Teenage Pregnancy and Motherhood in England:

Do parents' educational expectations matter?

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January, 2014

Abstract

This paper analyses to what extent parental expectations about school choices influence fertility decisions of teenage girls in England. Using the Longitudinal Study of Young People in England (LSYPE) and the National Pupil Data (NPD), I model the likelihood of becoming pregnant and having a child conditional on several socio-demographic factors including parental expectations. Maximum likelihood methods and instrumental variable techniques show that high parental expectations decreases the likelihood of conceiving and having a child during adolescence. The effect is fifty percent as important as being born to a teenage mother. In addition, larger effects of parental expectations on teenage motherhood are found for teenager girls under performing at school than for those performing above the mean of the academic achievement distribution. These findings open a new route for influencing fertility decisions among teenage girls by raising expectations of parents.

JEL : J13, D84, I20

Keywords : Subjective expectations, teen motherhood, teen pregnancy, maximum likelihood, simulated maximum likelihood, instrumental variables.

*I am very grateful to my PhD supervisors Marco Francesconi and Adeline Delavande for their guidance and comments to earlier versions of this paper. I also thank Jeffrey Wooldridge for his recommendations during the *IZA Summer School* 2013, as well as *IZA* and *RES-PhD* participants for their useful comments. I am indebted to the UK Data Service for providing access to LSOA identifiers through the SDS service, and the Department of Education for sharing information about the *Excellence in Cities* Programme. I gratefully acknowledge the funding received from the Mexican National Council of Science and Technology (*CONACYT*) during my doctoral studies.

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1 Introduction

The prevalence of teenage births is still a heated debate among academics and policy analysts in the developed world. According to the Unicef (2013), the United States and United Kingdom are in the first and third place of teenage births across twenty-nine developed countries considered in the report; both countries face rates above 29 per 1000 girls between 15 to 19 years old.

In spite of the vast number of sociological, psychological and economic studies about teen pregnancy and motherhood, just a few have analysed some of the causes of both social phenomena, such as Lundberg and Plotnick (1995) by using state welfare, abortion and family planning policies. The main focus of the economic literature since the early 1990s has been on out-of-wedlock childbearing (An et al. (1993); Akerlof et al. (1996); Willis (1999)), the consequences of teenage motherhood on child's outcomes (Geronimus and Korenman (1992); Rosenzweig and Wolpin (1995); Ashcraft and Lang (2006)) and on the teenager's school attendance and achievement, marriage and labour market outcomes (Klepinger et al. (1999); Ermisch and Pevalin (2005)).

The current empirical evidence underpin several socio-economic factors associated with both outcomes, such as income deprivation, academic failure, and intergeneration transmission of attitudes towards sexual behaviour and early childbearing. Nevertheless, it is still unknown whether other family factors influence the fertility decisions of teenage girls.

This paper contributes to the economic literature by analysing the role of parents' educational expectations on teenager's fertility decisions. To achieve this aim, I use a measure of subjective expectations collected by the Longitudinal Study of Young People in England (LSYPE) for a cohort of students who was firstly interview in 2004, when they were 13-14 years old. This measure is collected by the likelihood reported by parents about the teenager attending Higher Education (HE) after finishing compulsory education (at age 16).

Because parental expectations may be correlated with the teenager's preferences for schooling and for working, I use two approaches to address this potential endogeneity. Firstly, I use information about parental and teenager's preferences for entering the labour force after school leaving age. Secondly, I explore an exogenous increase of parental expectations through the *Excellence in Cities (EiC) Programme* that aimed at raising expectations and schooling achievement when the children were in key stage 2 (last three years of primary school). Because this programme was mainly targeted to deprived children, I assess my findings with a second instrument that affects the entire population. This instrument also explores the variation of expectations based on the supply of educational choices at the LSOA (Lower Super Ouput Area) level.

To estimate the effect of parental expectations, I explore the likelihood of being pregnant and becoming a mother as separate decisions. After considering the attrition of the survey, maximum likelihood methods with instrumental variables are used for identifying the effects of parental expectations on teenage pregnancy and motherhood.

In this paper, I argue the decision of becoming a teen mother is a rational decision that

involves the valuation of opportunity costs the teenager perceives about her alternatives after finishing compulsory education. This valuation is based on the teenager's accumulated academic experience, her school characteristics and other factors. After assessing these alternatives, parents and teenager form expectations about continue studying or doing something else. Both parental and teenager's expectations may be relevant for the decision of having a child during adolescence, however, parental expectations present a twofold role. Firstly, parent's expectations about educational choices may influence directly the formation of teenagers expectations and therefore, affect the perception of the opportunity cost of the teenager's alternatives. Secondly, if parents have high expectations about their teen's academic future, they will reinforce their human capital investment on the teenager. The formation of *high* and *low* parental expectations reflect the perceived teenager's returns to schooling conditional on academic achievement, school quality, and other factors. Thus, teenagers with high parental expectations will perceived higher opportunity costs of having a child during adolescence.

If early stages of schooling achievement are considered by parents to shape their expectations about the teenager's academic future; it is likely that parents will not revise their expectations unless the teenager changes her achievement or exogenous factors change the perception of parents. Moreover, teenagers under performing at school and having parents with low expectations about their academic future may tend to drop out school or look for non-academic alternatives after finishing compulsory education. As a result, having a child during adolescence may be perceived with low opportunity costs.

Our findings show that high parental expectations decreases the likelihood of teen motherhood and that this effect is about half of the effect of being born to a teenage mother. By analysing the marginal effects of parental expectations across the distribution of school achievement in English at Key Stage 2 (primary school), we observe that the marginal contribution of expectations is greater for teenage girls with low academic performance than for those performing above the mean.[1]

Finally, the paper briefly explores the performance of our parental expectations estimates across deprivation percentiles. This analysis shed light on the crucial role of parental expectations on low and middle-income teenage girls.

The relevance of this study has several edges. Firstly, the United Kingdom presents the highest teen pregnancy and motherhood rates of Western European countries, and this paper is the first attempt to explain some of the causes using English data. Secondly, the novelty of this study is to analyse for the first time the role of expectations on teenager's fertility decisions. In spite of the recent theoretical research for understanding the role of beliefs and subjective expectations on skill formation of children, there is scant evidence of the effect of parental expectations on fertility decisions and teenager's outcomes.[2]

This paper presents the following structure: section 2 briefly describes the literature on

[1] By low academic perfomance I mean between -3 to -2 standard deviations of the english z-score in key stage 2.

[2] Flavio Cunha has been recently developing theoretical and empirical work on this matter.

teenage motherhood and the model, section 3 provides a general discussion about the identification strategy follow by our empirical specifications, section 4 describes the LSYPE and NPD data, section 5 discusses our findings based on maximum likelihood models, and section 6 provides some robustness checks to validate our main results. The last section concludes and suggests some extensions of this paper.

2 Background and Economic Approach

2.1 Literature Review and Policies for the Youth

The majority of the empirical literature on adolescent pregnancy and motherhood identifies a set of socio-demographic factors associated with teenage motherhood. For instance, deprivation, lone motherhood, low school performance, being born to a teen mother and parent's marital disruption are regularly some of the factors highly correlated with teen motherhood and pregnancy. However, only a few studies have adopted an economic approach to identify some of the causes of teenage pregnancy and motherhood. The main strategy followed by these studies is the use of exogenous variations in the supply of contraceptives and abortion laws to estimate their effects on teenage motherhood and other sexual outcomes. For instance, Lundberg and Plotnick (1995) and Kane and Staiger (1996) use access to abortion and contraceptive supply across US states to analyse some of the causes of teen motherhood. These exogenous variations facilitate the identification of causal effects of such reforms on teenage motherhood, pregnancy and marriage decisions.

Lundberg and Plotnick (1995) analyse teenage fertility and marriage decision by exploiting the economic incentives and costs derived from public policies. By jointly estimating the decision of being pregnant, pregnancy resolution and marriage decisions, they find that if policies affect individual costs, changing the policy parameters would tend to change teenager's behaviour. While white teenager's behaviour is affected by welfare, abortion and family planning policies, black adolescent's shows no association with these policies. Similarly, Kane and Staiger (1996) exploit the cost of abortion by using county-level data to study the effect of distinct sources of variation in abortion access (geographic location of abortion providers, state Medicaid restrictions on abortion funding and parental consent laws). They find that restricting access to abortion is associated with a decline in teen births.

More recent studies such as Ananat and Hungerman (2012) use the geographical variation of the introduction of oral contraceptive (*pill*) to analyse its short and long-term effects on early motherhood and career decisions. With regard to teenage motherhood, this study suggests the pill had a short-term effect on the decline in fertility of unmarried women under 21 and that the pill reduced pregnancies more than it reduced teen births. Nevertheless, the decline in pregnancy was temporary and did not affect total childbearing in the long-term.

2.1.1 Consequences of Teen Pregnancy

This subsection briefly discusses the consequences of teen abortion and miscarriage. The medical, psychological and sociological literature explore the effects of these phenomena on the teenager's mental and physical health, as well as on the adaptation of the teenage girl into boy-girl interactions.

Medical studies using US data highlight that teenage girls have lower rates of mortality and morbidity derived from abortion than women over 20, nevertheless, they have an increased risk of cervical injury during *suction-curettage* abortion, see Cates Jr et al. (1983). In addition, xxx present evidence about symptoms of depression or anxiety before and after a women decides an abortion Bradshaw and Slade (2003).

2.1.2 Consequences of Teen Motherhood

Consequences for the teenage girl

Empirical studies about teenage pregnancy and motherhood developed by sociologists, economists, and other social scientists have revealed some of the consequences of teenage motherhood on the teenager's future and her child's well-being. The study of the consequences of these outcomes presents the challenge of disentangling between the effect of early motherhood from the effect of pre-existing conditions of the mother and environment. For this reason, empirical studies have used several approaches to take into account potential non-random selection into motherhood to study the consequences of this outcome for the child and for the mother. The main issue caused by this selection problem is that is difficult to evaluate how a teenage girl would have performed if she had decided for abortion or no pregnancy.

The focus of empirical studies about teen motherhood have varied across disciplines. For instance, Rosenzweig and Wolpin (1995), Hotz et al. (1997) , Klepinger et al. (1999), Chevalier and Viitanen (2003), Levine and Painter (2003), Ashcraft and Lang (2006) and Fletcher and Wolfe (2009) study the consequences of teen motherhood on human capital investment and labour outcomes; whereas others have researched on marriage and partner opportunities after becoming a teen mother; Plotnick (1992), Goodman et al. (2004) andErmisch and Pevalin (2005).

The consequences on the teenager's human capital investment and labour outcomes are diverse. Fletcher and Wolfe (2009) provide evidence that teenage childbearing in the United States reduces the likelihood of obtaining a high school diploma, decreases her annual income as a young adult, as well as increases the probability of receiving social programme assistance. For Britain, Chevalier and Viitanen (2003) find that teenage mothers are less likely to be enrolled in post-16 schooling, employment experience reduces by up to three years and the earning differentials are up to 20 per cent in comparison with those women without experiencing teen motherhood.

Conversely, Brien et al. (2002) find that the effects of teen motherhood on cognitive devel-

opment, measured by test scores, are quite negligible. By using American longitudinal data before and after the childbirth, they observe differences in academic performance between teen mothers and their contemporaries that decided not to have kids during adolescence. However, these differences are mainly explained by unobservable factors affecting both childbearing decisions and cognitive development (test scores). Similarly, Hotz et al. (1997) show that in the United States teen mothers present a smaller decrease in the likelihood of receiving a high school diploma than the reported in previous empirical studies. They also find that women having a child during adolescence present higher earnings and hours worked. To identify these consequences, Hotz et al. (1997) use miscarriage information as instrumental variable. In this regard, recent studies such as Fletcher and Wolfe (2009) and Ashcraft et al. (2013) have shown that the use of this information as instrumental variables upward biased the positive effects of teenage childbearing on the teenager's and child's outcomes. The main reason is the non-randomness of the instrument.[3] By acknowledging the disadvantage of the instrument, Ashcraft et al. (2013) derive a consistent estimator which consists on a weighted average of the OLS and IV estimators in order to obtain ATE (Average Treatment Effects). Even after using this estimator, they also find that the consequences for the mother are quite modest.

With regard to the quality of the partners the teenager will find in the marriage market, Ermisch and Pevalin (2005) highlight that teenage motherhood causes a British woman to perform worse in the marriage market, facing increasing chances of partnering with "poorly educated and unemployment-prone men". Likewise, Goodman et al. (2004) show that there is no difference in the likelihood of having a partner between teen mothers and those who did not become mothers, but their partners have lower qualifications and lower labour market status.

In spite of the discrepancies about the magnitude of the effects of teen motherhood as a result of unobserved family background, − see Geronimus and Korenman (1992) and Hoffman et al. (1993) for further discussion, there is no doubt that having a child during adolescence delays human capital investments (schooling) , affects negatively labour outcomes and their future partnerships.

Consequences for the child

The analysis of the consequences for the child presents similar problems of selection to the analysis of teen motherhood. The identification of these consequences become an empirical challenge to disentangle between the effects of early motherhood from the effects of pre-existing conditions of the mother and the environment where the child interacts. Nevertheless, the majority of empirical studies underpin negative effects of teen motherhood for the child. The focus of this literature is mainly on the effects on the child's health, education, social behaviour and labour market outcomes ; Grogger (2008), Haveman et al. (2008), Francesconi (2008).

With regard to the child's health outcomes, Haveman et al. (2008) show that children

[3]Hotz et al. (1997) also acknowledge this caveat and suggest the use of bounds to ameliorate the problem of having a *contaminated* natural experiment.

born to teenage mothers are more likely to report chronic health conditions such as obesity by their early adolescence. Baldwin and Cain (1980) compare several medical studies to find out the differences of babies born to teen and older mothers. Their conclusions underpin that regarding obstetric measures collected few days after the birth do not present significant differences between both type of children. However, one year later the differences between both groups were clearly driven by the absence of the father in the case of babies born to teenage mothers.

Additionally, these children are more likely to present differences in social behaviour from those born to non-teen mothers. For instance, they are more likely to be incarcerated Grogger (2008) and to become teen parents Haveman et al. (2008).

Francesconi (2008) shows that British children born to teen mothers have lower chances of higher education attainment, greater risks of teen childbearing and a greater probability of being in the bottom decile of the earnings distribution.

2.1.3 Public Policies for Young People

The Government of United Kingdom launched in 1999 the Teenage Pregnancy Strategy for reducing pregnancy and motherhood rates, as well as for raising the socio-economic conditions of teenage parents. According to the Department for Children and Schools (2010), the strategy was based on two main strands: a) provide information, advice an support and b) provide access to contraceptive methods. During the period of the Strategy (1999-2010), the rate of under 18 conceptions fell 13.3 percent, representing the lowest level over the past 20 years (46.6 to 40.4 per 1000 teenage girls). However, there is no formal impact evaluation of the real effect of these strategy on pregnancy and motherhood.

While the Teenage Pregnancy Strategy acknowledges the relevance of information , advice and support for young children related to relationships, sexual activity initiation and contraception, the strategy does not provide information about socio-economic factors that may also cause teen pregnancy and motherhood. The strategy could be complemented by acknowledging that pregnancy and childbearing decisions are likely to be based upon parental and teenager"s rational valuations about current and future alternatives for the teenager.

This paper contributes to the existent literature by exploring the impact of parental expectations about school choices, an unexplored family channel, on teenager's fertility decisions.

2.2 Relevance of Expectations for Teenage Pregnancy and Motherhood

Understanding the role of expectations on teenage behaviour embeds several edges. Firstly, what people aspire and expect about their future or their children's future may shape current behaviour. For instance, if parents aspire and expect a prominent future for their kid, they may invest in the child's human capital and guide her till reaching adulthood. Even in the

presence of credit constraints, parents with high aspirations and expectations may tend to help or support their kids to achieve their goals.

Genicot and Ray (2010) develops a theoretical framework that explains how aspirations and inequality are related, and in many situations how these are self-reinforcing. The main idea of their model is that aspirations impact investments and therefore economic mobility and income distribution. In the same spirit, I claim that if expectations influence fertility decisions among teenagers, raising expectations may delay childbearing decisions and therefore, expectations may impact returns to schooling and social mobility.

Secondly, if beliefs or expectations about future outcomes influence behaviour, the validity of the information considered for shaping these beliefs is crucial for changing people's attitudes. Specially, when people have little information about specific events or their preferences tend to bias the real costs and benefits of future outcomes or decisions. As Akerlof and Dickens (1982) discusses, people "can manipulate their own beliefs by selecting sources of information likely to confirm desired beliefs".[4]

In the context of teenage motherhood, the importance of expectations embraces similar reasons. First, if parents and teenagers have high expectations about the teen's future, parents will invest more on them and teenagers will put more effort on achieving their goals. As a consequence, parents and teenagers will avoid events that may jeopardize or delay the achievement of such goals. Second, if parents and teenager have high expectations, these increase the opportunity cost of those actions made by the teenager or by her parents that delay or distort the teenager's goals. And third, if expectations play a similar role to aspirations on social mobility, they may impact not only teenager's behaviour, but also her adult outcomes such as labour and marriage market options.

2.3 An economic approach: Expectations and Teen Motherhood

This section describes a simple theoretical model to understand the parameters involved in the decision of having or not having a child during adolescence. This theoretical framework follows a similar strategy to Manski (1993) where he derives the decision rules for schooling choices. The main two differences between Manski's work and this model are that this model explains the decision rules for fertility choices instead of schooling choices, and does not discusses the implication of forming expectations conditional and unconditional on the teenager's ability. This model assumes expectations about attending higher education are conditional on prior academic achievement and the quality of the child's school. At the end of this section, I provide a linkage between the parameters discussed in the theoretical model with the empirical specifications analysed in Section 5.

[4]By describing the definition of cognitive dissonance, the authors discusses this statement as one of the premises that compounds this psychological concept.

The model

This model provides a theoretical framework to understand how expectations about school choices influence the teenager's fertility decisions conditional on her schooling achievement, the quality of her school, tastes for schooling and for childbearing. The teenager will decide between having or not having a child when she is close to finishing compulsory education (at age 16).

To simplify the model, I initially assume parents are better at processing information to shape their expectations about the future teenager's educational choices. As a result, parental expectations are more influential on teenager's behaviour than the adolescent's. Parents may have *high* or *low* expectations about the likelihood of the teenager to attend higher education depending on the observed teenager's academic achievement and the quality of her previous and current schools. If parents believe the teenager is good at school and(or) the quality of her school is high, they will perceive high returns to schooling and therefore, these will be translated into high expectations about attending Higher Education after school leaving age. Thus, parents will encourage and support their teenager to continue studying after compulsory education and therefore, the opportunity cost of having a child during adolescence will raise.

The teenage girl has three alternatives after finishing compulsory education. Either she continues studying (enrollees at Higher Education), works or starts an apprenticeship, or has a child. The decision rules derived from this model simplifies the three alternatives into two: having a child or otherwise, where the latter embeds the choice of continue studying or start working. In this model there are two periods, where all alternatives are mutually exclusive and the teenager has to choose one of them in the first period. [5]

In the first period of this model, the teenager chooses between *having a child (c=b)* or *otherwise (either enrolling higher education or working (c=s))*[6] ; in the second period all adult women have children. The teenage girl will decide to have a child at age 16 if the utility of having a child U_b is greater than attending higher education (or start working) U_s. Both utilities can be represented by the following expressions:

$$U_b = \alpha + \beta_b E(S_{he}|\pi, \bar{s});\ \beta_b < 0 \tag{1}$$

$$U_s = \phi + \beta_s E(S_{he}|\pi, \bar{s});\ \beta_s \geq 0 \tag{2}$$

Where α and ϕ are the teenager's tastes for childbearing and attending school (or working); S_{he} represents attendance to higher education, π is the accumulated academic achievement prior to Higher Education; and $\bar{s}$ the quality of the schools she had attended. The teenager will choose early childbearing if:

$$Prob[b = 1|\pi, \bar{s}] = Prob[U_b > U_s] \tag{3}$$

[5]The choice of start working at age 16 can be explicitly included into the model, however, because this decision is not analysed in the empirical section, I do not separate schooling and working as non-childbearing options.

[6]These abbreviations stand for: c choice, b having a child, and s enrolling higher education or working.

Substituting both equations (1) and (2), the probability of having a child is given by the following expression:

$$Prob[\alpha - \phi + (\beta_b - \beta_s)E(S_{he}|\pi, \bar{s}) + \epsilon_b - \epsilon_s > 0] \tag{4}$$

Based on the utility functions describe earlier, the probability of having a child will depend on the differences in tastes, on the differences in returns to the expected attendance to higher education and on the differences in error components. Because β_b is negative, the expectations of attending higher education decreases the probability of becoming a teenage mother. If both β_b and β_s have the same value, expectations about educational choices do not influence the probability of becoming a teen mother.

At the age of 16, when the teenager will decide between early childbearing or continue studying (or working), parents and teenagers know the adolescent's accumulated academic achievement, the quality of her prior schools, as well as the teenager's preferences for schooling (or working) and childbearing. The teenage girl will obtain values of the vector (S_{he}, y, τ, $\bar{s}$, π) through independent draws taken from the following time-stationary process:

$$S_{he} = E(y|\bar{s}, \pi) + \eta_1 \tag{5a}$$

$$y = \beta_0 \bar{s} + \beta_1 \pi + \epsilon_1 \tag{5b}$$

$$\tau = \bar{\tau} \tag{5c}$$

Where y represents the income the teenager will obtain conditional on π and $\bar{s}$ and the differences in tastes $\alpha - \phi$ is represented by τ. The higher the expected income, the more likely the teenager will attend higher education. β_0 and β_1 are assumed to be positive or equal to zero.

Similar to Manski (1993), the two error components, the accumulated academic achievement and the school's quality are distributed as normal distributions with mean zero, known variance ($\sigma^2_{\eta_1}$, $\sigma^2_{\epsilon_1}$, $\sigma^2_{\pi} = 1$, $\sigma^2_{\bar{s}}$) and no correlation across terms.

Plugging the time-stationary process into equation (4) provides the following decision rule:

$$c = \begin{cases} b & \text{if } \bar{\tau} - \mathrm{E}(S_{he}|\bar{s},\, \pi) + \epsilon > 0 \\ s & \text{otherwise} \end{cases} \tag{6}$$

Thus, the probability of having a child can be expressed as :

$$Prob(c = b|\bar{s}, \pi) = \Phi\left(\frac{\bar{\tau} - \beta E(S_{he}|\bar{s}, \pi)}{\sigma_\epsilon}\right) \tag{7}$$

Assuming these expectations are rational, this implies that parents know that equations (5a), (5b), and (5c) hold; and as a result $E(S_{he}|\pi, \bar{s}) = \beta_0 \bar{s} + \beta_1 \pi$. Parents may compare their teenager's π and $\bar{s}$ with the preceding generation's values and choices and form their expecta-

tions about the likelihood of having their teenager's attending Higher Education. In addition, parents may also used their own experience as teenagers to complement their expectations about their own kid's educational choices.

Substituting the expectation of attending higher education into equation (7), we can express the probability of having a child conditional on π and $\bar{s}$:

$$Prob(c = b|\bar{s}, \pi) = \Phi\left(\frac{\bar{\tau} - \beta(\beta_0\bar{s} + \beta_1\pi)}{\sigma_\epsilon}\right) \tag{8}$$

By looking at equations (7), we observe the decision of having a child during adolescence will depend on the expectation of attending higher education and the tastes for schooling and childbearing ($\bar{\tau} \equiv \bar{\alpha} - \bar{\phi}$). For instance, if $\beta E(S_{he}|\bar{s}, \pi) + \bar{\phi} > \bar{\alpha}$ the girl will decide to attend higher education. However, if tastes for childbearing offsets the expectation of attending higher education (and preferences for schooling), the girl will decide to have a child. In addition, even if this expectation is greater than zero, but the taste for schooling (or working) $\bar{\phi}$ is negative and larger in absolute value than the expectation, the teenage girl will decide to have a child.

This model can be extended by considering parental and teenager's expectations separately. If we assume both parents and teenager draw different values of the same stationary process, expectations may be compounded by two elements:

$$\beta E(S_{he}|\bar{s}, \pi) = \gamma^P E(S_{he}) + \gamma^T E(S_{he}) \tag{9}$$

Even if expectations between parents and teenager are identical, they may differently contribute to $E(S_{he})$; thus γ^P and γ^T may be greater or equal to zero. By considering equation (9) into the probability described in equation (4), we obtain the following decision rule:

$$c = \begin{cases} b & \text{if } \bar{\tau} - \mu^P \text{ E}(S_{he}|\bar{s}, \pi) - \mu^T \text{ E}(S_{he}|\bar{s}, \pi) + \epsilon > 0 \\ s & \text{otherwise} \end{cases} \tag{10}$$

Where $\mu^P = \gamma^P/\beta$ and $\mu^T = \gamma^T/\beta$. Now, the probability of having a child depends on both types of expectations, as well as on tastes:

$$Prob(c = b|\bar{s}, \pi) = \Phi\left(\frac{(\bar{\tau} - (\mu^P + \mu^T)E(S_{he}|\bar{s}, \pi)}{\sigma_\epsilon}\right) \tag{11}$$

Similar to equation (8), we substitute the expectation of attending Higher Education into the previous probability:

$$Prob(c = b|\bar{s}, \pi) = \Phi\left(\frac{\bar{\tau} - (\mu^P + \mu^T)(\beta_0\bar{s} + \beta_1\pi)}{\sigma_\epsilon}\right) \tag{12}$$

It is worth highlighting this model helps on identifying the potential biases we may observe in fertility models if a measure of expectations is not available in our data. As we have shown in equation (8), the coefficient of prior academic achievement and the quality of school embeds

the effect of parental expectations, as well as the direct effect of these variables on the decision of having a child.

In the empirical specifications, we are able to identify the effects of parent's educational expectations on fertility choices by introducing parental preferences for having their teenager working at age 16 and expectations about attending Higher Education. We also control for the teenager's expectations about start working at age 16 if her intentions are different from enrolling higher education. I use number of siblings and being born to a teen mother as proxies of preferences for early childbearing. In addition, accumulated academic achievement is represented by Key Stage 2 marks in English, Maths and Science; and quality of school by the the Ofsted classification of management, efficiency and climate for learing in Key Stage 1 and 2 (1996-1999), and percentage of eligible pupils for Free School Meal benefits (2001-Key Stage 2 and 2002-Key Stage 3) the first one in Key Stage 3 (2002).

The remaining endogeneity of parental expectations is addressed by using instrumental variables. This endogeneity is derived from the potential correlation between parental expectations and the teenager's tastes for schooling. Section 3 presents a detailed explanation about the sources of the endogeneity of parental expectations.

Finally, this model also helps on understanding how our instruments facilitate the identification of the effect of parental expectations on fertility decisions. If exogenous factors change teenager's academic achievement and(or) the quality of the school, these may change parental expectations about schooling choices. [7]

3 Identification Strategy

This section describes the strategy I follow to identify the causal effects of parental expectations on the likelihood to become pregnant and to have a child during adolescence. The strategy uses the theoretical framework previously described to understand the mechanisms through which parental expectations influence our outcomes of interest, as well as to identify potential biases of parental expectations coefficients as a result of omitted variables and endogeneity.

The identification strategy of this study relies on the structure of the Longitudinal Survey of Young People in England *LSYPE* and the discrete/categorical nature of our measure of parental expectations. Therefore, to understand to what extend parental expectations matter for teenage pregnancy and motherhood, we use the information provided by the seven waves of the LSYPE and apply maximum likelihood techniques with instrumental variables to estimate the effect of parental expectations.

[7] The statement of the importance of early investments for cognitive (ability) production is based on the theoretical contribution of Cunha et al. (2010).

3.1 The Decision Process

The decision of becoming a teen mother follows a process of sequential decisions. Firstly, the teenager decides the age to initiate sexual activity, the use of contraceptives she or her partner will use, and if pregnancy occurs, she will need to chose between having or not having the child. Throughout the decision process, parental and teenager's expectations may or may not influence teenager's decisions. In this regard, I argue that for those stages perceived with high social, economic and(or) financial costs, expectations about school choices may play an imperative role on their resolution. In the existence of high expectations for the teenager's choices, parents and teenager will avoid any interruption or delay on the teenager's human capital investment.[8] The reason is that parents with high expectations perceive higher returns to schooling for their teenager than those with low expectations. Consequently, the opportunity cost of having a child during adolescence is perceived by high-expectation parents higher than the cost perceived by the low-expectation type.

The opportunity costs of having a child during adolescence may be already perceived by teenage girls even before starting their sexual activity. However, once they start acquiring sexual experience, they may revise their beliefs about the likelihood of getting pregnant and their consequences. Teenage girls with a high level of risk aversion in becoming a mother are likely to be more cautious when having sex by using contraceptives or to adopt sexual abstinence. This aversion or reluctance of a teenager girl to become a mother is directly related to the costs or benefits she perceives about early childbearing. Therefore, teenage pregnancy may occur only if a misuse of contraceptives happens, if the teenager is a sexual risk taking individual, or if the girl wants to become a mother. In the first two cases, girls will choose an abortion if they have high expectations about their future choices and these are reinforced by parents, conditional on other factors.[9] As a result, even though parental expectations may influence the decision process since the likelihood of being pregnant, if pregnancy occurs, only those teenage girls with low expectations about their educational choices or a taste for early childbearing will decide to have the child.

In spite of the sequential nature of fertility decisions, our data limitations do not allow to fully observed contraceptive use and pregnancy since the teenager became sexually active. Therefore, the empirical analysis is focused on pregnancy and motherhood stages from Wave 4 to Wave 7 of the LSYPE (16-17 to 19-20 years old) using family background and subjective expectation data from Wave 1 (13-14 years old). Further details about the data are discussed in Section 4.

3.2 Empirical Specifications

The empirical analysis of Section 5 starts by analysing clustered linear and non-linear probability models to understand the relationship between parental expectations on the likelihood of

[8] We assume that parental and teenager's preferences are consistent with expectations.

[9] Unless, the teen girl is constrained by social or religious rules.

teen pregnancy and motherhood. Although logit models allow thicker tails to better represent extreme probabilities, our reference models are probit models given their flexibility on estimating coefficients and marginal effects using instrumental variables. The clustering is identified at the individual level for considering the error correlation across waves within the same individual and the empirical model behind our specifications presents the following structure:

$$D_{it} = X_{it}\beta + E_i\gamma + \epsilon_{it} \tag{13}$$

Where D_{it} is the outcome of the teenager i in time t, either being pregnant or deciding to become a mother; X_{it} is a set of covariates compounded by demographic characteristics, academic performance of the teenager in Key Stage 2 (primary school-NPD records), alcohol intake in Wave 1, deprivation index collected in Wave 2, economic activity of father and mother when the teenager was 5 years old, and the rest of variables enlisted in Tables 3 and 4 ; E_i encompasses parental expectations having as reference category *likely* and *fairly likely*; and ϵ_{it} is a random error component at the individual level which varies across waves.[10]

The identification of the effect of parental expectations about the teenager's educational choices presents important challenges derived from their potential correlation with preferences for schooling and for occupational choices. In our context, when parents are asked about the likelihood of the teenager for attending higher education (our measure of expectations), parents may be more inclined to report higher expectations when they have also preferences for seeing their children into University or College; similarly, parents may report low expectations if they prefer their teenager to start working after compulsory education.[11]

Endogeneity and Strategies

The endogeneity of parental expectations can be better described by explicitly analysing the specification of teenage pregnancy/motherhood and the reduced form of parental expectations; both equations do not present the subscript t for simplicity:

$$D_i = 1[\mathbf{Z}_{i1}\varphi + E_i\gamma + \epsilon_i > 0] \tag{14}$$

$$E_i = 1[\mathbf{Z}_i\psi + \vartheta_i > 0] \tag{15}$$

Equations (14) and (13) are the same, whereas (15) represents the specification of parental expectations. This model will depend on $\mathbf{Z}_i$ that contains $\mathbf{Z}_{i1}$ and other variables not related to D_i or exclusion restrictions. Based on these empirical specifications, the endogeneity of expectations will be expressed through the correlation of error components in equations (14)

[10] Although alcohol intake may be considered as potentially endogenous, this variable is included into the empirical specifications to capture part of the teenager's risky behaviour.

[11] Kahneman (2011) argues that "if you dislike any of these things, you probably believe that its risks are high and its benefits negligible". In this way, parental preferences may bias their beliefs and expectations when they disapproved the idea of the teenager attending higher education, and vice-versa.

and (15). Consequently, to identify the parameter of parental expectations γ we need either: i) no correlation between both error components $E(\epsilon_i, \vartheta_i) = 0$, ii) if there is non-zero correlation, the introduction of the omitted variable that causes expectations and the outcome of interest, or iii) an instrument that allow us to identify the effect of parental expectations and do not directly influence pregnancy and motherhood.

Based on the theoretical model discussed in section 2.3, tastes for childbearing and alternative choices (schooling and occupational choices) influence the probability of conceiving and having a child during pregnancy, conditional on other factors. As a result, if these preferences are correlated with parental expectations, our estimates will be biased if preferences are not included in the model.

To address the endogeneity of parental expectations, I follow two strategies: a) to control for occupational preferences and expectations and b) to use instrumental variables. Additionally, to better understand the effect of parental expectations for deprived population, I complement the analysis by using *propensity score matching (PSM)* techniques to identify two homogeneous deprived groups and test the significance of parental expectations on teenage pregnancy and motherhood models. The latter technique also provides an upper bound of the effect of parental expectations and help us to determine if the marginal effects derived from the instrumental variable approach represent Average Treatment Effects (ATE) or Local Average Treatment Effects (LATE).

The **first strategy** uses variables of parental preferences for having the teenager working or starting an apprenticeship at Year 11 (after finishing compulsory education), as well as teenager's expectations about start working at Year 11 other than continue in higher education. Although the revision of expectations may drive changes in preferences, it is unlikely that parental preferences collected at the same time as expectations reflect an *outcome* variable of expectations. Thus, to *control for preferences and expectations about occupational choices* reduces the potential omitted variable bias that parental expectation coefficients might be subject to.

To obtain parental preferences and teenager's expectations about work and training, the survey asks the following questions respectively: *What would you like the young person (YP) to do when reach school leaving age?* and *What do you want to do at age 16 other than further education?*. The answer to this question has the following options: a) continue in full time education, b) start learning a trade, c) start an apprenticeship, d) get a full-time paid job, or e) something else. Because both questions report that approximately 95 percent of parents and teenagers prefer and expect the teenager to continue studying in full time education, we join the alternatives different from full time education and construct the variable of preferences and expectations for occupational choices. It is worth mentioning that only 0.9 and 0.5 per cent reported "something else" as an option, respectively.[12]

[12]The question asked to young people was derived from two questions. Firstly, the teenagers are asked about their intentions after Year 11 (age 15 at the beginning of this academic level). If they reported *leave full-time education*, they were asked the following alternatives: a) start working full time, b) start learning a trade or

Although the collection of preferences in the LSYPE does not follow an economic approach of *revealed preferences*, this variable involves an implicit ordering from the parent and helps to reduce the potential omitted variable bias previously mentioned.[13] The empirical specification considering parental preferences and teenager's expectations about occupational choices, represented by F_i, presents the same structure as equation (13):

$$D_{it} = X_{it}\beta + E_i\gamma + F_i\delta + \zeta_{it} \tag{16}$$

Following the theoretical model describe in Section 2.3, the decision of becoming a teen mother will depend on the tastes for schooling (and working) and tastes for childbearing in addition to parental expectations. Although the empirical models include two measures that might be highly correlated with teenage childbearing preferences, −being born to a teen mother and number of siblings, these variables do not fully capture tastes for childbearing. In addition, because our measure of preferences for occupational choices may present measurement errors, parental expectations is likely to continue facing some biases derived from their correlation between preferences and expectations. For this reason, the **second strategy** addresses this potential source of endogeneity by using two sets of instrumental variables in single probits, bivariate probits and multivariate probits.

The econometric literature provides different strategies for dealing with discrete endogenous variables under a discrete choice modelling framework. In spite of the similarities of the assumptions behind these strategies, it is worth highlighting four approaches that allows instrumental variable techniques: linear probability models (LPM), control functions, maximum likelihood, and simple regressor methods (also called special regressor in earlier literature).

The advantages of LPM and simple regressor methods is that they impose weaker conditions on the endogenous variables and instruments. However, LPM may not be useful for deriving policy recommendations given the difficulty on interpreting the effects estimated by OLS that can range out of the interval [0,1].[14] In addition, although the simple regressor allows to obtain meaningful interpretations of our marginal effects, it is difficult to implement in practice because we require instruments for our endogenous variables, as well as a *special regressor* that is exogenous, continuous, and significantly related with our dependent variable (pregnancy or motherhood).

work-based training, c) be unemployed and d) something else. The first two alternatives were jointly represented by a dummy in the empirical specification.

[13]The standard microeconomic theory suggests the use of preferences for ordering a set of goods or alternatives, however, to be able to order them these must satisfy several properties. If preferences are complete, reflexive, transitive, continuous, and strongly monotonic; then, there exists a continuous utility function representing them, see Varian (1992). If the researcher aims at knowing the individual's preferences for alternatives, it is required to know the individual's choice set and ordering. Even if the individual might be able to select several alternatives, the individual may have bounded information about his/her options. For this reason, it is crucial to know the choice set the individual perceives.

[14]Lewbel et al. (2012) argues that even negative values of marginal effects can be estimated by OLS when in reality the effect is positive. However, the evidence provided by him on this matter is scant. Regularly, when LPM provide extremely different results from ML, it can be interpreted as a problem with the specification of the model.

As a result, I use maximum likelihood (ML) methods to estimate the effect of parental expectations coefficients on teenager's fertility choices. I use the correlation of error terms to test the exogeneity of parental expectations, as well as a control function approach as a complementary test. The latter approach cannot be used to estimate *APE* when endogenous variables are discrete. It is worth mentioning that ML with instrumental variables require that the first stage and the joint distribution of error terms, residual of motherhood and residual of the reduced form of expectations, to be fully parametrized and correctly specified, see Lewbel et al. (2012) for further discussion. We argue that even though we do not know the data generation process of parental expectations, a good selection of instruments is enough for having reliable estimates under ML. In addition, by comparing LPM with ML, we observe that our findings present similar statistic significance.[15]

Section 5.3 uses ML with instrumental variables for addressing the potential endogeneity of parental expectations as a result of the correlation between parental expectations and unobservable variables not captured by the previous strategy. The analysis of the error correlation derived from ML and SML approaches are used for testing the exogeneity of parental expectations mentioned before. The appendix provides the results of a control function approach.

The first set of instrumental variables of high and low expectations is the *Excellence in Cities (EiC)* and *Educational Action Zones (EAZ)* programme implemented in 1999 at the national level by some deprived schools in UK.[16]

This variable was provided by the Department of Education for each school that received the programme, including their starting dates, upgrades into Cluster (in the case of EAZ) and their phase in the programme: phase 1, 2 or 3 (1999, 2000, 2001 respectively) in primary; phase 1 , 2 or 3 in secondary, cluster or EAZ (cluster and EAZ are mainly located in rural areas). The results presented in this section uses as instrument for high expectations the participation into the programme in 1999 when the child was in key stage 2 (primary school from 7 to 10 years old) and continue receiving the programme in key stage 3 (first half of secondary school from 11 to 13 years old) . In addition the instrument for low expectations is the non-participation of the primary school of the child in 1999, but participation of her secondary school in phase 1 (1999).[17]

Although the evaluation of the EiC and EAZ programme has been quite complex given its expansion during the implementation, as well the heterogeneous components across cohorts, in our case the use of this instruments is reduced to the LSYPE cohort.[18] The only source of

[15]These results can be provided to the reader upon request.

[16]A list of schools was provided by the Department of Education through the National Pupil Database and Transparency Team.

[17]Despite of the possibility of having students changing school in the transition between primary to secondary as a consequence of the programme, I argue that this was not possible at the beginning of Key stage 3 (when the teenager was 11 years old. The evaluation of the programme highlights that the main effects of the *EiC* component took place at the end of key stage 3 for mainly attainment in Mathematics, see Kendall et al. (2005). This implies that the effects of the *EiC* may have been evident to non-participant parents and teenagers till the end of key stage 3; when the decision of changing school was already made.

[18]Kendall et al (2005) presents details about the patterns of the introduction of EiC Programme, as well as

heterogeneity across LSYPE students is derived from the implementation of the programme. The intensity of exposure to the programme depends only on the initial period the school received the intervention: Phase 1 (1999), Phase 2 (2000) and Phase 3 (2001). Thus, the LSYPE cohort at Wave 1 already experienced around 5 years of the programme if this one was received in Phase 1 (1999) and a minimum of 3 years if the programme was received in Phase 3 (2001).

The main objective of this programme was to raise expectations of teenagers and parents, as well as to improve schooling achievement in english, maths, and science. The programme covered several strands: a) support for gifted and talented pupils; b) provision of Learning Mentors to support young people facing barriers to learning; c) Learning Support Units (LSUs) for pupils who would benefit from time away from the normal classroom ; d) City Learning Centres (CLCs) providing state-of-the-art ICT resources for a small number of schools; e) EIC Action Zones enabling small groups of primary and secondary schools to work together; and f) extensions of the existing Specialist and Beacon School programmes.

Kendall et al. (2005) describe an impact evaluation they carried out of the EiC programme for children in Key Stage 3 and 4 between 2001 to 2003, after receiving the treatment. This evaluation reveals that in terms of schooling achievement, only mathematics key stage 3 scores present significant differences between non-EiC beneficiaries and the EiC beneficiaries. The fact that this programme does not impact science subjects allow us to ensure that the programme does not directly impact pregnancy and motherhood through sexual education.

In spite of the several dimensions of the programme, the multiple stages of implementation allow us to distinguish heterogeneous effects on expectations depending on the exposure to the programme. As a consequence, those teenagers having a longer exposure (since 1999) may present better schooling achievement than the rest of benefited students, but not necessarily better than or the same as the non-eligible population. Figures 1, 2 and 3 of Appendix show that phase 1 and phase 2 present similar z-scores in english, maths and science to the non-eligible population, but phase 3 presents distributions slightly balanced towards the left.

Although the programme was targeted to schools in deprived areas, within schools not all students were benefited by the programme. Only those students at the extremes (top and bottom) of the schooling performance distribution (key stage 2 marks), were directly benefited by the programme. We account for these differences by including key stage 2 z-scores in english, maths and science in our empirical specifications.

The nature of our discrete choice model with potential endogenous discrete covariates leads us to consider econometric techniques that allow us to jointly model the probability of being a teen mother and the probability of having a parent with high or low expectations.

If parental expectation is endogenous, our econometric technique must allow non-zero correlation between both error components: $\rho_1 = Corr(\epsilon_i, \vartheta_i) \neq 0$. As a result, a joint maximum likelihood procedure is considered in this section, where even in the case of having an instru-

the evaluation of its different strands.

mental variable for parental expectations, a joint estimation provides more efficient estimates than separate estimation of both probabilities (being a teen mother and having a high or low expectation parent).

The model described by equations (14) and (15) assumes ϵ_i and ϑ_i are independent from $\mathbf{Z}$, distributed as bivariate normal with mean zero, $\text{Var}(\epsilon_i = 1)$ and $\text{Var}(\vartheta_i = 1)$ and $\rho_1 = Corr(\epsilon_i, \vartheta_i) \neq 0$. To identify γ, we use instrumental variables that are not directly related to D_i and just influence teen motherhood through parental expectations E_i. Hence, the set of $\mathbf{Z}_i$ contains $\mathbf{Z}_1$ and the rest of variables not contained in the latter are exclusion restrictions that allow us to identify the parameter of parental expectations. To obtain the average marginal effects of parental expectations we need to subtract the cumulative distributions when E_i is equal to one and zero: $\Phi(\mathbf{Z}_1\varphi + \gamma) - \Phi(\mathbf{Z}_1\varphi)$. Standard errors of marginal effects are computed by delta method.

Following Wooldridge (2010), to obtain the likelihood function of model (14) and (15) we need to recall that the joint distribution of (D_i, E_i) given $\mathbf{Z}$ can be decomposed into: $f(D_i|E_i, \mathbf{Z})f(E_i|X)$. Thus, we can express the probability of being a teen mother conditional on $\mathbf{Z}$ and having a parent with high or low expectations as:

$$P(D_i = 1|E_i = 1, \mathbf{Z}) = \frac{1}{1 - \Phi(\mathbf{Z}\psi)} \int_{-\infty}^{-\mathbf{Z}\psi} \Phi[(\mathbf{Z}_{i1}\varphi + E_i\gamma + \rho_1 \upsilon_i)/(1 - \rho_1^2)^{1/2}]\phi(\upsilon_i)d\upsilon_i \quad (17)$$

By combining the four outcomes $P(D_i = 1|E_i = 1, \mathbf{Z}), P(D_i = 0|E_i = 1, \mathbf{Z}), P(D_i = 1|E_i = 0, \mathbf{Z}), P(D_i = 0|E_i = 0, \mathbf{Z})$, considering the specification of parental expectations and taking the logarithms of these expressions, we obtain the log-likelihood function for our joint maximum likelihood:

$$logL = \sum_{i=1}^{n} ln\Phi_2(\mu_{i1}, \mu_{i2}, \rho_1) \quad (18)$$

Following a similar notation to Greene (2003), Φ_2 denotes the bivariate normal cdf, μ_{i1} and μ_{i2} represent the set of covariates and parameters of the teen motherhood equation and the reduced form of parental expectations respectively. To consider the four different outcomes we have under this bivariate modelling, $\mu_{ij} = q_{ij}z_{ij}$ which embeds the four combinations of possible outcomes mentioned before. Let $q_{i1} = 2D_i - 1$ and $q_{i2} = 2E_i - 1$. Thus, $q_{i1} = 1$ if $D_i = 1$ and $q_{i2} = 1$ if $E_i = 1$. In the same way, $q_{ij} = -1$ if D_i or E_i is equal to zero.

In this paper, the evaluation of ML bivariate probit has been done by calculating the bivariate normal probability density functions (pdfs) through numerical approximations. [19]

Although the bivariate probit model is more efficient than the separate estimation of pro-

[19]The majority of empirical studies faces the problem of endogeneity in discrete choice models by using linear models. Evans and Schwab (1995) is one of the few studies dealing with endogeneity through bivariate probit models. My approach follows a similar strategy by extending the implementation of seemingly unrelated maximum likelihood with a categorical endogenous variable.

bit for teen motherhood and expectations, we must acknowledge the categorical nature of our endogenous variable (*high* and *low* expectations). As a result, we propose the use of a seemingly unrelated multivariate probit to simultaneously model the likelihood of becoming a teen mother (or being pregnant) and the multinomial probit of parental expectations. In spite of the ordinal nature of parental expectations, the representation of missing values of this variable in our models does not make possible to estimate expectations as an order probit in the system of equations. For this reason, we estimate the probit of teen motherhood (or pregnancy) simultaneously with the multinomial probit of parental expectations.

By jointly modelling motherhood and expectations we obtain a more efficient estimate than the one derived through bivariate probit models. Because the evaluation of four integrals is quite cumbersome (one for motherhood and three for high, low and missing expectations), we need to make use of simulation techniques for solving the integrals involved in our model. Thus, SML techniques are used for obtaining estimates of parental expectations on teenage pregnancy and motherhood models.

The main idea of SML is to perform Monte-Carlo simulations of the integrals rather than evaluating them numerically, see Keane (1994) for further details. This technique is also useful even for bivariate probit cases where is not possible to obtain numerical solutions or convergence of the maximum likelihood. To obtain estimates by using SML techniques, I use the Geweke-Hajivassiliou-Keane (GHK) simulation method for maximum likelihood estimation of multivariate probit regression models. The computation of parental expectation coefficients and the rest of variables follow the application provided by Cappellari and Jenkins (2003).[20]

$$logL = \sum_{i=1}^{n} ln\Phi_4(\mu_{i1}, \mu_{i2}, \mu_{i3}, \mu_{i4}; \Omega) \tag{19}$$

Where Φ_4 is a four-dimension integral and Ω is a variance-covariance matrix of the error terms having as off-diagonal elements the correlation of error terms between motherhood and high-low-missing parental expectations.

As a robustness check, I use *propensity score matching* techniques for creating a comparable group of teen girls facing similar neighbourhood and school environments. To construct the *propensity score*, I use the criteria followed by the *Excellence in Cities (EiC)* and *Educational Action Zones (EAZ)* Programme for identifying deprived schools. This strategy allows to isolate neighbourhood and school effects for exploring the effect of parental expectations on sexual outcomes. This strategy only allows to identify a *local treatment effect (LATE)* of parental expectations given that the EiC-EAZ programme was only offered to a subset of schools with high rates of deprived population.

The exogeneity of expectations is tested by Wald Tests of the correlation between error terms of motherhood-pregnancy models and the error term of the reduced form of expectations. A

[20]The Stata ado-file *cmp* provided by Roodman (2009) has been used for obtaining marginal effects and coefficients, these results were verified and compared with the coefficients obtained by using the *triprobit* ado-file created by Cappellari and Jenkins (2003).

control function approach is also used for testing the exogeneity of parental expectations.

Selection Bias by Attrition

The sample design of the LSYPE survey is based on schools as primary sample units (PSU). As a result, survey attrition reflects drop-outs, or teenagers facing international migration (or local migration that the LSYPE team was not able to follow through their re-contact data). Because our analysis considers only those teenagers observed from Wave 4 to Wave 7, it is likely our model may present upward biased coefficients of parental expectations. The main reason is that teenagers found in the last waves of the LSYPE may be part of a *positive* selected group of individuals who may come from high-expectation households, or other beneficial family backgrounds (committed parents, teenagers with good interaction with their parents, highly motivated teenagers, high income students, among others). To acknowledge the selection bias caused by attrition in our empirical estimates, I construct *inverse probability weights* by modelling the selection of individuals from Wave 1 to Wave 6 by using only those variables available for everyone in Wave 1. These weights are used for all the empirical specifications of Section 5.

4 Data

This analysis is based on the LSYPE and NPD records for teenagers in England interviewed from 2004 to 2011 (Wave 1 to Wave 7). Secure data access has been provided by the Security Data Service (SDS) for identifying geographical identifiers at the Lower Super Output Areas (LSOA) for every LSYPE record. The total number of teen girls interviewed in 2004 (Wave 1) was 7,573 for which I observe 4,334 from Wave 1 to Wave 7 (57 per cent of the sample).[21] However, the empirical analysis uses the group of girls sexually active from wave 4 to wave 7 that accept to answer the questions about sexuality. The total number of girls used for the econometric models is around 2,500 per wave.[22] Table 1 summarizes the collection of parental and teenager's expectations, pregnancy and motherhood information:

Based on the data collection, it is worth highlighting that pregnancy questions were explicitly asked to teenager girls till Wave 6. Hence, our empirical specifications recovers pregnancy for Wave 4 and Wave 5 through the information about motherhood. For this reason, in the section of robustness check we discuss our empirical specifications by only using Wave 6 and Wave 7 of the LSYPE.

Finally, as a result of having expectation variables mainly collected at the beginning of the survey, I decide to use pooled clustered specifications, instead of fixed effects techniques.[23] To

[21] Total number of teen girls interviewed by the LSYPE in Wave 1 is 7,583. However, there are 10 teen girls not identified in our datasets for this wave.

[22] From the total of teen girls interviewed from wave 1 to wave 7 (4,334), 3,223 were already sexually active (74.4 per cent), 820 were not active (18.9 per cent), and 291 refused or decline to answer (6.7 per cent)

[23] Random effects methods provide similar results to the clustered models at the individual level.

acknowledge the dynamics of the data, all models include wave dummies to capture changes over time of unobserved characteristics. Further refinements are discussed in Section 5.

4.1 Measurement of Expectations

The use of subjective expectations is quite recent in the field of Applied Economics. As Manski (2004) discusses, the standard choice modelling have been able to estimate probabilistic choice models only by making assumptions about the individual's preferences over outcomes. However, several combinations of preferences, expectations and choice may exist. For this reason, the collection of subjective expectations has increased in the last 20 years. Some of the recent applications are focused on the formation of expectations in young population (Fischhoff et al. (2000); Zafar (2011b)), the usage of expectations in choice data (Zafar (2011a); van der Klaauw (2012)), and contraceptive choices (Delavande (2008)), among others. As a result of the applicability of this type of measurements, recent surveys have started including questions of subjective expectations measured by probabilities or Likert scales.

The measures of parental expectations are derived from a question asked to the main parent about the *likelihood of the young person to go to higher education.* Teenager's expectation questions followed a similar framework by asking the *likelihood of the young person of getting into university if apply.* Although both questions reveal expectations of both parents and teenagers after compulsory school leaving age (16 years for this cohort), parental expectations capture a broader definition of educational alternatives than the one asked to teenagers. Therefore, the differences observed in the descriptive statistics may primarily reflect the differences between higher education and university definitions. According to the Higher Education Funding Council for England (HEFCE), higher education can be provided by universities or colleges. The qualification obtained through colleges are validated either by universities or a national accrediting body. In addition, a student can enter college after year 11 (at the end of Key Stage 4-GCSE − when the teenager is 16), whereas for attending university the student has to pass A levels (College or Sixth Form).

The subjective likelihood reported by both parents and teenagers are measured by Likert scale with 4 categories: very likely, likely, fairly likely, and not likely at all. Because individuals may have different definitions about *likely*, this type of scales make difficult the comparison across individuals according to their subjective likelihood. For this reason, this paper focus the attention in the extremes of the Likert scale. Although we are not able to claim that *likely* and *fairly likely* individuals are different, we are able to argue that those individuals reporting *very likely* and *not very likely at all* will never overlap; in spite of their subjective cut-offs. Nevertheless parents reporting *not very likely* may have different subjective probabilities in their mind than those reporting *very likely*, we also know that they will never have in mind a subjective probability close to *very likely*.[24][25]

[24]Manski 2004 provides a theoretical explanation about the measurement of subjective probabilities and their use for modelling behaviour.

[25]Tables in Appendix show specifications of parental and teen's expectations on parental schooling, schooling

The following section analyses the role of parental expectations defining as reference category *likely* and *fairly likely*. Teenager's expectations are only considered in the robustness checks, but not in the main empirical specifications. The main reason for not including teenager's expectations in the main models is the lack of instruments for these data.

4.2 Descriptive Statistics

This section discusses summary statistics of the population considered for the analysis, as well as it presents additional statistics for those girls who became pregnant and those who decided to have the child. Tables 3 and 4 in Appendix present sociodemographic characteristics, academic performance measured by z-scores, alcohol intake in Wave 1, deprivation index in 2004, parental employment, and expectation variables. The variables shown in these tables are the covariates originally considered for the specifications that are discussed in Section 5. Thus, these omit the reference categories for the following variables: mother's and father's schooling (no instruction), religion (without religion), siblings (no siblings), alcohol intake (never), deprivation index (1st quintile - the richest), parental employment when teenager was 5 years old (paid job for less than 30 hrs per week), expectations (Likely and Fairly likely), and wave 4.

The sample of this study belongs to families with one or two children in the household (71 per cent), primarily Christian (51 per cent), and one quarter of them lives with lone mothers. The mothers of this sample of teenage girls are slightly more educated than fathers. The z-scores reported in this table reveal that girls did better in English than in Maths and Science in Key Stage 2 (primary school when these girls were 7 to 10 years old). Key stage z-scores were constructed by using the entire population of girls and boys interviewed by the LSYPE in Wave 1.[26] Because this cohort presents the same age, z-scores are not constructed based on this variable.

Tables 3 and 4 show that Wave 1 captures around 18 per cent of the sample having the habit of frequent alcohol intake during the week. The deprivation index provided by the LSYPE reveals that the sample is slightly concentrated in the first two quintiles of the deprivation distribution, having 48 per cent of the girls in the 1st and 2nd quintile. Because this concentration is mainly attributed to the selection of the sample by attrition, we consider this bias by correcting our empirical specifications with *inverse probability weights*. In regard to the expectation variables, we observe that parents report higher expectations about future academic choices than teenagers. However, this is not surprising given that parental expectations capture the likelihood of attending higher education whereas the teenager's collects the likelihood of getting into university. This differences will be discussed in the following subsection.

Finally, it is worth highlighting some of the differences between the whole population and the

achievement, alcohol intake in early waves and teen mother. We observe that teenager's with highly educated parents may tend to have high expectations on teen's future academic success; but also what parents observed in early stages (Key Stage 2) plays an important role. These tables will be changed according to the observations used for the empirical specifications used in the following section.

[26]Schooling performance variables were previously linked by the LSYPE team using the NPD records.

teenagers who became pregnant or mothers. As we would expect, those girls facing pregnancy or motherhood belong to more vulnerable backgrounds. From the total of pregnant girls, 7 per cent born to a teenage mother and from the total of teenage mothers the percentage is 3 points higher. In addition, their mothers and fathers are less educated, and also their academic performance is below the mean (negative z-score of Key Stage 2). Teen mothers present poorer academic performance in english, maths and science than the teenage pregnant sample. When we compare the whole population with the pregnant/mother sample, we observe that the highest concentration appears in the the 4th and 5th quintile. However, it is crucial to underpin the incidence of pregnancy and motherhood is not negligible for the rest of the quintiles.

Finally, comparing the variables of expectations across the three columns of Table 4, we observe that pregnant girls and teen mothers have much less parents reporting a high likelihood to attend higher education than the whole sample. An inverse pattern is observed for low parental expectations. The latter is at least twice as the percentage reported by the whole population. Because there are significant differences across groups on the number of missing values in parental expectations, a dummy of missing values was also considered in the empirical models.

5 Results

This section presents results of our empirical specifications based on discrete choice modelling techniques to analyse the influence of parental expectations on the probability of being pregnant and becoming a teen mother. These techniques are usually derived under an assumption of utility-maximizing behaviour by the decision-maker. The origins of this type of modelling date back to Thurstone (1927) who developed the concepts of utility in terms of psychological stimuli. These concepts led him to a probit model to understand whether respondents are able to differentiate the level of stimuli.

Following Thurstone's work, Marschak (1960) publishes an extension of Thurstone's methodological contribution by interpreting the psychological stimuli as an utility; he derived its derivation through an utility maximization framework. [27] Those models embedding this psychological stimuli have been called random utility models (RUMs). It is worth mentioning that models derived from utility maximization can also be used to represent decision-making that does not entail utility maximization. These models can also be seen as simple frameworks for describing the relationship between explanatory variables and the outcome of a choice without explaining how the choice is made.

In our case, although we cannot ensure the decision of being pregnant follows a rational decision, we argue that the choice of having a child involves a rational valuation of the current and future opportunity costs for the teenage girl. Hence, the difference between low-expectation and high-expectation parents will be the perceived opportunity costs of non-academic decisions

[27] A comprehensive discussion of the evolution and extension of discrete choice models can be found in Train (2009).

made by the teenager during adolescence. Parents with low expectations about the teenager's school choices may perceive a lower cost than those parents with higher expectations. If an unexpected pregnancy happens, teenagers with (perceived) low opportunity costs may tend to resolve the pregnancy by having the child.

5.1 Discrete Choice Models

This section discusses how parental expectations are related to the likelihood of becoming pregnant and being a teen mother using the unbalanced panel from Wave 4 to Wave 7.

Tables 7 present pooled linear probability models (LPM), logit and probit marginal effects based on equation 13 and using Wave 4 to Wave 7 of the LSYPE. A cluster-robust estimate for the standard errors is used for taking into account error correlation over time for the same individual. Although LPM may have the disadvantage of estimating probabilities out of the range [0,1]; as well as can provide negative effect estimates even when the true effect is non-negative as Lewbel et al. (2012) highlight, these models are presented for completeness.

Table 7 presents the marginal effects of *parental expectations*, *key stage 2 z-scores*, and *being born to a teen mother* on the likelihood of being pregnant under 20. These models reveal that having parents with high expectations in early stages (Wave 1), decrease the likelihood of becoming pregnant during adolescence; conversely, teenage girls having parents with low expectations are more likely to become pregnant.

But, **how relevant is this result**? By looking at the magnitude of the marginal effect of *born to a teenage mother* and comparing it with the marginal effect of parental expectations, we observe that the marginal effect of parental low expectations is around 20 percent as important as being born to a teen mother.

Probit and logit estimates underpin teenage girls having parents with high expectations, are approximately 2 percent less likely to become pregnant than those having parents with middle expectations (reference category).[28] Conversely, teen girls having parents with low expectations are 2 percent more likely to become pregnant than our reference group. In addition, teenagers who were born to a teen mother are on average 8 percent more likely to become pregnant than those who were born to an adult mother. These results are conditional on the baseline probability of pregnant girls of 8.2 percent.[29]

In addition, table **??** presents results for the likelihood of being a teen mother for which we observe similar marginal effects as the ones discussed for the pregnancy specifications. Although teen motherhood models are only conditional on having sex under 20 years old, independently of pregnancy experiences, we observed that parents with high expectations decreases in about 2 percent the likelihood of becoming a mother in comparison to the reference category (middle

[28] Middle expectations refer to those parents reporting a likelihood of teen girl going into high education as *fairly likely* and *not very likely*

[29] Additional covariates have been included in earlier specifications such as geographical regions, teenager's expectations and other family background characteristics. The findings discussed in this paper do not change after including such covariates.

expectations). The magnitude of this marginal effect is about 20 percent of the effect of being *born to a teen mother*. In addition, the only significant academic performance indicator is english at key stage 2. This may reflect that academic performance at early stages of childhood may not only shape parental expectations (as shown in table 13), but also may have a direct impact on the outcomes of interest through the information teenagers obtain at school on sexual behaviour, contraception and maternity. Hence, we would expect to have direct effects on both pregnancy and motherhood.[30]

5.2 Relevance of Attrition in Unbalanced Panel

As section 3 has discussed, the survey design of the LSYPE may drive a *positive* selection bias. This type of selection is caused by dropping out of the most disadvantaged teenagers or individuals living unstable housing conditions. Thus, as we move along waves, the teenage girls observed in the last waves may come from highly motivated backgrounds, having parents with high expectations on teenager's school choices, among other beneficial environments. Because sexual outcomes are mainly collected from Wave 4 to Wave 7, our concern regarding this *positive* selection is driven by the potential upward biased marginal effects and coefficients obtained for parental expectations. Table 9 shows the differences in covariates collected in Wave 1 by intensity of attrition. We observe that as we move along the waves, the sample of girls shows better characteristics; they are wealthier, with more educated parents and better schooling performance (higher z-scores in key stage 2). For this reason, we construct *inverse probability weight* for taking into account the selection bias caused by attrition.

Table 8 reports probit estimates of table 7 compared with two weighted models. The first weighted model is presented in column (2) considering the survey weight of Wave 1 for taking into account the original population distribution. Column (3) shows the results of a weighted model by using *inverse probability weighting (IPW)* to balance our sample based on the probability of each individual to appear in the sample in the following wave. The main idea of this technique is to use full information of both types of individuals (attrited and non-attrited) before the attrited individuals are no longer observed by the survey. For this reason, IPW is constructed by modelling the probability of observing the individual in the seven waves. The inverse value of the predicted probability corresponds to the weight used for the pregnancy and motherhood models. The attrition model is constructed by using fully observed covariates of Wave 1 (2004) and is presented in Table 12 of Appendix.[31] The models of the following subsections use IPW in all cases.

[30] Multinomial logit of expectations will be updated with the sample used in the empirical models.

[31] Wooldridge (2007) shows that estimating the selection probabilities is generally more efficient than if the known selection probabilities are used in estimation.

A matter of deprivation or parental expectations ?

The above sections have shown the relevance of parental expectations for our sample of teenage girls interviewed by the LSYPE from Wave 4 to Wave 7. To better understand the performance of these outcomes across the deprivation distribution, table 2 presents the incidence of teen pregnancy and motherhood across deprivation percentiles.

In spite of the clear concentration of pregnancy and motherhood in the most deprived percentile (column 3), we observe a non-negligible incidence in the first two partitions (1st and 2nd percentiles). For instance, 5 percent of teenage girls from the first percentile have been pregnant and 1 percent of them decided to have the child; in contrast, 12 percent of teenage girls from deprived backgrounds (last percentile) has experienced pregnancy, where 55 percent of them decided to have the child.[32]

Based on the the extended version of weighted probits, we observe that teenagers living in highly deprived environments are 4 percent more likely to become pregnant and between 3 to 5 percent more likely to being teen mothers.[33] It is worth mentioning that only the two most deprived quintiles are significant for pregnancy specifications. In contrast, teen motherhood models reveal that the more deprived is the environment, teenage girls have an increasing risk for being teen mothers. The marginal effect of income deprivation goes from 2 to 4 percent, where the reference category is the lowest deprivation quintile (the richest). Thus, the fact that this result is relevant for the whole income distribution, underpinning a high concentration in the poorest quintiles, sheds light on the relevance of analysing these phenomena beyond the argument of income deprivation as the main cause of teen motherhood.

Tables 14 and 15 of Appendix present models for each percentile partition. To have enough number of observations, we contruct three-percentile partitions instead of quintiles. Although these samples are not strictly comparable, these tables shed light on the relevance of parental expectations for the middle and top deprivation percentiles. For the richest percentile (column 1), parental expectations do not show significant effects on teen pregnancy and motherhood. Column 2 and 3 shows that teen girls having parents with high expectations are decreases the likelihood of 2.5 and 4.5 percent less likely to become pregnant than the reference category if they belong to the middle and top percentile, respectively. For those in the middle group, it is 4 percent more likely to get pregnant if they have parents with low expectations.

Teen motherhood specifications show an effect of high parental expectations as high as the one observed from the marginal effect of *born to a teenage mother*, but with negative sign. Those girls living in deprived households are 3.7 less likely to become a teen mother if their parents have high expectations. Nonetheless the number of teen mother cases has been reduced as a consequence of this partitioning, we are still able to identify for the middle group that girls having low expectation parents are 1.3 more likely to become a mother. The magnitude of this effect is around 35 percent as high as being born to a teenage mother.

[32] I will complement this paragraph with the national incidence of pregnancy and motherhood.
[33] These results are not presented in the Appendix.

An interesting finding based on these tables is that the effect of being born to a teenage mother in pregnancy models is relatively the same across percentiles. However, in motherhood specifications, this variable is larger for the first percentile, but decreases for the 2nd and 3rd partitions. High parental expectations appear with an increasing influence on the 2nd and 3rd percentile. Because highly deprived areas face higher incidence of teenage motherhood and anti-social behaviour than non-deprived areas, high expectations of parents may have a stronger impact on teenagers as a consequence of the lack of high expectations and aspirations in the area. In the same manner, for those teenagers living in well-off areas, even if parents may have low expectations about their academic futures, peer and neighbourhood interaction may compensate for the lack of parental support or expectations.

5.3 Endogeneity of Expectations

5.3.1 Control for Preferences and Expectations about occupational choices

The LSYPE has the advantage of collecting parental expectations for Wave 1 and 4 as shown in table 1, respectively. However, the closer the measure is from the age where the teenager has her sexual debut, the more likely is the expectation variable is endogenous. For this reason, the above empirical analysis considers the measure of expectations collected in Wave 1. In this manner, by not considering later expectations we eliminate the potential endogeneity derived by the simultaneity between sexual outcomes (or fertility outcomes) and expectations. However, this does not control for the endogeneity of parental expectations that may be driven by the correlation of expectations with unobservable variables such as preferences, neighbourhood effects or other sources.

This subsection presents the specifications discussed in section in table 8 by considering a measure of preferences collected by the following question: *What would you like the teenager to do when reach school leaving age?*

If parental expectations are mainly reflecting preferences, γ may turn insignificant or change its magnitude. Although the magnitude of effects is not strictly comparable between columns 2 and 4 of tables 7 and columns 1 and 4 of table 8, the marginal effects of parental preferences are still significant with similar magnitudes.[34] Hence, this result ensures our measure of expectations is not reflecting this type of parental preferences.

5.3.2 Instrumental Variable Approach

Tables and show weighted probit, bivariate and SML results for pregnancy and motherhood using as instrumental variables the *EiC* programme. Probit and bivariate models consider the endogeneity of high and low expectations separately. Whereas SML considers both of them by

[34]The comparison of non-linear models where one of them contains additional variables do not ensure which of the models still follow a normal or logistic distribution for the error term, Jeffrey Wooldridge at the IZA summer school 2013.

estimating seemingly unrelated separate probits.[35]

We observe that from column (3) to (6) high expectations is significant and as we would expect, column (6) presents more efficient estimates than column (5). The latter estimates the system of equations by considering separate probits of expectations and motherhood, whereas column (6) estimates the system by considering a probit for motherhood and a multivariate probit for parental expectations. Comparing column (3) of table **??** with column (6) of table 19 we observe that SML is slightly bigger than the reported by column (3), but this is not significantly different. Pregnancy SML model in table **??** does not reveal significant effects of parental expectations, − this will be discussed further in section 6. It is worth mentioning the marginal effects reported in 19 reports marginal effect evaluated when marginal expectations are equal to one. Hence, these results are not strictly comparable with tables of weighted probits. However, section of Robustness Checks present marginal effects evaluated at the means of all values, with exception of discrete variables.

Using instrumental variable techniques we observe that high expectations are important for teen motherhood and their effect is as large as being born to a teenage mother. Because these models are *conditional on having sex*, these estimates may reflect a lower bound of the effect of parental expectations on teen motherhood. However, the benefits of conditioning on *having sex* makes possible to compare pregnancy and motherhood models.

To validate our results, I use a second set of instrumental variables construct at the LSOA level. This instrument is a score at this geographical level that assesses the access to educational choices and training. The indicator is constructed by the Office for National Statistics and the components of the score are the following: a) average points score of children at Key Stage 2 (2002); b) average points score of children at Key Stage 3 (2002); c) average points score of children at Key Stage 4 (2002); d) proportion of young people not staying on in school or school level education above 16 (2001); e) Proportion of those aged under 21 not entering Higher Education (1999-2002); f) secondary school absence rate (2001-2002); and g) proportions of working age adults (aged 25-54) in the area with no or low qualifications (2001). After controlling for deprivation and employment status of parents when the teenager was 5 years old in our specifications, we may argue parental expectations is independent from the error term of motherhood.

The results are shown in table 21 and are consistent with the results previously discussed in this section. The advantage of this instrument is the power of prediction of first stage models in contrast to the instrument based on the *EiC-EAZ* programme. The F-statistic of the instrument of high expectations using *EiC-EAZ* programme is 2.55 (p-value= 0.11) and using *educational-training score* at the LSOA level is 25.71 (p-value=0.000). Regarding the instrument for low expectations, using the *EiC-EAZ* programme the F-statistic is 11.17 (p-value=0.001) and using

[35]The suggested number of replications according to Cappellari and Jenkins (2003) is the square root of the number of observations. Because the number of individuals in our panel is around 2,500 individuals per wave, SML models compute 45 random draws for each SML model. For those models for which convergence was not obtained, the number of draws was reduced to 35.

the education-training score is 7.39 (p-value=0.007). Both set of instruments are not directly correlated with motherhood and pregnancy, and are significant in the first stages of estimation (reduced form of expectations).[36]

Finally, analysing the marginal effects of parental expectations across the english z-score distribution, we observe that there is a large and significant impact at the bottom of the distribution. This reveals a crucial result about the importance of high expectations on the likelihood of having a child during adolescence. Although parental high expectations matter for the whole academic performance distribution, the largest marginal effect is found for teenage girls underperforming at school, see Figure 7.[37] This result may be reflecting the negative factors that faces a teenager with low academic performance. As a result, the marginal contribution of high expectations is higher for her than for a girl that performs better at school and that may have other factors to compensate *absence of high expectations* at home. It is likely that teenage girls performing above the average of their distribution may have teachers, peers and other adults that may reinforce or promote high expectations about school choices.

5.3.3 Propensity Score Matching: Deprived Population

By using the eligibility criteria followed by the social programme *Excellence in Cities (EiC)* and *Educational Action Zones (EAZ)* , a group of *comparable* teen girls was created by controlling for peer and neighbourhood effects.[38]. This programme aimed at increasing schooling achievement and raising expectations of students and parents. The programme was implemented in 1999, 2000 and 2001 across some deprived schools. The fact this programme did not tackle every deprived school gives the opportunity of constructing a control group. In this section, this programme is mainly used as a criterion for creating comparable groups, but not for evaluating the programme or for being used as an instrument. By considering pre-treatment variables for constructing homogeneous groups, we are able to assess the effect of parental expectations among comparable groups facing similar peer and neighbourhood effects.

Propensity Score Matching *(PSM)* techniques were used for creating a more homogeneous group called *deprived or eligible* group by the programme. The pre-treatment variables used for constructing the propensity score are: average size of teacher classes in key stage 1 (1997-2nd and 3rd year of primary school); evaluation of the 1996-1999 period of the standards achieved by the teenager's school; percentage of pupils achieving level 4 or above in english and maths (1998) and science (1999); and mother's and father's schooling.

Table 22 highlights a significant and negative effect of parental expectations on the likelihood of becoming pregnant for a *deprived homogeneous* group. Because the selection criteria for constructing this group is based on the definition of deprivation followed by the *EiC* programme, this coefficient should be interpreted as a Local Average Treatment Effect *LATE* and not as

[36]First stages can be provided upon request.

[37]High expectations are significant across the whole distribution of academic-performance based on Key Stage 2 z-scores in english, whereas being born to a teen mother is significant from values of the z-score of -1.

[38]The *EiC* is briefly described in the next subsection.

a Population Average Effect (PAE). These coefficients are very similar in magnitude to those obtained by partitioning the models in deprivation percentiles.

Tests of Exogeneity

Table 20 presents Wald test of exogeneity by testing if error correlations are significantly different from zero. The error correlation has been converted into fisher's transformations. The original correlation coefficients are reported in table 18. The tests of this table show that the correlations between the reduced forms of low and high expectations and the error component of teen motherhood are not significantly different from zero. The only error correlated with teen motherhood is the one derived from the reduced form of missing parental expectation.

Additionally, we offer a complementary test of exogeneity by following the method suggested by Burnett (1997). This method consists on explicitly introducing the residuals of equation 15 as an additional *control* of equation 14. As Wooldridge (2010) discusses, this method provides a valid test of the exogeneity of parental expectations by using probit specifications. Hence, parental expectations is modelled as a probit, and from this I predict the generalized residuals of equation 15 and plug them into equation 14. Table **??** shows the results of this exercise using high parental expectations as the only endogenous variable. When the residuals are introduced in the main specification, generalised residuals are not significant. This result does not reject the null hypothesis of exogeneity in parental expectations as it has been also concluded by the test of correlations. This method only provides a valid test of exogeneity, but does not consistently estimate the average population effects (APE).

6 Robustness Checks

This section explores two exercises for assessing the robustness of our findings in pregnancy and motherhood models. The first exercise explores the introduction of teenager's expectations into the SML models. As previous sections have discussed, the LSYPE collected the likelihood of attending University from teenagers. Because this variable might be highly correlated with parental expectations, this variable has been introduced into the models as a robustness check.

Marginal effects are shown in table **??**. Column (1) and (3) present marginal effects evaluated at high expectations equal to one, and the rest of the tables at the means of all variables, considering the discreteness of dummy variables. Comparing column (1) and (3) with column (6) of tables 19 and **??**, we observe that high parental expectations in both models stay with similar magnitudes, nevertheless, pregnancy models present more precise estimates. This gain in precision makes significant the effect of parental expectations in this model. Additionally, the marginal effects evaluated at the means present bigger magnitudes than columns (1) and (3); where the effect of high expectations is greater than the effect of being born to a teen mother. For pregnancy,

The second exercise analyses SML models by reducing the sample to only Wave 6 and Wave

7. Because the variable of pregnancy for Wave 4 and Wave 5 has been constructed based on questions about motherhood, it is likely that parental expectations coefficients are downward biased in our estimates. Although we do not know *a priori* if teen pregnancy decisions already embed a rational valuation of teen motherhood consequences and costs, we observed from our separate weighted probits that parental high expectations is significant in most of our models of pregnancy. These results shed light on the potential rational valuation the teenage girl may carry out even before becoming a mother. For this reason, it is likely that the construction of our pregnancy variable may lead to an underestimation of parental expectation coefficients in our pregnancy models. In addition, the number of pregnancy and motherhood cases in wave 4 and wave 5 are small and may affect the precision of our estimates.

Table **??** presents SML models for both types of outcomes. By reducing the sample to only Wave 6 and 7, we observe our results are still holding, but the magnitudes of the marginal effects are much bigger. For pregnancy specifications we observe that parental expectation marginal effects double, as well as english and being born to a teenage mother. As it is expected, motherhood models do not present drastic changes in effects for parental expectations, but there are significant changes for the effect of being born to a teenage mother. [39] Although the comparison between both types of samples is not strictly comparable, we observe that the marginal effects of high parental expectations are 20 per cent bigger than the effect of being born to a teen mother, and 65 per cent bigger in teen motherhood models.

The previous exercises allow us to confirm that high parental expectations influence teenage motherhood and pregnancy, and this effect can be at least as big as being born to a teen mother.

7 Conclusions and extensions

In this paper I analyse the effect of parental expectations about school choices on the likelihood of becoming a teen mother. Based on maximum likelihood methods and instrumental variables, our results shed light on the extent and significance of parental expectations on teenager's fertility choices. This study contributes to the literature on teenage fertility decisions by providing empirical evidence about a channel that not necessarily may be related to income deprivation.

After considering simulated maximum likelihood methods, we confirm that high parental expectations decreases the likelihood of teen motherhood, and this effect is larger for girls underperforming at school. The magnitude of the effect is as large as the one shown by being born to a teenage mother. Our results underpin that for teenage girls with poor academic performance is crucial to raise parental expectations to influence their fertility decisions. Finally, robustness check of teen pregnancy models reveal that pregnancy decision may embed already a rational valuation of the opportunity costs behind teen motherhood. Further analysis is require to confirm our results on pregnancy.

[39] Tables 10 and 11 present weighted probit for the reduced sample to be compared with the same models using Wave 4 to Wave 7.

The relevance of these findings encourages an extension of this work by considering structural modelling techniques for understanding how parental and teenager's expectations are shaped, and when these become more relevant for teenager's fertility decisions. This extension will also help on forecasting teenagers fertility decisions when the state of the world changes.

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8 Appendix 1: Tables and Figures

Table 1: Data collection of expectations and fertility outcomes in the LSYPE

Data	**W1** 2004	**W2** 2005	**W3** 2006	**W4** 2007	**W5** 2008	**W6** 2009	**W7** 2010
Parental Expectations	x			x			
Teenager's Expectations	x	x	x				
Motherhood				x	x	x	x
Pregnancy						x	x
Observations	7,573	6,568	6,068	5,599	5,088	4,818	4,334

Table 2: Incidence of Teen Pregnancy and Motherhood by Deprivation Percentiles

Sexual Outcome	**1st Pct. (1)**	**2nd Pct. (2)**	**3rd Pct. (3)**
Pregnancy	0.05	0.07	0.12
Motherhood	0.01	0.03	0.07
Percentage of Mothers	0.26	0.43	0.55

Note: Percentiles are based on the child deprivation index collected in Wave 2, the first percentile refers to the richest part of the index distribution.

Table 3: Descriptive statistics of sample

Socio-demographic characteristics, schooling achievement and alcohol intake

	Whole Population		Pregnancy		Motherhood		Pregnant, but not Mum	
	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Siblings, religion and family type								
Siblings <=2	0.71	(0.45)	0.65	(0.48)	0.56	(0.50)	0.71	(0.46)
Siblings > 2	0.13	(0.33)	0.20	(0.40)	0.30	(0.46)	0.13	(0.34)
No siblings (reference)	0.16	(0.37)	0.15	(0.36)	0.13	(0.34)	0.16	(0.37)
Christian	0.51	(0.50)	0.41	(0.49)	0.37	(0.48)	0.50	(0.50)
Muslim	0.04	(0.20)	0.05	(0.21)	0.07	(0.26)	0.04	(0.20)
Sikh	0.01	(0.11)	0.01	(0.10)	0.00	(0.07)	0.01	(0.11)
Others	0.03	(0.16)	0.03	(0.16)	0.03	(0.17)	0.03	(0.16)
No religion (reference)	0.41	(0.49)	0.50	(0.50)	0.52	(0.50)	0.42	(0.49)
Sex of MP (father=1)	0.12	(0.33)	0.12	(0.33)	0.16	(0.36)	0.12	(0.33)
Step Family	0.11	(0.31)	0.16	(0.37)	0.16	(0.37)	0.11	(0.32)
Lone Mother	0.25	(0.43)	0.34	(0.47)	0.40	(0.49)	0.26	(0.44)
Teen Mother	0.02	(0.14)	0.06	(0.23)	0.08	(0.27)	0.02	(0.15)
Mother's Schooling								
Degree or equivalent	0.14	(0.35)	0.08	(0.26)	0.05	(0.21)	0.14	(0.34)
HE below degree level	0.15	(0.36)	0.13	(0.33)	0.10	(0.30)	0.15	(0.35)
GCE A level or equivalent	0.15	(0.35)	0.13	(0.34)	0.11	(0.31)	0.14	(0.35)
GCSE grades A-C or equiv	0.31	(0.46)	0.31	(0.46)	0.24	(0.43)	0.31	(0.46)
Qualifications at level 1 and below	0.08	(0.28)	0.12	(0.33)	0.17	(0.38)	0.08	(0.28)
Other qualification	0.02	(0.15)	0.02	(0.15)	0.02	(0.13)	0.02	(0.15)
No qualifications (reference)	0.14	(0.35)	0.19	(0.40)	0.28	(0.45)	0.14	(0.35)
Fathers's Schooling								
Degree or equivalent	0.13	(0.33)	0.06	(0.23)	0.02	(0.14)	0.12	(0.33)
HE below degree level	0.10	(0.30)	0.06	(0.24)	0.06	(0.23)	0.10	(0.29)
GCE A level or equivalent	0.13	(0.34)	0.11	(0.31)	0.08	(0.28)	0.13	(0.34)
GCSE grades A-C or equiv	0.19	(0.39)	0.17	(0.37)	0.16	(0.36)	0.18	(0.39)
Qualifications at level 1 and below	0.05	(0.21)	0.07	(0.25)	0.05	(0.21)	0.05	(0.22)
Other qualification	0.02	(0.13)	0.02	(0.15)	0.02	(0.13)	0.02	(0.14)
No qualifications (reference)	0.13	(0.34)	0.17	(0.37)	0.21	(0.41)	0.13	(0.34)
Key Stage 2 Z-scores								
K2 z-score of English	0.31	(0.92)	-0.07	(0.92)	-0.40	(0.91)	0.28	(0.92)
K2 z-score of Maths	0.10	(0.93)	-0.23	(0.93)	-0.53	(0.90)	0.07	(0.93)
K2 z-score of Science	0.19	(0.87)	-0.10	(0.91)	-0.40	(0.94)	0.17	(0.87)
Alcohol Intake in Wave 1								
Frequently during the week	0.18	(0.39)	0.25	(0.43)	0.22	(0.42)	0.19	(0.39)
Once to 3 times per month	0.30	(0.46)	0.34	(0.47)	0.33	(0.47)	0.19	(0.39)
Once every couple of months	0.23	(0.42)	0.24	(0.43)	0.24	(0.42)	0.30	(0.46)
Less often or never drink alcohol (reference)	0.54	(0.50)	0.47	(0.50)	0.51	(0.50)	0.53	(0.50)

Note: Total number of observations in columns 1-2 is 10,146 (W4-W7), in columns 3-4 is 1,712 (W4-W7), in columns 5-6 is 701 and in the last two is 600 (W6-W7).

Table 4: Descriptive statistics of sample

Deprivation, employment, expectations, preferences and school characteristics

	Whole Population		Pregnancy		Motherhood		Pregnant, but not Mum	
Variable	**Mean (1)**	**St. Dev (2)**	**Mean (3)**	**St. Dev (4)**	**Mean (5)**	**St. Dev (6)**	**Mean (7)**	**St. Dev (8)**
Deprivation index 2004								
2nd quintile of deprivation	0.19	(0.39)	0.16	(0.37)	0.13	(0.34)	0.19	(0.39)
3rd quintile of deprivation	0.21	(0.41)	0.22	(0.42)	0.21	(0.41)	0.22	(0.41)
4th quintile of deprivation	0.15	(0.36)	0.22	(0.41)	0.22	(0.41)	0.16	(0.37)
5th quintile of deprivation (worst)	0.15	(0.36)	0.23	(0.42)	0.35	(0.48)	0.15	(0.36)
1st quintile of deprivation (richest-reference)	0.29	(0.45)	0.17	(0.38)	0.10	(0.30)	0.28	(0.45)
Parental Employment when teenager was 5 years old								
Mother: Paid job for more than 30 hrs per week	0.45	(0.50)	0.46	(0.50)	0.37	(0.48)	0.45	(0.50)
Mother: Unemployed/Training/Retired	0.20	(0.40)	0.27	(0.44)	0.39	(0.49)	0.21	(0.41)
Mother: Paid job for less than 30 hrs per week (reference)	0.33	(0.47)	0.26	(0.44)	0.21	(0.41)	0.33	(0.47)
Father: Paid job for more than 30 hrs per week	0.66	(0.47)	0.56	(0.50)	0.47	(0.50)	0.66	(0.48)
Father: Unemployed/Training/Retired	0.06	(0.24)	0.07	(0.26)	0.10	(0.30)	0.06	(0.24)
Father: Paid job for less than 30 hrs per week (reference)	0.02	(0.15)	0.02	(0.14)	0.02	(0.13)	0.02	(0.14)
Missing information of father and mother in schooling and employment variables								
Father not present or not interviewed	0.25	(0.43)	0.35	(0.48)	0.41	(0.49)	0.26	(0.44)
Mother not present or not interviewed	0.01	(0.11)	0.02	(0.12)	0.03	(0.18)	0.01	(0.11)
Parental Expectations and Preferences in Wave 1								
High	0.41	(0.49)	0.25	(0.43)	0.20	(0.40)	0.39	(0.49)
Low	0.08	(0.28)	0.15	(0.36)	0.18	(0.38)	0.09	(0.29)
Missing information	0.05	(0.23)	0.08	(0.28)	0.12	(0.33)	0.05	(0.23)
Likely and Fairly Likely (reference)	0.45	(0.50)	0.52	(0.50)	0.50	(0.50)	0.46	(0.50)
MP would like the teenager to work or start an apprenticeship at age 16	0.07	(0.26)	0.11	(0.32)	0.12	(0.33)	0.08	(0.26)
Teenager's Expectations at age 16 in Wave 1								
Expect to start working or learning a trade other than higher education	0.05	(0.21)	0.10	(0.30)	0.10	(0.31)	0.05	(0.22)
School variables (KS1 to KS3)								
Management and Efficiency 96−99: Good	0.35	(0.48)	0.37	(0.48)	0.38	(0.49)	0.35	(0.48)
Management and Efficiency 96−99: Required some improvement	0.22	(0.41)	0.22	(0.42)	0.24	(0.43)	0.22	(0.42)
Management and Efficiency 96−99: Required substantial improvement	0.06	(0.23)	0.08	(0.27)	0.11	(0.31)	0.06	(0.23)
Management and Efficiency 96−99: No Ofstead assessment	0.11	(0.31)	0.10	(0.30)	0.07	(0.26)	0.11	(0.31)
Management and Efficiency 96−99: Very good (reference)	0.26	(0.44)	0.23	(0.42)	0.19	(0.40)	0.26	(0.44)
Climate for Learning 96−99: Good	0.36	(0.48)	0.40	(0.49)	0.44	(0.50)	0.36	(0.48)
Climate for Learning 96−99: Required some or substantial improvement	0.09	(0.28)	0.13	(0.33)	0.18	(0.38)	0.09	(0.28)
Climate for Learning 96−99: No Ofstead assessment	0.11	(0.31)	0.09	(0.29)	0.06	(0.24)	0.11	(0.31)
Climate for Learning 96−99: Very good (reference)	0.45	(0.50)	0.38	(0.49)	0.32	(0.47)	0.44	(0.50)
Percentage of elegible pupils for Free School Meal benefits (2001-KS2)	15.62	(14.54)	20.24	(16.35)	25.28	(17.39)	15.93	(14.70)
Percentage of elegible pupils for Free School Meal benefits (2002-KS3)	15.21	(14.33)	19.93	(16.24)	24.80	(17.49)	15.53	(14.47)
Waves								
Wave 5	0.244	(0.43)	0.25	(0.43)	0.24	(0.43)	–	–
Wave 6	0.252	(0.43)	0.24	(0.43)	0.24	(0.43)	0.10	(0.31)
Wave 7	0.253	(0.43)	0.25	(0.44)	0.26	(0.44)	0.90	(0.31)
Wave 4 (reference)	0.251	(0.43)	0.26	(0.44)	0.26	(0.44)	–	–

Note: Total number of observations in columns 1-2 is 10,146 (W4-W7), in columns 3-4 is 1,712 (W4-W7), in columns 5-6 is 701 and in the last two is 600 (W6-W7).

Table 5: UK educational system

<table>
<tr><th>Age</th><th>LSYPE
& EiC-EAZ</th><th>Year</th><th>Curriculum Stage</th><th colspan="3">Schools</th></tr>
<tr><td>3</td><td>1994</td><td>Nursery</td><td rowspan="2">Foundation Stage</td><td colspan="3">Nursery School</td></tr>
<tr><td>4</td><td>1995</td><td>Reception</td><td rowspan="3">Infant School</td><td rowspan="6">Primary
School</td><td rowspan="3">First School</td></tr>
<tr><td>5</td><td>1996</td><td>Year 1</td><td rowspan="2">Key Stage 1</td></tr>
<tr><td>6</td><td>1997</td><td>Year 2</td></tr>
<tr><td>7</td><td>1998</td><td>Year 3</td><td rowspan="4">Key Stage 2</td><td rowspan="4">Junior School</td></tr>
<tr><td>8</td><td>1999 Phase 1</td><td>Year 4</td><td rowspan="3">Middle School</td></tr>
<tr><td>9</td><td>2000 Phase 2</td><td>Year 5</td></tr>
<tr><td>10</td><td>2001 Phase 3</td><td>Year 6</td></tr>
<tr><td>11</td><td>2002</td><td>Year 7</td><td rowspan="3">Key Stage 3</td><td rowspan="5">Senior School</td><td rowspan="5">Secondary
School with
Sixth Form</td></tr>
<tr><td>12</td><td>2003</td><td>Year 8</td></tr>
<tr><td>13</td><td>Wave 1 (2004)</td><td>Year 9</td><td rowspan="3">Upper School
or High
School</td></tr>
<tr><td>14</td><td>Wave 2 (2005)</td><td>Year 10</td><td rowspan="2">Key Stage 4/GCSE</td></tr>
<tr><td>15</td><td>Wave 3 (2006)</td><td>Year 11</td></tr>
<tr><td>16</td><td>Wave 4 (2007)</td><td>Year 12</td><td rowspan="2">Sixth Form / A Level, International
Baccalaureate, Cambridge Pre-U, etc.</td><td rowspan="2">College /
Sixth Form</td></tr>
<tr><td>17</td><td>Wave 5 (2008)</td><td>Year 13</td></tr>
</table>

Table 6: Wave 1 feelings about school using wave 7 respondents

Variable	Non-Preg-Mum	Preg-NonMum	Mum	Total
I am happy when I am at school				
Strongly agree	30.6	27.6	15.2	29.2
Agree	61.4	61.7	58.4	61.2
Disagree	6.4	8.2	19.7	7.5
Strongly disagree	1.5	2.5	6.7	2.0
School is a waste of time for me				
Strongly agree	1.1	1.2	3.4	1.3
Agree	2.0	4.0	7.3	2.6
Disagree	28.9	29.9	45.2	30.2
Strongly disagree	67.9	64.9	44.1	66.0
School work is worth doing				
Strongly agree	54.7	51.4	43.3	53.6
Agree	40.7	41.0	50.0	41.4
Disagree	1.9	3.6	3.9	2.2
Strongly disagree	2.6	4.0	2.8	2.8
Most of the time I don't want to go to school				
Strongly agree	4.0	6.2	16.0	5.1
Agree	18.5	21.4	24.6	19.2
Disagree	51.2	47.7	40.0	50.1
Strongly disagree	26.2	24.7	19.4	25.6
People think my school is a good school				
Strongly agree	24.3	21.8	14.5	23.4
Agree	54.3	46.1	43.0	52.7
Disagree	17.4	24.7	29.1	18.9
Strongly disagree	4.1	7.4	13.3	5.0
On the whole I like being at school				
Strongly agree	30.0	28.2	17.0	28.9
Agree	61.7	58.5	55.7	61.0
Disagree	6.8	10.9	17.6	7.9
Strongly disagree	1.5	2.4	9.7	2.2
I work as hard as I can in school				
Strongly agree	35.1	32.5	31.6	34.6
Agree	53.6	47.8	53.7	53.0
Disagree	10.7	16.5	14.1	11.5
Strongly disagree	0.6	3.2	0.6	0.8
In a lesson, I often count the minutes till it ends				
Strongly agree	11.0	16.3	22.0	12.3
Agree	39.4	40.2	37.6	39.3
Disagree	41.7	32.5	34.1	40.3
Strongly disagree	7.9	11.0	6.4	8.1
I am bored in lessons				
Strongly agree	6.7	11.1	15.4	7.7
Agree	34.6	35.0	39.1	34.9
Disagree	51.5	44.9	41.4	50.1
Strongly disagree	7.2	9.1	4.1	7.2
The work I do in lessons is a waste of time				
Strongly agree	0.9	2.0	2.3	1.1
Agree	4.3	8.1	4.6	4.7
Disagree	51.4	46.2	58.0	51.3
Strongly disagree	43.4	43.7	35.1	42.9
The work I do in lessons is interesting to me				
Strongly agree	12.8	14.8	11.6	12.9
Agree	69.2	64.6	61.0	68.2
Disagree	16.8	17.3	26.2	17.5
Strongly disagree	1.2	3.4	1.2	1.4
I get good marks for my work				
Strongly agree	26.9	27.8	18.6	26.4
Agree	68.0	62.4	73.1	67.8
Disagree	4.7	8.2	7.8	5.2
Strongly disagree	0.4	1.6	0.6	0.6
My school is clean and tidy				
Strongly agree	7.6	9.3	3.6	7.5
Agree	45.0	37.2	33.1	43.4
Disagree	34.4	34.0	45.0	35.1
Strongly disagree	13.1	19.4	18.3	14.1
Sample size	2,107	252	174	2,533

Note: The total number of respondents is 2,533 in Wave 7 .

Table 7: Likelihood of Teen Pregnancy and Motherhood conditional on having sex

Marginal effects of clustered models − Wave 4 to Wave 7

	Teen Pregnant		**Teen Mother**	
	OLS	**Probit**	**OLS**	**Probit**
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Born to a teenage mother	0.152***	0.110***	0.104***	0.061**
	[0.042]	[0.034]	[0.039]	[0.026]
Key Stage 2 Z-scores				
English	-0.016**	-0.015**	-0.009*	-0.007*
	[0.007]	[0.006]	[0.005]	[0.004]
Maths	0.000	-0.001	-0.003	-0.005
	[0.006]	[0.006]	[0.005]	[0.004]
Science	-0.002	-0.001	-0.006	-0.003
	[0.008]	[0.006]	[0.006]	[0.004]
Main Parent's Expectations in Wave 1				
High	-0.029***	-0.031***	-0.013**	-0.017***
	[0.008]	[0.008]	[0.006]	[0.005]
Low	0.040**	0.030**	0.015	0.011
	[0.018]	[0.015]	[0.014]	[0.010]
Missing	0.030	0.024	0.034*	0.021
	[0.022]	[0.019]	[0.019]	[0.014]
Observations	10,146	10,146	10,146	10,146
Pseudo R−squared	0.123	0.235	0.088	0.263
Log−likelihood	–	-2197	–	-1186

Note: These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, deprivation index in Wave 2, lone mother and/or father, mother's and father's employment status, as well as wave dummies from W5 to W7. Reference categories of parental expectations are *Likely* and *Fairly Likely*. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Attrition correction in pregnancy and motherhood models conditional on having sex

Marginal effects of clustered probits − Wave 4 to Wave 7

	Teen Pregnant			Teen Mother		
	No W	**Svy W**	**IPW**	**No W**	**Svy W**	**IPW**
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Born to a teenage mother	0.110***	0.098***	0.101***	0.061**	0.048**	0.048**
	[0.034]	[0.033]	[0.032]	[0.026]	[0.023]	[0.022]
Key Stage 2 Z-scores						
English	-0.015**	-0.014**	-0.016***	-0.007*	-0.006	-0.007**
	[0.006]	[0.006]	[0.005]	[0.004]	[0.004]	[0.003]
Maths	-0.001	0.001	-0.001	-0.005	-0.005	-0.003
	[0.006]	[0.006]	[0.005]	[0.004]	[0.004]	[0.003]
Science	-0.001	0.001	-0.001	-0.003	-0.003	-0.002
	[0.006]	[0.006]	[0.006]	[0.004]	[0.004]	[0.003]
Main Parent's Expectations in Wave 1						
High	-0.031***	-0.028***	-0.023***	-0.017***	-0.017***	-0.012***
	[0.008]	[0.008]	[0.007]	[0.005]	[0.005]	[0.004]
Low	0.030**	0.032**	0.023*	0.011	0.010	0.005
	[0.015]	[0.015]	[0.013]	[0.010]	[0.009]	[0.007]
Missing	0.024	0.035*	0.023	0.021	0.028*	0.020
	[0.019]	[0.019]	[0.017]	[0.014]	[0.015]	[0.012]
Observations	10,146	10,146	10,146	10,146	10,146	10,146
Pseudo R−squared	0.235	0.242	0.235	0.263	0.275	0.273
Log−likelihood	-2197	-2457	-6764	-1186	-1276	-3244

Note: *No W* refers to *no weight*, *Svy W* to *survey weight* and *IPW* to *inverse probability weights*. These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, deprivation index in Wave 2, lone mother and/or father, mother's and father's employment status, as well as wave dummies from W5 to W7. Reference categories of parental expectations are *Likely* and *Fairly Likely*. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: Wave 1 sociodemographic characteristics and key stage 2 z-scores by intensity of attrition

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mother Education							
Degree or equivalent	15.8	6.1	6.5	8.1	7	8.9	11.9
HE below degree level	10.5	12	9.2	11.3	8.1	11.2	13.2
GCE A level or equivalent	10.5	9.8	12.3	6.7	13.1	11.4	13.1
GCSE grades A-C or equiv	15.8	25.9	23	25.3	25.9	23.7	27
Qualifications at level 1 and below	0.0	9.1	9.0	7.0	11	7.7	7.5
Other qualification	2.6	1.9	4	3.4	2.4	3.1	2.6
Mother not interviewed or present	13.2	6.1	6.8	8.8	7.5	7.3	3.3
Fathers education							
Degree or equivalent	5.3	7.1	6	5.4	7.3	7.1	12.7
HE below degree level	2.6	4.8	5	5.3	4.6	5	9.1
GCE A level or equivalent	2.6	9.6	8.7	8.3	10	12.1	12.7
GCSE grades A-C or equiv	2.6	14.7	13.3	13.8	16.9	16.4	17.5
Qualifications at level 1 and below	0.0	3	3.1	3.8	3.2	5.9	4.6
Other qualification	0.0	1.9	1.9	1.7	1.9	2.3	1.9
Father not interviewed or present	73.7	40.6	42.7	45.2	40.6	36.2	25.5
Parent's expectations							
MP: High Expectations W1	36.2	32.1	36.7	32.3	29.6	34.8	42.6
MP: Low Expectations W1	14.1	15.3	11.5	11.9	15.6	11.5	8.3
Teenager's Expectations							
YP: High Expectations W1	17.5	17.2	19.2	12.2	15.4	14.1	19.9
YP: Low Expectations W1	10.5	9.9	11.1	9.1	14.2	10.4	7.7
Deprivation index 2004							
2nd quintile of deprivation	12.4	12.9	11.9	16.4	15.9	17.8	17
3rd quintile of deprivation	20.3	18	13.9	18.7	18.6	20.5	19.9
4th quintile of deprivation	21.9	23.4	26.3	24.2	22.5	17.6	19.1
5th quintile of deprivation (worst)	29.5	33.8	30.5	22.8	23.2	19.3	21.1
Key Stage 2 z-scores							
English	-0.13	-0.13	-0.06	-0.09	-0.06	0.01	0.23
Maths	-0.29	-0.37	-0.37	-0.34	-0.26	-0.22	0.03
Science	-0.28	-0.32	-0.35	-0.22	-0.16	-0.16	0.09

Note: Intensity of attrition is measured by the number of waves the teenager was interviewed.

Table 10: Attrition and Weighting in Pregnancy Models

Marginal effects of clustered probits − Wave 6 to Wave 7

Variable	No Weight (1)	Survey Weight (2)	IPW (3)
Born to a teenage mother	0.143***	0.129***	0.129***
	[0.036]	[0.038]	[0.034]
Key Stage 2 Z-scores			
English	-0.032***	-0.032***	-0.032***
	[0.010]	[0.011]	[0.010]
Maths	0.004	0.007	0.003
	[0.011]	[0.011]	[0.010]
Science	0.001	0.005	0.002
	[0.011]	[0.012]	[0.011]
Main Parent's Expectations in Wave 1			
High	-0.050***	-0.048***	-0.041***
	[0.015]	[0.016]	[0.014]
Low	0.056***	0.060***	0.046**
	[0.021]	[0.021]	[0.019]
R^2 / Pseudo R^2	0.11	0.12	0.11

Note: Total number of observations used for this model is 5,160. These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, deprivation index in Wave 2, lone mother and/or father, mother's and father's employment status, as well as a wave dummy for W7. Reference categories of parental expectations are *Likely* and *Fairly Likely*. Robust standard errors in brackets.. *** p<0.01, ** p<0.05, * p<0.1.

Table 11: Attrition and Weighting in Teen Motherhood Models

Marginal effects of clustered probits − Wave 6 to Wave 7

Variable	No Weight (1)	Survey Weight (2)	IPW (3)
Born to a teenage mother	0.061***	0.050***	0.046***
	[0.019]	[0.019]	[0.016]
Key Stage 2 Z-scores			
English	-0.016***	-0.013**	-0.014***
	[0.006]	[0.006]	[0.005]
Maths	-0.004	-0.004	-0.003
	[0.007]	[0.007]	[0.005]
Science	-0.004	-0.005	-0.004
Main Parent's Expectations in Wave 1			
High	-0.023**	-0.024**	-0.018**
	[0.010]	[0.011]	[0.008]
Low	0.018	0.017	0.009
	[0.012]	[0.011]	[0.009]
R^2 / Pseudo R^2	0.20	0.21	0.21

Note: Total number of observations used for this model is 5,160. These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, deprivation index in Wave 2, lone mother and/or father, mother's and father's employment status, as well as a wave dummy for W7. Reference categories of parental expectations are *Likely* and *Fairly Likely*. Robust standard errors in brackets.. *** p<0.01, ** p<0.05, * p<0.1.

Table 12: Inverse Probability Weighting *IPW* Model

Marginal effects of probit

Variable	**Probit**
Father with degree or equivalent	-0.103***
	[0.024]
Father with HE below degree level	-0.116***
	[0.027]
Father not interviewed	0.658***
	[0.007]
Key Stage 2 in Maths	-0.031***
	[0.012]
Key Stage 2 in Science	-0.040***
	[0.012]
No of schools child has attended up to wave 1	0.032***
	[0.009]
Mother: Paid job for more than 30 hrs per week	0.053***
	[0.017]
Mother: Unemployed/Training/Retireed	0.063***
	[0.018]
Mother not interviewed	0.108
	[0.134]
Mother's age (continuous)	-0.009***
	[0.001]
Intentions of leaving full-time education after year 11	0.082***
	[0.026]
Observations	6,172

Note: Variables from the LSYPE-Wave 1.

Table 13: Parental Expectations - Wave 1 and Wave 4

Marginal Effects of Clustered Multinomial Logit

	Unconditional		Conditional on Having Sex	
	High Exp.	Low Exp.	High Exp.	Low Exp.
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Father's Schooling				
Degree or equivalent	0.174***	-0.170***	0.174***	-0.222***
	[0.0268]	[0.0310]	[0.0334]	[0.0427]
HE below degree level	0.087***	-0.065***	0.104***	-0.087***
	[0.0263]	[0.0196]	[0.0312]	[0.0244]
GCE A level or equivalent	0.034	-0.036**	0.019	-0.048**
	[0.0240]	[0.0150]	[0.0295]	[0.0190]
GCSE grades A-C or equiv	0.026	-0.034**	0.038	-0.050***
	[0.0221]	[0.0133]	[0.0271]	[0.0167]
Qualifications at level 1 and below	-0.010	-0.034*	0.004	-0.048**
	[0.0327]	[0.0176]	[0.0398]	[0.0220]
Other qualification	0.024	-0.038	0.053	-0.065
	[0.0443]	[0.0305]	[0.0525]	[0.0398]
Father not present or not interviewed	-0.043	-0.051**	-0.013	-0.071**
	[0.0371]	[0.0232]	[0.0462]	[0.0295]
Reference category:				
Father without instruction				
Mother's Schooling				
Degree or equivalent	0.159***	-0.104***	0.173***	-0.127***
	[0.0269]	[0.0226]	[0.0310]	[0.0279]
HE below degree level	0.096***	-0.062***	0.111***	-0.080***
	[0.0240]	[0.0171]	[0.0284]	[0.0210]
GCE A level or equivalent	0.023	-0.033**	0.031	-0.038**
	[0.0238]	[0.0148]	[0.0287]	[0.0181]
GCSE grades A-C or equiv	0.015	-0.019	0.032	-0.030**
	[0.0209]	[0.0122]	[0.0257]	[0.0152]
Qualifications at level 1 and below	-0.057**	0.011	-0.053	0.005
	[0.0274]	[0.0152]	[0.0321]	[0.0185]
Other qualification	-0.004	-0.026	0.019	-0.042
	[0.0395]	[0.0244]	[0.0500]	[0.0313]
Mother not present or not interviewed	0.076	-0.062	0.027	-0.029
	[0.0739]	[0.0466]	[0.1264]	[0.0577]
Reference category:				
Mother without instruction				
Teenage Mum				
Teen mother	-0.041	0.023	-0.032	0.014
	[0.0500]	[0.0249]	[0.0518]	[0.0303]
Key Stage 2 z-scores				
K2 z-score of English	0.085***	-0.036***	0.081***	-0.040***
	[0.0106]	[0.0062]	[0.0125]	[0.0078]
K2 z-score of Maths	0.070***	-0.023***	0.075***	-0.028***
	[0.0106]	[0.0067]	[0.0124]	[0.0085]
K2 z-score of Science	0.028**	-0.026***	0.054***	-0.034***
	[0.0116]	[0.0067]	[0.0144]	[0.0085]
Alcohol Intake				
Frequently during the week in Wave 1	-0.034*	0.023*	-0.035	0.026*
	[0.0209]	[0.0129]	[0.0218]	[0.0157]
Once to 3 times per month in Wave 1	-0.007	0.004	-0.002	0.004
	[0.0153]	[0.0096]	[0.0161]	[0.0116]
Once every couple of months in Wave 1	0.011	-0.013	0.017	-0.020
	[0.0172]	[0.0120]	[0.0179]	[0.0147]
Frequently during the week in Wave 3	-0.090***	0.044***	-0.073***	0.047***
	[0.0205]	[0.0113]	[0.0218]	[0.0140]
Once to 3 times per month in Wave 3	-0.051***	0.035***	-0.041**	0.037***
	[0.0157]	[0.0097]	[0.0172]	[0.0120]
Once every couple of months in Wave 3	-0.003	-0.001	0.006	-0.000
	[0.0181]	[0.0127]	[0.0196]	[0.0156]
Reference category:				
Less often or never for W1 and W3.				
Observations	25,188	25,188	18,988	18,988

Note: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 14: Likelihood of being pregnant by deprivation percentiles

Marginal effects of clustered logits - Wave 4 to Wave 7

Variable	1st Pct. (1)	2nd Pct. (2)	3rd Pct. (3)
Born to a teenage mother	0.095**	0.059**	0.077**
	[0.039]	[0.025]	[0.033]
Key Stage 2 Z-scores			
English	-0.020**	-0.013*	-0.012
	[0.009]	[0.007]	[0.012]
Maths	-0.003	0.009	-0.011
	[0.008]	[0.009]	[0.012]
Science	0.025**	-0.006	-0.010
	[0.011]	[0.009]	[0.011]
Main Parent's Expectations in Wave 1			
High	-0.010	-0.025*	-0.045**
	[0.012]	[0.014]	[0.018]
Low	0.013	0.041***	-0.002
	[0.020]	[0.013]	[0.024]
Teen's Expectations in Wave 1			
High	-0.018	-0.048**	0.005
	[0.015]	[0.021]	[0.021]
Low	0.001	0.000	-0.009
	[0.017]	[0.015]	[0.024]
Observations	3,596	3,255	3,371
R^2 / Pseudo R^2	0.23	0.28	0.22

Note: Total number of observations used for this model is 10,222. These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, deprivation index in Wave 2, lone mother and/or father, mother's and father's employment status, as well as wave dummies from W5 to W7. Reference categories: Likely and Fairly Likely in both teen's and parent's expectations. *Inverse probability weights (IPW)* are used for these specifications. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 15: Likelihood of becoming teen mother by deprivation percentiles

Marginal effects of clustered logits - Wave 4 to Wave 7

Variable	1st Pct. (1)	2nd Pct. (2)	3rd Pct. (3)
Born to a teenage mother	0.032**	0.037**	0.036
	[0.014]	[0.018]	[0.024]
Key Stage 2 Z-scores			
English	-0.011**	-0.006	-0.009
	[0.005]	[0.005]	[0.008]
Maths	-0.007**	-0.002	-0.006
	[0.004]	[0.007]	[0.009]
Science	0.009*	0.004	-0.012
	[0.005]	[0.006]	[0.007]
Main Parent's Expectations in Wave 1			
High	-0.000	-0.002	-0.037**
	[0.008]	[0.011]	[0.015]
Low	0.002	0.013*	-0.009
	[0.007]	[0.008]	[0.016]
Teen's Expectations in Wave 1			
High	-0.014	-0.033*	-0.008
	[0.014]	[0.017]	[0.017]
Low	-0.006	0.007	-0.001
	[0.007]	[0.009]	[0.018]
Observations	3,412	3,059	3,371
R^2 / Pseudo R^2	0.32	0.34	0.24

Note: Total number of observations used for this model is 10,222. These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, deprivation index in Wave 2, lone mother and/or father, mother's and father's employment status, as well as wave dummies from W5 to W7. Reference categories: Likely and Fairly Likely in both teen's and parent's expectations. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 16: Single, Bivariate and Simulated Maximum Likelihood: Teen Pregnancy

Marginal effects of clustered models − Wave 4 to Wave 7

	Probit w/IV		**Bivariate w/IV**		**Trivariate w/IV**
	IV for HExp	**IV for LExp**	**IV for HExp**	**IV for LExp**	**IV for H/L Exp**
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Born to a teenage mother	0.072	0.053	0.076***	0.072***	0.074***
	[0.071]	[0.067]	[0.020]	[0.019]	[0.019]
Key Stage 2 Z-scores					
English	0.012	-0.053***	-0.015**	-0.019***	-0.017***
	[0.022]	[0.011]	[0.006]	[0.006]	[0.006]
Maths	0.045***	-0.012	0.003	-0.001	0.001
	[0.016]	[0.010]	[0.006]	[0.006]	[0.006]
Science	0.019	-0.020	0.001	-0.002	-0.001
	[0.013]	[0.013]	[0.006]	[0.006]	[0.006]
Main Parent's Expectations					
High	-0.478***	-0.031*	-0.058***	-0.024***	-0.042**
	[0.102]	[0.018]	[0.019]	[0.008]	[0.020]
Low	0.018	-1.029***	0.016	-0.032	-0.009
	[0.017]	[0.178]	[0.011]	[0.030]	[0.034]
Missing	0.025	0.026	0.022	0.021	0.022
	[0.022]	[0.020]	[0.014]	[0.014]	[0.014]
Observations	10,146	10,146	10,146	10,146	10,146

Note: These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, deprivation index in Wave 2, lone mother and/or father, mother's and father's employment status, as well as wave dummies from W5 to W7. Reference categories of parental expectations are *Likely* and *Fairly Likely*. SML models considered 50 random draws using the *GHK* simulation method. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 17: Single, Bivariate and Simulated Maximum Likelihood: Teen Motherhood

Marginal effects of clustered models − Wave 4 to Wave 7

	Probit w/IV		**Bivariate w/IV**		**Trivariate w/IV**
	IV for HExp	**IV for LExp**	**IV for HExp**	**IV for LExp**	**IV for H/L Exp**
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Born to a teenage mother	0.062	0.039	0.031***	0.029***	0.030***
	[0.070]	[0.037]	[0.010]	[0.010]	[0.010]
Key Stage 2 Z-scores					
English	0.008	-0.019***	-0.007**	-0.007**	-0.007**
	[0.023]	[0.006]	[0.003]	[0.003]	[0.003]
Maths	0.030	-0.007	-0.002	-0.003	-0.002
	[0.022]	[0.005]	[0.004]	[0.003]	[0.003]
Science	0.011	-0.008	-0.002	-0.002	-0.002
	[0.015]	[0.006]	[0.003]	[0.003]	[0.003]
Main Parent's Expectations					
High	-0.407***	-0.021*	-0.023**	-0.013***	-0.019**
	[0.115]	[0.013]	[0.010]	[0.005]	[0.009]
Low	0.005	-0.234	0.002	0.002	0.002
	[0.015]	[0.254]	[0.006]	[0.014]	[0.014]
Missing	0.036	0.023	0.015**	0.014*	0.015**
	[0.031]	[0.016]	[0.008]	[0.007]	[0.007]
Observations	10,146	10,146	10,146	10,146	10,146

Note: These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, deprivation index in Wave 2, lone mother and/or father, mother's and father's employment status, as well as wave dummies from W5 to W7. Reference categories of parental expectations are *Likely* and *Fairly Likely*. SML models considered 50 random draws using the *GHK* simulation method. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 18: Error correlations of Probit, Bivariate and Simulated Maximum Likelihood: Teen Motherhood

	Probit w/IV		Bivariate w/IV		SML w/IV	
	IV for HExp	IV for LExp	IV for HExp	IV for LExp	IV for H/L Exp	
Corr. Coeff. (rho) /					Separate Probits	Probit vs MvProbit
Fisher's transf. (Athrho)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Probit and Bivariate Probit						
Rho (Motherhood vs High or Low)	0.57	0.54	0.63	-0.02		
Std. Error of Rho	[0.77]	[0.55]	[0.15]	[0.23]		
SML Probits						
Rho (Motherhood vs High)					0.39	0.17
St. error of Rho					[0.66]	[0.23]
Rho (Motherhood vs Low)					-0.17	0.02
St. error of Rho					[0.71]	[0.21]
Rho (High vs Low)						-0.60
St. error of Rho						[0.28]
Rho (Motherhood vs Missing)						0.68
St. error of Rho						[0.18]
Rho (High vs Missing)						0.56
St. error of Rho						[0.06]
Rho (Low vs Missing)						-0.11
St. error of Rho						[0.21]
Probit with IV and Bivariate Probit						
Athrho (Motherhood vs High or Low)	0.64	0.60	0.75	-0.02		
Std. Error of Athrho	[1.13]	[0.78]	[0.26]	[0.23]		
SML Probit and Mvprobit)						
Athrho (Motherhood vs High)					0.41	0.17
Std. Error of Athrho					[0.78]	[0.24]
Athrho (Motherhood vs Low)					-0.17	0.02
Std. Error of Athrho					[0.74]	[0.21]
Athrho (Motherhood vs Missing)					-1.23	0.83
Std. Error of Athrho					[0.23]	[0.33]
Athrho (High vs Low)						-0.69
Std. Error of Athrho						[0.43]
Athrho (High vs Missing)						0.63
Std. Error of Athrho						[0.09]
Athrho (Low vs Missing)						-0.11
Std. Error of Athrho						[0.21]

Note: Total number of observations used for this model is 10,222. These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, deprivation index in Wave 2, lone mother and/or father, mother's and father's employment status, as well as wave dummies from W5 to W7. Young Person's expectations are not considered in these models. Reference categories of parental expectations are *Likely* and *Fairly Likely*. SML models considered 45 random draws using the *GHK* simulation method. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 19: Bivariate probit and Simulated Maximum Likelihood: Teen Motherhood

Marginal effects of clustered models − Wave 4 to Wave 7
Instrumental Variable: Excellence in cities (EiC) Programme at the individual-school level

	Probit w/IV		**Bivariate w/IV**		**SML w/IV**	
	IV for HExp	**IV for LExp**	**IV for HExp**	**IV for LExp**	**IV for H/L Exp**	
					Separate Probits	Probit vs MvProbit
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Born to a teenage mother	0.048	0.037*	0.024*	0.002	0.012	0.015*
	[0.047]	[0.022]	[0.013]	[0.002]	[0.012]	[0.009]
Main Parent's Expectations						
High	-0.154	-0.034	-0.065*	-0.002*	-0.018**	-0.020***
	[0.425]	[0.046]	[0.036]	[0.001]	[0.008]	[0.004]
Low	-0.027	-0.197	0.003	0.001	0.004	-0.008
	[0.096]	[0.434]	[0.005]	[0.002]	[0.019]	[0.011]
Missing	-0.025	-0.006	0.013*	0.002	0.006	-0.022**
	[0.127]	[0.047]	[0.008]	[0.001]	[0.006]	[0.010]

Note: Total number of observations used for this model is 10,222. These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, deprivation index in Wave 2, lone mother and/or father, mother's and father's employment status, as well as wave dummies from W5 to W7. Young Person's expectations are not considered in these models. Reference categories of parental expectations are *Likely* and *Fairly Likely*. By running linear models with instrumental variables the instrument of low-expectations presents a value of F-statistic 2.55 (p-value= 0.11) and the instrument for high expectations a value of F-statistic 11.17 (p-value=0.001). SML models considered 45 random draws using the *GHK* simulation method. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Table 20: Wald tests of error correlation in Probit, Bivariate and Simulated Maximum Likelihood

	Probit w/IV		Bivariate w/IV		SML w/IV	
	IV for HExp	IV for LExp	IV for HExp	IV for LExp	IV for H/L Exp	
					Separate Probits	Probit vs MvProbit
Tests	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
WaldTests: Maximum Likelihood						
Wald test of exogeneity (athrho = 0):						
Chi^2	0.32	0.60	8.39	0.01		
Prob > chi2	0.57	0.44	0.00	0.93		
WaldTests: Simulated Maximum Likelihood						
Athrho (Motherhood vs High) = 0						
$Chi^2(1)$					0.29	0.51
Prob > chi2					0.59	0.47
Athrho (Motherhood vs Low) = 0						
$Chi^2(1)$					0.06	0.01
Prob > chi2					0.81	0.91
Athrho (High vs Low) = 0						
$Chi^2(1)$					29.15	2.55
Prob > chi2					0.00	0.11
Athrho (Motherhood vs Missing)=0						
$Chi^2(1)$						6.20
Prob > chi2						0.01
Athrho (High vs Missing) = 0						
$Chi^2(1)$						44.97
Prob > chi2						0.00
Athrho (Low vs Missing) = 0						
$Chi^2(1)$						0.27
Prob > chi2						0.60
Joint Wald Tests						
Athrho Mother vs High/Low/Missing = 0						
$Chi^2(3)$						6.68
Prob > chi2						0.08
Athrho Mother vs High/Low = 0						
$Chi^2(2)$					0.87	0.82
Prob > chi2					0.65	0.66
Athrho all constraints = 0						
$Chi^2(3),(6)$					115.80	76.98
Prob > chi2					0.00	0.00

Note: Wald test are applied to fisher's transformation of correlation coefficients. Delta method has been used to calculate standard errors and tests. *** p<0.01, ** p<0.05, * p<0.1.

Table 21: Likelihood of being a teen mother conditional on having sex

Marginal effects of clustered models − Wave 4 to Wave 7
Instrumental Variable: Education and Training Score at LSOA level

	Bivariate w/IV		**Probit**
	(IV for HExp)	**(IV for LExp)**	**(SML w/IV)**
			Probit vs MvProbit
Born to a teenage mother	0.007**	0.002	0.014
	[0.003]	[0.003]	[0.009]
Main Parent's Expectations in Wave 1			
High	-0.014***	-0.002**	-0.018***
	[0.005]	[0.001]	[0.004]
Low	0.001	0.001	0.006
	[0.001]	[0.003]	[0.007]
Missing	0.004*	0.002*	-0.008
	[0.002]	[0.001]	[0.009]

Note: Total number of observations used for this model is 10,206. These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, deprivation index in Wave 2, lone mother and/or father, mother's and father's employment status, as well as wave dummies from W5 to W7. Reference categories of parental expectations are *Likely* and *Fairly Likely*. By running linear models with instrumental variables the instrument of low-expectations presents a value of F-statistic 7.39 (p-value=0.007) and the instrument for high expectations a value of F-statistic 25.71 (p-value=0.000). SML models considered 45 random draws using the GHK simulation method. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

9 Appendix 2: Complementary Tables and Figures

Table 22: Likelihood of teen pregnancy and motherhood for a deprived homogeneous group

Marginal effects of clustered probit

Variable	**Pregnancy**	**Motherhood**
Main Parent's Expectations in Wave 1		
High	-0.041*	-0.033*
	[0.022]	[0.019]
Low	0.016	-0.007
	[0.036]	[0.021]

Note: The selection of this *homogeneous* group is based on a nearest neighbour with replacement and caliper using pre-treatment variables (before 1999). These specifications have as covariates parental expectations and wave 5 to 7.

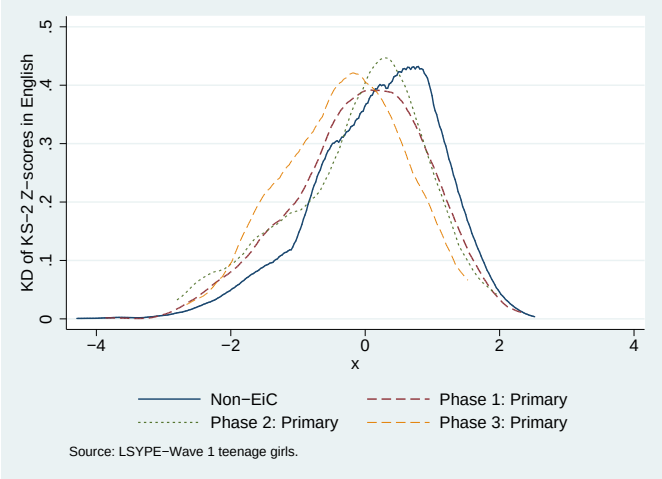

Figure 1: Kernel Densities of English z-scores in Key Stage 2 by EiC group

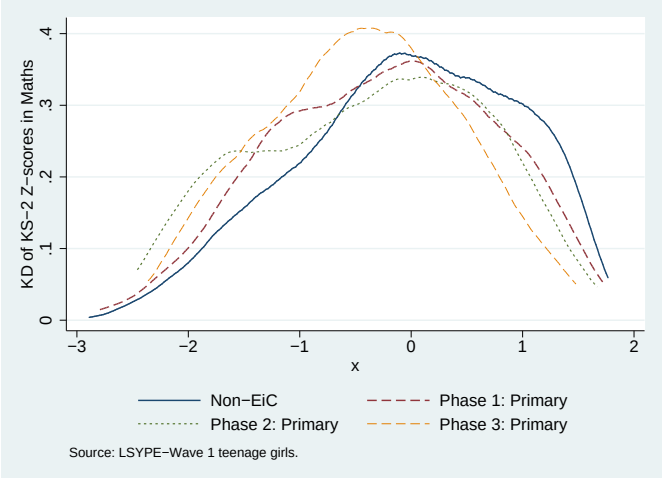

Figure 2: Kernel Densities of Maths z-scores in Key Stage 2 by EiC group

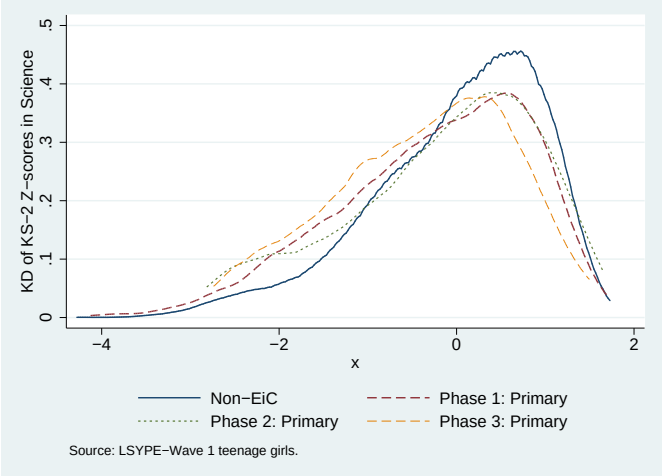

Figure 3: Kernel Densities of Science z-scores in Key Stage 2 by EiC group

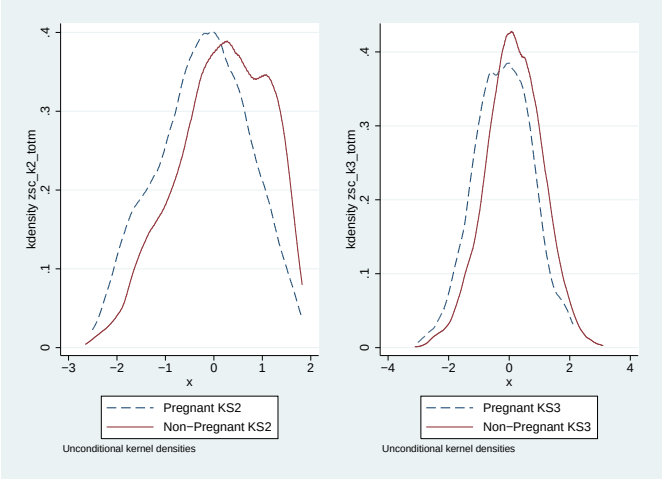

Figure 4: Math Z-scores in Key Stage 2 and 3

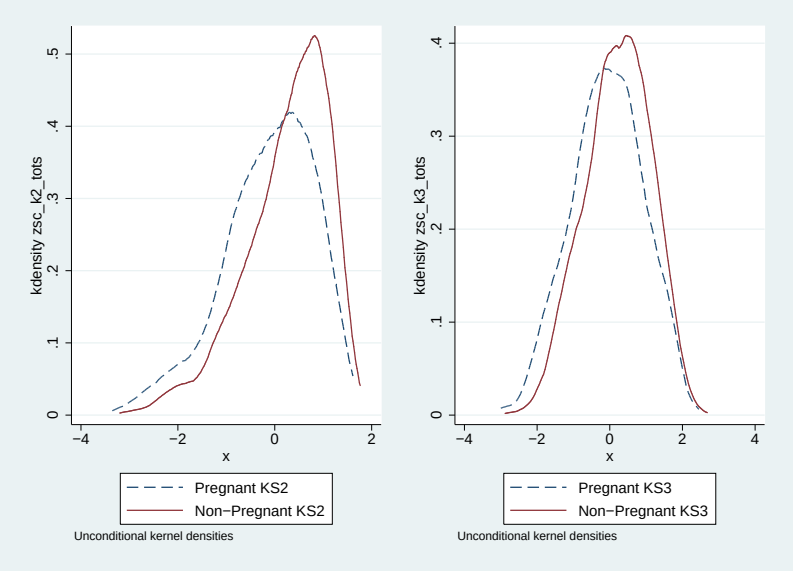

Figure 5: Science Z-scores in Key Stage 2 and 3

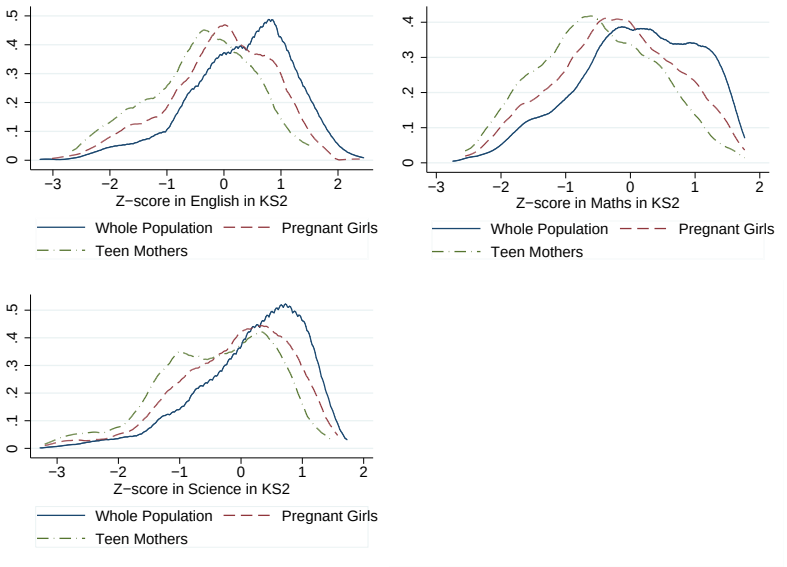

Figure 6: Kernel Densities of English, Maths and Science z-scores in Key Stage 2

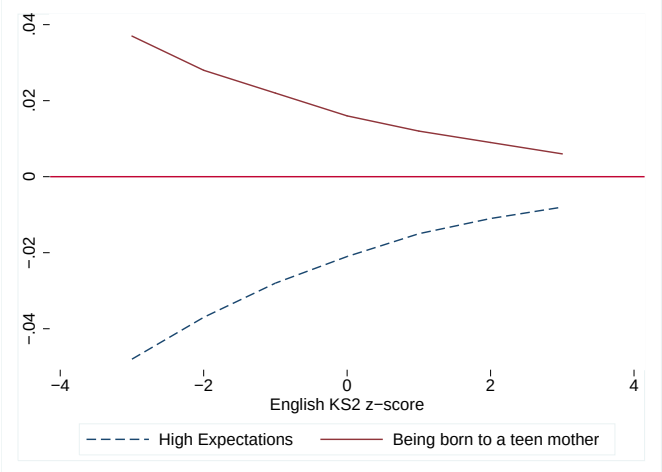

Figure 7: Marginal Effects across Key Stage 2