear probability model of the effect of parent characteristics and aspirations on student achievement.	The positive effect of aspirations on achievement is strongest in middle school, and is greater for girls than boys.
Hao and Bonstead-Bruns (1998)	NELS:88	2SLS estimation of the effects of parent and child characteristics on expectations	There is a positive relationship between child and parent expectations, which becomes insignificant after controlling for parent-child interactions.
Jacob (2010)	middle- and high school students in the US Midwest	Factor analysis of the distinction between parent expectations and aspirations; one-way ANOVAs assessing the level and stability of parent expectations.	Expectations and aspirations are highly correlated, though the latter are higher than the former. Parent education and student achievement are positively related to the level of parent expectations, and achievement is also positively related to the stability of parent expectations.
Jacob and Wilder (2010)	various panels of high school students in the US	OLS regressions of how students update their expectations during and after high school.	The overall level of expectations over time has increased substantially. Updating by individual students is in part based on new information, particularly academic scores. Though this is especially true for marginal students, over 60% of students update their expectations at least once after grade 8.
Zhang (2011)	rural children aged 9 12 in China, 2000 - 2007	Logit models of the effect on student enrolment of child and family characteristics, including maternal expectations and the discrepancy between these and the child's own expectations.	Maternal expectations are positively related to children's chances of staying in school, especially at higher grade levels and in low-income households.

education outcomes, these investment decisions correspond to parents' education expectations, such that expectations act as a proxy for parents' underlying or "latent" utility function of the child's education.

With a categorical variable representing expected education levels, studying expectations simplifies the continuous utility function into a set of "bundles" which parents choose between to maximize child welfare. This paper groups education expectations into three levels: high school graduation or less, completion of a college program, or earning at least one university degree. Treating this variable as continuous would impose that the change from high school to college expectations is the same as that from college to university. This is not necessarily true, as the increase in costs and returns of obtaining any level of post-secondary education (PSE) over a high school diploma are likely greater than those between subsequent levels of PSE. However, the categories do represent increasing levels of both time/monetary costs and earnings potential, and treating the expectations variable simply as a categorical variable does not take advantage of this natural ordering. Expectations are thus represented by an ordered probit model to reflect the categorical nature, natural ordering, and underlying utility function of the expectations data [1].

3.1 Econometric model

The ordered probit model is a generalization of the probit model used for binary dependent variables. As with a binary variable, the estimation fits parameters of a latent variable to a linear function of a vector of inputs x, with a random error term u that is assumed to be normally distributed. Where the latent variable represents parent expectations $pexp*$, this function for an individual i is expressed as follows:

$$pexp*_i = x_i'\beta + u_i, u_i \sim N(\overline{u}, \sigma^2) \tag{1}$$

The standard cumulative normal function Φ then transforms the estimated latent function into the probability that the observed dependent variable $pexp$ is equal to each of its categories. The

[1] Another way to model the evolution of expectations over time is with a Bayesian Learning Model. This model is not used in this study because it requires observations to have data on both current and previous-period expectations, this would have excessively reduced the samples studied here, due to high rates of missing data. However, notes on how such a model may be applied in cases of better data coverage are included in Appendix A.

marginal effects predicted by an ordered probit model are therefore not directly represented by the coefficients reported after estimation. Rather, estimation of Equation 1 yields estimates for the coefficients β as well as for cut-off points between the categories, which are used to calculate the marginal effects according to Equations 2 - 4 below. In this case, with three categories of the dependent variable for education expectations, two cut-off points are estimated, μ_1 and μ_2; the outside cut off points are not estimated, as μ_0 = -∞ and $\mu_3 = \infty$.

$$Pr(pexp = 1\,|x) = Pr(-\infty < x'\beta < \mu_1) \;= \Phi(-x'\beta) \tag{2}$$

$$Pr(pexp = 2\,|x) = Pr(\mu_1 < x'\beta < \mu_2) \;= \Phi(\mu_1 - x'\beta) - \Phi(-x'\beta) \tag{3}$$

$$Pr(pexp = 3\,|x) = Pr(\mu_2 < x'\beta < \infty) \;= \Phi(\mu_2 - x'\beta) - \Phi(\mu_1 - x'\beta) \tag{4}$$

As a result, we know that the marginal effects of the regressor on the probability of expecting HS completion (pexp=1) will have the same sign as the estimated coefficients, and the opposite sign as the probability of expecting university completion (pexp=3). We cannot predict pre-estimation the relationship between the sign of the estimated coefficients and marginal effects on the probability of expecting college (pexp=2), because this depends on the relative densities of the fitted values.

As a baseline specification, we model parent expectations *pexp* as a function of child gender, child ability as represented by test scores, family income, ethnicity, and site, as expressed in Equation 5 below. We estimate this model separately for each period t of four survey rounds. Treating the data as a series of cross sections in this way does not fully take advantage of the panel structure of the data, and fails to control for individual fixed effects. However, it allows the effects of covariates on expectations to differ in each round, providing insight on how the expectations formation process evolves over time. It also permits the consideration of variables that are available for only a subset of the sample periods.

$$pexp*_{it} = \beta_{0t} + \beta_{1t} male_{it} + \beta_{2t} score_{it} + \beta_{3t} income_{it} + \beta_{4t} Asian_{it} + \beta_{5t} site_{it} + u_{it}, u_{it} \sim N(\overline{u}, \sigma^2), t = 1, 2, 3, 4 \tag{5}$$

Equation 5 represents a contemporaneous model, where the included covariates are observed in the same period as the dependent variable. This circumvents the issue of reverse causality. For example, parent expectations are likely influenced by child academic performance, but this performance may also be impacted by parent behaviour related to their expectations. Although expectations may be updated within one period in response to the observed grades, expectations formed at the end of a period would not effect grades in that same period. As the variables are contemporaneously linked only in one direction, reverse causality should not lead to bias in the estimated parameters.

The assumptions of a contemporaneous model are that (1) only contemporaneous variables matter for the dependent variable, or that (1') inputs do not change over time, and that (2) contemporaneous variables are not related to unobserved factors that persist over time (Todd and Wolpin 2003). The assumption that inputs do not change over time is certainly justifiable for child characteristics such as gender, ethnicity, and parent education. For those variables that do change over time, the assumption that only their contemporaneous values matter may be true to at least a certain extent. For example, current test scores may be more relevant than past scores, as parents revise their expectations on the latest information about their child's ability that they receive, rather than equally weighting scores observed over the child's whole academic history.

The assumption that contemporaneous covariates are unrelated to unobserved components of the error term is not necessarily realistic. For example, a child's mental capacity may be observed by parents and thus related to expectations as well as academic performance at each grade level. On the other hand, many relevant yet unobserved factors may not persist over time, such as the effect of a particularly good or bad teacher on a child's motivation and academic achievement in the particular grade for which they have that teacher.

4 Program Description and Data

4.1 Better Beginnings, Better Futures Program

The Better Beginnings, Better Futures (BBBF) Program was implemented in Ontario in the 1990s as an initiative to support child development in disadvantaged neighbourhoods through the provision of comprehensive and community-targeted programs. For example, projects implemented under BBBF included after-school activity groups, parenting workshops, and neighbourhood safety initiatives (Peters et al 2010). The program was funded by the provincial government and implemented by an independent group of researchers from several Canadian universities. The three communities of Cornwall (located in Eastern Ontario), Sudbury (Northern Ontario), and Highfield (Greater Toronto Area) were selected as "treatment" sites in which the program activities were offered. The two communities of Etobicoke (Greater Toronto Area) and Vanier (Ottawa) were studied as control sites, in which no special programming was offered. The five sites were characterized as "very economically disadvantaged", as measured by high unemployment, high numbers of families below the poverty line, and high numbers of children living in households receiving social assistance and/or subsidized housing. Although the distribution of pre-program characteristics across treatment and control sites was not perfectly random, this does not limit the data's usefulness from this study's perspective, as we do not seek the evaluate the effectiveness of the intervention, but rather simply take advantage of the longitudinal data collected as part of the program evaluation.

The focal cohort of children studied was born in 1989-90. The first round of data collection focused on these children when they were four years old and entering Junior Kindergarten (JK), a free half-day school program in Ontario. This was followed by a short-term research period until 1998, and subsequent follow-up rounds when the children were in grades 3, 6, and 9, and then at ages 18-19. Data was collected from school administration records, interviews with teachers and parents, and interviews with the children themselves starting in grade 9. The original sample includes 959 children in JK, with 601 of them from treatment sites and 358 from control sites. Both types of site exhibit an attrition rate of about one-third, with 626 children surveyed in the latest follow-up round, with 401 from treatment sites and 225 from control sites.

4.2 Variables

This paper uses data collected in the four rounds of interviews and administrative records of the BBBF program. The dependent variable of interest, parent expectations of their child's eventual education attainment, is collected from JK and grade 3 parents through the survey question "What is the highest level of schooling that you think your child will complete?" Answers are recorded as an ordinal variable, where categories indicated by a higher rank correspond to higher levels of schooling, from 1="no formal schooling" to 7="completed university degree". In the grade 9 and age 18-19 surveys, the question is changed to measure parent aspirations rather than expectations. The revised question is "How far do you hope your child will go in school?", and the response categories range from 1="elementary school" to 5="university." The change from expectations to aspirations means that neither variable may be tracked across the entire period of the panel. Due to the similar nature of the variables, this paper will treat both sets of responses as "parent expectations" in order to compare models and estimates over the period of study. Since aspirations are on average higher than expectations, an increase in "expectations" from grades 3 to 9 would not necessarily provide evidence on the updating process, as we cannot distinguish between changes due to new information and changes due simply to the different variable. Interpretation may be further complicated by different parents being surveyed in the different periods, such that part of the variation in expectations over time may reflect parents' different personal processes through which they form expectations based on a given set of information [2]. However, it appears that mothers make up the majority of the respondents, in which case the parent respondent is likely the same over time for most children. Assuming that there is no particular reason explaining those cases where fathers respond instead, this imprecision in identifying the respondent would not be expected to systematically bias results either up or down.

Children's academic ability is measured by various test scores appropriate to their grade level. In JK and grade 3, ability is represented by a child's score on the Peabody Individual Achievement Test, which assesses reading, mathematics, and spelling skills (Pearson Education 2012). The scores have been standardized to approximate a normal distribution. Education Quality and Accountability Office (EQAO) math scores, taking integer values from 1 to 4, are used for grade 9 students, as these scores are standardized across Ontario, making marks more comparable between sites and schools. For students at ages 18-19, we use the final grade average from the Ministry of Education, which again are standardized across the province and fit to a normal distribution.

[2]Not all survey rounds collect enough information to uniquely identify the respondents, so estimation of the model cannot control for parent identity.

Family income is the parent respondent's approximation of their family's monthly income, quoted in \$10,000. When respondents were unable or unwilling to give a precise value, they could instead report a minimum and maximum income level, which we averaged to get a monthly income value. Although the BBBF program was targeted at sites characterised by poverty and low incomes, there is nevertheless variation in this variable as the program was designed to be "universal", affecting and monitoring all individuals within a community, even those with much higher or lower incomes than average. Where missing, income was imputed as the appropriate period- and site-specific average. [3]

Parent education is represented as an ordinal value, ranking the highest level education attained by the parent respondent from 1=none to 11=university graduate degree. The education of the respondent's partner was also collected, where applicable. We combine these values to a single variable capturing the highest education level attained by either parent. As this is unlikely to change over the survey period for the vast majority of parents, missing values were set equal to values in the previous period [4]).

Children's ages were also imputed, when necessary. Actual values were recorded to the day, and the average age difference between rounds was found and added to the previous-period age of any child with an unreported age in a particular period.

Data on race was not collected, though parent respondents could identify themselves by up to three ethnicities. These include cultural, linguistic, and regional groups from both within Canada and abroad, including First Nations status. We used this data to create a series of ethnicity indicators corresponding to broad geographical categories, and found that the "Asian" indicator accounted for the majority of ethnicity's significance in the model [5]. To preserve degrees of freedom, only the "Asian" indicator is included in the estimation model, where an individual is classified as Asian if at least one of the reported ethnicities corresponds to a country in Asia.

Several additional variables may provide relevant information on expectations, though are not available for every survey round. For example, children are interviewed directly in the last two

[3] An indicator of 'income imputed' is not found to be significant in estimation of the model, and is therefore omitted from the regression results reported in Appendix B

[4] An indicator of 'parented education imputed' is not found to be significant in estimations of the model.

[5] This result is robust to alternative classification of the ethnicity indicators. Results available upon request.

survey rounds, and an index of their relationship with their mother is constructed based on their responses [6]. In addition, children's aspirations for their own education attainment are collected in grade 9, as a categorical variable coded from 0 = middle school to 4 = more than one university degree. Children's expectations are collected at age 18-19, coded from 1 = less than high school to 6 = more than one university degree [7].

4.3 Sample characteristics

Period-specific averages of the variables described above are reported in Table 2 [8]. As would be expected, child gender, age, and ethnicity are consistent over time and reported for the vast majority of individuals in the sample. Parent education is fairly level over time, with the slight increase between survey rounds 2 and 3 driven by an increase in the number of college graduates. This may also contribute towards the increase in household income over time.

Data on academic achievement is available for less than half of the children in the sample, and the different measures make it difficult to compare scores over time. There is slightly better data coverage for parents' expectations and aspirations. Under the hypothesis that aspirations are greater than or equal to expectations for a given information set, for the mean and standard deviation of these variables to remain almost constant over time suggests that either (a) parents' aspirations and expectations are perfectly aligned by elementary school and are unchanged as the child progresses to high school, which seems unlikely, or (b) expectations and aspirations decline together over time, such that last-period aspirations are equivalent to earlier expectations.

As with parents, children's expectations and aspirations appear to be similarly level, and only slightly higher than those of their parents. More variation is seen in the other child-reported variable, an index of the child-mother relationship. It indicates that children's relationships with their mothers became closer from grade 9 to age 18, at least among the half of the sample which

[6]The mother-child relationship index is constructed as the sum of children's responses to the following questions: a. Overall, how would you describe your relationship with your mother? (1=very close, 2=somewhat close, 3=not very close); b. How well do you feel that your mother understands you? (1=a great deal, 2=some, 3=very little/not at all); c. How much fairness do you receive from your mother? (1=a great deal, 2=some, 3=very little/not at all); d. How much affection do you receive from your mother? (1=a great deal, 2=some, 3=very little/not at all).

[7]Children's expectations were recoded for reporting in Table 2 to be comparable to the other expectations variables, though the original variable as described here was used in estimation

[8]Imputed values are included in the averages reported for child age, parent education, and family income.

responded to the survey questions used to construct this index.

The sample sizes reported in Table 2 show that response rates vary between variables and survey rounds. Since only individuals with complete information in a given round are included in estimation of Equation 5, non-response even for one variable of interest represents “attrition” from the study. To the extent that this attrition is selective, it may lead to bias in the estimation results. To examine the degree to which attrition is non-random, we follow the approach taken by Ding and Lehrer (2010), who tested for attrition due to observables using the procedure developed in Becketti et al. (1988). This method uses OLS to estimate the significance of subseqent attrition on parent expectations, after controlling for the other observed covariates. In the below equations, the indicator Att_{i1} takes the value of 1 if an individual in JK is not present in at least one subsequent survey round after the baseline period, $t = 1$, and 0 otherwise. The remaining covariates are included in the vector X_{i1}. Equation 6 examines whether expectations are on average higher or lower for students who do not complete the survey in at least one survey round, while Equation 7 includes interaction terms between attrition Att_{i1} and covariates X_{i1}, to allow for differential effects between attritors and non-attritors.

$$pexp{*}_{i1} = \beta_{0t} + \beta_A Att_{i1} + \beta_X X_{i1} + u_{i1}, u_{i1} \sim N(\overline{u}, \sigma^2) \quad (6)$$

$$pexp{*}_{i1} = \beta_{0t} + \beta_A Att_{i1} + \beta_X X_{i1} + \beta_{AX} Att_{i1} * X_{i1} + u_{i1}, u_{i1} \sim N(\overline{u}, \sigma^2) \quad (7)$$

The results of estimating Equations 6 and 7 are reported in Table 14. Panel 1 of this table shows that parent expectations do not significantly differ between students who attrit and those who do not in subsequent periods. This provides no evidence to suggest that attrition patterns vary with the outcomes of interest, allowing us to treat all missing data as random. Panel 2 suggests that only among Asian children, representing 17% of the total sample, are there statistically different expectations between respondents with complete and incomplete information across survey rounds[9].

[9] Attrition may still be correlated with unobservables, but accounting for this in our model would require additional assumptions on the estimating equations, particularly on the functional form of the unobservables. We do not wish to introduce such assumptions which may misleadingly drive results about the variables of interest, particularly as we do not have reason to assume ex ante that attrition in this case is more likely due to unobserved than observed factors. Therefore, at this stage we proceed by assuming that the effects of attrition are as independent of unobserved factors as they are of observed factors. In Section 3 we test and find that our results are not sensitive to sampling

4.4 Trends in the data

While the overall mean and standard deviation of parent expectations are similar over time as discussed in Section 4.3, Figures 1 - 6 reveal that these summary statistics mask significant compositional changes over time.

Figure 1 shows that parents of girls and boys start out with similar beliefs in JK, but increasing portions of parents expect their sons to complete college rather than university by the time children reach age 18. In contrast, the parents of girls maintain fairly constant proportions of high school, college, and university expectations over time. However, the proportion of parents expecting the completion of high school or less declines overall through time for both boys and girls.

Figure 2 shows that parent beliefs are not distinguishable by child test scores in JK. Over time, however, parent expectations differ sharply by child ability, with parents of children who achieve above-average scores expecting dominantly at least some post-secondary (college or university), with university making up over 75% in total. Parents of students achieving average or below-average scores expect both a lower share of post-secondary overall, and university makes up a smaller portion of that.

In contrast, family income appears to become a much weaker predictor of parent expectations over time, as shown in Figure 3. While high-income parents expect higher portions of post-secondary and university completion in JK, the distinction fades over time to become insignificant by age 18.

Figure 4 classifies students according to their JK scores. In grade 3, JK scores remain somewhat significant predictors of expectations, though over time these become less significant, though this is gone by grade 9.

To examine the persistence of expectations, Figure 5 distinguishes students by the level of their parent's expectations in JK, as either university or less than university. Expectations of the former continue to be higher throughout the survey period, both for university and PSE, though the difference declines over time. Figure 6 distinguishes the same two groups, but compares the direction of revisions. The great divide in grade 3 reflects the upper bound to expectations of the second group. Expectations seem to balance until the revisions are the same in age 18.

definitions, which increases our confidence in this approach.

Figures 7 - 10 examine the geographical variation in expectations, and find that the site is a significant predictor in all cases, with the exception of boy- and girl- specific samples in grade 9 (note that these are the smallest samples). Expectations are on average highest in Highfield, and lowest in Sudbury. The geographical variation is highest in grade 3 and declines thereafter, though it is still more important at age 18 than it was in JK. These trends are observed when considering the sample for girls and boys separately as well as combined [10].

5 Estimation Results

5.1 Baseline model of parent expectations

The results of estimating the baseline model in Equation 5 for each survey round are reported in Tables 3 - 6 as marginal effects. Panel 1 reports estimates yielded by a regression of parent expectations for all children in the sample, while Panels 2 and 3 report those for girls and boys separately. Due to the relatively small sample sizes that result from dividing observations into these subgroups, bootstrapped standard errors are reported.

Table 3 shows that for the combined and male samples in JK, family income is positively and significantly related to parent expectations of university completion, while child gender, ability, and ethnicity are insignificant. In contrast, the only significant regressor for girls is the Asian indicator, which is positively related to university expectations. Table 4 shows that in grade 3, the Asian indicator becomes significant for the combined and male samples, while actually becoming insignificant for girls. Child ability also becomes significant for the combined sample.

There is insufficient variation in the parent expectations of grade 9 students to estimate the model on only girls, so Table 5 reports only the results of estimation on boys and on all children combined. Even though the male sample is large enough for estimation, it is also much smaller than in the earlier rounds [11], so note that the standard errors are high and thus Wald test statistics

[10] The same patterns are observed when breaking the sample into high/low ability students (as measured by test scores above/below average) instead of boy/girl; see Figures 11 - 14 in Appendix C.

[11] The smaller samples in grade 9 result from the lack of data coverage of test scores capturing child academic achievement.

are low. The only significant covariates in the combined sample are income and, to a lesser extent, gender.

By age 18, child ability becomes a highly significant predictor of parent expectations across all samples, as seen in Table 6. Gender and the Asian indicator are also highly significant for the combined sample.

5.2 Extended models of parent expectations

To examine the channels through which the variables comprising the baseline model may impact expectations, additional covariates are included in extended versions of the model [12]. The first variable added is a measure of parent education, with results reported in Tables 7 - 10.

Table 7 shows that parent education is a significant predictor of expectations in JK for both the combined and female samples. Controlling for parent education does not affect the significance of the other variables, with income remaining significant for all children and boys, and Asian ethnicity remaining significant for girls. This changes in grade 3, when parent education becomes significant for all subsamples, and reduces the significance of the other covariates (Table 8).

Parent education is also significant for the combined sample in grade 9, as reported in Table 9. Its inclusion eliminates the significance of income, though it slightly increases that of child gender. As in the baseline specification, the extended model is jointly insignificant for the male subsample, though individually parent education is significant at the 10% level, and also causes Asian ethnicity to become slightly significant.

Finally, parent education is found to be significant at age 18 for the combined and male samples, and to increase the significance of Asian ethnicity for the combined sample (Table 10). Child ability remains a highly significant regressor for all samples, though the magnitude of its effect decreases slightly.

The extended model including parent education may be further supplemented by variables on children's expectations and their relationships with their mothers, from data collected in the child-

[12]This section reports those covariates found to be significant in the given model. Other variables tested and found to be insignificant include child age, child age squared, family income squared, interaction terms with income and parent education, an indicator of parent's immigrant status, and index of the child's relationship with their father.

respondent section of the grade 9 and age 18 surveys. Table 11 reports that these new variables are not significant in grade 9, nor do they affect the significance of the other variables for the combined sample. For boys, Asian and parent education become significant in the extended model, though as before the specification as a whole remains insignificant.

In contrast, Table 12 shows that child expectations are highly significant for all subsamples at age 18. For the combined and male samples, the "relationship with mother" index is also significant, while the significance of parent education disappears. Child ability remains a significant regressor for all subsamples, though its significance decreases slightly for girls.

Due to missing data for some of the child-reported variables, the expanded specifications reported in Tables 11 and 12 are estimated with a smaller sample size than the previous specifications. To check whether the observed changes were the result of the restricted sample size rather than the additional variables, the "parent education model" reported in Tables 9 - 10 was re-estimated using only those observations with complete data on the child-reported variables. These estimations suggest that the few changes noted for grade 9 students are indeed due to the new sample rather than the model [13]. However, at age 18 the different sample only accounts for the higher significance of ethnicity for girls, while the remaining differences are still attributed to the extended specification.

5.3 Modelling revisions to parent expectations

Table 13 provides further insight into how expectations may evolve over time. It reports estimates of a probit model of an indicator that takes the value of 1 if parent expectations in the given period are lower than those in the previous period, and 0 if they are higher or the same. The sample is restricted to children whose parents expected university completion when the children were in grade 3, or in JK if the grade 3 data is missing [14]. To maximize efficiency, observations from grade 9 and age 18 are pooled, and indicators of the survey round are included. The specification reported in Panel 1 basic model includes a single indicator allowing a level difference in expectations between rounds, while the models in Panels 2 and 3 include interaction terms to allow the effect

[13] See Figures 15 and 16 in Appendix C for the results of these restricted estimations.

[14] An indicator of whether grade 3 or JK expectations were used was found to be insignificant in all specifications of the model.

of covariates to also vary between rounds. The latter are found to fit the data better, though even different combinations of interaction terms do not yield a model jointly significant at the 10% level. The only two covariates individually significant in these specifications were parent education and the interaction term between score and the “age 18” indicator, both of which had negative effects on the “revision down” indicator. This suggests that higher-educated parents are less likely to revise their expectations down in either grade 9 or at age 18, and parents of high-scoring students are less likely to revise down their expectations from grade 9 to age 18.

5.4 Discussion

The estimation results reported above indicate that child ability replaces family income as a key determinant of parent expectations over time. In defining the level of education possible for a child to complete, ability may to some extent act as a direct substitute for family income, for example through the receipt of merit-based scholarships that finance higher education for high-achieving students. However, a more significant explanation for the trend is likely related to how ability and income are considered by parents over time. The feasibility of basing expectations on ability increases with a child’s progression through school, as parents obtain more complete information from the child’s growing history of academic performance. Furthermore, even if parents do receive and trust information on ability through child test scores in early grades, they may anticipate that the subsequent years of school will be more important in preparing children for post-secondary education, and therefore still do not base their expectations on these early scores.

The declining effect of income over time, meanwhile, may in part indicate that family income plays a smaller role in defining a child’s academic potential as the child progresses through school grades. It may also reflect that the effects of income on expectations occur through intermediate outcomes which have largely taken effect by the time children reach age 18. For example, if high-income families are able to improve children’s education prospects by paying for tutors, this would be realized through better academic performance by the time the child reaches high school, at which point it is the student’s test scores rather than family income directly that provide the advantage in terms of expected education.

Even in the early years, however, income is only significant for the combined and male samples, while expectations for girls are only sensitive to ethnicity in JK and none of the included covariates in grade 3. Recalling the divergent trends seen in Figure 1, we anticipate that expectations for girls remain relatively stable over time, while those for boys decrease. It may be the case, then, that parents' decisions to invest in girls' education are primarily motivated by factors that are slow to change over time and that are unrelated to individual characteristics, such as the higher labour market returns to education generally experienced by girls. In contrast, if boys generally face a wider variety of labour market options than girls upon graduation, parents may perceive the returns of education to be lower, such that they are more sensitive to income constraints. This is consistent with Fortin et al's (2011) finding that girls' achievement is more sensitive than boys' to expectations, under our model that expectations reflect parent investment in children's education; if girls' performance is more elastic to parental inputs, altruistic parents would invest more in their education (as proxied by higher expectations) in order to improve academic outcomes at any given value of covariates, while inputs for boys would be more sensitive to these covariates, as different levels of parent investment would not have such direct consequences on the boys' achievement.

Beyond the direct constraints that low incomes impose on parents' ability to provide adequate resources for their children's education, part of income's positive relationship with expectations is likely through the channel of parent education. Parent education is positively associated with both income, as higher certification is typically required for high-salary jobs, and expectations, as parents who chose higher education for themselves are likely to prefer and expect similar choices for their children. Parent education may also be positively associated with parents' ability to support children more generally. For example, teenage mothers would be expected to both have low levels of education and be less able to provide children an environment conducive to academic success. Such correlations would lead to an upward bias in the estimate of the income effect on expectations when parent education is omitted from the model.

When parent education is added to the baseline model, both it and income are found to be highly significant in JK for the combined sample. However, estimating the model separately for girls and boys reveals that this is driven by parent education's effect for only girls, and income's effect for only boys. By grade 3, parent education is significant across all subsamples while income's significance has begun to decrease for the combined and male subsamples. By age 18, parent education has replaced income as a significant predictor of parent education in the combined and male samples, and neither variable is significant for girls. That the effect of parent education on income's significance varies across time and samples suggests that the channels through which income impacts expectations depends on child age and gender. In particular, income's effect on expectations for boys appears depend predominantly on the direct effect in early years, and switch to the indirect effect of parent education as boys progress through school grades. In contrast, it seems that girls are not sensitive to the direct income effect at any age, and the indirect effect declines with grade level. Furthermore, the fact that expectations for girls are independent of income even without controlling for parent education in JK suggests that there are also direct effects of parent education on expectations.

The effect of child ability on parent expectations in higher grades remains after controlling for parent education, which is consistent with Jacob and Wilder's (2010) similar findings for child expectations. However, Jacob and Wilder found that this effect was concentrated among students in the middle of the income distribution, while our estimation did not find that the effect of score on expectations varied with income. This may reflect the different dependent variables used in the different studies, if children are more likely than parents to base their expectations on their family's socioeconomic status. However, it likely occurs in large part simply due to the much larger samples used by Jacob and Wilder, such that interaction terms between income and scoreare found to be significant in their estimation of the expectations model.

In the further-extended specification of the model, it is difficult to interpret the lack of significance of the child-reported variables in grade 9, due to the smaller sample sizes in this survey round. At age 18, the positive relationship between child and parent expectations may suggest that parents believe that children with high expectations are more likely to successfully complete higher levels of education, and thus form their own beliefs accordingly. Similarly, children may "learn" to expect certain outcomes from their parents, such that there is reverse causality from parent to child expectations. However, it is very likely that at least a portion of this relationship arises due to unobserved variables which impact the formation of both parent and child expectations, such as the child's enjoyment of school or interest in a career requiring higher education. In this sense, the estimated significance of child expectations may best be interpreted as indicating that some of the factors internalized by the child (other than those explicitly included in the model) are also relevant in determining parent expectations.

The extended model estimated at age 18 also suggests that expectations for boys are also more sensitive to the child-mother relationship than are those for girls. As with income, this may again suggest that parents perceive lower returns to education for boys, and their expectations are therefore more sensitive to variables such as the quality of the child's interaction with family members (note that the negative coefficient indicates a positive relationship between expectations and the mother-child index, as the index uses lower values to indicate closer relationships). However, both income and the relationship index are family-specific characteristics, so taken together these may suggest that family "quality" factors into parent expectations for boys more than for girls.

Overall, results suggest that our model of parent expectations captures some of the important factors that determine expectations at progressive grade levels, though it does not fully account for either the level or the updating path of expectations. This may suggest that expectations are comprised both of an altruistic component that varies with child characteristics, and a merit component that reflects underlying parent preferences and is independent of covariates, as proposed by Foley (2011). However, Foley recognizes that the apparent independence of parent expectations from covariates may also result from expectations' dependence on factors that are unobserved by researchers and thus omitted from the model. Given the small models estimated here, the patterns observed in our results likely follow from a combination of the two explanations, where parent expectations are due in part to unobserved factors and in part to underlying parent preferences for education, in addition to observed child and family characteristics.

The included site indicators are found to be significant in all of the specifications discussed above. To explore a possible source of the site-specific effects, the annual unemployment rate and unemployment rate squared for each district were added as covariates to the regressions [15].

[15] The unemployment rates are from public Statistics Canada data on both the total unemployment of individual

However, these were found to be collinear with the included site indicators. The site- and period-specific unemployment rates are thus not included explicitly in the models, though it is likely one of the factors that cause expectations to vary significantly by site. Depending on the industries and occupations making up the local labour market, unemployment rates may have opposite effects on parent expectations. On the one hand, high unemployment may make the local labour market more competitive such that there are greater returns and lower opportunity costs to schooling, increasing parent's expectations. On the other hand, if education is not seen as a productive investment in a child's future earning opportunities, high unemployment would be more likely to be correlated with low motivation and value placed on academic achievement, such that it would be negatively related to expectations.

6 Conclusion

This study finds that the factors associated with parent education expectations vary significantly with grade level. For JK students, income and parent education are positively and significantly associated with expectations. By the time children reach the age at which they have made or are making decisions about their post-secondary pursuits, parent expectations are still positively associated with their own education level, but also with child ability, gender, and ethnicity, rather than income. While these results hold for the total sample, estimating the model for girls and boys separately further reveals that the included covariates tend to have more predictive power on expectations for boys than girls at all grade levels.

These findings are based on new data from low-income neighbourhoods in Ontario. A key limitation of this data set for the study of expectations is the change in variable collected from parent expectations in JK and grade 3 to parent aspirations in grade 9 and age 18. Interpretation of the above results must therefore be qualified with the consideration that some of the variation in "expectations" over time may arise from the change in variable rather than actual updating in

ages 15+, and youth unemployment for ages 15-24. These rates are available at the level of Public Health Units, where the health units of Eastern Ontario, Sudbury, Peel, Toronto, and Ottawa are used for the sites of Cornwall, Sudbury, Highfield, Etobicoke, and Vanier, respectively.

response to changing covariates.

Nevertheless, this data represents a new source of potentially informative insights about the role of parent expectations and other inputs in children's education outcomes. Further work with the BBBF data may take advantage of its panel structure to control for individual fixed effects over time, or by expanding the models to control for additional parent, school, and community characteristics.

More generally, there is potential for much more economic study of this topic, where econometric methodologies may be used to model the evolution of parent expectations over time and provide further insight on the factors that are most important in shaping the child's education experience.

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A Bayesian Learning Model of Updating Expectations

A Bayesian learning model may be used to represent the process through which expectations are formed and updated over time. This model is based upon Bayes' Rule, which relates a "posterior probability" (the probability of a particular hypothesis being true, given the observed evidence) to the product of the "prior probability" (the probability of the hypothesis being true, before the evidence is observed) and the likelihood of observing the given evidence if the hypothesis were true.

When using the Bayesian framework to model expectations, the expected value of a variable in each period depends on a linear combination of the expected value in the previous period and any additional relevant information observed since then. While such a framework has to our knowledge not previously been applied to modeling parent expectations of children's education attainment, the approach has found a range of applications elsewhere in the economics literature, such as modeling inflation forecasts and technological progress (e.g. Arrow 1969, Caskey 1985, and Madeira and Zafar 2012, among others).

The model may be expressed as in Equation 8 below:

$$pexp_{it} = \lambda_1 pexp_{i,t-1} + \lambda_2 \Omega_{it},\ \Omega_{it} = \Omega_{i,t}^{obs} + \Omega_{i,t}^{unobs} \tag{8}$$

Here, $pexp_{it}$ represents a parent's expectation in period t of the highest degree that the child i will eventually earn, $pexp_{i,t-1}$ represents the corresponding expectation in the previous period, and Ω_{it} is the information set available to the parent in period t. While all of the variables making up the information set are observed by parents, they may not all be observed by researchers. For example, a child's school grades would be expected to impact parent expectations and may easily be observed by both the parents and researcher, however, changes in the child's level are not easy to quantify and so may be unknown by a researcher, even as parents observe their child's effort and update their expectations accordingly.

In addition, some of the variables in the information set may not change between periods. In this case, expectations are updated in response only to new information, rather than "all" information. Information is "new" if it was unobserved in the previous period, as it would otherwise already be incorporated in the model through its effect on the previous period expectation (assuming the expectation formation process is constant over time). To represent information in this way, Equation 8 may be rewritten as Equation 9 below:

$$pexp_{it} = \lambda_1 pexp_{i,t-1} + \lambda_2(\omega_{it} - E(\omega_{it}|\Omega_{t-1})) \tag{9}$$

Under the rational expectations hypothesis, λ_1 as it appears in Equation 9 should be equal to 1 (Benitez-Silva and Dwyer 2005). However, when the model is actually estimated, the observed component is represented by a vector of control variables, while the unobserved component comprises the error term and possible constant. Thus the econometric specification is:

$$pexp_{it} = \lambda_0 + \lambda_1 pexp_{i,t-1} + \lambda_2 \omega_{it} + u_{it} \tag{10}$$

The model represented by Equation 10 above treats parent expectations as an autoregressive process of order 1 ("AR(1)"). If the coefficient λ_1 were indeed equal to 1, it would follow a unit root process and thus cause problems in statistical inference by violating the stationarity condition. However, it is very likely that at least some of the unobserved components of the information set are persistent over time, introducing correlation between the error term and regressor $pexp_{i,t-1}$. This leads to bias in the estimated coefficient λ_1, so we do not expect it to actually equal 1, and as a result the stationary condition should not be violated (Benitez-Silva and Dwyer 2005).

Whereas the ordered probit model given in Equation 5 represents a contemporaneous specification, the Bayesian model expressed in Equation 10 represents a value-added model. Such a model assumes that the function relating regressors to regressand is constant across the survey time periods (Todd and Wolpin 2003). That is, the effect of income on expectations is the same for children in JK and at age 18. This seems unlikely given the different needs of the children as they develop over the survey period. The model further assumes that the effect of all past variables declines at the same rate across variables and over time.

B Figures and Tables

Table 2: Sample characteristics by round

variable [a]		round			
		JK	grade 3	grade 9	age 18
male (d)	mean	0.5	0.5	0.5	0.5
	sd	0.5	0.5	0.5	0.5
	N	1012	1012	1012	1012
child age	mean	4.6	8.7	14.6	18.5
	sd	0.5	0.4	0.4	0.5
	N	914	914	914	914
Asian (d)	mean	0.2	0.2	0.2	0.2
	sd	0.4	0.4	0.4	0.4
	N	911	911	911	911
monthly family income ($10 000)	mean	0.3	0.3	0.4	0.5
	sd	0.1	0.2	0.3	0.3
	N	1012	1012	1012	1012
highest parent education	mean	6.3	6.3	6.5	6.5
(c, from 1=none to 11=university)	sd	1.9	1.9	1.8	1.8
	N	878	878	910	913
Peabody IQ score	mean	0.8	0.8		
	sd	0.2	0.2		
	N	322	545		
EQAO math mark	mean			2.5	
	sd			0.8	
	N			212	
MoE grade average	mean				0.7
	sd				0.1
	N				502
parent education expectations	mean	2.6	2.5	2.5	2.5
(JK, g3) and aspirations (g9, a18)	sd	0.7	0.7	0.6	0.6
(c, 1=HS to 3=university)	N	369	778	648	540
child education aspirations (g9)	mean			2.6	2.6
and expectations (a18)	sd			1.0	0.8
(c, 0=less than HS to 4=graduate degree)	N			518	590
child-mother relationship	mean			6	5.4
(c, from 4=very close to 12=not close)	sd			2.2	1.9
	N			507	590

[a] d indicates a binary variable that takes the value 1 if the child has the given characteristic; c indicates a categorical variable

Figure 1: Parent education beliefs over time for girls and boys

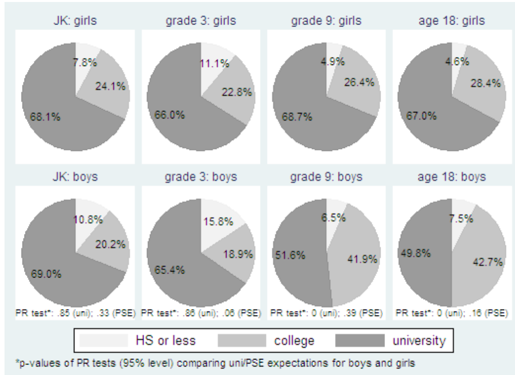

Figure 2: Parent education beliefs over time, by child academic ability

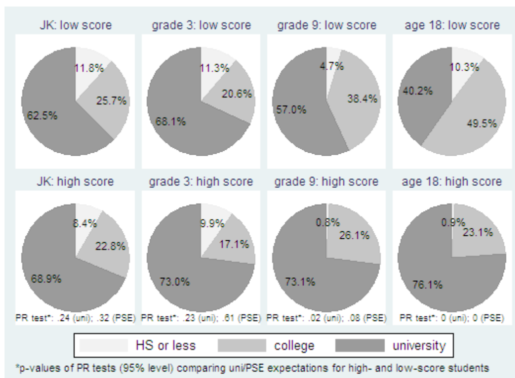

Figure 3: Parent education beliefs over time, by family income

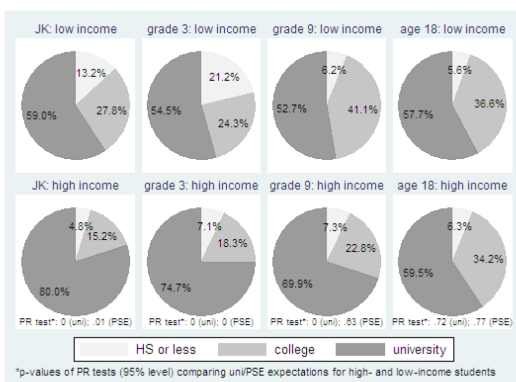

Figure 4: Parent education beliefs over time, by baseline ability

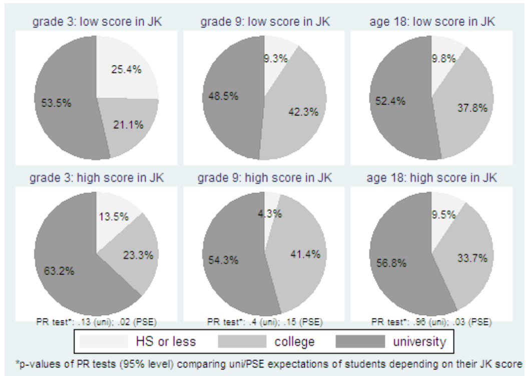

Figure 5: Parent education beliefs over time, by baseline beliefs

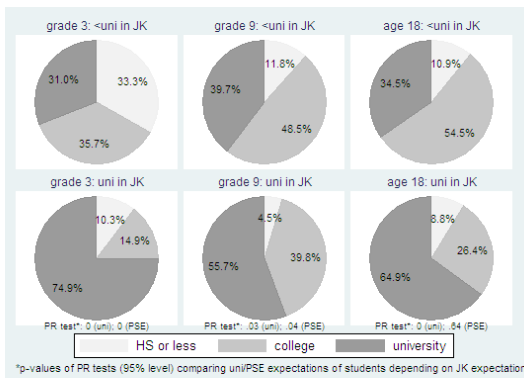

Figure 6: Revisions to parent education beliefs over time, by baseline beliefs

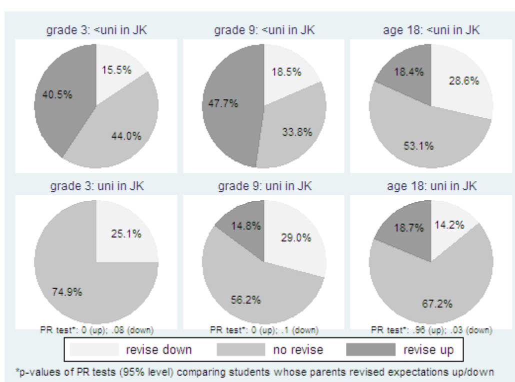

Figure 7: Parent education beliefs for girls and boys in JK, by site

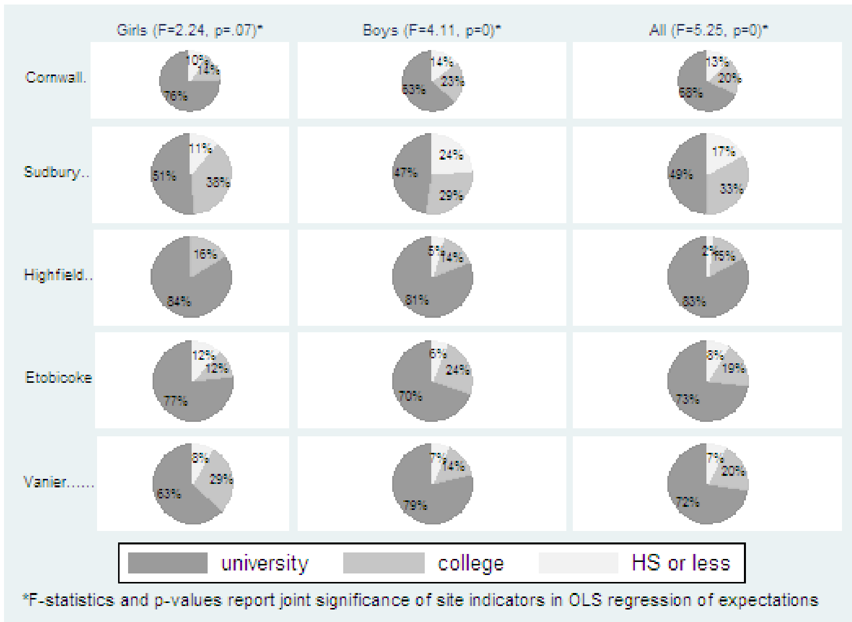

Figure 8: Parent education beliefs for girls and boys in grade 3, by site

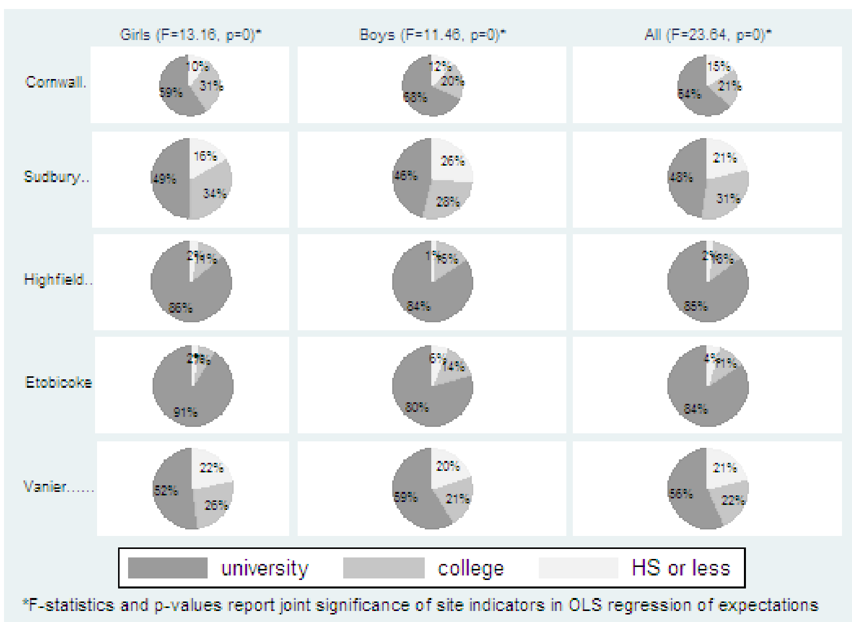

Figure 9: Parent education beliefs for girls and boys in grade 9, by site

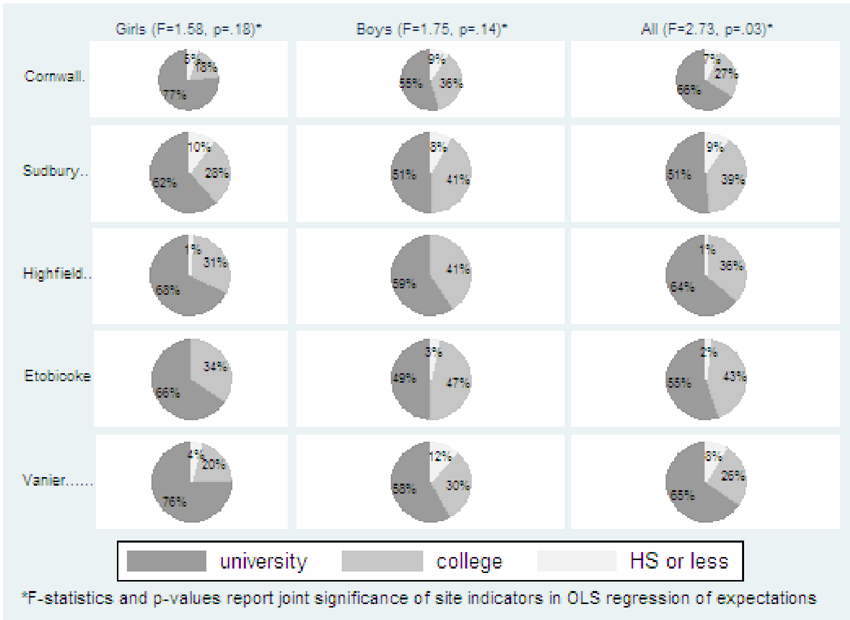

Figure 10: Parent education beliefs for girls and boys at age 18, by site

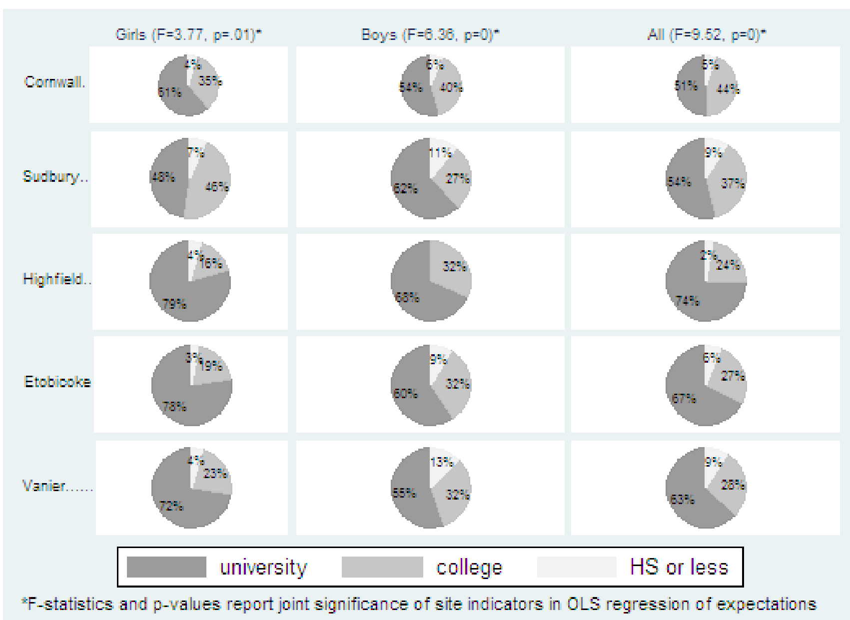

Table 3: Baseline ordered probit model of parents' education expectations, JK

	(1) All			(2) Girls			(3) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	-0.00883	-0.0126	0.0215						
	(.0223)	(.0318)	(.054)						
child ability	-0.0386	-0.0557	0.0943	-0.0238	-0.0417	0.0655	-0.0225	-0.0339	0.0563
	(.0553)	(.0791)	(.134)	(.07)	(.123)	(.193)	(.0707)	(.108)	(.178)
family income	-0.296***	-0.426***	0.722***	-0.113	-0.198	0.311	-0.461***	-0.695***	1.156***
	(.0896)	(.143)	(.209)	(.121)	(.215)	(.33)	(.149)	(.219)	(.282)
child is Asian (d)	-0.0795**	-0.193	0.272	-0.0842***	-0.295***	0.379***	-0.0690	-0.157	0.226
	(.0405)	(.207)	(.245)	(.0312)	(.0436)	(.0513)	(.0506)	(.2)	(.246)
site controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	311	311	311	132	132	132	179	179	179
Wald test p-value	0	0	0	0	0	0	0.0100	0.0100	0.0100

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Baseline ordered probit model of parents' education expectations, grade 3

	(1) All			(2) Girls			(3) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	0.0116	0.0181	-0.0297						
	(.0157)	(.0248)	(.0404)						
child ability	-0.0928**	-0.145**	0.238**	-0.0624	-0.146	0.208	-0.0938	-0.121	0.214
	(.0443)	(.0689)	(.111)	(.0549)	(.11)	(.158)	(.0684)	(.0898)	(.155)
family income	-0.234***	-0.364***	0.598***	-0.0672	-0.157	0.224	-0.438***	-0.563***	1.001***
	(.0725)	(.114)	(.177)	(.0747)	(.165)	(.234)	(.144)	(.172)	(.283)
child is Asian (d)	-0.0684***	-0.128***	0.196***	-0.0517	-0.147	0.199	-0.0748**	-0.114*	0.189**
	(.0171)	(.0342)	(.0477)	(.0391)	(.143)	(.177)	(.0312)	(.0655)	(.0934)
site controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	510	510	510	232	232	232	278	278	278
Wald test p-value	0	0	0	0	0	0	0	0	0

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Baseline ordered probit model of parents' education expectations, grade 9

	(1) All			(2) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	0.0133	0.0999*	-0.113*			
	(.0119)	(.0589)	(.0683)			
child ability	-0.00741	-0.0553	0.0627	-0.0164	-0.0703	0.0867
	(.00607)	(.0381)	(.0426)	(.0161)	(.0607)	(.0735)
family income	-0.0446*	-0.333**	0.377**	-0.0834	-0.358	0.441*
	(.0232)	(.164)	(.174)	(.0518)	(.237)	(.265)
child is Asian (d)	-0.0143	-0.129	0.143	-0.0421	-0.231*	0.273*
	(.0105)	(.0843)	(.0912)	(.0271)	(.138)	(.151)
site controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	205	205	205	111	111	111
Wald test p-value	0.0600	0.0600	0.0600	0.210	0.210	0.210

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Baseline ordered probit model of parents' education expectations, age 18

	(1) All			(2) Girls			(3) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	0.0150**	0.0978**	-0.113**						
	(.00658)	(.0445)	(.0497)						
child ability	-0.223***	-1.478***	1.701***	-0.179	-1.203***	1.383***	-0.272***	-1.652***	1.924***
	(.06)	(.213)	(.215)	(.135)	(.307)	(.369)	(.0999)	(.318)	(.326)
family income	-0.000232	-0.00154	0.00177	-0.0116	-0.0779	0.0895	0.00951	0.0578	-0.0673
	(.0122)	(.0809)	(.0931)	(.0143)	(.0863)	(.0983)	(.0225)	(.132)	(.154)
child is Asian (d)	-0.0246**	-0.214***	0.239***	-0.0268*	-0.246	0.272	-0.0219	-0.165	0.187
	(.00963)	(.061)	(.067)	(.0162)	(.187)	(.195)	(.0149)	(.107)	(.119)
site controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	427	427	427	211	211	211	216	216	216
Wald test p-value	0	0	0	0	0	0	0	0	0

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Ordered probit model of parents' education expectations, controlling for parent education, JK

	(1) All			(2) Girls			(3) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	-0.00531	-0.00842	0.0137						
	(.0212)	(.0336)	(.0548)						
child ability	-0.0363	-0.0578	0.0941	-0.0156	-0.0344	0.0500	-0.0274	-0.0433	0.0707
	(.0538)	(.0838)	(.137)	(.0595)	(.13)	(.189)	(.0717)	(.114)	(.185)
family income	-0.196**	-0.313**	0.509**	0.00259	0.00574	-0.00833	-0.398***	-0.629***	1.027***
	(.0879)	(.146)	(.222)	(.103)	(.228)	(.331)	(.153)	(.226)	(.309)
child is Asian (d)	-0.0697	-0.179	0.249	-0.0683**	-0.294***	0.362***	-0.0638	-0.149	0.213
	(.0505)	(.265)	(.314)	(.027)	(.0454)	(.0531)	(.0551)	(.231)	(.283)
parent education	-0.0207***	-0.0330***	0.0537***	-0.0278**	-0.0614***	0.0892***	-0.0120	-0.0189	0.0309
	(.00726)	(.0114)	(.017)	(.0123)	(.0217)	(.0291)	(.00911)	(.0147)	(.0229)
site controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	311	311	311	132	132	132	179	179	179
Wald test p-value	0	0	0	0	0	0	0.0100	0.0100	0.0100

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Ordered probit model of parents' education expectations, controlling for parent education, grade 3

	(1) All			(2) Girls			(3) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	0.0109	0.0227	-0.0336						
	(.012)	(.0247)	(.0365)						
child ability	-0.0636*	-0.132*	0.196*	-0.0405	-0.126	0.167	-0.0570	-0.103	0.160
	(.036)	(.0689)	(.103)	(.0431)	(.119)	(.157)	(.0534)	(.0935)	(.145)
family income	-0.103*	-0.215*	0.318*	-0.00837	-0.0262	0.0345	-0.194*	-0.353**	0.547**
	(.0596)	(.113)	(.169)	(.0575)	(.179)	(.236)	(.107)	(.177)	(.272)
child is Asian (d)	-0.0445**	-0.108*	0.153**	-0.0355	-0.133	0.168	-0.0454*	-0.0943	0.140
	(.0187)	(.0557)	(.0726)	(.0336)	(.154)	(.183)	(.0268)	(.0687)	(.0935)
parent education	-0.0297***	-0.0617***	0.0913***	-0.0187	-0.0585***	0.0772***	-0.0398***	-0.0722***	0.112***
	(.00634)	(.0124)	(.0158)	(.0121)	(.021)	(.0288)	(.0104)	(.0171)	(.0224)
site controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	508	508	508	232	232	232	276	276	276
Wald test p-value	0	0	0	0	0	0	0	0	0

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Ordered probit model of parents' education expectations, controlling for parent education, grade 9

	(1) All			(2) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	0.0164	0.138**	-0.154**			
	(.0131)	(.0599)	(.0685)			
child ability	-0.00578	-0.0489	0.0547	-0.0142	-0.0794	0.0936
	(.00581)	(.0384)	(.0431)	(.0156)	(.065)	(.0759)
family income	-0.0128	-0.108	0.121	-0.0180	-0.100	0.118
	(.0166)	(.151)	(.165)	(.0437)	(.256)	(.298)
child is Asian (d)	-0.0139	-0.144*	0.158*	-0.0382	-0.273**	0.312***
	(.00984)	(.0802)	(.0851)	(.0286)	(.111)	(.115)
parent education	-0.00784*	-0.0662**	0.0741***	-0.0150	-0.0837*	0.0987**
	(.00457)	(.026)	(.0272)	(.0102)	(.0461)	(.048)
site controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	205	205	205	111	111	111
Wald test p-value	0.0100	0.0100	0.0100	0.110	0.110	0.110

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Ordered probit model of parents' education expectations, controlling for parent education, age 18

	(1) All			(2) Girls			(3) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	0.0168***	0.121**	-0.137***						
	(.00636)	(.0473)	(.0514)						
child ability	-0.184***	-1.359***	1.544***	-0.158	-1.117***	1.275***	-0.199**	-1.509***	1.708***
	(.0578)	(.21)	(.216)	(.128)	(.304)	(.368)	(.0825)	(.311)	(.329)
family income	0.00899	0.0663	-0.0753	-0.00509	-0.0361	0.0412	0.0226	0.172	-0.195
	(.0115)	(.0847)	(.0959)	(.0136)	(.0924)	(.105)	(.0199)	(.14)	(.157)
child is Asian (d)	-0.0220**	-0.213***	0.234***	-0.0263	-0.254	0.281	-0.0152	-0.139	0.155
	(.00933)	(.0656)	(.0712)	(.0167)	(.166)	(.172)	(.0121)	(.119)	(.13)
parent education	-0.00688***	-0.0507***	0.0576***	-0.00486	-0.0345	0.0394	-0.00980**	-0.0745***	0.0843***
	(.00259)	(.0191)	(.0207)	(.00421)	(.0252)	(.0277)	(.00466)	(.0287)	(.0312)
site controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	427	427	427	211	211	211	216	216	216
Wald test p-value	0	0	0	0	0	0	0	0	0

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Ordered probit model of parents' education expectations, controlling for child-reported characteristics, grade 9

	(1) All			(2) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	0.00442	0.148*	-0.152*			
	(.00415)	(.0812)	(.0838)			
child ability	-0.000429	-0.0147	0.0151	-0.000673	-0.0503	0.0510
	(.00134)	(.0469)	(.0482)	(.00152)	(.0855)	(.0861)
family income	-0.00109	-0.0371	0.0382	0.000210	0.0157	-0.0159
	(.0054)	(.188)	(.193)	(.00599)	(.435)	(.441)
child is Asian (d)	-0.00310	-0.130	0.133	-0.00387	-0.315***	0.319***
	(.00308)	(.0991)	(.101)	(.00823)	(.115)	(.117)
parent education	-0.00342	-0.117***	0.120***	-0.00266	-0.199***	0.202***
	(.00261)	(.0265)	(.027)	(.00562)	(.0616)	(.06)
rship with mom	0.0000575	0.00197	-0.00203	0.000175	0.0131	-0.0132
	(.000459)	(.0157)	(.0162)	(.000529)	(.0313)	(.0317)
child aspiration	-0.00155	-0.0531	0.0547	-0.000931	-0.0696	0.0706
	(.00143)	(.0392)	(.04)	(.0021)	(.0662)	(.0667)
site controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	174	174	174	95	95	95
Wald test p-value	0	0	0	0.280	0.280	0.280

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Ordered probit model of parents' education expectations, controlling for child-reported characteristics, age 18

	(1) All			(2) Girls			(3) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	0.00349	0.0581	-0.0616						
	(.00323)	(.0532)	(.0557)						
child ability	-0.0514	-0.861***	0.912***	-0.0557	-0.712**	0.767*	-0.0304	-0.910**	0.940**
	(.0341)	(.22)	(.234)	(.0776)	(.344)	(.396)	(.0273)	(.386)	(.398)
family income	0.00245	0.0411	-0.0436	-0.00466	-0.0595	0.0642	0.00598	0.179	-0.185
	(.00529)	(.0869)	(.092)	(.0104)	(.103)	(.112)	(.00714)	(.15)	(.155)
child is Asian (d)	-0.00776	-0.164**	0.172**	-0.0146	-0.247*	0.262*	-0.000867	-0.0271	0.0280
	(.00636)	(.0717)	(.0761)	(.0161)	(.14)	(.146)	(.00423)	(.136)	(.14)
parent education	-0.00128	-0.0215	0.0228	-0.000892	-0.0114	0.0123	-0.00159	-0.0475	0.0491
	(.00121)	(.0221)	(.0231)	(.00182)	(.025)	(.0265)	(.00168)	(.0308)	(.0319)
rship with mom	0.00166*	0.0278*	-0.0294*	0.000713	0.00911	-0.00982	0.00165	0.0492**	-0.0508**
	(.000962)	(.015)	(.0154)	(.00142)	(.0181)	(.0193)	(.00139)	(.021)	(.0215)
child expectation	-0.0143**	-0.240***	0.255***	-0.0115	-0.147**	0.159**	-0.0117	-0.349***	0.361***
	(.00703)	(.0508)	(.0477)	(.0132)	(.0713)	(.0746)	(.00821)	(.0802)	(.0771)
site controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	414	414	414	207	207	207	207	207	207
Wald test p-value	0	0	0	0.0200	0.0200	0.0200	0	0	0

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Probit model of downward revisions to parents' expectations from "university", students in grade 9 and age 18

	(1)			(2)			(3)		
	a. All	b. Girls	c. Boys	a. All	b. Girls	c. Boys	a. All	b. Girls	c. Boys
	.	.	.	.	.	.	.	.	.
male child	0.374*			0.329			0.366		
	(.227)			(.239)			(.248)		
child ability	-0.307	-0.0914	-0.594*	-0.217	0.108	-0.533*	-0.0985	0.238	-0.795
	(.227)	(.501)	(.32)	(.229)	(1.06)	(.301)	(.262)	(1.98)	(10.1)
family income	-0.116	-0.330	0.398	-0.0894	-0.399	0.466	-0.779	-2.258	0.0135
	(.323)	(.628)	(.69)	(.373)	(1)	(.718)	(1.04)	(20.2)	(116)
child is Asian	0.000892	0.0224	-0.0496	0.199	-0.0721	0.230	0.187	-0.111	0.0551
	(.309)	(.531)	(.476)	(.329)	(.604)	(.552)	(.334)	(3.54)	(.617)
parent education	-0.162**	-0.0317	-0.280*	-0.143*	-0.00278	-0.261*	-0.315**	0.0105	-0.953
	(.0768)	(.111)	(.144)	(.0805)	(.134)	(.154)	(.153)	(.72)	(18.9)
age 18 (d)	-0.564	-0.448	-0.861	3.035**	5.579	1.593	1.462	5.155	-4.531
	(.431)	(.906)	(.664)	(1.22)	(7.13)	(1.88)	(1.58)	(547)	(138)
age 18 * score				-5.087***	-8.451	-3.499	-5.680***	-8.838	-3.450
				(1.62)	(10.2)	(2.4)	(1.74)	(974)	(10.6)
age 18 * income							1.067	2.368	0.519
							(1.1)	(123)	(116)
age 18 * parented							0.267	0.0205	0.837
							(.178)	(6.8)	(18.9)
site controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	235	110	125	235	110	125	235	110	125
Wald test p-value	0.390	0.940	0.200	0.0700	1	0.230	0.110	1	0.900

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

C Additional Figures and Tables

Figure 11: Parent education beliefs in JK, by site and student score

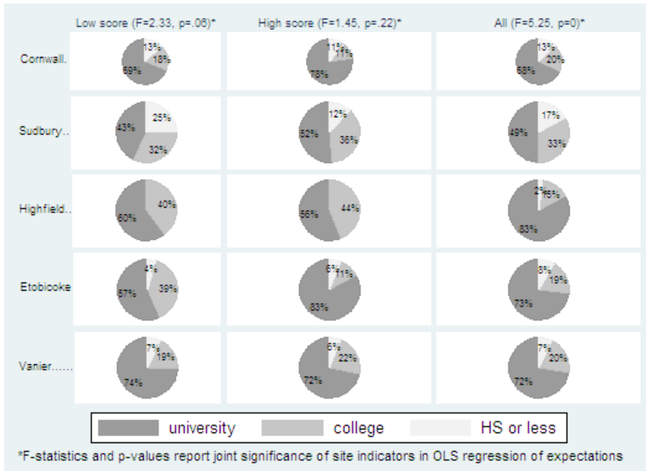

Figure 12: Parent education beliefs in grade 3, by site and student score

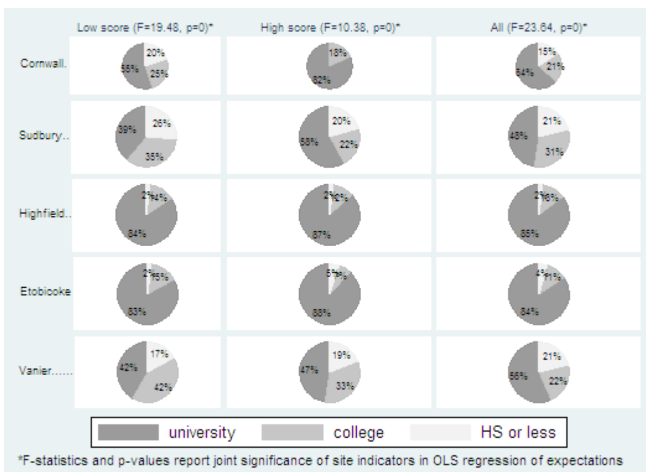

Figure 13: Parent education beliefs in grade 9, by site and student score

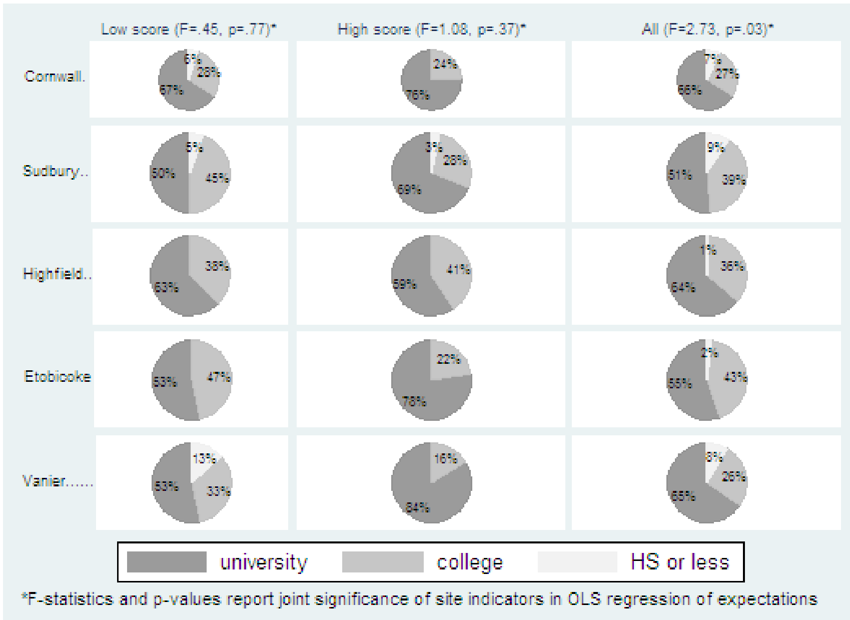

Figure 14: Parent education beliefs at age 18, by site and student score

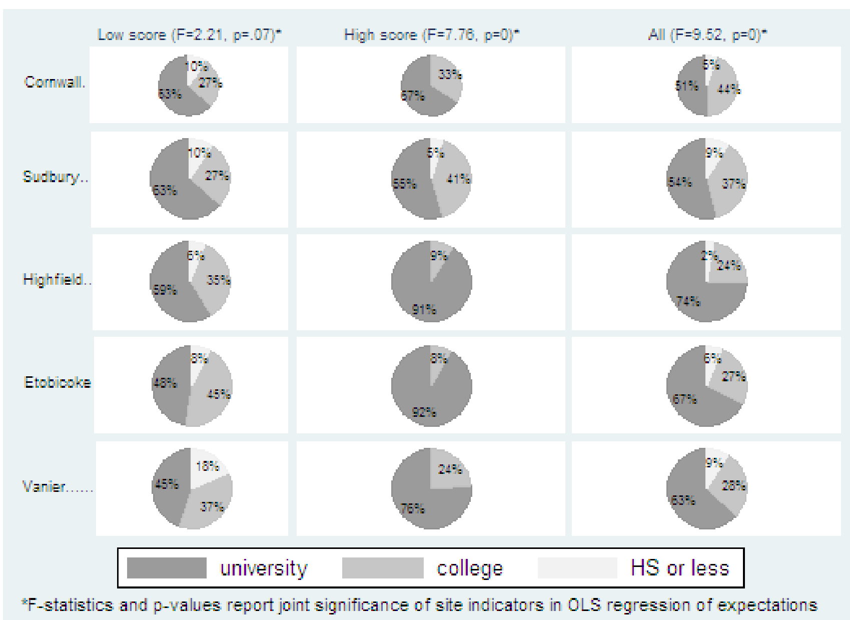

Table 14: Ordered probit model of the predictive power of attrition on parent expectations, JK

	(1) Ordered probit, level effect			(2) Ordered probit, differential effects		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	-0.00597	-0.00951	0.0155	0.0134	0.0250	-0.0384
	(.0213)	(.0339)	(.0551)	(.0305)	(.0584)	(.0888)
child ability	-0.0367	-0.0588	0.0955	0.00444	0.00818	-0.0126
	(.0541)	(.0851)	(.139)	(.0734)	(.135)	(.209)
family income	-0.198**	-0.318**	0.516**	-0.228*	-0.421	0.649*
	(.0878)	(.148)	(.223)	(.131)	(.272)	(.394)
child is Asian (d)	-0.0697	-0.181	0.250	-0.0940***	-0.274***	0.368***
	(.049)	(.261)	(.308)	(.023)	(.0332)	(.044)
parent education	-0.0205***	-0.0328***	0.0533***	-0.0252**	-0.0464**	0.0716**
	(.0073)	(.0113)	(.0169)	(.0115)	(.0186)	(.0287)
attrition indicator (d)	0.0150	0.0242	-0.0392	-0.00152	-0.00280	0.00433
	(.0199)	(.0324)	(.0519)	(.0917)	(.169)	(.26)
attrition indicator * male (d)				-0.0276	-0.0539	0.0816
				(.0323)	(.0695)	(.101)
attrition indicator * score				-0.0585	-0.108	0.166
				(.0878)	(.161)	(.247)
attrition indicator * income				0.0753	0.139	-0.214
				(.163)	(.308)	(.47)
attrition indicator * asian (d)				0.945***	-0.189***	-0.756***
				(.0489)	(.0536)	(.0283)
attrition indicator * parented				0.00953	0.0176	-0.0271
				(.013)	(.023)	(.0358)
site controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	311	311	311	311	311	311
Wald test p-value	0	0	0	0	0	0

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 15: Ordered probit model of parents' education expectations, grade 9 sample with non-missing child-reported characteristics

	(1) All			(2) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	0.00524	0.160**	-0.165**			
	(.00448)	(.0786)	(.0813)			
child ability	-0.000721	-0.0225	0.0233	-0.00105	-0.0634	0.0644
	(.00148)	(.0471)	(.0485)	(.00195)	(.0827)	(.0833)
family income	-0.00207	-0.0648	0.0669	-0.00190	-0.115	0.117
	(.00565)	(.181)	(.187)	(.00602)	(.385)	(.39)
child is Asian (d)	-0.00365	-0.141	0.145	-0.00466	-0.314***	0.319***
	(.00318)	(.0904)	(.0922)	(.00875)	(.107)	(.108)
parent education	-0.00362	-0.113***	0.117***	-0.00317	-0.191***	0.195***
	(.00258)	(.0254)	(.026)	(.00583)	(.0571)	(.0555)
site controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	174	174	174	95	95	95
Wald test p-value	0	0	0	0.0600	0.0600	0.0600

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 16: Ordered probit model of parents' education expectations, age 18 sample with non-missing child-reported characteristics

	(1) All			(2) Girls			(3) Boys		
	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation	HS expectation	college expectation	university expectation
male child (d)	0.0162**	0.128***	-0.144***						
	(.00664)	(.0472)	(.0513)						
child ability	-0.172***	-1.404***	1.577***	-0.124	-1.074***	1.198**	-0.201**	-1.631***	1.832***
	(.0579)	(.218)	(.226)	(.123)	(.398)	(.484)	(.0848)	(.32)	(.327)
family income	0.00562	0.0457	-0.0513	-0.00741	-0.0642	0.0717	0.0209	0.170	-0.191
	(.0113)	(.0904)	(.102)	(.0127)	(.0892)	(.101)	(.0201)	(.15)	(.168)
child is Asian (d)	-0.0187**	-0.198***	0.216***	-0.0232	-0.267**	0.290**	-0.00973	-0.0903	0.100
	(.00858)	(.0627)	(.0681)	(.0142)	(.13)	(.134)	(.0106)	(.109)	(.118)
parent education	-0.00558**	-0.0454**	0.0510***	-0.00306	-0.0266	0.0296	-0.00890**	-0.0724***	0.0813***
	(.0022)	(.0184)	(.0198)	(.00317)	(.0215)	(.0236)	(.00421)	(.027)	(.0289)
site controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	414	414	414	207	207	207	207	207	207
Wald test p-value	0	0	0	0	0	0	0	0	0

Marginal effects; Standard errors in parentheses

(d) for discrete change of dummy variable from 0 to 1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$