Teenage Pregnancy and Motherhood in England: Do parents' educational expectations matter?

Ericka G. Rascon-Ramirez *
University of Essex
Institute for Social and Economic Research
erasco@essex.ac.uk

September 26, 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 and 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 half as important as being born to a teenage mother. In addition, larger effects of parental expectations on teenage pregnancy and motherhood are found for teenage 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, teenage motherhood, teenage pregnancy, maximum likelihood, simulated maximum likelihood, instrumental variables (9905 words without considering tables).

*I am very grateful to my PhD supervisors Marco Francesconi and Adeline Delavande for their guidance and comments to earlier versions of this paper, as well as to my *viva voce* examiners Sonia Bhalotra and Wilvert van der Klaauw for their detailed comments and suggestions that clearly helped on improving the final version of this thesis. 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 LA and 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.

Contents

1 Introduction **4**

2 Literature Review **6**

2.1 Causes of teenage pregnancy and motherhood 6

2.2 Consequences of Teenage Pregnancy 7

2.3 Consequences of Teenage Motherhood 7

2.4 Expectations and Behaviour 9

3 Institutional Background **11**

3.1 Teenage Pregnancy and Motherhood in the UK 11

3.2 Policies for the Young People 12

4 Expectations and Teenage Fertility Decisions **13**

4.1 Relevance of Expectations for Teenage Pregnancy and Motherhood 13

4.2 A Model of Educational Expectations and Teenage Motherhood 14

5 Data **15**

5.1 Measurement of Expectations 16

5.2 Descriptive Statistics 17

6 Identification Strategy **18**

6.1 Empirical Specifications 19

6.2 Sources of Endogeneity 20

6.2.1 Strategies of Identification 21

6.3 Econometric Methods 25

6.4 Further checks and Tests of exogeneity 29

7 Results **29**

7.1 Discrete Choice Models and Correction for Attrition 30

7.2 Endogeneity of Expectations 32

7.2.1 Control for Preferences and Expectations about occupational choices . . . 33

7.2.2 Instrumental Variable Approach 33

7.3 Propensity Score Matching: Deprived Population defined by the *EiC* Programme 37

7.4 Tests of Exogeneity 38

8 Robustness Checks **39**

9 Conclusions **40**

10 Appendix 1: Tables and Figures **47**

11 Appendix 2: Complementary Tables and Figures **72**

List of Figures

1 Marginal Effects across Key Stage 2 of Teen Pregnancy Models 71
2 Marginal Effects across Key Stage 2 of Teen Motherhood Models 71
3 Kernel densities of the growth rate of English z-scores in Key Stage 2 and Key Stage 3 for girls benefited by the *EiC Programme* and the total rest of teenage girls 72
4 Kernel densities of the growth rate of Math z-scores in Key Stage 2 and Key Stage 3 for girls benefited by the *EiC Programme* and the total rest of teenage girls 72
5 Kernel densities of the growth rate of Science z-scores in Key Stage 2 and Key Stage 3 for girls benefited by the *EiC Programme* and the total rest of teenage girls 72

Life is largely a matter of expectation.
Horace

1 Introduction

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

Despite the large number of studies analysing the consequences of teenage childbearing on the teenage girls and her child (e.g., Ashcraft and Lang, 2006; Ermisch and Pevalin, 2005), little is known about why teenage girls decide to have a child (exceptions include Lundberg and Plotnick, 1995 who shed light on some of the causes by analysing welfare, abortion, and family planning policies on teenage childbearing).

This paper contributes to the literature by analysing the causal effect of parent's educational expectations (e.g., the likelihood reported by parents about the teenager attending Higher Education (HE) after finishing compulsory education) on teenage pregnancy and motherhood. It uses a measure of subjective expectations collected by the Longitudinal Study of Young People in England (LSYPE) for a cohort of students who was firstly interviewed in 2004, when they were 13-14 years old.

Educational expectations are likely to be relevant to teenagers' fertility decisions because the perceived opportunity cost of having a child is lower for those teenage girls perceiving a low likelihood to attend Higher Education. In contrast, the perceived opportunity cost is higher for those teenagers with higher educational expectations. 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, parents' expectations about educational choices may directly influence the formation of the teenager's expectations and therefore, affect the perception of the teenager's opportunity cost of current and future choices. Secondly, if parents have high expectations about their teenager's academic choices, then they will continue investing in the teenager's human capital.

To estimate the effect of parental expectations on teenagers' fertility decisions, I model the likelihood of being pregnant and becoming a mother as separate decisions. For both decisions, potential endogeneity issues may arise because parental expectations may be correlated with the teenager's and parents' preferences for schooling and for working, as well as with the teenager's schooling performance. I use two approaches to address these potential issues. Firstly, I use information about parental preferences and teenager's expectations 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 when

the teenage girl was attending Key Stage 2 (last three years of primary school). Despite the *EiC* programme aimed at improving schooling achievement too, there was no effect on Science and Maths scores, and only negligible differences between Key Stage 2 and Key Stage 3 were observed for English scores.[1] In addition, all empirical specifications control for the teenager's schooling performance, schools' and socio-demographic characteristics. Because the *EiC* programme was mainly targeted at deprived schools, I evaluate the robustness of the main findings with a second set of instruments that affects the entire population. This set also explores the variation of expectations based on the supply of educational choices and employment conditions at the Lower Super Ouput Area (LSOA) level.[2] Simulated maximum likelihood methods with instrumental variables are used for identifying the effects of parental expectations on teenage pregnancy and motherhood. These estimates are contrasted with those obtained from maximum likelihood methods.

My findings show that high parental expectations decrease the likelihood of teenage pregnancy and 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, the marginal contribution of expectations is greater for teenage girls with lower academic performance than for those with better performance. In addition, the paper briefly explores the performance of parental expectations estimates across deprivation percentiles. My results do not find heterogeneous effects across deprivation partitions.

This paper contributes to the public policy debate and the literature about the causes of teenage pregnancy and motherhood. From the public policy perspective, the high rates of teenage pregnancy and motherhood in the United Kingdom pose an urgent need to better understand the causes of both phenomena. This paper provides new evidence to the British Government and policy analysts to complement public policy strategies for reducing teenage pregnancy and motherhood by increasing educational choices and expectations.

In addition, this paper contributes to: (i) the literature that seeks to establish the causes of teenage pregnancy and motherhood (see Lundberg and Plotnick, 1995; Kane and Staiger, 1996; Ananat and Hungerman, 2012) and (ii) the literature that uses subjective expectations to make inference on behaviour (see Delavande, 2008; Arcidiacono et al., 2012; van der Klaauw, 2012; and De Paula et al., 2013).

The structure of the paper is as follows: Section 2 briefly describes the literature on teenage pregnancy and motherhood, as well as it reviews current studies using subjective expectations to make inference about behaviour. In addition, Section 3 discusses some of the public policies target at young people in the United Kingdom. Section 4 presents a simple model to explain how educational expectations may influence teenagers' fertility decisions. Section 5 describes the

[1] Kendall et al. (2005) also found similar results while assessing the impact of the *EiC* programme on schooling achievement.

[2] LSOAs are geographic boundaries designed by the Office for National Statistics (ONS) and are aggregations of Output Areas. Output Areas are subdivisions of 2003 wards and each contains approximately 125 households (300 residents). LSOAs are the next largest area up and each contains a minimum population of 1,000 persons and a maximum of 3,000. In 2001 there were 32,482 LSOAs in England.

LSYPE and NPD data, discusses the measures of expectations, and presents a brief summary of the collection of sexual outcomes and expectations.[3] Section 6 provides a description of the strategies to identify parental expectations' parameters, as well as the econometric techniques that are used for obtaining the main findings. Section 7 presents the main findings derived from the econometric specifications. Section 8 provides some robustness checks to validate the main results and the last section concludes and suggests some extensions of this paper.

2 Literature Review

2.1 Causes of teenage pregnancy and motherhood

The majority of the empirical literature on teenage pregnancy and motherhood identifies a set of socio-demographic factors associated with both outcomes. For instance, deprivation, lone motherhood, poor academic performance, being born to a teenage mother and parents' marital disruption are regularly some of the factors highly correlated with teenage pregnancy and motherhood. However, only few studies have identified some of the causes of teenage pregnancy and motherhood. The main identification strategy of 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 the United States to analyse some of the causes of teenage motherhood. These exogenous variations facilitate the identification of causal effects of such reforms on teenage pregnancy, motherhood, and marriage decisions.

Lundberg and Plotnick (1995) analyse teenage fertility and marriage decisions 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 teenagers' behaviour. While white teenagers' behaviour is affected by welfare, abortion, and family planning policies, black teenagers show 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 (e.g., 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 teenage 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 that the pill had a short-term effect on the decline in fertility of unmarried teenagers and women under 21. The decrease in pregnancies was larger than in teenage births. Nevertheless, the

[3]The National Pupil Database (NPD) contains information about pupils who attend schools and colleges in England (e.g., English, Maths, and Science marks in Key Stage 2, 3, 4 and 5).

decline in pregnancy was temporary and did not affect total childbearing in the long-term. It is worth noticing that the majority of these studies has used US data.

2.2 Consequences of Teenage Pregnancy

After describing some of the causes of teenage pregnancy and motherhood, the following subsections review their consequences for teenage girls and children. I begin with a brief overview about the consequences of abortion and miscarriages, followed by the consequences of motherhood.

The literature about abortion and miscarriages focuses on the effects of abortion on the teenager's physical and psychological health. However, it is worth mentioning that there is scant evidence about the consequences of abortion or miscarriage in young populations.

Medical studies from the US highlight that teenage girls have lower rates of mortality and morbidity derived from abortion than women over 20. Nevertheless, teenagers have an increased risk of cervical injury during a *suction-curettage* abortion (Cates Jr et al., 1983). In addition, induced abortion of unintended pregnancies increases the risks for both a "subsequent pre-term delivery" and psychological estates that may provoke self-harm (Thorp Jr et al., 2003).

In addition, Bradshaw and Slade (2003) and Fergusson et al. (2006) present evidence about symptoms of depression or anxiety before and after a woman decides to have an abortion. By using, a 25-year longitudinal data from New Zealand, Fergusson et al. (2006) show that young women under 25 who have experienced an abortion are more likely to present mental disorders, such as depression, anxiety, suicidal behaviours, and substance use disorders.

With regard to spontaneous abortion or miscarriage, Friedman and Gath (1989) use a small sample of 67 young and old British women who experienced this type of abortion. They also find depression as a consequence of this experience. Similarly, Garel et al. (1994) provides further evidence about the long-term depression (about 18 months) after experiencing a miscarriage. This study uses a sample of 144 British women.

2.3 Consequences of Teenage Motherhood

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 the child's well-being. The study of the consequences of these outcomes presents the challenge of disentangling 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 the non-random selection into motherhood to study its consequences for the mother and for the child. The main issue caused by this selection problem is that it is difficult to know how the child and the girl would have performed (academically and professionally) if the teenage girl had chosen not to get pregnant or abortion.

Consequences for the teenage girl

The empirical evidence about the consequences of teenage motherhood may be grouped by consequences on: human capital investment and labour market outcomes (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) and partnerships (Plotnick, 1992; Goodman et al., 2004; and Ermisch and Pevalin, 2005).

The consequences on the teenager's human capital investment and labour market outcomes are diverse. Fletcher and Wolfe (2009) provide evidence that teenage motherhood 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. In Britain, Chevalier and Viitanen (2003) find that teenage mothers are less likely to be enrolled in post-16 schooling, their 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 teenage motherhood.

Conversely, Brien et al. (2002) find that the effects of teenage motherhood on the teenager's cognitive development, measured by test scores, are quite negligible. By using US longitudinal data before and after the childbirth, they observe differences in academic performance between teenage mothers and their contemporaries that decided not to have kids when they were teenagers. However, these differences are mainly explained by unobservable factors affecting both teenagers' fertility decisions and cognitive development as measured by test scores.

Similarly, Hotz et al. (1997) show that in the US teenage mothers present a smaller decrease in the likelihood of receiving a high school diploma than reported in previous empirical studies. They also find that teenage mothers present higher earnings and hours worked. To identify these consequences, Hotz et al. (1997) use miscarriage information as an 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, causes upwardly biased estimates of the effects of teenage motherhood on the teenager's and child's outcomes. The main reason is the non-randomness of the instrument.[4] By acknowledging the disadvantage of the instrument, Ashcraft et al. (2013) derive a consistent estimator which consists of a weighted average of the Ordinary Least Squares (OLS) and Instrumental Variable (IV) estimators in order to obtain Average Treatment Effects (ATE). 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". Additionally, Goodman et al. (2004) show that there is no difference in the likelihood of having a partner between teenage mothers and those who

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

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 consequences of teenage motherhood as a result of unobserved family background (see Geronimus and Korenman, 1992 and Hoffman et al., 1993), the majority of empirical studies highlight several negative consequences, such as the delay in human capital investments, poorer labour market outcomes, and worse alternatives in the marriage market.

Consequences for the child

The identification of the consequences of teenage motherhood for the child presents similar selection problems to the ones discussed for the teenage girl. The empirical challenge is 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. Despite this challenge, the majority of empirical studies sheds light on the negative effects of teenage motherhood on the child's outcomes. 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 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 teenage and older mothers. Their conclusions underscore, based on obstetric measures collected few days after the birth of the child, that both types of babies do not present significant differences. However, one year later, the differences between both groups were clearly driven by the absence of a 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-teenage mothers. For instance, they are more likely to be incarcerated (Grogger, 2008) and to become teenage parents (Haveman et al., 2008).

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

2.4 Expectations and Behaviour

The use of subjective expectations about future outcomes or events in choice models is quite recent in the field of Applied Economics. As Manski (2004) discusses, the standard choice modelling has 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 and analysis of subjective expectations has increased in the last twenty years.

The focus of recent studies using subjective expectations has been on: college decisions (Attanasio and Kaufmann, 2009; Arcidiacono et al., 2012; Zafar, 2013), teacher career decisions (van der Klaauw, 2012), contraceptive choices (Delavande, 2008), risky behaviour (De Paula et al., 2013; Shapira, 2013), non-marital childbearing choices (Wolfe et al., 2007), and retirement saving decisions (Dominitz et al., 2002; van der Klaauw and Wolpin, 2008); as well as on the formation of expectations among young population (Manski, 1993; Fischhoff et al., 2000), and how information changes expectations (Benitez-Silva and Dwyer, 2005; Zafar, 2011; Wiswall and Zafar, 2013).

The main findings of these studies highlight the relevance of using subjective expectations about outcomes and choices to make inference about behaviour. For instance, Arcidiacono et al. (2012) show that the subjective expectations on the probabilities of entering different careers and the future expected earnings associated with these alternatives, play an important role in the choice of college major. By using subjective expectations about the outcomes related to contraceptive methods, Delavande (2008) shows that the main determinants of the contraceptive-method choice is the effectiveness, protection against sexually transmitted diseases (STDs), and partner disapproval. Similarly, De Paula et al. (2013) find that downward revisions in the perceived probability of being HIV positive increase risky behaviour measured by extramarital affairs.

With regard to the influence of new information on subjective expectations, Zafar (2011) finds that college students revise expectations consistent with a Bayesian learning model and shows that this learning affects major choices. Using retirement and health data, Benitez-Silva and Dwyer (2005) show that individuals correctly anticipate the majority of uncertain events when planning their retirement. The only factors that alter the individual's retirement plans are related to health conditions, unemployment uncertainty, and the availability of private health insurance.

The common methods used by these studies are discrete choice models, where just a few account for the potential endogeneity of subjective expectations. Van der Klaauw (2012) proposes a methodology to incorporate subjective expectation data on choices in stochastic dynamic models and De Paula et al. (2013) use a semi-parametric panel data estimator that takes into account the unobserved heterogeneity and belief endogeneity. Benitez-Silva and Dwyer (2005) use an instrumental variable approach to account for the measurement error of subjective expectations and a sample selection correction to consider the potential bias derived from the non-response of retirement expectation data. Delavande and Kohler (2014) use a recursive system of equations with several exclusion restrictions to deal with the potential endogeneity of beliefs.

As a result of the relevance of analysing the role of expectations to infer the individual's behaviour, recent surveys and experimental data have started including questions of subjective expectations about future outcomes, events, and choices. The contribution of this study is twofold: (a) it analyses the effect of subjective expectations (albeit measured on a Likert scale

rather than a probabilistic format) about future academic choices on fertility decisions for the first time; and (b) it accounts for the endogeneity of expectations by using simulated maximum likelihood with instrumental variables.

3 Institutional Background

3.1 Teenage Pregnancy and Motherhood in the UK

The UNICEF (2013) report highlights that teenage fertility rate in the United Kingdom was already the highest in Europe at the beginning of 2000. However, the United Kingdom has had reductions in teenage conception rates and legal abortions.

According to the Office for National Statistics (ONS), the under-18 conception rate for 2011 in England and Wales has been the lowest since 1969. The decrease in conception rates for teenagers aged 15 to 17 was about 32 per cent, leaving a rate of 30.9 conceptions per thousand women. The North East of England presents the highest under-18 conception rate with 38.4 per thousand women for the same age group.[5] For the same group of the population, the number of legal abortions decreased between 2001 to 2011 from 18 abortions per thousand women to 15. In England, half of the under-18 conceptions lead to an abortion (Department for Children, Families and Schools, 2010). In addition, the group of young girls aged 18 to 19 also experienced a reduction in abortion rates from 32 to 28.8 per thousand women.

Ermisch and Pevalin (2003) highlight some of the factors associated with teenage motherhood using British data such as family social class, low household income, local labour market conditions, as well as the mother's age at birth and her education.

The most recent intervention the British Government launched to reduce teenage birth rates was in 1999. The programme was called 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, Families and Schools (2010), the strategy had two main strands: (a) provide information, advice, and support and (b) provide access to contraceptive methods. Wilkinson et al. (2006) find that the net change between 1994-98 and 1999-2003 was a fall in under-18 conceptions of 3.2 per cent, a rise in abortions of 7.5 and the fall in birth rates of 10.6 per cent as a result of the strategy.

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 to teenagers and parents about socio-economic factors that are associated to teenage pregnancy and motherhood.

[5]The ONS includes in the definition of "conception" pregnancies that result in either one or more live births or stillbirths or a legal abortion.

3.2 Policies for the Young People

This subsection describes some of the public policies for the young people in the United Kingdom since the late 1990s. The aim of this subsection is to provide a better understanding about the alternatives the teenagers had in 2000-2010 after finishing compulsory education. The policies that I discuss in this section embrace two main objectives: (i) Higher Education enrolment and (ii) participation in apprenticeships or work-based trainings.[6]

Some of the individual-based social programmes targeted at young people are: Modern Apprenticeships (*MA*, 1994-present), New Deal for Young People (*NDYP*, 1998-present), Teenage Pregnancy Strategy (1999-2010), Connexions (2000-present), Entry to Employment (*E2E*, 2003-present), Educational Maintenance Allowance (*EMA*, 2004-2010; stopped in England but not in the rest of UK) and 16-19 Bursary Fund (2011-present).[7]

The *MA*, initially targeted at the "most able" school leavers, but in 1997 the Government expanded its coverage to all school leavers. Since 2000 the *MAs* became the main source of training available for young people who left school (Bynner et al., 2004). Similarly, the *E2E* programme offers support to young people between 16 to 18 years old who are not ready to directly enter *MAs*. The programme provides individual learning strategies for helping on **progression to apprenticeship or further education**. The *NDYP* offers personal advice for job search, return to education or start a training to young people between 18 and 25.

The Connexions programme targets young people aged 13 to 19 and provides personal guidance outside the schools. Similar to the previous programmes, Connexions aims at raising aspirations of young people, at offering services to engage effectively in **learning and employment**, and at accessing to services and discounts through the Connexions Smart Card. [8]

For the young people facing **financial constraints**, the *EMA* and the 16-19 Bursary Fund aim at helping them with the financial costs to continue in education. EMA is only available in Wales, Scotland and North Ireland for the continuation in education between year 12, 13, and 14 (16 to 19 years old). This programme consists of a weekly allowance, an attendance bonus per term, and an end-of-course achievement payment (Bynner et al., 2004). In contrast, the 16-19 Bursary Fund has the objective to help on specific education-related costs during the school year such as meals, transportation, books, clothing, equipment, or educational visits; see

[6]The concept of Young People embraces teenagers and people under 25 depending on the social programme. The targeted population is specified for each public policy discussed in this section. It is worth mentioning that the New Deal for Young People (*NDYP*) programme covers people under 25, the rest of the programmes discussed in this section are mainly targeted at teenagers under 19.

[7]According to Bynner et al. (2004), most of these policies took place as extensions of the pre-1997 policies such as the Training and Enterprise Councils (TECs) and the Youth Training Scheme (YTS). Additionally, some of the area and school-based programmes that target at young people are: the Education Action Zones (1999-2001), Excellence in Cities (1999-2001), and Aimhigher (2001-2010). These programmes aimed at improving schooling achievement in deprived areas and raise educational aspirations of children. Section 6 presents a detailed description of these policies as part of the description of the instruments used for this study.

[8]The connexions Smart Card is targeted to young people between 16 to 19 and offers a mean of earning "reward points" for learning, work-based training, and voluntary activities.

Education Funding Agency (2013) .

While these strategies try to tackle specific social problems faced by young people, some of them may also have "unintended positive effects" on teenage pregnancy and motherhood. For instance, if higher education enrolment increases, this may indirectly impact teenage pregnancy and motherhood through the increase of opportunity costs. Similarly, if those students underperforming at school decide not to enter higher education, social programmes promoting the link between Key Stage 4 and apprenticeships or early entry to the job market, may expand the choice set of the teenager when she reaches school leaving age. Thus, social programmes that encourage employment or enrolment into Higher Education may decrease teenage pregnancy and motherhood by increasing the opportunity costs of early childbearing. These effects are not tested in this study.

4 Expectations and Teenage Fertility Decisions

4.1 Relevance of Expectations for Teenage Pregnancy and Motherhood

The role of parental expectations in teenage pregnancy and motherhood embraces three main edges: perceived opportunity costs, human capital investment, and long-term effects on labour market and marriage outcomes.

The first mechanism through which parental expectations may impact teenage pregnancy and teenage motherhood is that having *high* or *low* expectations about the teenager's likelihood of attending Higher Education, translates into *high* or *low* **perceived opportunity costs** of those alternatives not related to schooling (such as early motherhood or early employment).[9] This mechanism directly impacts teenagers' behaviour.

The second mechanism is that parents invest according to their expectations about the teenager's likelihood of attending Higher Education. Parents will decide to continue investing in human capital if they have *high* expectations about this likelihood. As a result, teenage girls will be less likely to drop out of school or to have a child as a result of the **increase in the opportunity costs** derived from this investment.

Finally, if parental expectations impact fertility decisions of teenagers, then expectations have indirect effects on labour and marriage market alternatives. As I have previously discussed, teenage mothers face lower earnings and professional experience, as well as worse alternatives in the marriage market.

It is worth highlighting that the measure of expectations considered in this study, reflects a combination of aspirations and beliefs about the likelihood of attending Higher Education reported by the main parent, who in the majority of cases, is the mother.

[9]Early employment refers to employment after compulsory education instead of enrolment in Higher Education.

4.2 A Model of Educational Expectations and Teenage Motherhood

This subsection describes a simple theoretical model to understand the parameters involved in the teenager's decision of having or not having a child. For simplicity, the model does not differentiate between teenage pregnancy and motherhood.

In this model, 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 than their teenagers 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 their own. Parents may have *high* or *low* expectations about the likelihood of the teenager attending higher education, depending on the observed teenager's academic achievement and the quality of her previous and current schools. If parents believe that the teenager is good at school, the quality of her school is high or both, they will perceive high returns to schooling and translate them 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 teenage years will rise.

The teenage girl faces two alternatives after finishing compulsory education. Her options are: (i) having a child after finishing compulsory education b or (ii) not having a child s. Both choices are mutually exclusive and the teenager makes her decision in period 1. In period 2, all women work and earn a wage dependent on the education they have acquired. The teenager's lifetime utility (dependent on the period 1's choice) is given by:

$$At16 = \begin{cases} b & \text{if } U_b + \beta W_b + \epsilon_b \\ s & \text{if } p[\phi + \beta W_s] + (1\text{-}p)[W_b + \beta W_b] + \epsilon_s \end{cases} \tag{1}$$

The teenager's lifetime utility, if she chooses b, depends on the taste for early childbearing U_b; the second-period wage W_b (unskilled wage); the discount rate β; and an unobserved random component (to the econometrician) ϵ_b. If she does not have a child, with probability p, she attends Higher Education. In this case, she derives satisfaction (or cost) ϕ for attending HE and earns a second-period wage $W_s > W_b$. With probability *(1-p)*, she does not attend HE and earns a wage W_b in both periods. Her utility also depends on an unobserved random component ϵ_s.

The teenage girl will decide to have a child if the perceived gains of this choice are greater than the gains of not having the child:

$$U_b + \beta W_b + \epsilon_b > p[\phi + \beta W_s] + (1 - p)[W_b + \beta W_b] + \epsilon_s \tag{2}$$

The probability p can be expressed as a function of the teenager's early academic achievement π, the quality of the schools she has attended prior to Higher Education $\bar{s}$, and exogenous factors θ:

$$p = p(\pi, \bar{s}; \theta) \tag{3}$$

Arranging terms and plugging equation (3), the decision rule faced by the teenage girl is:

$$U_b - p(\pi, \bar{s}; \theta)\phi > p(\pi, \bar{s}; \theta)\beta(W_s - W_b) + \{1 - p(\pi, \bar{s}; \theta)\} W_b + \bar{\epsilon} \tag{4}$$

Where $\bar{\epsilon}$ is the difference of unobserved components $\epsilon_s - \epsilon_b$ with mean zero and variance equal to one. If the difference in tastes for early childbearing and for schooling is greater than $p(\pi, \bar{s}; \theta)\beta(W_s - W_b) + \{1 - p(\pi, \bar{s}; \theta)\} W_b$ the teenage girl will decide to have a child. The larger the probability of attending Higher Education, the more likely the teenage girl will delay childbearing. Similarly, the larger the tastes for schooling, the less likely the teenage girl will become a teenage mother.

It is worth highlighting that tastes for schooling and for early childbearing play an important role in the decision of having a child, as well as the subjective probability of attending Higher Education. The empirical specifications consider as subjective probabilities the reported parental expectations about the teenager's likelihood of attending Higher Education. In addition, potential endogeneity issues may arise as a result of the correlation between parental and the teenager's tastes for schooling and for early childbearing and parental expectations. To control for this potential issue, I introduce in the empirical models parental preferences for having their teenager working at age 16 and the teenager's expectations about start an apprenticeship or job after compulsory education. The inclusion of these variables aims at reducing the omitted variable bias derived from the absence of preference information in our empirical models.

Finally, this model also helps on understanding how instrumental variables facilitate the identification of the effect of parental expectations on fertility decisions. In equation (3), I define the subjective probability as a function of early academic achievement, school quality, and exogenous variables. To identify the effect of parental expectations, I use the exogenous variation of these expectations as a result of a social programme that aimed at raising expectations and improve academic achievement of deprived population. A second set of instruments, based on educational supply and labour market conditions, is also explored to evaluate the robustness of the main findings of this study.[10]

5 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

[10]The empirical specifications control for academic achievement and school quality by including Key Stage 2 marks in English, Maths, and Science, as well as school variables measured in 1996-1999 about the school's management, efficiency, and climate for learning.

(LSOA) for every LSYPE record. The total number of teenage 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).[11]

The empirical analysis uses the group of sexually active girls from Wave 4 to Wave 7 that accepted to answer the module on sexuality. The total number of girls used for the econometric models is around 2,500 per wave.[12]

Table 3.1 *Appendix 1* summarises the collection of parental and the teenager's expectations, pregnancy, and motherhood information. This table shows that pregnancy information was collected from Wave 6 in the LSYPE. Consequently, the empirical models use pregnancy information for Wave 4 and Wave 5 constructed from questions such as *Whether the young person (YP) has own children?*. For this reason, in the robustness check subsection I discuss the results of pregnancy models exploring the relevance of Wave 4 and Wave 5 on parental expectation estimates. The percentage of teenage pregnancy in the sample is 8.2 per cent and of teenage motherhood is 3.7 considering Wave 4 to Wave 7. According to official data, approximately 5.5 per cent of teenage girls under 20 are teenage mothers at the national level in England and Wales.[13]

Finally, as a result of having expectation variables mainly collected at the beginning of the survey, I use pooled probits with individual clustering, instead of fixed effects techniques.[14] To acknowledge the dynamics of the dependent variable, all models include wave dummies to capture changes of unobserved characteristics over time.

5.1 Measurement of Expectations

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*. 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 parents is measured by a Likert scale with four categories: very likely, likely, fairly likely, and not likely at all. Because individuals may have different definitions about *likely*, this type of scales makes difficult the comparison across individuals based on their subjective likelihood. For this reason, this paper focuses on the extremes of the Likert scale. Although I am not able to claim that *likely* and *fairly likely* individuals

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

[12]From the total of teenage 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).

[13]This number was calculated based on the total number of young females between 15 to 19 years old in 2010 (1,633,900) and the total number of conceptions for the same group in the same year (89,563).

[14]Random effect models present similar coefficients to the ones estimated by clustered probits at the individual level. Random effects are not discussed in section 7

are different, I argue that those individuals reporting *very likely* and *not very likely at all* will never overlap; in spite of their subjective cut-offs. I use as reference categories *likely* and *fairly likely* in all the empirical specifications.[15]

Table 2 *Appendix 1* shows specifications of parental expectations using observations of only Wave 4 and observations of Wave 4 to Wave 7, respectively, on parental schooling, schooling achievement, alcohol intake in Wave 1, deprivation index 2004 (based on information of 2002), being born to a teenage mother, among other characteristics. As expected, this table shows that parental expectations are highly correlated with parents' schooling and early academic performance (Key Stage 2 z-scores).

5.2 Descriptive Statistics

This section discusses summary statistics of the sample used for this study and presents additional statistics for teenage girls who became pregnant and those who decided to have the child. Tables 3 and 4 of *Appendix 1* present socio-demographic characteristics, academic performance measured by z-scores, alcohol intake in Wave 1, deprivation index in 2004, parental employment and expectation.[16] The variables shown in these tables are the covariates originally considered for the specifications that are discussed in Section 7. Thus, these omit the reference categories for the following variables: parental 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), parental expectations (Likely and Fairly likely), and wave 4. It is worth mentioning that parental schooling and parental employment were collected from both fathers and mothers; whereas parental expectations was only collected from the "main parent".

The sample of this study, shown in columns (1) and (2), belongs to families with one or two children in the household (71 per cent), primarily Christian (51 per cent), one quarter of them lives with lone mothers and mothers 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

[15]Despite subjective probability measures are more preferred than Likert scale (e.g, they allow strict interpersonal comparability and the distribution of expectations can be used as part of the analysis), the LSYPE does not collect subjective probability measures. To overcome the potential problem of lack of interpersonal comparability, I use the extreme values of the Likert scale (very likely and not very likely at all). By using data from Malawi, Delavande et al. (2011) compare subjective probabilities and Likert responses about the probability of being infected of HIV/AIDS. Comparing the Likert responses of *no likelihood, low, medium,* and *high* with the reported subjective probabilities, they show that a large proportion of the extreme responses of the Likert scale correspond to the extremes of the subjective probability. However, the authors also show that most of the discrepancy between both types of measures happens in the middle categories between 0.5 and 0.6 of the subjective probability spectrum.

[16]The deprivation index corresponds to the *Income Deprivation affecting Children Index (IDACI)* based on information of 2001 and 2002 at the super output area (SOA) and measures the proportion of children under the age of 16 living in low-income households.

in Wave 1.[17] Because this cohort presents the same age, z-scores are not constructed based on this variable.

Tables 3 and 4 also show that Wave 1 captures around 18 per cent of the sample having the habit of frequent alcohol intake during the week. Additionally, the sample is slightly concentrated in the richest quintiles of the deprivation distribution, having 48 per cent of the teenage girls in the 1st and 2nd quintile. Because this concentration is mainly attributed to the selection of the sample by attrition, I consider this bias by using in the empirical specifications *inverse probability weights*.With regard to the parental expectation variables, 41 per cent of the teenage girls have parents reporting high expectations (Very Likely) about attending Higher Education (HE) and 8 per cent have parents reporting low expectations (Not very likely at all). In addition, 7 per cent of the teenage girls has parents preferring the teenager to start working or to learn an apprenticeship at age 16 instead of continue full time-education; the teenager's expectations about the same alternative is about 5 per cent.[18]

By comparing the whole sample with the teenage girls who conceived and decided to have a child, this table shows that those experiencing pregnancy or motherhood belong to more vulnerable backgrounds. From the total of pregnant girls, 6 per cent was born to a teenage mother and from the total of teenage mothers the percentage is 2 percentage points higher. In addition, their mothers and fathers are less educated and their academic performance is below the mean (negative z-score of Key Stage 2). Teenage mothers present poorer academic performance in English, Maths and Science than the pregnant sample. In addition, teenage girls experiencing pregnancy or motherhood are highly concentrated in the most deprived quintiles, 4th and 5th quintile. However, it is crucial to highlight the concentration in the 2nd and 3rd quintiles is very similar. By looking at the sample of pregnant girls who decided not to have the child in Wave 6 and Wave 7, column (7) and (8), the differences between the whole sample and this group are in most of the cases not significant.

Finally, comparing the variables of expectations across the three columns, Table 4 shows that pregnant girls and teenage 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 has been included in the empirical models.

6 Identification Strategy

This section describes the strategies I follow to identify the causal effects of parental expectations on the teenager's likelihood to become pregnant and to have a child. These are based on the

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

[18] See Section 6.2.1 for further details about the construction of the variables of preferences for working or for learning and apprenticeship.

model discussed in Section 4 to explain the mechanisms through which parental expectations influence the outcomes of interest and to identify the potential bias of parental expectations coefficients.

To understand to what extend parental expectations matter for teenage pregnancy and motherhood, I use the information of pregnancy and motherhood from Wave 4 to Wave 7 of the LSYPE, as well as parental expectations and background information collected in Wave 1. To estimate the effect of parental expectations, I use maximum likelihood techniques with instrumental variables.

Before describing the empirical specifications, it is worth mentioning that the the decision of becoming a teenage 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.

In spite of the sequential nature of fertility decisions, my 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).

6.1 Empirical Specifications

The empirical analysis of Section 7 starts by analysing clustered linear and non-linear probability models to understand the relationship between parental expectations and the likelihood of conceiving and having a child. Although logit models allow thicker tails to better represent extreme probabilities, the reference models are probit models given their flexibility on estimating coefficients and marginal effects using instrumental variables.[19] The clustering is identified at the individual level for considering the error correlation across waves within the same individual. The empirical model behind my specifications presents the following structure:

$$D_{it} = X_{it}\beta + E_i\gamma + \epsilon_{it} \tag{5}$$

Where D_{it} is the outcome of the teenager i at 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 the teenager's parents 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

[19]The models used correspond to panel data discrete choice models where the dependent variable is equal to one once pregnancy or motherhood is observed. It maintains this value till the last wave of the survey. If the dependent variable is defined as 1 if teenage pregnancy occurs till the age at birth or 1 once teenage birth is observed and zero otherwise, the analysis of this paper will be focused on at what age expectations matter most instead of to what extent expectations influence teenagersâĂŹ fertility decisions. Despite the first question is also relevant for public policy purposes, this is not the aim of the current paper.

ϵ_{it} is an unobserved (to the econometrician) random error component at the individual level which varies across waves.[20]

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 this context, when parents are asked about the likelihood of their teenager for attending Higher Education (the measure of expectations used in this study), parents might 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.[21][22]

6.2 Sources of Endogeneity

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:

$$D_i = 1[\mathbf{Z}_{i1}\varphi + E_i\gamma + \epsilon_i > 0] \tag{6}$$

$$E_i = 1[\mathbf{Z}_i\psi + \vartheta_i > 0] \tag{7}$$

Equations (5) and (6) are the same, whereas (7) represents the specification of parental expectations. This model depends 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 (6) and (7). Consequently, to identify the parameter of parental expectations γ, it is needed 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) a set of instruments that allows us to identify the effect of parental expectations and does not directly influence pregnancy and motherhood outcomes.

Based on the theoretical model discussed in section 4.2, tastes for childbearing, for schooling, and for occupational choices may influence the probability of conceiving and having a child, conditional on other factors. As a result, if these preferences are correlated with parental expectations, parental expectations coefficients will be biased if this endogeneity is not considered in the empirical models.

[20] 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.

[21] 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.

[22] It is worth noticing that the measure of parental expectations is about the teenager's future behaviour and not about specific future outcomes, such as subjective probabilities about income, contraceptive effectiveness, or age at first marriage as in Wolfe et al. (2007) and Delavande (2008), to mention some of them.

Finally, potential endogeneity issues may also arise as a consequence of reverse causality. The closer the collection of parental expectations is from the teenager's sexual initiation, the more likely is that parental expectations are endogenous. For instance, expectations may capture unobserved traits of the teenage girl such as how outgoing the girl is with boys, how sexually active she is, among other characteristics. To address this potential issue, I use the earliest information collected in Wave 1 (when the teenage girl was 13/14) on parental expectations about educational choices. The majority of teenagers in the sample initiated their sexual activity at the age of 15 or 16.

6.2.1 Strategies of Identification

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.[23] Because parental expectations may be also correlated with the teenager's schooling performance and other unobserved behaviour, I use in all specifications the early school performance of the teenager (Key Stage 2 scores) and a measure of parental expectations collected in Wave 1 to reduce the potential problem of reverse causality. 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.

Tastes and Expectations for Occupational Choices

The **strategy (a)** uses variables of parental preferences for having the teenager working or enrolling an apprenticeship at Year 11 (after finishing compulsory education), as well as the 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 the teenager's expectations about work and training, the survey asks the following questions respectively: *What would you like the young person (YP)*

[23]Despite the challenges to distinguish between parental preferences for start working and for attending higher education, the framing of the preference question asks the parent for reporting the most preferred option among the following five choices: (i) continue in full-time education, (ii) start learning a trade, (iii) start an apprenticeship, (iv) get a full-time paid job, or (v) something else. In addition, even though the distinction between preferences for start working and expectations for attending higher education may be hard to distinguish by the respondent, if respondents would not be able to distinguish between one and other, we would observe a strong correlation between both type of variables in the data. However the correlation between high expectations about attending higher education and preferring the teenager to start working after compulsory education is -0.20, whereas between low expectations and preferences for working is 0.30. Despite both correlations are significantly different at a 5 per cent significance level and with the expected sign, their magnitude do not support the idea that respondents could have reported, in the majority of cases, preferences as expectations and vice versa.

to do when reach school leaving age? and *What do you want to do at age 16 other than further education?*. The answer to these questions has the following options: (i) continue in full-time education, (ii) start learning a trade, (iii) start an apprenticeship, (iv) get a full-time paid job, or (v) 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, I 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.[24] As a result of the high concentration observed in the alternative "continue studying in full-time education", it is likely that those reporting a different option may belong to a group of individuals with really different tastes from the rest of the sample.

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 on reducing the potential omitted variable bias previously mentioned.[25] The empirical specification considering parental preferences and the teenager's expectations about occupational choices, represented by F_i, presents the same structure as equation (5):

$$D_{it} = X_{it}\beta + E_i\gamma + F_i\delta + \zeta_{it} \tag{8}$$

The findings derived from this specification are discussed in Section 7.

Tastes for early childbearing and other preferences

Following the theoretical model describe in Section 4.2, the decision of becoming a teenage mother will depend on the tastes for schooling, for working and for early childbearing, as well as on parental expectations and other factors. Although the empirical models include two variables that might be highly correlated with the teenager's tastes for childbearing, such as being born to a teenage mother and number of siblings, these variables do not fully capture tastes for childbearing. In addition, because the measure of preferences for occupational choices may present measurement error, parental expectations are likely to continue facing some bias derived from their correlation between preferences and expectations. For this reason, the **strategy (b)** accounts for the remaining endogeneity by using two sets of instrumental variables in univariate,

[24]The question asked to young people was derived from two questions. Firstly, the teenager is asked about her intentions after Year 11 (age 15 at the beginning of this academic level). If she reported *leave full-time education*, she was asked the following alternatives: a) start working full-time, b) start learning a trade or work-based training, c) be unemployed, and d) something else. The first two alternatives were jointly represented by a dummy in the empirical specification.

[25]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 her options. For this reason, it is crucial to know the choice set the individual perceives.

bivariate, and multivariate probits using Simulated Maximum Likelihood (SML) techniques.[26]

The first set of instrumental variables of high and low expectations is based on the *Excellence in Cities (EiC)* and *Educational Action Zones (EAZ)* programme implemented in 1999 and targeted deprived schools in the United Kingdom.[27] Despite the implementation of the *EiC-EAZ* programme had several components across British cohorts, the main source of heterogeneity within the LSYPE-cohort is derived from the intensity of exposure to the programme. The programme consisted in Phase 1 (1999), Phase 2 (2000) and Phase 3 (2001) where schools in deprived areas were randomly selected to participate in one of the three phases.

Consequently, in Wave 1 (2004) those pupils that attended schools that received the programme in Phase 1 (1999) were benefited by the programme a maximum of five years. Similarly, those pupils that attended schools that received the programme in Phase 3 (2001) were exposed to the programme for about three years. The LSYPE sample contains 35 per cent of pupils that belonged to schools that received the *EiC-EAZ* programme. Although the programme was allocated at the school level, within schools not all pupils were directly benefited. As part of the programme's design, only those students at the top and bottom of the academic performance distribution were benefited by the programme. The difference between *benefited* and *non-benefited* pupils from schools that received the programme is accounted for in the empirical specifications by including standardised marks of Key Stage 2 in English, Maths, and Science. These marks are an approximation of the school performance of pupils before the implementation of the programme.

The instrument for high parental expectations was constructed based on the school's participation into the programme in 1999 when the teenage girl was in Key Stage 2 (at age 8 in Year 4 of primary school) and attended a school in Key Stage 3 that received the programme in 1999. In addition, the instrument for low expectations is the non-participation in the *EiC-EAZ* programme by the primary school of the teenage girl in 1999, but participation of her secondary school in phase 1 (1999).[28] Table 5 of the *Appendix 1* shows the structure of the UK Educational System, the implementation of the *EiC-EAZ* programme, and the collection of the LSYPE.

The aim of the *EiC-EAZ* 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: (i) support for gifted and talented pupils; (ii) provision of Learning

[26]Error correlations are contrasted with maximum likelihood (ML) estimates for the univariate and bivariate case.

[27]This information was provided by the Department of Education for each school from 1999 to 2005, 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 (where cluster and EAZ are mainly located in rural areas).

[28]Despite of the possibility of having students changing school in the transition between primary to secondary as a consequence of the programme, according to Kendall et al. (2005) the main effects of the *EiC-EAZ* took place at the end of Key Stage 3 on the increase of academic achievement in mathematics. This implies that the effects of the *EiC-EAZ* may have been evident to non-beneficiaries of the programme till the end of Key Stage 3, when the decision of changing school was already made.

Mentors to support young people facing barriers to learning; (iii) Learning Support Units (LSUs) for pupils who would benefit from time away from the normal classroom; (iv) City Learning Centres (CLCs) providing state-of-the-art ICT resources for a small number of schools; (v) EiC Action Zones enabling small groups of primary and secondary schools to work together; and (vi) extensions of the existing Specialist and Beacon School programmes.

While the aim of the programme was to increase expectations of both teenager and parents, in the sample I observe that only parental educational expectations are significantly related to the programme, but not to the teenager's occupational expectations. This ensures that the programme is mainly an instrument for parental expectations about school choices and not for the teenager's occupational expectations. Additionally, because the programme aimed at improving English, Maths, and Science scores, the instrument could have been potentially problematic if this achievement had a direct impact on pregnancy or motherhood. This potential impact can be driven by two channels: a) information about contraceptives and fertility decisions and b) increase of opportunity costs by improving z-scores. Comparing the distributions of the growth rates of Key Stage 2 and Key Stage 3 z-scores between those benefited by the programme and the whole sample of teenage girls, Figures 3 to 5 show no differences in the shapes of the distributions. When we compare the differences between *EiC* and *non-EiC* beneficiaries in Key Stage 2 and Key Stage 3 scores, we observe that the difference of the difference is only significant for Maths scores. This difference is still in favour of *non-EiC* beneficiaries. Given this finding, it is unlikely the programme directly impacted the outcomes of interest through information about sexual education or through the increase of opportunity costs. Instead the programme impacted pregnancy and motherhood choices through the increase in expectations.

To validate the final findings, I use a second set of instrumental variables constructed at the Local Super Output Area (LSOA) level. The instrument for high expectations is the domain of *Education, skills, and training* of the *Index of Multiple Deprivation (IMD 2004)*.[29] This component captures schooling achievement in 2002 at the local level, post-16 educational choices, and proportion of working adults with low education.[30] All sub-domains were standardised by the Social Disadvantage Centre to construct the educational component of the *IMD (2004)* where higher values represent higher levels of educational deprivation. This indicator is a continuous variable that was transformed into quintiles.[31] The quintiles that were used as instruments for high expectations were the third, fourth, and fifth. For low parental expectations, I use the fifth quintile of this index, as well as the first quintile of the *Employment Deprivation Index*. The

[29]This index was commissioned by the Office of the Deputy Prime Minister (ODPM) to the Social Disadvantage Centre (SDRC) at the University of Oxford.

[30]This component considers the following sub domains: 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) proportion of working age adults (aged 25-54) in the area with no or low qualifications (2001), see Neighbourhood Renewal Unit (2004) for further details.

[31]The continuous versions of these variables were also used, as well as squared root and quadratic transformations, however, the partition into quintiles provide larger F-statistics in the first stage.

latter is also a domain of the *IMD (2004)* that captures the proportion of people in working age that is unemployed or cannot work as a result of health or family circumstances.[32]

These instruments are likely to affect parental expectations through the educational supply and the labour market conditions at the local level. After controlling for the *income deprivation index affecting children* at the LSOA level and other factors, the first instrument reflects the opportunities for studying in primary, secondary, and Higher Education, as well as attitudes towards school choices at the local level. It is likely that those children living in areas with lower *education, skills, and training* deprivation, will present higher expectations about attending Higher Education. In addition, the instrument based on the employment deprivation sub-domain of the *IMD (2004)* reflects the concentration of benefit claimants among adult population. The expectations about attending Higher Education are likely to depend on the relation between the perceived return to attending Higher Education and the observed unemployment benefits in the local area. A person who perceives the returns to be smaller than the observed benefits will have lower expectations than a person who perceives the opposite. In addition, employment deprivation also reflects the concentration of low-skilled and low-educated workers that may influence the attitudes, at the local level, towards enrolling in Higher Education. [33]

6.3 Econometric Methods

The econometric literature provides different methods for dealing with discrete endogenous variables under a discrete choice modelling framework. In spite of the similarities of the assumptions behind these approaches, it is worth highlighting four methods that allow instrumental variable techniques: Linear Probability Models (LPM), control functions, maximum likelihood, and simple regressor methods (also called special regressor in earlier literature).[34]

Discrete choice models with an endogenous categorical covariate lead us to consider econo-

[32]The sub domains of this index are: a) unemployment claimant count of women aged 18-59 and men aged 18-64 averaged over 4 quarters (2001), b) incapacity benefit claimants women aged 18-59 and men aged 18-64 (2001), c) severe disablement allowance claimants women aged 18-59 and men aged 18-64, d) participants in New Deal for the 18-24s who are not included in the claimant count (2001), e) Participants in New Deal for 25 or over who are not included in the claimant count (2001), and f) Participants in New Deal for Lone Parents aged 18 and over (2001).

[33]The instrument based on unemployment benefits has a different association with low parental expectations depending on the level of employment deprivation. For instance, when the first stage includes all quintiles, having as reference category the fifth one (highest), the highest employment quintile presents a significant and negative association with low parental expectations. This association may capture areas of extreme absence of employment opportunities that may affect parental expectations about school choices as a result of the lack of alternatives the teenager has outside of school.

[34]The advantage 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]. 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. In addition, although the simple regressor allows to obtain meaningful interpretations of marginal effects, it is difficult to implement in practice because the researcher requires instruments for the endogenous variables, as well as a *special regressor* that is exogenous, continuous, significantly related with the dependent variable (pregnancy or motherhood), and with large support.

metric techniques that allow us to jointly model the probability of being a teenage mother and the probability of having a parent with high or low expectations. While the bivariate probit is more efficient than the separate estimation of the teenager's outcome and expectations, the categorical nature of parental expectations suggests a multivariate approach.[35]

As a result, I propose the use of seemingly unrelated multivariate probits to simultaneously model the likelihood of being pregnant or becoming a teen mother, as well as the likelihood of having a parent with high or low expectations. In spite of the ordinal nature of parental expectations, the representation of missing values of this variable in my models does not make possible to estimate expectations as an order probit in the system of equations. For this reason, I model each teenager's outcome (pregnancy and motherhood) simultaneously with high and low parental expectations probits.[36]

It is worth highlighting the majority of empirical studies facing the problem of endogeneity in discrete choice models use linear models. However, recent econometric studies have highlighted several disadvantages with this approach, see Lewbel et al. (2012) for further details. Evans and Schwab (1995) is one of the few studies dealing with endogeneity through bivariate probit models.[37]The method I suggest in this section is an extension of this approach by allowing more than two equations to be considered in the system of equations.

By jointly modelling pregnancy/motherhood and expectations, I obtain a more efficient estimate than the one derived through single or bivariate probit models. However, the evaluation of three integrals by numerical methods may be cumbersome (one for motherhood and two for parental expectations). Consequently, I use Simulated Maximum Likelihood (SML) techniques to solve the integrals and obtain estimates of parental expectations coefficients in teenage pregnancy and motherhood models. [38]

The main idea of SML is to perform Monte Carlo simulations of the integrals rather than evaluating them numerically (see Keane, 1994). This technique is also useful even for bivariate probit cases where is not possible to obtain numerical solutions or convergence of the maximum

[35]It is worth mentioning that maximum likelihood techniques with instrumental variables require that the first stage and the joint distribution of error terms to be fully parametrized and correctly specified. Because of the potential sensitivity of results based on different specifications of parental expectation models, I test my results with a second set of instruments, previously discussed. By comparing single with bivariate probit, I observe that the marginal effects of parental expectations present similar magnitudes.

[36]Because there was no available instrumental variable for the equation of missing expectations, I did not include this category as an additional equation in the system of equations.

[37]Wooldridge (2010, p. 598) also suggests this alternative for dealing with endogenous discrete variables under discrete choice modelling.

[38]The use of nonsimulation procedures such as *quadrature methods* and the *Clark algorithm* were not considered given that, as suggested by Train (2003), the first one can be used for probit in panel data if the number of alternatives times the number of time periods is no more than four or five. The second method provides approximations that can be highly inaccurate in some cases and the degree of accuracy is difficult to assess. Because the number of alternatives times the number of periods is 12 (3 alternatives times 4 waves of the LSYPE), the SML framework is more appropriate. In addition, using a seemingly unrelated multivariate probits allow a flexible structure of error terms where their correlations are accounted for in the estimation. An additional advantage of this procedures is the inclusion of a selection model as an additional equation where its error component can be correlated with the errors of the pregnancy/motherhood decisions and the reduced forms of expectations.

likelihood. To obtain SML estimates, 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).[39]

To show the differences in results between single, bivariate and trivariate probits, I use SML for the three cases to allow comparability across them. In addition, section 7 also provides single and bivariate probit estimates calculating the normal probability density functions (pdfs) through numerical approximations.[40]

To better understand the SML method, the bivariate and trivariate probit cases are described based on equations (6) and (7). These assume 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 the parameter of parental expectations γ, I use the instrumental variables discussed in the previous section which are not directly related to D_i and just influence teen pregnancy/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.

Based on Wooldridge (2010), to obtain the likelihood function of model (6) and (7) 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, the probability of being pregnant or becoming a teenage mother conditional on $\mathbf{Z}$ and having a parent with high or low expectations can be expressed as:

$$P(D_i = 1|E_i = 1, \mathbf{Z}) = \frac{1}{1 - \Phi(\mathbf{Z}\psi)} \int_{-\infty}^{-\mathbf{Z}\psi} \Phi[(\mathbf{Z}_{i1}\varphi + E_i\gamma + \rho_1 \upsilon_i)/(1 - \rho_1^2)^{1/2}]\phi(\upsilon_i)d\upsilon_i \qquad (9)$$

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 low or high parental expectations and taking the logarithms of these expressions, the log-likelihood function for the joint bivariate maximum likelihood is:

$$logL = \sum_{i=1}^{n} ln\Phi_2(\mu_{i1}, \mu_{i2}, \rho_1) \qquad (10)$$

Using a similar notation to Greene (2003), Φ_2 denotes the bivariate normal cumulative distribution function (cdf), μ_{i1} and μ_{i2} represent the set of covariates and parameters of the teenage pregnancy or motherhood equation and the reduced form of parental expectations respectively. To consider the four different outcomes under this bivariate framework, $\mu_{ij} = q_{ij}z_{ij}$ embeds the four combinations of possible outcomes mentioned before. Let $q_{i1} = 2D_i - 1$,

[39]The Stata ado-file *cmp* provided by Roodman (2009) has been used for obtaining coefficients of simulated single probit with instrumental variables.

[40]By single probits I mean that the reduced form of parental expectations is modelled by LPM and the pregnancy/motherhood outcomes as probit models using maximum likelihood.

$q_{i2} = 2E_i - 1$ and $z_{ij} = \mathbf{x}_{ij}\beta_{ij}$ where $j = 1, 2$. 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. Additionally, ρ_1 represents the correlation of error terms ϵ and ϑ of equations (6) and (7).

Similarly, the log-likelihood for a three dimensional maximum likelihood can be expressed as follows:

$$logL = \sum_{i=1}^{n} ln\Phi_3(\mu_{i1}, \mu_{i2}, \mu_{i3}; \Omega) \tag{11}$$

Where Φ_3 is a three-dimension integral and Ω is the variance-covariance matrix of the error terms having as off-diagonal elements the correlation of error terms between pregnancy or motherhood and high-low parental expectations. The main conclusions of this study are based on this trivariate simulated maximum likelihood of pregnancy and motherhood models.[41]

Selection Bias by Attrition

The LSYPE interviewed 15,770 teenagers with a 74 per cent response rate at the first wave. The subsequent waves present around 85 to 95 per cent of response rate. While the Primary Sample Units (PSU) of the survey are schools, the LSYPE re-contacted the original selected pupils through their addresses. Thus, the attrition observed in the survey is driven by people moving house and leaving no forwarding addresses or people no longer wanting to be involved.

Because the analysis considers those teenagers observed from Wave 4 to Wave 7, as a result of the collection of sexual behaviour outcomes from Wave 4, the coefficients of parental expectations may be upward biased. The main reason is that teenagers appearing in later waves may reflect a *positive* selected group of individuals who may come from more stable families (experiencing less migration or fewer housing reallocations) or other beneficial family backgrounds.

To acknowledge the selection bias caused by attrition in the empirical estimates, I constructed *inverse probability weights (IPW)* by modelling the selection of individuals from Wave 1 to Wave 6. The main idea of *IPW* is to use full information of both types of individuals (attrited and non-attrited) before the attrited individuals are no longer observed in the survey. For this reason, *IPW* are constructed by modelling the probability of observing the individual in the seven waves. The dependent variable of this model is equal to one if the individual is observed 7 times and equal to zero if otherwise. The inverse value of the predicted probability is used as a weight for pregnancy and motherhood specifications of Section 7. The attrition model is constructed by using fully observed covariates of Wave 1 (2004). [42]

[41] Marginal effects are calculated by finite-difference methods and standard errors are corrected by delta method.

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

6.4 Further checks and Tests of exogeneity

I discuss three additional checks in Section 7. In the first one, I use *propensity score matching* techniques for creating a comparable group of teenage girls facing similar neighbourhood and school environments, and assess whether expectations matter for deprived population. To construct the *propensity score*, I use the criteria followed by the *EiC-EAZ* Programme for identifying deprived schools prior to 1999.

In the second, I explore an alternative strategy for dealing with the attrition of the survey by including a selection equation in the SML trivariate probit, instead of using the *IPW*.

Finally, because the information about pregnancy in Wave 4 and Wave 5 was constructed by using motherhood information, in the last robustness check I assess the importance of these waves on parental expectation coefficients by using interactions between waves and parental expectations. These results are discussed in Section 7.

To asses the exogeneity of expectations I use Wald Tests for testing the significance of the Fisher's transformation of error correlations for each specification. Additionally, a control function approach is used as a complementary test of exogeneity. This approach cannot be used to estimate ATE when endogenous variables are discrete, but provide a reliable test of exogeneity in a discrete choice modelling framework. This test is also known as the Rivers-Vuong approach discussed in Wooldridge (2010, pg.597).

7 Results

This section presents results of discrete choice models following the identification strategy discussed in Section 6. These models are used to analyse to what extent parental expectations influence the probability of being pregnant and becoming a teenage mother. The analysis is structured as follows: I start discussing linear probability and probit models to explore the association between parental expectations and teenagers' fertility outcomes. Subsequently, I present probit models correcting by attrition bias through inverse probability weights. These results are contrasted with non-weighted and survey weighted probits. Before exploring instrumental variable techniques, I briefly analyse heterogeneous effects across deprivation groups. Finally, this section discusses average treatment effects and local effects of parental expectations on teenage pregnancy and motherhood, by estimating simulated maximum likelihood models using two sets of instrumental variables previously described.

Discrete choice models are usually derived under an assumption of utility-maximising behaviour by the decision-maker; however, they can also be used to describe the relationship between explanatory variables and an outcome without explaining how the choice has been made.[43]

[43]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 presented

As I have discussed earlier, teenage girls with high parental expectations will perceive higher opportunity costs of teenage motherhood than those with low expectations. Thus, teenager girls having parents with high expectations will try to avoid pregnancy. However, if pregnancy occurs, the teenager will decide to have the child only if she or her parents have low expectations about her post-16 choices, conditional on other factors.

7.1 Discrete Choice Models and Correction for Attrition

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 of the LSYPE. The main analysis of this section is based on models that have accounted for the selection bias caused by survey attrition.

Table 6 of the *Appendix 1* presents pooled LPM and probit marginal effects based on equation (5). 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 6 presents the marginal effects of parental expectations, Key Stage 2 z-scores, and being born to a teenage 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 teenage years; conversely, teenage girls having parents with low expectations are more likely to become pregnant. The magnitudes of these marginal effects are similar between OLS and probit models.

As Section 6 has discussed, the attrition of the survey may cause a *positive* selection bias. Table 7 shows the differences in covariates collected in Wave 1 by intensity of attrition. As we move along the waves, the sample of teenage 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, I construct IPW to take into account this selection bias. Table 8 of the *Appendix 1* shows the Wave 1 variables used to construct these IPW weights. The sample of this model is all teenage girls that reported non-missing values of the variables shown in this table. The percentage of correctly classified individuals is 70.4.

Table 9 reports probit estimates of Table 6 compared with two weighted models. The first set of weighted models is presented by column (2) and (5) considering the survey weight of Wave 1 for taking into account the original population distribution. The second set is shown by Columns (3) and (6) by using IPW. Estimates reported by columns (1) and (4) present larger marginal effects than the ones reported by the models that control for attrition (3) and (6). The

its derivation through an utility maximization framework. Those models embedding psychological stimuli have also been called random utility models (RUMs). A comprehensive discussion of the evolution and extension of discrete choice models can be found in Train (2009).

upward bias is about 35 and 40 per cent of the marginal effect of high parental expectations reported by pregnancy and motherhood specifications using IPW, respectively. The bias of the marginal effects of low parental expectations is about 30 per cent in pregnancy models (column (1) vs (3)) and in spite of the large difference in motherhood models, none of the low parental expectations effects is significant (column (4) vs (6)). The magnitude of marginal effects using survey weights is between both non-weighted and IPW models.[44]

Probit estimates of Table 9 shows teenage girls having parents with high expectations, are about 2 percent less likely to become pregnant than those having parents with middle expectations (reference category).[45]Conversely, teenage girls having parents with low expectations are 2 percentage points more likely to become pregnant than the reference group. In addition, teenagers who were born to a teenage mother are on average 10 percent more likely to become pregnant than those who were born to an adult mother. The relevance of the marginal effect of parental expectations is clearly seen when this is evaluated in the overall probability of teenage pregnancy (8.2 per cent of the sample). The overall probability decreases from 8.2 percent at the baseline to 6 per cent (8.2-2.3=5.9), representing a decrease of 28 per cent of the overall teenage pregnancy.[46]

In addition, this table also presents results for motherhood models. The marginal effects show similar significance to the pregnancy specifications. Teenage motherhood models are also conditional on having sex under 20 years old, independently of pregnancy experiences. This allows to compare probit estimates between both types of models. This table reveals that high parental expectations decreases by 1.2 percent the likelihood of becoming a mother in comparison to the reference category (middle expectations). For teenage motherhood models, low parental expectations is not significant. When I compare the coefficients of pregnancy and motherhood models, none of the variables shown in this table present significant difference between both models, see column (7) reporting non-linear Wald Tests. Additionally, when I jointly test whether these coefficients are significantly different from zero, only being born to a teenage mother, Key Stage 2 of English z-scores, and high expectations are significant, see column (8) of Table 9.

But, **how relevant is the magnitude of parental expectations marginal effects?** By looking at the magnitude of the marginal effect of being born to a teenage mother, high parental expectations' are 25 per cent as important as being born to a teenage mother in both specifications.

[44]Log-likelihood values are not comparable across columns with exception of those belonging to the same type of weighting. In this regard, the *IPW* weighted motherhood model presents a value of -3244 and the pregnancy one -6764. This reveals that the specification selected is better for motherhood models than for pregnancy.

[45]Middle expectations refer to those parents reporting a likelihood of the teenage girl going into High Education as *fairly likely* and *not very likely*

[46]As it is specified in the footnotes of all tables, these models control also for: number of siblings, religion, parental schooling, the teenager's alcohol intake in Wave 1, deprivation index in Wave 2, lone parent, parental employment status when the child was 5 years old, and wave dummies. Additional covariates were included in earlier specifications such as geographical regions and other family background characteristics, however, the main results do not change.

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 2), but also may have a direct impact through preferences for schooling.

Heterogeneous effects across deprivation groups

The above sections have shown the relevance of parental expectations for the sample of teenage girls interviewed by the LSYPE from Wave 4 to Wave 7. To better understand the concentration of these outcomes across the deprivation distribution, Table 10 presents the incidence of teenage pregnancy and motherhood across deprivation percentiles.

In spite of the clear concentration of pregnancy and motherhood in the most deprived percentile (column 3), there is 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.

Table 11 presents the coefficients of interacted parental expectation variables with deprivation percentiles. Instead of using the five deprivation partitions used in the previous models, I use three-percentile grouping for reducing the number of parameters to estimate. In addition, this table presents tests of equality within the same percentile (Test A and B) and between the 2nd and 3rd percentile (Test C). Tests A and B reveal that the interacted coefficients of low and high parental expectations are not significantly different within percentiles (and the majority of the interacted effects are not significantly different from zero). This result might also be driven by the number of observations the interactions with low parental expectations have (3.5 and 3 per cent of the 2nd and 3rd percentile, respectively). In addition, when I compare across percentiles there is no evidence about heterogeneous effects. This result hold for both pregnancy and motherhood models.

This finding may be explained by: a) the definition of deprivation or b) the influence of deprivation on parental expectations, but not on their coefficients in pregnancy and motherhood models. The first point is addressed by using a complementary definition of deprivation by using the eligibility criteria of the *EiC-EAZ* programme. These results are discussed in subsection 7.3. The second reason is analysed by using the multinomial logit of parental expectations shown in Table 2. In general, this table shows that parental expectations are not responsive to deprivation with exception to the most deprived percentile (5th). The association between high deprivation and high expectations is positive; contrary to what we would expect.

7.2 Endogeneity of Expectations

The LSYPE has the advantage of collecting parental expectations for Wave 1 and 4 as shown in Table 3.1, respectively. However, the closer the measure of expectations is from the age

where the teenager has initiated her sexual activity, the more likely is parental expectations are endogenous. For this reason, the empirical specifications use the measure of expectations collected in Wave 1. Consequently, by not considering later expectations I eliminate the potential endogeneity derived by the simultaneity between sexual outcomes (or fertility decisions) and expectations. However, this timing does not solve the potential endogeneity of parental expectations that may be driven by the correlation of expectations with tastes for schooling, for childbearing, and for occupational choices. The following subsections describes the results obtained based on the two strategies described in Section 6.

7.2.1 Control for Preferences and Expectations about occupational choices

This subsection presents the empirical specifications discussed in Section 6 by controlling for parental preferences and the teenager's expectations about occupational choices.

Based on equation (8), if parental expectations are mainly reflecting preferences for occupational choices, the coefficient of parental expectations γ may turn insignificant or change its magnitude. Although the magnitude of effects is not strictly comparable between columns (3) and (6) of Table 9 and columns (1) and (2) of Table 12, the marginal effects of parental expectations are still significant with similar magnitudes. In addition, low parental expectations are no longer significant in both models; and teenagers' expectations about occupational choices is significant and positively related to pregnancy.

The introduction of these variables improve my models in 12 and 8 units of the log-likelihood of pregnancy and motherhood models, respectively. Using likelihood ratio (LR) tests, I compare the restricted model with the unrestricted one. The first one corresponds to the model without preferences and expectations about occupational choices and the second, includes these variables. The χ^2 of the LR test for pregnancy models is 23.83 (p-value = 0.000) and for motherhood models is 16.99 (0.000).[47] Both tests support the introduction of these variables into pregnancy and motherhood models. These tests show that restricting preference parameters to zero affects the fit of the model. Thus, these variables have to be included in both models. It is worth mentioning that the inclusion of these variables does not make more exogenous parental expectations. However, it reduces the potential omitted variable bias in our models.

7.2.2 Instrumental Variable Approach

Table 13 presents the first stages of both set of instruments. From column (1) to (4), the first stages correspond to the *EiC-EAZ* programme and the last two to the educational and employment deprivation indexes at the LSOA level. By using the standard F-statistic of single probit models, the F-statistic of the *EiC-EAZ* instruments for high and low expectations are around 40. However, when the error correlation is considered by using simulated seemingly unrelated probits, the F-statistic of this set of instruments substantially declines.

[47] LR tests have been calculated by using the *lrtest* command in stata, specifying *force* to allow clustering at the individual level.

Comparing columns (3) to (6), it is clear that the advantage of the second set of instruments is the power of prediction in first stage models in contrast to the set based on the *EiC-EAZ* programme. The F-statistic of the instrument for high parental expectations using *EiC-EAZ* programme is 2.72 (p-value= 0.100) and using the *educational-skill-training index* at the LSOA level is 21.44 (p-value=0.000). With regard to the instrument for low expectations, using the *EiC-EAZ* programme the F-statistic is 6.05 (p-value=0.014) and using the instrument based on the educational and employment index at the LSOA level is 11.33 (p-value=0.004). Despite the first set of instruments, based on the *EiC-EAZ* programme, presents p-values below or equal 0.10, SML models are also estimated by using the second set of instruments that present larger F-statistics in the first stages. It is worth highlighting that both set of instruments are not directly correlated with pregnancy and motherhood, and are significant in the first stages of estimation (reduced form of expectations).

The relationship of these instruments and parental expectations is as expected. The *EiC-EAZ* programme is positively associated with high parental expectations and negatively related to low parental expectations. With regard to the second set of instruments, the higher the educational deprivation, the lower the probability of parents reporting high expectations. Conversely, the higher the employment deprivation measured by the proportion of people in working age that is unemployed, the higher the probability of parents reporting low expectations about the teenager attending higher education.[48]

Tables 14 and 15 show simulated single probit, bivariate and trivariate maximum likelihood results for pregnancy and motherhood, using as instrumental variable the *EiC-EAZ* programme. Single and bivariate probit models use SML to be comparable across models. The first type of model uses LPM for the dummy of expectations (high or low) and for pregnancy and motherhood a probit model. In contrast, the bivariate probit uses probits for both cases.[49] As discussed in Section 6.3, the trivariate probit is modelled as seemingly unrelated probits of the probability of being pregnant, of having a parent with high and low expectations; the same strategy is followed for the motherhood specifications.[50]

Table 14 from column (3) to (5) shows that high parental expectations are significant and as expected, after considering the correlation between pregnancy, high, and low expectations, the standard errors are slightly larger than the reported by previous models. Comparing column

[48]Unfortunately, the number of observations of teenagers who had teenage mothers is quite small (214 observations) for carrying out a regression analysis with the same controls used in the rest of models. However, it is worth highlighting that within this group, from those teenagers that were benefited by the programme, 42 percent has parents that reported high expectations about the teenager's school choices. In contrast, the rest of teenagers who had a teenage mother but did not receive the programme, only for 27 percent their parents reported high expectations. This difference is significantly greater than zero at a 10 percent significance level. These results must be taken with caution given that only 19 teenagers who had a teenage mother received the programme in both primary and secondary schools.

[49]The single probit is known as IV probit by statistical softwares, however, I use SML techniques for obtaining the single probit.

[50]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 the panel is around 2,500 individuals per wave, SML models compute 50 random draws for each SML model.

(1) of Table 12 with column (5) of Table 14, we observe the marginal effect of high expectations of column (1) is downward biased.[51] If I treat parental expectations as separate dummies, as in column (1) to (4), in all cases the marginal effects are larger than the reported by the non-instrumented specification in Table 12. It is worth highlighting that the marginal effects of single probits are extremely large and different from the reported by the non-instrumented specifications. The value of low parental expectations in column (2) goes out of the [0, 1] interval. This value has been contrasted to the one provided by maximum likelihood (ML) instrumental probit and we observe that the marginal effect for this variable is close to 0.98.[52] While the coefficient of born to a teenage mother may be endogenous, I use it as a reference point for understanding the magnitude of the marginal effects of parental expectations. In the trivariate SML, the effect of high parental expectations on the likelihood of being pregnant is sixty percent as important as born to a teenage mother.

With regard to teenage motherhood models, high parental expectations are highly significant too and their relationship with born to a teenage mother is also about sixty percent of the marginal effect of the latter. In both models, English z-scores are significant which may reveal preferences for schooling. When teenage girls are asked about how much they like English, Maths, and Science in Key Stage 2, the highest concentration of "like it a lot" is in English with 35 per cent, followed by Science with 26 per cent, and with 21 percent by Maths.

Because these models are conditional on having sex, the models do not consider the potential effect that expectations may have on having sex by age 20. As a consequence, the models may primarily reflect the efficacy of contraception and fecundity.[53] To understand the contribution of parental expectations on the unconditional sample, we model pregnancy and motherhood models based on the *EiZ-EAZ* instruments. Table 28 of Appendix 2 shows simulated bivariate probits of pregnancy and motherhood for a sample of teenage girls unconditional on having sex before age 20. This table shows that after considering both types of population (sexually active and inactive girls), high parental expectations' coefficients are still significant but slightly smaller than the ones shown by the conditional models.[54] Finally, it is worth noticing that the fact that my instrument mainly affects deprived population, makes parental expectations estimates more likely to be capturing the effect on this specific population.

As Section 6.2.1 discusses, to validate my results I use a second set of instrumental variables available at the LSOA level. The results are also shown in Tables 14 and 15. Using the second set of instruments, in pregnancy models, parental expectations is no longer significant. The standard error remains the same, as well as the magnitude of effects and standard errors of the rest of variables; however, the magnitude of the marginal effects of high parental expectations

[51] It is worth mentioning the marginal effects reported in Tables 14 and 15 are evaluated at discrete values for categorical and dummy variables and at the mean for continuous variables.

[52] The complete estimates of instrumented ML are not shown in the tables of *Appendix 1 and 2*, but their error correlations are discussed when the exogeneity of parental expectations is tested.

[53] This point was suggested by a reviewer.

[54] Simulated trivariate probits are not shown for this exercise given that they did not converge after considering the population sexually inactive.

decrease. This result does not allow us to conclude that in the case of pregnancy models what I have estimated is an ATE, it is more likely that the first set of instruments captures a local average treatment effect. Conversely, in motherhood models, the new set of instrumental variables shows a significant effect of high parental expectations with a similar magnitude to the one shown by the first set of instruments.[55]

Even though both trivariate SML probits are not strictly comparable, given that they consider different instruments for high and low expectation models, the relationship between being born to a teenage mother and high parental expectations is exactly the same under both sets of instruments. The effect of expectations is about sixty per cent of being born to a teenage mother. This finding provides evidence for ensuring that the marginal effect of high parental expectations in teenage motherhood models is likely to be capturing an ATE.

Figures 1 and 2 provides a graphical representation of high expectations' marginal effects evaluated at different values across the English z-score distribution. These figures reveal that the effects are larger for those teenage girls under-performing at Key Stage 2. The results are also contrasted with *born to a teenage mother* which also shows larger values for the bottom of the distribution of academic achievement.[56] This is a crucial finding about the importance of high expectations on the likelihood of having a child during teenage years. The magnitude of these effects may be reflecting the negative factors that surrounds a teenager with low academic performance. As a result, the marginal contribution of high expectations is higher for poor-academic performers than for their more successful counterparts driven by the "absence of high expectations" at home. For instance, teenage girls doing better at school may experience further sources of positive influences, such as teachers, peers, and other adults that may reinforce or promote high expectations about school choices.

Finally, a valid concern is the potential correlation between attrition probability and the instrumental variables. Table 25 of Appendix 2 shows two clustered OLS regressions were the dependent variable is the IPW and the regressors are the same as the above equations and the two sets of instrumental variables. We observe that the first set of instruments is not related to attrition. However, two of the four instrumental variables of the second set are significantly related with the IPW. Table 27 presents the results of pregnancy and motherhood models using the second set of instruments without those instruments related to the attrition probability. Our main findings and conclusions do not change after reducing the number of instrumental variables to those unrelated to the attrition probability.

To summarise, this subsection shows that high parental expectations are important for decreasing both teenage pregnancy and motherhood. The effect is sixty per cent as large as being born to a teenage mother, where larger effects are found for those teenage girls under-performing at Key Stage 2. For motherhood specifications, the results derived from both sets

[55]Using the *EiC-EAZ* programme and the LSOA instruments in the same model, the marginal effects of parental expectations are similar to the ones observed in the models with LSOA instruments, see Table 29.

[56]The marginal effects evaluated at the different values of the academic distribution are all significant for high expectations and born to a teenage mother.

of instruments suggest an ATE, whereas for pregnancy models it is likely that the main effects capture a local effect. The next subsections explores the effect of parental expectations on a sample of deprived population and discusses some tests of exogeneity.

7.3 Propensity Score Matching: Deprived Population defined by the *EiC* Programme

This subsection explores heterogeneous effects of parental expectations on teenage girls by using an alternative definition of deprivation. In Section 7.1 the empirical models use deprivation percentiles derived from the Income Deprivation affecting Children Index (IDACI) based on information of 2001. This section uses the eligibility criteria followed by the social programme *EiC-EAZ* to find the deprived population. To do so, I construct a comparable group who did not receive the programme at all, but had similar characteristics to the targeted population prior to the implementation of the programme. The treatment group is composed by only those teenagers that attended schools that received in 1999 (primary school) the *EiC-EAZ* programme.

As Section 6 discusses, the programme was implemented in 1999, 2000, and 2001 across some deprived schools. The fact that this programme did not tackle every deprived school gives the opportunity for constructing a control or comparable group. By considering pre-treatment variables for constructing homogeneous groups, I am able to assess the effect of parental expectations among comparable groups facing similar peer and neighbourhood effects. It is worth noticing that this subsection does not use the information of the programme as an instrument, as the previous section does.

Propensity Score Matching *(PSM)* techniques were used for creating a comparable 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); as well as parental schooling. Several *PSM* techniques were used to identify a comparable group to the population benefited by the programme, however, Table 16 only presents the results derived from the weights constructed by the method of "nearest neighbour without replacement and caliper".[57] Cochran and Rubin (1973) suggest this method for avoiding "bad" matches by imposing a tolerance in the maximum distance between the propensity score of treated and untreated individuals.

[57]The techniques used for identifying the common support were: nearest neighbour without replacement and caliper, nearest neighbour with replacement and caliper, one to one matching, kernel-based matching, and the Mahalanobis distance. Kernel and nearest neighbour matching identified a common support with an absolute bias between 2 to 4.5 per cent. The Mahalanobis distance matching, using the same covariates as the rest of the techniques, was the method that identified a control group with the largest absolute bias, an average of 13 per cent of bias and a maximum of 24 per cent. The identification of the common support in all cases used the same seed, as well as a random ordering of the sample. This section of the paper uses the *Stata matching package* version 2010 (June) programmed by Barbara Sianesi, Institute for Fiscal Studies (IFS).

This table shows a significant and negative effect of parental expectations on the likelihood of becoming pregnant and having the child for deprived girls. The marginal effects reported by pregnancy models are similar to the ones reported by the first set of instruments, and greater in motherhood models. If high parental expectations are scant in deprived areas, we expect that their marginal contribution will be higher for deprived teenage girls than for non-deprived. Even though this happens for motherhood decisions, the comparison of these models with those using the complete sample must be taken with caution given that maximum likelihood models are extremely sensitive to different samples and the inclusion of different variables in both specifications.

7.4 Tests of Exogeneity

This subsection provides two types of tests of exogeneity when using maximum likelihood techniques. The first type uses Wald tests for analysing if the error correlations of the seemingly unrelated probits are significant. The second uses a control function approach also to test the exogeneity of parental expectations.

Tables 17 and 18 show the values of the Fisher's transformation of the error correlation and their significance. If the error correlation is significant would reveal that even after considering instrumental variables and preferences for occupation, parental expectations are still endogenous. These tables show that the values of the correlations between ML and SML are very similar in magnitude and in significance for single instrumental probits and in significance for bivariate instrumental probits.

For teenage pregnancy models, there are significant correlations between the unobservable component of pregnancy and the reduced form of low expectations in the IV probits, even after using instruments (see column (2) of Table 17). A similar finding is reveal by both bivariate probits after accounting for the endogeneity of high parental expectations. However, when the three probits are considered simultaneously, column (5) shows no correlation between pregnancy and high or low parental expectations. The same conclusion is derived for motherhood models. As we expect, the only significant correlation is between the reduced form of low and high expectations given that they belong to the same categorical distribution.

The Wald Tests reported in Tables 19 and 20 present single tests that confirm the significance of the error correlations of the previous tables. In addition, they present joint tests for the trivariate simulated probits. Looking at column (5) of both tables, I conclude that the joint test of the error correlation equal to zero between pregnancy-high expectations and pregnancy-low expectations is not rejected. The same is observed for the motherhood specifications. These tests confirm that the estimates of parental expectations are not endogenous.[58]

To complement the tests of exogeneity, I provide the results of a method suggested by Burnett (1997) and discussed in Wooldridge (2010). This method consists on explicitly introducing

[58] Wald Tests from the models using the second set of instruments are not shown in Appendix, however, single and joint tests reveal the same conclusions discussed in this subsection.

the residuals of the reduce form of parental expectations, shown in equation (7), as an additional control of equation (6). As Wooldridge (2010) discusses, this method provides a valid test of the exogeneity of parental expectations by using probit specifications. Hence, high and low parental expectations are modelled as a probit and their generalized residuals are predicted; then, these are plugged into the pregnancy and motherhood specifications. Table 21 shows the results of this exercise, plugging both low and high expectation residuals into both models. The residuals are not significant and high parental expectations are still significant. This result does not reject the null hypothesis of exogeneity in parental expectations as concluded by testing the error correlations. It is worth highlighting that this method only provides a valid test of exogeneity, but does not consistently estimate the average treatment effects.

8 Robustness Checks

This final section discusses two exercises for assessing the robustness of my findings in pregnancy and motherhood models. The first exercise explores a different method to account for the selection bias caused by the attrition of the survey. The second focuses on pregnancy models to evaluate if the absence of questions about pregnancy experiences in Wave 4 and Wave 5 bias the estimates of parental expectations.

The first exercise uses the specification for predicting attrition from Wave 1 to Wave 6 used for constructing the inverse probability weights. To assess the effect of parental expectations in teenage pregnancy and motherhood, I include the selection probit model as an additional equation in the simulated trivariate probit. Thus, four equations are estimated by SML where the fourth is a selection probit.

Table 22 shows the marginal effects of born to a teenage mother, Key Stage 2 z-scores, and parental expectations using the *EiC-EAZ* programme as an instrumental variable. These specifications do not use *inverse probability weights*, instead, the selection probit accounts for the potential attrition bias through the error correlations in the SML. The findings of this exercise confirms the significance of parental expectations for both outcomes, and the magnitudes of these effects are similar to those discussed in the previous section. The standard errors are slightly bigger when I follow this approach.

Finally, as I have discussed in Section 5, pregnancy questions were collected only for Wave 6 and Wave 7 of the LSYPE. For recovering information about pregnancy in Wave 4 and Wave 5, I use information about motherhood. As a consequence, one concern is that parental expectations might be reflecting their effect on motherhood and not on pregnancy. Because the maximum likelihood results are not comparable when models from different samples are compared, I cannot assess this concern by reducing the sample for Wave 6 and Wave 7. However, I simple analysis about the influence of early waves on parental expectations estimates can be considered by interacting wave dummies with expectation variables.

Table 23 shows parental expectations and their interaction with wave dummies. In contrast

to the previous models, this specification has as reference category Wave 7 instead of Wave 4. If parental expectation estimates in pregnancy models are mainly driven by the measure of motherhood from Wave 4 and Wave 5, interactions with early waves would be significant.[59] This table shows that most of the interactions are not significant with exception of the interaction of Wave 6 with high parental expectations. By exploring these interactions, I can conclude that the marginal effects of pregnancy models, previously discussed, are not entirely explained by the measure of pregnancy in Wave 4 and Wave 5. Also, the number of observations about motherhood are relatively small in Wave 4 and Wave 5 in comparison to the rest of waves.

To sum up, after analysing SML with instrumental variables and evaluating the robustness of the main findings, I can conclude that parental expectations have a significant influence on teenage motherhood for the cohort analysed in this study. In addition, parental expectations significantly affect the teenager's likelihood of becoming pregnant in deprived areas. Tests of exogeneity do not reject that parental expectations are exogenous after considering instrumental variables in the empirical specifications.

9 Conclusions

In this paper I analyse the effect of parental educational expectations about school choices on the likelihood of being pregnant and becoming a teenage mother. Based on simulated maximum likelihood methods using two sets of instrumental variables, my findings shed light on the extent and significance of parental expectations on teenage pregnancy and motherhood in England for a cohort of young people between 2004 to 2010.

After considering the potential endogeneity of parental expectations, I find that high parental expectations decreases the likelihood of teenage pregnancy and motherhood. The effect is about half as being born to a teenage mother. By using two sets of instrumental variables, one affecting deprived population and the other affecting a wider population, the main findings suggest that parental expectations marginal effects are mainly capturing a local effect in pregnancy models. For teenage motherhood specifications, the evidence suggests that the estimated effect captures an average treatment effect. Pregnancy specifications show that high parental expectations decrease by 4 per cent the likelihood of being pregnant in comparison to teenage girls having parents reporting *middle* expectations (likely and fairly likely). Similarly, teenage motherhood models reveal that high parental expectations decrease by 2 percent the likelihood of becoming a teenage mother in comparison to the reference group.

Additionally, the results highlight that for teenage girls with poor academic performance, negative values of the standardised English z-score in Key Stage 2, the effect of parental expectations is larger than for the rest of the teenage girls. This salient result might be reflecting the absence of additional sources of motivation and expectations at home and at school. As a result, this absence gives high parental expectations a marginal contribution on teenagers'

[59] In addition, these interactions allow for differential effects over time.

fertility decisions much larger than the observed for the rest of the population.

Although this study does not evaluate any of the employment or training programmes for young people, the theoretical model and the discussion of the mechanisms of parental expectations suggest that these programmes may have indirect impacts on teenage pregnancy and motherhood through the expansion of alternatives for teenagers. The expansion of the teenager's choice set, as well as the information about how to obtain a job or how to be enrolled into an apprenticeship, may change teenagers' fertility decisions for those who do not want to enroll in Higher Education.

Finally, the relevance of these findings has encouraged the extension of this work by considering structural modelling techniques to better understand the formation of expectations on fertility choices. This framework will help on understanding how parents and teenagers form expectations and when these expectations matter most for teenagers' fertility decisions. This extension will also help to forecast teenagers' fertility decisions when the state of the world changes. A second extension of this work will be the analysis of the effect of job and training programmes for the young people on the teenager's fertility decisions by using panel data containing several cohorts.

References

Elizabeth O Ananat and Daniel M Hungerman. The power of the pill for the next generation: oral contraception's effects on fertility, abortion, and maternal and child characteristics. *Review of Economics and Statistics*, 94(1):37–51, 2012.

Peter Arcidiacono, V Joseph Hotz, and Songman Kang. Modeling college major choices using elicited measures of expectations and counterfactuals. *Journal of Econometrics*, 166(1):3–16, 2012.

Adam Ashcraft and Kevin Lang. The consequences of teenage childbearing. Technical report, National Bureau of Economic Research, 2006.

Adam Ashcraft, Iván Fernández-Val, and Kevin Lang. The consequences of teenage childbearing: Consistent estimates when abortion makes miscarriage non-random. *The Economic Journal*, 2013.

Orazio Attanasio and Katja Kaufmann. Educational choices, subjective expectations, and credit constraints. Technical report, National Bureau of Economic Research, 2009.

Wendy Baldwin and Virginia S Cain. The children of teenage parents. *Family planning perspectives*, 12(1):34–43, 1980.

Hugo Benitez-Silva and Debra S Dwyer. The rationality of retirement expectations and the role of new information. *Review of Economics and Statistics*, 87(3):587–592, 2005.

Zoë Bradshaw and Pauline Slade. The effects of induced abortion on emotional experiences and relationships: a critical review of the literature. *Clinical Psychology Review*, 23(7):929–958, 2003.

Michael J Brien, Gregory E Loya, and John V Pepper. Teenage childbearing and cognitive development. *Journal of Population Economics*, 15(3):391–416, 2002.

Nancy J Burnett. Gender economics courses in liberal arts colleges. *The Journal of Economic Education*, 28(4):369–376, 1997.

John Bynner, Mary Londra, and Gill Jones. The impact of government policy on social exclusion among young people. Technical report, Office of the Deputy Prime Minister, Social Exclusion Unit, September 2004.

Lorenzo Cappellari and Stephen P Jenkins. Multivariate probit regression using simulated maximum likelihood. *The Stata Journal*, 3(3):278–294, 2003.

Willard Cates Jr, Kenneth F Schulz, and David A Grimes. The risks associated with teenage abortion. *New England Journal of Medicine*, 309(11):621–624, 1983.

Arnaud Chevalier and Tarja K Viitanen. The long-run labour market consequences of teenage motherhood in britain. *Journal of Population Economics*, 16(2):323–343, 2003.

William G Cochran and Donald B Rubin. Controlling bias in observational studies: A review. *Sankyha*, pages 417–446, 1973.

Áureo De Paula, Gil Shapira, and Petra E Todd. How beliefs about hiv status affect risky behaviors: Evidence from Malawi. *Journal of Applied Econometrics*, 2013.

Adeline Delavande. Pill, patch, or shot? subjective expectations and birth control choice. *International Economic Review*, 49(3):999–1042, 2008.

Adeline Delavande and Hans-Peter Kohler. HIV/AIDS-related expectations and risky sexual behaviour in Malawi, February 2014. University of Essex and University of Pennsylvania.

Adeline Delavande, Xavier Giné, and David McKenzie. Measuring subjective expectations in developing countries: A critical review and new evidence. *Journal of Development Economics*, 94(2):151–163, 2011.

Department for Children, Families and Schools. Teenage pregnancy strategy: Beyond 2010. Technical report, Department of Health, 2010.

Jeff Dominitz, Charles F Manski, and Jordan Heinz. Social security expectations and retirement savings decisions. Technical report, National Bureau of Economic Research, 2002.

Education Funding Agency. The 16-19 bursary fund: Your questions answered. Technical report, Education Funding Agency, 2013.

John Ermisch and David J Pevalin. Who has a child as a teenager? *ISER Working Papers*, 30, 2003.

John Ermisch and David J Pevalin. Early motherhood and later partnerships. *Journal of Population Economics*, 18(3):469–489, 2005.

William N Evans and Robert M Schwab. Finishing high school and starting college: Do catholic schools make a difference? *The Quarterly Journal of Economics*, 110(4):941–974, 1995.

David M Fergusson, L John Horwood, and Elizabeth M Ridder. Abortion in young women and subsequent mental health. *Journal of Child Psychology and Psychiatry*, 47(1):16–24, 2006.

Baruch Fischhoff, Aandrew M Parker, Wändi Bruine de Bruin, Julie Downs, Claire Palmgren, Robyn Dawes, and Charles F Manski. Teen expectations for significant life events. *The Public Opinion Quarterly*, 64(2):189–205, 2000.

Jason M Fletcher and Barbara L Wolfe. Education and labor market consequences of teenage childbearing evidence using the timing of pregnancy outcomes and community fixed effects. *Journal of Human Resources*, 44(2):303–325, 2009.

Marco Francesconi. Adult outcomes for children of teenage mothers. *The Scandinavian Journal of Economics*, 110(1):93–117, 2008.

Trevor Friedman and Dennis Gath. The psychiatric consequences of spontaneous abortion. *The British Journal of Psychiatry*, 155(6):810–813, 1989.

M Garel, B Blondel, N Lelong, S Bonenfant, and M Kaminski. Long-term consequences of miscarriage: the depressive disorders and the following pregnancy. *Journal of reproductive and infant psychology*, 12(4):233–240, 1994.

Arline T Geronimus and Sanders Korenman. The socioeconomic consequences of teen childbearing reconsidered. *The Quarterly Journal of Economics*, 107(4):1187–1214, 1992.

Alissa Goodman, Greg Kaplan, and Ian Walker. Understanding the effects of early motherhood in britain: the effects on mothers. Discussion Paper 1131, IZA, 2004.

William H Greene. *Econometric Analysis, 5th edition*. Pearson Education India, 2003.

Jeffrey Grogger. Incarcelation among children of teen mothers. In Saul D Hoffman and Rebecca A Maynard, editors, *Kids having Kids: Economic Costs and Social Consequences of Teen Pregnancy*. The Urban Insitute Press, 2008.

Robert Haveman, Barbara Wolfe, and Elaine Peterson. The life chances of the children of teen mothers, 1968-88. In Saul D Hoffman and Rebecca A Maynard, editors, *Kids having Kids: Economic Costs and Social Consequences of Teen Pregnancy*. The Urban Insitute Press, 2008.

Saul D Hoffman, E Michael Foster, and Frank F Furstenberg Jr. Reevaluating the costs of teenage childbearing. *Demography*, pages 1–13, 1993.

V Joseph Hotz, Charles H Mullin, and Seth G Sanders. Bounding causal effects using data from a contaminated natural experiment: analysing the effects of teenage childbearing. *The Review of Economic Studies*, 64(4):575–603, 1997.

Daniel Kahneman. *Thinking, fast and slow*. Macmillan, 2011.

Thomas J Kane and Douglas Staiger. Teen motherhood and abortion access. *The Quarterly Journal of Economics*, 111(2):467–506, 1996.

Michael P Keane. A computationally practical simulation estimator for panel data. *Econometrica*, pages 95–116, 1994.

Lesley Kendall, Lisa O'Donnell, Sarah Golden, Kate Ridley, Stephen Machin, Simon Rutt, Sandra McNally, Ian Schagen, Costas Meghir, Sheila Stoney, et al. Excellence in cities: The national evaluation of a policy to raise standards in urban schools 2000-2003. Technical Report Research Report No. 675A, Department for Education and Skills, 2005.

Daniel Klepinger, Shelly Lundberg, and Robert Plotnick. How does adolescent fertility affect the human capital and wages of young women? *Journal of Human Resources*, pages 421–448, 1999.

David I Levine and Gary Painter. The schooling costs of teenage out-of-wedlock childbearing: analysis with a within-school propensity-score-matching estimator. *Review of Economics and Statistics*, 85(4):884–900, 2003.

Arthur Lewbel, Yingying Dong, and Thomas Tao Yang. Comparing features of convenient estimators for binary choice models with endogenous regressors. *Canadian Journal of Economics/Revue canadienne d'économique*, 45(3):809–829, 2012.

Shelly Lundberg and Robert D Plotnick. Adolescent premarital childbearing: Do economic incentives matter? *Journal of Labor Economics*, pages 177–200, 1995.

Charles F Manski. Adolescent econometricians: How do youth infer the returns to schooling? In *Studies of supply and demand in higher education*, pages 43–60. University of Chicago Press, 1993.

Charles F Manski. Measuring expectations. *Econometrica*, 72(5):1329–1376, 2004.

Jacob Marschak. Binary-choice constraints and random utility indicators. In *Proceedings of a Symposium on Mathematical Methods in the Social Sciences*, 1960.

Neighbourhood Renewal Unit. The english indices of deprivation 2004: Summary (revised). Technical report, Office of the Deputy Prime Minister, June 2004.

Robert D Plotnick. The effects of attitudes on teenage premarital pregnancy and its resolution. *American Sociological Review*, pages 800–811, 1992.

David Roodman. Estimating fully observed recursive mixed-process models with cmp. *Center for Global Development Working Paper*, 168:1–57, 2009.

Mark R Rosenzweig and Kenneth I Wolpin. Sisters, siblings, and mothers: the effect of teen-age childbearing on birth outcomes in a dynamic family context. *Econometrica: journal of the Econometric Society*, pages 303–326, 1995.

Gil Shapira. How subjective beliefs about hiv infection affect life-cycle fertility evidence from rural Malawi. Technical Report 6343, The World Bank, 2013.

John M Thorp Jr, Katherine E Hartmann, and Elizabeth Shadigian. Long-term physical and psychological health consequences of induced abortion: review of the evidence. *Obstetrical & gynecological survey*, 58(1):67–79, 2003.

Louis L Thurstone. A law of comparative judgment. *Psychological review*, 34(4):273, 1927.

Kenneth Train. *Discrete choice methods with simulation*. Cambridge university press, 2003.

Kenneth Train. *Discrete choice methods with simulation*. Cambridge university press, 2009.

UNICEF. Child well-being in rich countries: A comparative overview. Technical Report Innocenti Report Card 11, UNICEF Office of Research, Florence, 2013.

Wilbert van der Klaauw. On the use of expectations data in estimating structural dynamic choice models. *Journal of Labor Economics*, 30(3):521–554, 2012.

Wilbert van der Klaauw and Kenneth I Wolpin. Social security and the retirement and savings behavior of low-income households. *Journal of Econometrics*, 145(1):21–42, 2008.

Hal R Varian. *Microeconomic analysis*, volume 2. Norton New York, 1992.

Paul Wilkinson, Rebecca French, Ros Kane, Kate Lachowycz, Judith Stephenson, Chris Grundy, Paul Jacklin, Patricia Kingori, Maryjane Stevens, and Kaye Wellings. Teenage conceptions, abortions, and births in england, 1994–2003, and the national teenage pregnancy strategy. *The Lancet*, 368(9550):1879–1886, 2006.

Matthew Wiswall and Basit Zafar. How do college students respond to public information about earnings. Technical Report 516, Federal Reserve Bank of New York, 2013.

Barbara Wolfe, Robert Haveman, Karen M Pence, and Jonathan Schwabish. Do youth nonmarital childbearing choices reflect income and relationship expectations? *Journal of Population Economics*, 20:73–100, 2007.

Jeffrey M Wooldridge. Inverse probability weighted estimation for general missing data problems. *Journal of Econometrics*, 141(2):1281–1301, 2007.

Jeffrey M Wooldridge. *Econometric analysis of cross section and panel data*. The MIT press, 2010.

Basit Zafar. How do college students form expectations? *Journal of Labor Economics*, 29(2): 301–348, 2011.

Basit Zafar. College major choice and the gender gap. *Journal of Human Resources*, 48(3): 545–595, 2013.

10 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 Educational Expectations	x			x			
Teenager's Occupational Expectations	x	x	x				
Pregnancy						x	x
Motherhood				x	x	x	x
Pregnancy				18	63	317	432
Motherhood				18	63	115	180
Observations	7,573	6,568	6,068	5,599	5,088	4,818	4,334

Note: The baseline probability of teenage pregnancy is 8.2 per cent and of teenage motherhood 3.7 per cent, considering W4 to W7.

Table 2: Parental Expectations in Wave 1 – Marginal Effects of Clustered Multinomial Logit

	Wave 4		Wave 4 to 7	
Variable	**High Exp. (1)**	**Low Exp. (2)**	**High Exp. (3)**	**Low Exp. (4)**
Siblings, religion and family type				
Siblings ≤2	-0.003	-0.005	-0.003	-0.006
	[0.025]	[0.011]	[0.025]	[0.011]
Siblings > 2	0.052	-0.011	0.054	-0.011
	[0.037]	[0.015]	[0.037]	[0.013]
Christian	-0.005	-0.009	-0.006	-0.009
	[0.019]	[0.008]	[0.019]	[0.008]
Muslim	0.280***	-0.100***	0.255***	-0.053***
	[0.062]	[0.036]	[0.053]	[0.008]
Sikh	0.288***	-0.078**	0.276***	-0.048***
	[0.090]	[0.037]	[0.073]	[0.010]
Others	-0.034	-0.036	-0.039	-0.029*
	[0.052]	[0.028]	[0.052]	[0.017]
Sex of MP (father=1)	0.048*	0.005	0.044	0.005
	[0.029]	[0.012]	[0.029]	[0.012]
Step Family	0.003	0.016	0.000	0.018
	[0.031]	[0.011]	[0.031]	[0.013]
Lone Mother	-0.340**	-0.060	-0.387***	-0.044***
	[0.133]	[0.048]	[0.036]	[0.013]
Teen Mother	-0.037	-0.039	-0.039	-0.031
	[0.064]	[0.036]	[0.063]	[0.020]
Mother's Schooling				
Degree or equivalent	0.201***	-0.083***	0.187***	-0.053***
	[0.041]	[0.031]	[0.043]	[0.009]
HE below degree level	0.066*	-0.056***	0.059	-0.042***
	[0.038]	[0.017]	[0.040]	[0.010]
GCE A level or equivalent	-0.005	-0.044***	-0.009	-0.035***
	[0.039]	[0.015]	[0.040]	[0.010]
GCSE grades A-C or equiv	-0.001	-0.019*	-0.005	-0.019*
	[0.035]	[0.011]	[0.035]	[0.011]
Qualifications at level 1 and below	-0.067	-0.012	-0.071	-0.012
	[0.045]	[0.014]	[0.044]	[0.012]
Other qualification	0.074	-0.019	0.072	-0.017
	[0.069]	[0.023]	[0.069]	[0.018]
Fathers's Schooling				
Degree or equivalent	0.127***	-0.109***	0.116***	-0.058***
	[0.039]	[0.035]	[0.041]	[0.008]
HE below degree level	0.062	-0.027*	0.060	-0.025**
	[0.039]	[0.016]	[0.040]	[0.012]
GCE A level or equivalent	-0.062*	-0.019	-0.065*	-0.017

Continued on next page

Table 2 – continued from previous page

Variable	Wave 4 High Exp. (1)	Wave 4 Low Exp. (2)	Wave 4 to 7 High Exp. (3)	Wave 4 to 7 Low Exp. (4)
	[0.036]	[0.014]	[0.036]	[0.012]
GCSE grades A-C or equiv	-0.018	-0.023*	-0.022	-0.022**
	[0.034]	[0.012]	[0.035]	[0.010]
Qualifications at level 1 and below	-0.005	-0.056***	-0.012	-0.037***
	[0.053]	[0.020]	[0.053]	[0.010]
Other qualification	0.123	-0.079**	0.116	-0.047***
	[0.076]	[0.036]	[0.076]	[0.011]
Key Stage 2 Z-scores				
English	0.079***	-0.028***	0.080***	-0.028***
	[0.017]	[0.006]	[0.017]	[0.006]
Maths	0.105***	-0.021***	0.103***	-0.021***
	[0.017]	[0.007]	[0.017]	[0.007]
Science	0.055***	-0.013*	0.054***	-0.013**
	[0.019]	[0.007]	[0.019]	[0.007]
Alcohol Intake in Wave 1				
Frequently during the week	-0.054*	0.007	-0.052*	0.005
	[0.028]	[0.014]	[0.028]	[0.014]
Once to 3 times per month	-0.014	-0.001	-0.018	0.001
	[0.022]	[0.010]	[0.022]	[0.010]
Once every couple of months	0.023	-0.004	0.023	-0.003
	[0.025]	[0.013]	[0.025]	[0.013]
Deprivation index 2004				
2nd quintile of deprivation	-0.005	0.014	-0.007	0.013
	[0.027]	[0.012]	[0.026]	[0.013]
3rd quintile of deprivation	0.002	0.001	0.002	-0.000
	[0.026]	[0.012]	[0.026]	[0.012]
4th quintile of deprivation	0.047	0.008	0.046	0.007
	[0.033]	[0.014]	[0.033]	[0.015]
5th quintile of deprivation (worst)	0.090**	-0.007	0.089**	-0.007
	[0.039]	[0.018]	[0.038]	[0.017]
Mother's Employment Status at age 5				
Paid job > 30 hrs/wk	0.056***	0.000	0.056***	-0.000
	[0.021]	[0.009]	[0.021]	[0.009]
Unemployed/Training/Retired	0.062**	-0.024**	0.061**	-0.022**
	[0.028]	[0.012]	[0.028]	[0.010]
Paid job < 30 hrs/wk (reference)	0.224**	0.011	0.035	-0.037**
	[0.100]	[0.036]	[0.105]	[0.017]
Father's Employment Status at age 5				
Paid job > 30 hrs/wk	0.028	-0.011	0.028	-0.011
	[0.069]	[0.025]	[0.069]	[0.026]
Unemployed/Training/Retired	0.044	-0.005	0.040	-0.002
	[0.078]	[0.029]	[0.077]	[0.028]
Paid job < 30 hrs/wk (reference)	0.373**	0.023	0.139	-0.009
	[0.150]	[0.052]	[0.137]	[0.021]
Observations	2,549	2,549	10,146	10,146

Note: The reference categories are: parental schooling (no instruction), religion (without religion), siblings (no siblings), alcohol intake (never), deprivation index (1st quintile - the richest), parental employment when the teenager was 5 years old (paid job for less than 30 hours per week). Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1

,

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		Preg., but no Mum	
	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev	Mean	St. Dev
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(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, LSYPE, and *EiC-EAZ* Programme

<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="6">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="5">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: 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 7: Wave 1 socio-demographic 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
Observations	7,573	6,568	6,068	5,599	5,088	4,818	4,334

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

Table 8: Inverse Probability Weighting (IPW) Model

Marginal effects of clustered probit − Wave 1

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]
Sensitivity	37.20 %
Specificity	94.11 %
Correctly classified	70.41 %
R−squared	0.195
Observations	6,172

Note: Variables from the LSYPE-Wave 1.

Table 9: Correction for attrition in pregnancy and motherhood models conditional on having sex

Marginal effects of clustered probits − Wave 4 to Wave 7

	Teen Pregnant			Teen Mother			Wald Test for IPW	
							Chi^2(1)/p−value	Chi^2(2)/p−value
	No W	Svy W	IPW	No W	Svy W	IPW	$\beta_{preg}=\beta_{mum}$	$\beta_{preg}=\beta_{mum}=0$
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Born to a teenage mother	0.110***	0.098***	0.101***	0.061**	0.048**	0.048**	0.10	16.86
	[0.034]	[0.033]	[0.032]	[0.026]	[0.023]	[0.022]	(0.747)	(0.000)
Key Stage 2 Z-scores								
English	-0.015**	-0.014**	-0.016***	-0.007*	-0.006	-0.007**	0.00	9.33
	[0.006]	[0.006]	[0.005]	[0.004]	[0.004]	[0.003]	(0.995)	(0.009)
Maths	-0.001	0.001	-0.001	-0.005	-0.005	-0.003	1.22	1.30
	[0.006]	[0.006]	[0.005]	[0.004]	[0.004]	[0.003]	(0.270)	(0.521)
Science	-0.001	0.001	-0.001	-0.003	-0.003	-0.002	0.69	0.81
	[0.006]	[0.006]	[0.006]	[0.004]	[0.004]	[0.003]	(0.408)	(0.669)
Main Parent's Expectations in Wave 1								
High	-0.031***	-0.028***	-0.023***	-0.017***	-0.017***	-0.012***	0.35	11.88
	[0.008]	[0.008]	[0.007]	[0.005]	[0.005]	[0.004]	(0.553)	(0.003)
Low	0.030**	0.032**	0.023*	0.011	0.01	0.005	1.02	4.20
	[0.015]	[0.015]	[0.013]	[0.010]	[0.009]	[0.007]	(0.313)	(0.123)
Missing	0.024	0.035*	0.023	0.021	0.028*	0.02	1.28	3.69
	[0.019]	[0.019]	[0.017]	[0.014]	[0.015]	[0.012]	(0.258)	(0.158)
Observations	10,146	10,146	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 10: 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 11: Heterogeneous effects in pregnancy and motherhood models

Coefficients of clustered probits - Wave 4 to Wave 7

Variable	Pregnancy (1)	Motherhood (2)
Deprivation Index in 2004		
2nd Percentile	0.195*	0.426**
	[0.116]	[0.167]
3rd Percentile	0.355***	0.407**
	[0.128]	[0.178]
Main Parent's Expectations in Wave 1		
High	-0.056	-0.045
	[0.143]	[0.276]
Low	0.426*	0.474
	[0.220]	[0.319]
Missing	-0.386	0.139
	[0.334]	[0.418]
Interactions: 2nd Percentile*Expectations		
(1) 2nd Percentile*High Exp.	-0.238	-0.322
	[0.182]	[0.324]
(2) 2nd Percentile*Low Exp.	-0.252	-0.408
	[0.262]	[0.369]
(3) 2nd Percentile*Missing Exp.	0.795**	0.286
	[0.392]	[0.502]
A:Test of Equality		
Ho: (1)=(2)		
$Chi^2(1)$	0.00	0.04
Prob > chi2	(0.959)	(0.842)
Ho: (1)=(2)=(3)		
$Chi^2(2)$	6.93	1.56
Prob > chi2	(0.031)	(0.458)
Interactions: 3rd Percentile*Expectations		
(4) 3rd Percentile*High Exp.	-0.277	-0.280
	[0.183]	[0.308]
(5) 3rd Percentile*Low Exp.	-0.340	-0.489
	[0.268]	[0.370]
(6) 3rd Percentile*Missing Exp.	0.518	0.095
	[0.381]	[0.466]
B:Test of Equality		
Ho: (4)=(5)		
$Chi^2(1)$	0.05	0.25
Prob > chi2	(0.823)	(0.618)
Ho: (4)=(5)=(6)		
$Chi^2(2)$	4.6	1.14
Prob > chi2	(0.100)	(0.564)
Across Percentiles		
C:Test of Equality		
Ho: (1)=(4)		
$Chi^2(1)$	0.06	0.03
Prob > chi2	(0.812)	(0.858)
Ho: (2)=(5)		
$Chi^2(1)$	0.17	0.09
Prob > chi2	(0.684)	(0.762)
Ho: (1)=(2)=(4)=(5)		
$Chi^2(4)$	3.31	2.36
Prob > chi2	(0.507)	(0.670)
Ho: (1)=(2)=(3)=(4)=(5)=(6)		
$Chi^2(6)$	8.99	3.08
Prob > chi2	(0.174)	(0.799)
Observations	10,146	10,146
Pseudo R−squared	0.237	0.275
Log−likelihood	-6738	-3235

Note: These specifications also control for: number of siblings, religion, father's and mother's schooling, alcohol intake in Wave 1, 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 12: Pregnancy and motherhood models conditional on having sex and including preferences and expectations for occupational choices

Marginal effects of clustered probits - Wave 4 to Wave 7

Variable	Teen Pregnancy (1)	Teen Motherhood (2)
Born to a teenage mother	0.100***	0.047**
	[0.032]	[0.022]
Key Stage 2 Z-scores		
English	-0.016***	-0.007**
	[0.005]	[0.003]
Maths	-0.000	-0.003
	[0.005]	[0.003]
Science	-0.001	-0.002
	[0.006]	[0.003]
Main Parent's Expectations in Wave 1		
High	-0.023***	-0.012***
	[0.007]	[0.004]
Low	0.017	0.002
	[0.013]	[0.007]
Missing	0.025	0.020*
	[0.017]	[0.012]
Occupational Choices in Wave 1		
Parental Preferences	-0.004	-0.003
	[0.011]	[0.006]
Teenager's Expectations	0.033*	0.017
	[0.017]	[0.011]
Likelihood-ratio Tests		
χ^2	23.83	16.99
Prob > chi2	(0.000)	(0.000)
Observations	10,146	10,146
Pseudo R−squared	0.236	0.275
Log−likelihood	-6752	-3236

Note: These models use *inverse probability weights (IPW)* and 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 13: First Stage of Instrumental Variables

Marginal Effects of clustered models − Wave 4 to Wave 7
IV: EiC-EAZ programme at the school level and educational supply & employment conditions at the LSOA level

	Single Probit: IV EiC-EAZ		**SML: IV EiC-EAZ**		**SML: IV LSOA**	
	IV for HExp	**IV for LExp**	**IV for HExp**	**IV for LExp**	**IV for HExp**	**IV for LExp**
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Instrumental Variables: EiC-EAZ						
EiC in KS2 and KS3	0.066*		0.066*			
	[0.010]		[0.040]			
Non-EiC in KS2 and Phase 1 KS3		-0.033**		-0.033**		
		[0 .005]		[0.014]		
Instrumental Variables: Edu-Emp at LSOA						
3rd Quintile of Edu. Dep. Index					-0.100***	
					[0.030]	
4rd Quintile of Edu. Dep. Index					-0.142***	
					[0.035]	
5th Quintile of Edu. Dep. Index					-0.174***	0.027**
					[0.045]	[0.104]
1st Q of Employment Dep. Index						0.021**
						[0.010]
F-Statistic	39.69	44.76	2.72	6.05	21.44	11.33
p-value	0.000	0.000	0.100	0.014	0.000	0.004
Observations	10,146	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 14: Simulated Single, Bivariate and Trivariate Maximum Likelihood: Teen Pregnancy

Marginal effects of clustered SML models − Wave 4 to Wave 7
IV: EiC-EAZ programme at the school level and educational supply & employment conditions at the LSOA level

	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**	
					IV:EiC-EAZ	**IV: LSOA Edu-Emp**
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Born to a teenage mother	0.072	0.053	0.076***	0.072***	0.074***	0.073***
	[0.071]	[0.067]	[0.020]	[0.019]	[0.019]	[0.019]
Key Stage 2 Z-scores						
English	0.012	-0.053***	-0.015**	-0.019***	-0.017***	-0.018***
	[0.022]	[0.011]	[0.006]	[0.006]	[0.006]	[0.006]
Maths	0.045***	-0.012	0.003	-0.001	0.001	0.001
	[0.016]	[0.010]	[0.006]	[0.006]	[0.006]	[0.006]
Science	0.019	-0.02	0.001	-0.002	-0.001	-0.001
	[0.013]	[0.013]	[0.006]	[0.006]	[0.006]	[0.006]
Main Parent's Expectations						
High	-0.478***	-0.031*	-0.058***	-0.024***	-0.042**	-0.025
	[0.102]	[0.018]	[0.019]	[0.008]	[0.020]	[0.020]
Low	0.018	-1.029***	0.016	-0.032	-0.009	-0.018
	[0.017]	[0.178]	[0.011]	[0.030]	[0.034]	[0.033]
Missing	0.025	0.026	0.022	0.021	0.022	0.021
	[0.022]	[0.020]	[0.014]	[0.014]	[0.014]	[0.014]
Observations	10,146	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 15: Simulated Single, Bivariate and Trivariate Maximum Likelihood: Teen Motherhood

Marginal effects of clustered SML models − Wave 4 to Wave 7
IV: EiC-EAZ programme at the school level and educational supply & employment conditions at the LSOA level

	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**	
					IV:EiC-EAZ	**IV: LSOA Edu-Emp**
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Born to a teenage mother	0.062	0.039	0.031***	0.029***	0.030***	0.030***
	[0.070]	[0.037]	[0.010]	[0.010]	[0.010]	[0.010]
Key Stage 2 Z-scores						
English	0.008	-0.019***	-0.007**	-0.007**	-0.007**	-0.007**
	[0.023]	[0.006]	[0.003]	[0.003]	[0.003]	[0.003]
Maths	0.03	-0.007	-0.002	-0.003	-0.002	-0.003
	[0.022]	[0.005]	[0.004]	[0.003]	[0.003]	[0.003]
Science	0.011	-0.008	-0.002	-0.002	-0.002	-0.002
	[0.015]	[0.006]	[0.003]	[0.003]	[0.003]	[0.003]
Main Parent's Expectations						
High	-0.407***	-0.021*	-0.023**	-0.013***	-0.019**	-0.017*
	[0.115]	[0.013]	[0.010]	[0.005]	[0.009]	[0.010]
Low	0.005	-0.234	0.002	0.002	0.002	0.000
	[0.015]	[0.254]	[0.006]	[0.014]	[0.014]	[0.015]
Missing	0.036	0.023	0.015**	0.014*	0.015**	0.014**
	[0.031]	[0.016]	[0.008]	[0.007]	[0.007]	[0.007]
Observations	10,146	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 16: 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.

Table 17: Error correlations of ML and Simulated ML IV Probit, Bivariate and Trivariate Probit: Teen Pregnancy

Clustered ML and SML Models − Wave 4 to Wave 7
Instrumental Variable: Excellence in cities (EiC) Programme at the individual-school level

	IV Probit		**Bivariate**		**Trivariate**
	IV for HExp	**IV for LExp**	**IV for HExp**	**IV for LExp**	**IV for H/L Exp**
Fisher's transf. (Athrho)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
ML: Single and Bivariate Probit					
Athrho (Pregnancy vs High or Low)	1.224	1.313**	0.418*	0.416	
Std. Error of Athrho	[0.747]	[0.547]	[0.217]	[0.360]	
SML: Single and Bivariate Probit					
Athrho (Pregnancy vs High or Low)	1.200	1.318**	0.173*	0.251	
Std. Error of Athrho	[0.733]	[0.546]	[0.098]	[0.155]	
SML: Trivariate Probit)					
Athrho (Pregnancy vs High)					0.085
Std. Error of Athrho					[0.110]
Athrho (Pregnancy vs Low)					0.109
Std. Error of Athrho					[0.169]
Athrho (High vs Low)					-0.780***
Std. Error of Athrho					[0.056]
Observations	10,146	10,146	10,146	10,146	10146

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, parental prefererences and teenager's expectation about occupational choices, as well as dummies for 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 ML and Simulated ML IV Probit, Bivariate and Trivariate Probit: Teen Motherhood

Clustered ML and SML Models − Wave 4 to Wave 7
Instrumental Variable: Excellence in cities (EiC) Programme at the individual-school level

	IV Probit		**Bivariate**		**Trivariate**
	IV for HExp	**IV for LExp**	**IV for HExp**	**IV for LExp**	**IV for H/L Exp**
Fisher's transf. (Athrho)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
ML: Single and Bivariate Probit					
Athrho (Motherhood vs High or Low)	1.153	0.641	0.583	-0.114	
Std. Error of Athrho	[0.887]	[0.891]	[0.388]	[0.286]	
SML: Single and Bivariate Probit					
Athrho (Motherhood vs High or Low)	1.130	0.644	0.112	-0.004	
Std. Error of Athrho	[0.873]	[0.892]	[0.106]	[0.146]	
SML: Trivariate Probit)					
Athrho (Motherhood vs High)					0.072
Std. Error of Athrho					[0.108]
Athrho (Motherhood vs Low)					-0.015
Std. Error of Athrho					[0.153]
Athrho (High vs Low)					-0.784***
Std. Error of Athrho					[0.056]
Observations	10,146	10,146	10,146	10,146	10146

Note: 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 19: Wald Test of Error Components for Teen Pregnancy Models

Clustered ML and SML Models − Wave 4 to Wave 7
Instrumental Variable: Excellence in cities (EiC) Programme at the individual-school level

	IV Probit		Bivariate		Trivariate
	IV for HExp	IV for LExp	IV for HExp	IV for LExp	IV for H/L Exp
Wald Test on Athrho	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
WaldTests: ML of Single and Bivariate Probit					
Athrho = 0					
Chi^2	2.68	5.77	3.70	1.33	
Prob > chi2	0.10	0.02	0.05	0.25	
WaldTests: SML of Single and Bivariate Probit					
Athrho = 0					
Chi^2	2.68	5.83	3.15	2.64	
Prob > chi2	0.1018	0.02	0.08	0.10	
WaldTests: Simulated Maximum Likelihood					
Athrho (Pregnancy vs High) = 0					
$Chi^2(1)$					0.61
Prob > chi2					0.44
Athrho (Pregnancy vs Low) = 0					
$Chi^2(1)$					0.42
Prob > chi2					0.52
Athrho (High vs Low) = 0					
$Chi^2(1)$					195
Prob > chi2					0.00
Joint Wald Tests					
Athrho Pregnancy vs High and Pregnancy vs Low = 0					
$Chi^2(2)$					4.21
Prob > chi2					0.12
Athrho Pregnancy vs High and High vs Low = 0					
$Chi^2(2)$					196
Prob > chi2					0.00
Athrho Pregnancy vs Low and High vs Low = 0					
$Chi^2(2)$					202
Prob > chi2					0.00
Athrho all constraints = 0					
$Chi^2(3)$					220
Prob > chi2					0.00
Observations	10,146	10,146	10,146	10,146	10,146

Note: 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 20: Wald Test of Error Components for Teen Motherhood Models

Clustered ML and SML Models − Wave 4 to Wave 7
Instrumental Variable: Excellence in cities (EiC) Programme at the individual-school level

	IV Probit		Bivariate		Trivariate
	IV for HExp	IV for LExp	IV for HExp	IV for LExp	IV for H/L Exp
Wald Test on Athrho	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
WaldTests: ML of Single and Bivariate Probit					
Athrho = 0					
Chi^2	1.69	0.52	2.25	0.16	
Prob > chi2	0.19	0.47	0.13	0.69	
WaldTests: SML of Single and Bivariate Probit					
Athrho = 0					
Chi^2	1.67	0.52	1.12	0.00	
Prob > chi2	0.20	0.47	0.29	0.98	
WaldTests: Simulated Maximum Likelihood					
Athrho (Motherhood vs High) = 0					
Chi^2					0.44
Prob > chi2					0.51
Athrho (Motherhood vs Low) = 0					
Chi^2					0.01
Prob > chi2					0.92
Athrho (High vs Low) = 0					
Chi^2					199
Prob > chi2					0.00
Joint Wald Tests					
Athrho Pregnancy vs High and Pregnancy vs Low = 0					
$Chi^2(2)$					0.81
Prob > chi2					0.67
Athrho Pregnancy vs High and High vs Low = 0					
$Chi^2(2)$					202
Prob > chi2					0.00
Athrho Pregnancy vs Low and High vs Low = 0					
$Chi^2(2)$					199
Prob > chi2					0.00
Athrho all constraints = 0					
$Chi^2(3)$					205
Prob > chi2					0.00
Observations	10,146	10,146	10,146	10,146	10,146

Note: 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 21: Control Function Approach for Pregnancy and Motherhood models

Marginal effects of clustered probits - Wave 4 to Wave 7

Variable	Teen Pregnancy (1)	Teen Motherhood (2)
Main Parent's Expectations		
High	-0.142*	-0.070*
	[0.077]	[0.042]
Low	-0.061	0.039
	[0.071]	[0.045]
Missing	0.020	0.015*
	[0.013]	[0.008]
Generalised residuals		
High	0.050	0.023
	[0.032]	[0.017]
Low	0.031	-0.015
	[0.028]	[0.018]
Observations	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, parental prefererences and teenager's expectation about occupational choices, as well as dummies for 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 22: Simulated Multivariate Probits considering attrition bias through selection probit

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

Variable	Teen Pregnancy (1)	Teen Motherhood (2)
Born to a teenage mother	0.073***	0.033**
	[0.019]	[0.010]
Key Stage 2 Z-scores		
English	-0.014**	-0.006
	[0.006]	[0.003]
Maths	0.000	-0.003
	[0.006]	[0.004]
Science	-0.002	-0.002
	[0.006]	[0.003]
Main Parent's Expectations		
High	-0.046**	-0.020*
	[0.021]	[0.011]
Low	-0.010	0.008
	[0.040]	[0.017]
Missing	0.021	0.013*
	[0.014]	[0.008]
Observations	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, parental prefererences and teenager's expectation about occupational choices, as well as dummies for 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 23: Simulated Trivariate probit using wave interactions in pregnancy models

Marginal effects of clustered probits - Wave 4 to Wave 7
IV: Excellence in cities (EiC) Programme at the individual-school level

Variable	**Teen Pregnancy (1)**
Main Parent's Expectations	
High	-0.053***
	[0.014]
Low	-0.003
	[0.026]
Missing	0.015
	[0.014]
Interactions with Wave	
Wave4*High	-0.484
	[0.297]
Wave4*Low	-0.048
	[0.047]
Wave4*Missing	0.028
	[0.029]
Wave5*High	0.024
	[0.020]
Wave5*Low	0.010
	[0.028]
Wave5*Missing	0.027
	[0.021]
Wave6*High	0.033*
	[0.011]
Wave6*Low	0.025
	[0.021]
Wave6*Missing	0.000
	[0.010]
Observations	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, parental prefererences, and teenager's expectation about occupational choices. The reference category for wave dummies is Wave 7. Reference categories of parental expectations are *Likely* and *Fairly Likely*. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

Figure 1: Marginal Effects across Key Stage 2 of Teen Pregnancy Models

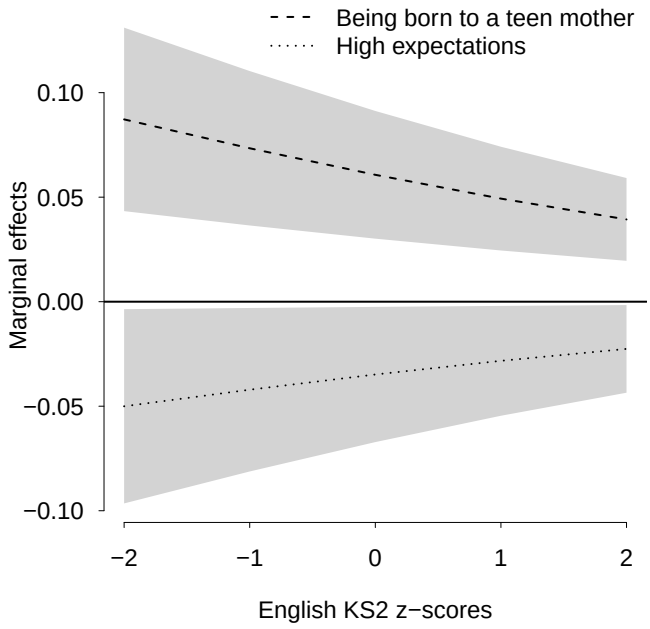
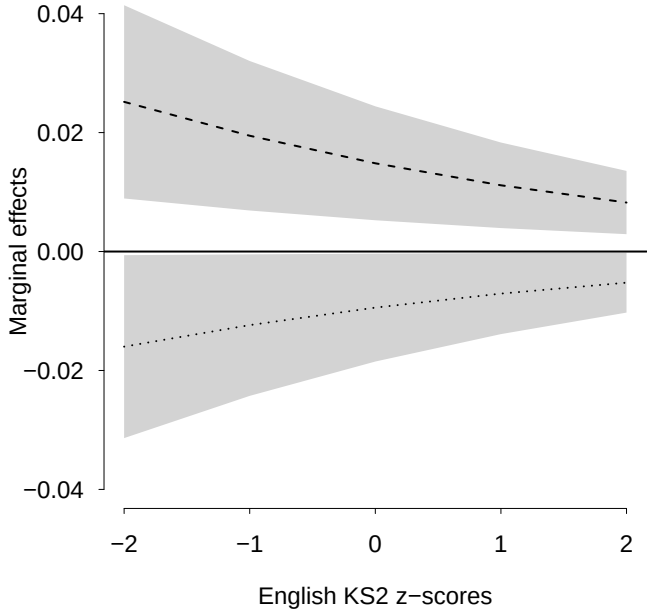


Figure 2: Marginal Effects across Key Stage 2 of Teen Motherhood Models



11 Appendix 2: Complementary Tables and Figures

Figure 3: Kernel densities of the growth rate of English z-scores in Key Stage 2 and Key Stage 3 for girls benefited by the *EiC Programme* and the total rest of teenage girls

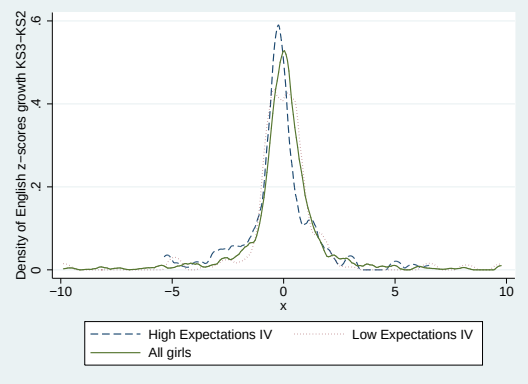


Figure 4: Kernel densities of the growth rate of Math z-scores in Key Stage 2 and Key Stage 3 for girls benefited by the *EiC Programme* and the total rest of teenage girls

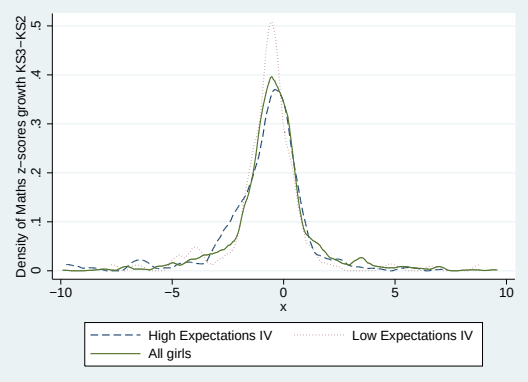


Figure 5: Kernel densities of the growth rate of Science z-scores in Key Stage 2 and Key Stage 3 for girls benefited by the *EiC Programme* and the total rest of teenage girls

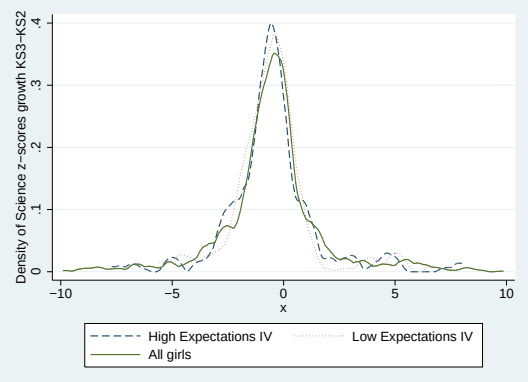


Table 24: Differences in English, Math, and Science z-scores between *EiC* and *non-EiC* beneficiaries

Difference: Zscore of *Non-EiC*-Zscore of *EiC*

	English		Maths		Science	
	IV for HExp	**IV for LExp**	**IV for HExp**	**IV for LExp**	**IV for HExp**	**IV for LExp**
Key stage 2						
Difference	0.19	0.13	0.12	0.05	0.12	0.09
St. Error	0.04	0.04	0.04	0.04	0.04	0.04
p-values						
Ha: diff < 0	1.00	1.00	1.00	0.89	1.00	0.98
Ha: diff != 0	0.00	0.00	0.00	0.22	0.00	0.04
Ha: diff > 0	0.00	0.00	0.00	0.11	0.00	0.02
Key stage 3						
Difference	0.28	0.05	0.24	0.27	0.16	0.09
St. Error	0.04	0.04	0.04	0.04	0.04	0.04
p-values						
Ha: diff < 0	1.00	0.90	1.00	1.00	1.00	0.99
Ha: diff != 0	0.00	0.20	0.00	0.00	0.00	0.02
Ha: diff > 0	0.00	0.10	0.00	0.00	0.00	0.01
T-test of Diff-Diff	-1.62	1.47	-2.15	-3.73	-0.91	0.03

Table 25: Attrition Probability and Instrumental Variables

Variable	IPW	IPW
Instrumental Variables: EiC-EAZ		
EiC in KS2 and KS3	0.0523	
	(0.0664)	
Non-EiC in KS2 and Phase 1 KS3	0.107	
	(0.0660)	
Instrumental Variables: Edu-Emp at LSOA		
3rd Quintile of Edu. Dep. Index		-0.063
		[0.0412]
4rd Quintile of Edu. Dep. Index		-0.111**
		[0.044]
5th Quintile of Edu. Dep. Index		-0.181**
		[.0522]
1st Q of Employment Dep. Index		0.036
Observations	10,146	10,146
R-squared	0.704	0.731

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

Table 26: Pregnancy and Motherhood Models: SML using LSOA instruments not related to attrition

Variable	Pregnancy	Motherhood
Born to a teenage mother		
	0.073***	0.030***
	[0.019]	[0.010]
Main Parent's Expectations		
High	-0.026	-0.015*
	[0.019]	[0.009]
Low	-0.010	0.001
	[0.031]	[0.013]
Missing	0.021	0.014**
	[0.014]	[0.007]
Observations	10,146	10,146

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

Table 27: Probit of teenagers' expectations about working or learning a trade rather than higher education

Marginal effects of clustered probits − Wave 4 and Wave 7 using same controls of pregnancy and motherhood models and instruments

Instrumental Variables: EiC-EAZ								
EiC in KS2 and KS3	0.008		0.008					
	[0.009]		[0.009]					
Non-EiC in KS2 and Phase 1 KS3		-0.000	0.001					
		[0.011]	[0.012]					
Instrumental Variables: Edu-Emp at LSOA								
3rd Quintile of Edu. Dep. Index				-0.105				-0.091
				[0.144]				[0.178]
4rd Quintile of Edu. Dep. Index					0.069			0.046
					[0.130]			[0.180]
5th Quintile of Edu. Dep. Index						0.036		0.046
						[0.169]		[0.225]
1st Q of Employment Dep. Index							-0.233	-0.234
							[0.175]	[0.179]
Observations	10,016	10,016	10,016	10,016	10,016	10,016	10,016	10,016

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

Table 28: Simulated Bivariate Maximum Likelihood: Teen Pregnancy and Motherhood

Marginal effects of clustered SML models – Wave 4 to Wave 7
IV: EiC-EAZ programme at the school level

	Pregnancy		**Motherhood**	
	IV for HExp	**IV for LExp**	**IV for HExp**	**IV for LExp**
Variable	**(1)**	**(2)**	**(3)**	**(4)**
Born to a teenage mother	0.058***	0.057***	0.023***	0.023***
	[0.015]	[0.014]	[0.009]	[0.008]
Key Stage 2 Z-scores				
English	-0.012**	-0.013***	-0.005*	-0.005**
	[0.005]	[0.005]	[0.003]	[0.003]
Maths	0.000	-0.001	-0.002	-0.003
	[0.005]	[0.005]	[0.003]	[0.003]
Science	-0.001	-0.002	-0.003	-0.003
	[0.005]	[0.005]	[0.003]	[0.002]
Main Parent's Expectations				
High	-0.040**	-0.023***	-0.018*	-0.012***
	[0.019]	[0.006]	[0.011]	[0.004]
Low	0.017*	-0.003	0.003	0.005
	[0.009]	[0.028]	[0.005]	[0.018]
Missing	0.014	0.014	0.012*	0.012*
	[0.011]	[0.011]	[0.006]	[0.006]
Observations	13,614	13,614	13,614	13,614

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 29: Pregnancy and Motherhood Models: SML using *EiC-EAZ* and LSOA instruments in the same model

Variable	Pregnancy	Motherhood
Born to a teenage mother	-0.073***	0.030**
	[0.019]	[0.010]
Main Parent's Expectations		
High	-0.025	-0.016*
	[0.020]	[0.009]
Low	-0.0163	0.000
	[0.031]	[0.014]
Missing	0.021	0.014**
	[0.014]	[0.007]
Observations	10146	10,146

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

Table 30: Number of observations per school from Wave 4 to Wave 7

Obs. per School	Number of Pupils	Percentage
1	69	0.68
2	166	1.64
3	411	4.05
4	396	3.9
5	410	4.04
6	804	7.92
7	343	3.38
8	232	2.29
9	702	6.92
10	170	1.68
11	231	2.28
12	972	9.58
14	154	1.52
15	1,125	11.09
16	32	0.32
17	102	1.01
18	900	8.87
19	38	0.37
20	180	1.77
21	756	7.45
23	161	1.59
24	360	3.55
26	130	1.28
27	405	3.99
29	116	1.14
30	270	2.66
32	64	0.63
33	198	1.95
36	144	1.42
42	42	0.41
63	63	0.62
Total	10,146	100

Table 31: Correction for attrition in pregnancy and motherhood models conditional on having sex

Marginal effects of clustered probits − Wave 6 and 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	0.188***	0.170***	0.176***	0.091**	0.073**	0.072**
	[0.058]	[0.060]	[0.058]	[0.038]	[0.035]	[0.033]
Key Stage 2 Z-scores						
English	-0.030***	-0.030***	-0.031***	-0.015**	-0.012*	-0.014***
	[0.010]	[0.011]	[0.010]	[0.006]	[0.006]	[0.005]
Maths	0.005	0.008	0.004	-0.003	-0.004	-0.002
	[0.011]	[0.011]	[0.010]	[0.007]	[0.007]	[0.005]
Science	-0.001	0.003	0.000	-0.005	-0.005	-0.004
	[0.011]	[0.012]	[0.011]	[0.006]	[0.007]	[0.005]
Main Parent's Expectations in Wave 1						
High	-0.050***	-0.046***	-0.040***	-0.022***	-0.023***	-0.017**
	[0.014]	[0.014]	[0.013]	[0.008]	[0.008]	[0.007]
Low	0.065**	0.069**	0.053**	0.021	0.019	0.011
	[0.027]	[0.028]	[0.025]	[0.015]	[0.014]	[0.012]
Missing	0.029	0.049	0.028	0.026	0.039*	0.025
	[0.030]	[0.032]	[0.028]	[0.020]	[0.021]	[0.017]
Observations	5,121	5,121	5,121	5,121	5,121	5,121
Pseudo R−squared	0.118	0.123	0.117	0.214	0.224	0.224
Log−likelihood	-1880	-2127	-5939	-886.7	-969.7	-2480

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 32: Bivariate Simulated Maximum Likelihood: Teen Pregnancy and Motherhood

Marginal effects of clustered SML models − Wave 4 to Wave 7
Instrumental Variable for High Expectations: Educational Supply at the LSOA

	Pregnancy				Motherhood			
	3rd,4th,5th Q	**3rdQ**	**4thQ**	**5thQ**	**3rd,4th,5th Q**	**3rdQ**	**4thQ**	**5thQ**
Born to a teenage mother	0.076***	0.076***	0.076***	0.076***	0.030**	0.030**	0.030**	0.031**
	[0.019]	[0.019]	[0.019]	[0.019]	[0.010]	[0.010]	[0.010]	[0.010]
Key Stage 2 Z-scores								
English	-0.016**	-0.015**	-0.015**	-0.016**	-0.007**	-0.007**	-0.007**	-0.007**
	[0.006]	[0.006]	[0.006]	[0.006]	[0.003]	[0.003]	[0.003]	[0.003]
Maths	0.001	0.002	0.002	0.002	-0.002	-0.002	-0.002	-0.002
	[0.006]	[0.006]	[0.006]	[0.006]	[0.003]	[0.003]	[0.003]	[0.003]
Science	0.000	0.000	0.001	0.000	-0.002	-0.002	-0.002	-0.002
	[0.006]	[0.006]	[0.006]	[0.006]	[0.003]	[0.003]	[0.003]	[0.003]
Main Parent's Expectations in Wave 1								
High	-0.042**	-0.051**	-0.054**	-0.048**	-0.020**	-0.020**	-0.021**	-0.021**
	[0.021]	[0.020]	[0.021]	[0.021]	[0.010]	[0.009]	[0.010]	[0.010]
Low	0.016	0.016	0.016	0.016	0.002	0.002	0.002	0.002
	[0.011]	[0.011]	[0.011]	[0.011]	[0.006]	[0.006]	[0.006]	[0.006]
Missing	0.022	0.022	0.022	0.022	0.015*	0.015*	0.015**	0.015*
	[0.014]	[0.014]	[0.014]	[0.014]	[0.007]	[0.007]	[0.008]	[0.008]
Observations	10,146	10,146	10,146	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, parental preferences and teenager's expectations about occupational choices, 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.