Abstract

Common wisdom states that teenage childbearing reduces schooling, labour market experience and adult wages. However, the decisions to be a teenage mother, to quit school, and be less attached to the labour market might all stem from some personal or family characteristics.

Using the National Child Development Study (NCDS), we find that in Britain teenage childbearing decreases the probability of post-16 schooling by 12% to 24%. Employment experience is reduced by up to three years, and the adult pay differential ranges from 5% to 22%. The negative impact of teen motherhood on various adult outcomes is not due to some pre-motherhood characteristics; hence policies aiming to encourage return to school and participation in the labour market may be an efficient way to reduce the long-term consequences of teenage pregnancy.

JEL Codes: I200, J130, J310
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The Long-Run Labour Market Consequences of Teenage Motherhood in Britain

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Britain has the worst record on teenage pregnancies in Europe. […] As a country, we can't afford to continue to ignore this shameful record. Few societies find it easy to talk honestly about teenagers, sex and parenthood. It can seem easier to sweep such uncomfortable issues under the carpet. But the consequences of doing this can be seen all round us in shattered lives and blighted futures.

Tony Blair, in "Teenage Pregnancy", Social Exclusion Unit, 1999, HMSO, p. 4

1. Introduction

In addition to having the worst record on teenage motherhood in Western Europe, Britain is the only EU country where the rate has not decreased in the past 20 years (Micklewright and Stewart, 1999). The UK average is nearly three times as high (around 30 births per 1000 women in 1995) as the European rate (around 11 per 1000)[1]. The UK government is concerned with the long-term consequences of various teenage outcomes and teenage motherhood in particular. Early motherhood is commonly associated with lower education, reduced labour market participation and poverty. The lower income of teen mothers possibly affects both their own and their children's economic well-being[2]. Politicians have repeatedly emphasised the importance of reducing the rate of teenage motherhood, mainly to reduce the risk of long-term social exclusion and welfare dependency. The 1992 White Paper "Health of the Nation" promised to halve the teenage pregnancy rate by the year 2000; a goal now aimed to be achieved by 2010. However, the rate of teenage conception has been stable at 45 per thousand women for the past decade with approximately 40% ending in an abortion (Population Trends, 1999).

Teenage motherhood is prone to conflict with human capital investment that typically takes place during adolescence by rising the opportunity costs of time spent in education. Early childbearing is also likely to reduce labour force participation because of the low compatibility of employment and child rearing. The negative effect of early childbearing on adult wages is both direct and indirect as the wages of teenage mothers are negatively affected by their reduced education and work experience. As teenage mothers typically come

[1] See Micklewright and Stewart (1999) for a comparison of child welfare throughout Europe.

[2] Haveman *et al*. (1997), using the PSID, report that children of teen mothers have less education and a reduced labour force participation. However, Levine *et al*. (2000), using the data on the children of NLSY respondents, argue that lower test scores and grade repetition are almost entirely due to differences in family background and

from less favourable socio-economic background, the causality of teenage motherhood on adult outcomes is debatable.

The question of interest in this study is whether early fertility has a real impact on later socio-economic outcomes or whether the perceived adverse outcomes are due to unobserved heterogeneity. Are teenagers who give birth like other teenagers but supporting a child or are they different in the first place? If state dependence exists i.e. motherhood *per se* leads to poorer outcomes, policies reducing early childbearing will have positive effects on the economic prospects of these young women. Alternatively, if the differences in adult outcomes were due to pre-motherhood heterogeneity between women who became teen mothers and those who delayed childbearing, the poor outcomes would surface even in the absence of teenage motherhood. Therefore, awareness of the consequences of teenage childbearing is essential in designing an effective policy preventing social exclusion and the propagation of poverty from one generation to the next.

This paper is organised as follows. The literature on the effects of teenage motherhood on various adult outcomes is reviewed in the next section. The data used in the analysis is described in Section 3 while the model and econometric methods are presented in Section 4. Our results are presented in Section 5 and Section 6 concludes.

2. Literature Review

Economists have introduced models of childbearing decisions based on a cost-benefit analysis (see Becker, 1976 for an early exposition). Additionally, empirical work accounting for the endogeneity of teenage motherhood has been conducted in more recent years. We focus on three outcomes that are commonly regarded to be negatively affected by teenage motherhood: schooling, work experience and wages.

Most studies for the US have found that early motherhood has negative effects on educational achievement. Earlier results can be questioned since the fertility decision was treated as exogenous to the educational choice. The simultaneity of childbearing and schooling decisions may reflect common preferences underlying both actions. Therefore, failure to account for this endogeneity leads to an over-estimate of the negative consequences

not teenage motherhood per se. Nevertheless, children of teenage mothers are found to have more behavioural problems than other teenagers.

of teen childbearing on schooling. Both instrumental variables and natural experiments have been used to take account of the potential endogeneity.

Olsen and Farkas (1989) and Ribar (1994) report that after accounting for the endogeneity of the fertility decision, childbearing exerts no significant effect upon school completion. However, using a large set of instruments, Klepinger *et al.* (1995, 1999) report a substantial reduction in the schooling attainment of teen mothers, lower participation in the work force and lower wages[3].

Results obtained with instrumental variables estimation can be questioned as the effects of teen childbearing on future socio-economic well-being may be overstated because of family heterogeneity bias. This bias can be accounted for by using within-family estimates. Geronimus and Korenman (1992), Hoffman *et al.* (1993), and Rosenzweig and Wolpin (1995) use family-specific fixed effect models (comparing sisters). Accounting for family heterogeneity reduces, but does not eliminate, the estimated adverse effects of teenage motherhood on schooling attainment. Additionally, Geronimus and Korenman (1992) find no effect of teen birth on current employment status for women aged 28-38. However, within family estimates are based on small and potentially unrepresentative samples.

Various natural experiments have been proposed to remove the individual unobserved heterogeneity; for example, Angrist and Evans (1999) rely on state-specific variations in exposure to abortion reforms. They found that black women exposed to abortion reforms had a reduced fertility rate and increased education and employment rate. Bronars and Groggers (1994) compare teen mothers with twins to teen mothers who bore a singleton and find large negative effects of early motherhood on years of education and high school graduation[4] but the negative impact on labour force participation and wages were only short-lived. Hotz *et al.* (1999) attempt to remove the endogeneity by using the occurrence of miscarriage as a natural experiment. Their results suggest that many of the negative consequences of teenage motherhood are much smaller than previously estimated[5]. In addition to the negative consequences appearing short-lived, the authors report that in the long-run, teenage

[3] These authors propose age at menarche as well as a various measures of abortion facilities. However, a large number of instruments might not be the recommended solution, as "even a weak correlation between the instruments and the error in the original equation can lead to a large inconsistency in IV estimates" (Bound *et al.*, 1995). Increasing the number of instruments augments the risk of correlation between the instruments and the error term, thus leading to biased results.

[4] This study is therefore not directly comparable to the previous ones, which typically compares women with one child to those with none.

[5] The relevance of miscarriage as an instrument is questionable as it is affected by risky behaviour such as smoking or drinking, which may be correlated with other characteristics affecting the earnings potential.

childbearing raises the level of labour supply, earnings and work experience and reduces the chances of living in poverty as opposed to delaying childbearing until adulthood.

In the UK, the majority of the work has been on the determinants of teenage motherhood (Kiernan, 1997; Manlove, 1997 or Cheesbrough, 2000) rather than its consequences on later labour market behaviour. Specifically, the above-mentioned studies find that young mothers were more likely to have a mother who herself was a teenage mother, had lower ability, less stable family and a lower socio-economic background. Hobcraft and Kiernan (1999) look at the consequences of teenage motherhood on some adult outcomes (welfare participation among other measures of social exclusion). However, none of the UK studies did account for the possible endogeneity of teenage motherhood.

Most studies have found that the schooling attainment of teenage mothers is significantly reduced but the extent of the reduction is debatable. Results on the effects of teenage childbearing on labour force attachment and earnings are less clear. Studies based on natural experiments and within family differences, tend to show that the effects of teenage childbearing on wages are short lived, whereas studies using instrumental variables report significant negative effects of teenage motherhood on labour market outcomes. Whichever estimation technique is applied, it appears that a large part of the observed adverse consequences of teenage motherhood are due to pre-existing differences between teen mothers and other adolescents. Thus, policies preventing teenage conception may not be a panacea to reduce the gap in educational attainment between teenagers at risk and other teenagers.

3. Data

The National Child Development Study is a continuous survey of all individuals born in Britain during the first week of March 1958. These individuals have been surveyed at different points in time. To define our sample we use the fifth wave conducted in 1991 when the respondents were 33 years old. A sub-sample of 5799 women, who responded to a questionnaire relating to the history of their fertility, is selected. Those who provided information on the outcome of their first pregnancy and the year the event took place are used in the analysis. We distinguish between four outcomes: never pregnant, motherhood/still

pregnant, miscarriage[6], and abortion[7]. The year in which the outcome took place is misreported in 82 cases and no outcome was reported in another 20 cases leaving us with a sample size of 5697 women: 1070 have never been pregnant, 3895 are pregnant for the first time or had their first pregnancy ending with the birth of a child, 445 miscarried, and 287 aborted.

Contrary to most studies, we assess the age at which the pregnancy started by using the date at the end of the first pregnancy (regardless of the outcome) and information on whether the delivery was late or premature[8]. Out of the 4627 women who have ever been pregnant, 97 (2%) started their pregnancy before their 16th birthday; another 406 began their pregnancy before their 18th birthday. These lead to pregnancy rates of 17/1000 when considering 16th birthday (88/1000 with the 18th birthday definition). Table 1 summarises the distribution of fertility outcomes.

At the age of 33, nearly 20% of women have never been pregnant[9]. The outcome of the first pregnancy differs by age at which it takes place. More than a third of females under the age of 16 terminate their pregnancy by abortion; this proportion falls to 12% for the less than 18 year olds and less than 4% for adult women. Also, it is worth noting that the risk of miscarriage increases with age, from 4% for the younger age group to 8% for adult women[10].

Teenage pregnancy is assumed to affect adult socio-economic outcomes only in the case of a birth[11]. Therefore, we split our sample into women who gave birth before their 18th birthday, women who conceived before eighteen but did not give birth, and all other women. Some women, who miscarried or aborted their first pregnancy, got pregnant again before their 18th birthday. For this group of women, we determine the time and outcome of their second pregnancy. This leaves us with 404 teenagers who gave birth, another 99 who conceived but did not give birth and 5194 teenagers who did not report a pregnancy spell as a teenager.

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[6] Under this term we re-group stillbirth (delivery of a dead foetus after the 26th week of pregnancy) and miscarriage (loss of the foetus before the 26th week).

[7] We do not differentiate between single and multiple births (33 cases) and classify these outcomes as motherhood. Thirty-one missing observations were recoded as motherhood using information on baby's weight at birth. An extra five missing observations were classified as abortion since no further information on the baby was available (the choice of abortion versus miscarriage is arbitrary but does not affect our results as these pregnancies did not affect teenagers).

[8] The delivery variable reports differences between birth and forecasted term in weeks. We recode this variable in months and adjust our calculations regarding the first month of pregnancy for women whose pregnancy ended with a birth or a stillbirth, accordingly. For miscarriage and abortion, we approximate that the pregnancy started four months before its termination.

[9] This is exactly the national rate of non-motherhood for women born in the fifties (OPCS 95).

[10] It is possible that some abortions were subsequently reported as miscarriage (see Wu *et al*, 2001).

Micklewright and Stewart (1999), using Eurostat data, report that over the mid-Seventies, the fertility rate (pregnancy that ended in a live birth) for 15 to 19 year olds was around 50/1000 in the UK. With a similar definition we calculate a teenage fertility rate at 18 of 71/1000 for Britain. We had initially feared that our sample would underestimate teenage pregnancy as sexual events are usually badly reported in surveys (Wu *et al.*, 2001) and attrition more likely for respondents from the less favoured background. However, it appears that our sample might over-represent the extent of teenage pregnancy in Britain.

Focusing on the outcomes most likely to be affected by fertility decisions, Table 2 reports the proportion of teenagers investing in post-compulsory education, the highest qualification obtained[12], labour force status, total spells in the labour force[13] and average wage[14] by age 33, and for mothers, the average number of children. The sample size drops due to missing information on educational achievement, and misreporting of labour force attachment at age 33.

Comparing women with and without a conception spell as a teenager, childbearing has a negative effect on schooling investment. Only 10% of teenage mothers attended post-compulsory education, while this proportion is 45% for other teenagers[15]. This choice made at 16 has a permanent impact on the educational attainment of these women. By the age of 33, teenage mothers are three times as likely than women who did not experience pregnancy in their teens, to have no qualification. At the other end of the distribution, less than 8% of teenage mothers have a degree or high vocational qualification when this proportion is nearly 30% for other women. Women without a teenage motherhood pregnancy spell have almost twice as much work experience and are 8 percentage points more likely to be currently participating in the labour force. These differences in human capital and the direct effect of teenage motherhood lead to a pay differential of 45% between the two groups of women. Additionally, women who gave birth before 18 have more children than other mothers by the age of 33. This might stem from a stronger preference for children or differences in lifecycle.

Women who experience teenage pregnancy but did not give birth have characteristics common to both groups of women. Their behaviour led to a teenage pregnancy, however, by

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[11] The possible trauma effects of abortion or miscarriage are neglected here and so are the possibilities of children being given for adoption.

[12] Qualifications are defined as in Dearden (1998).

[13] The NCDS includes a diary section, where for each month, respondents report their main occupation. The labour market spells variable reports the full time equivalent labour force experience.

[14] Gross earnings are reported as well as the period that this payment covers. Gross pay per week can therefore be inferred. However, this method leads to a few outliers (probably not reporting the period of payment correctly). We therefore delete observations with a weekly gross pay greater than £1000 (42 observations).

[15] A birth before the age of 16 is associated with an even larger negative impact on schooling.

choice or by chance, they did not give birth and have therefore faced similar conditions to women who did not experience a teenage birth. They nevertheless tend to be less qualified and are 13 percentage points less likely to have attended post-compulsory education than women with no teenage conception. Also, despite a similar length of experience in the labour market they earn 13% less by age 33. These facts support the view that some of the negative effects associated with teenage motherhood are not solely due to the presence of a child, as women who made a similar conception decision but did not give birth are subsequently characterised by a lower educational achievement and a pay reduction compared to women who did not experience teenage pregnancy[16].

4. Model and Econometric Techniques

4.1 Educational choice

Teenage motherhood is the result of a chain of decisions: engagement in sexual activity, use of contraceptives and the decision not to abort. In this paper we do not concentrate on the process leading to teenage motherhood but rather on its consequences. The net benefits of teenage motherhood are reflected in a latent model (1), where the subscript *i* refers to an individual. This unobservable model is a positive function of the utility of having a child (U(child)) and social transfers associated with motherhood (B), and a negative function of the direct costs of parenthood (C) and the present value of foregone earnings (discounted at a rate *r*). The foregone earnings are a function of the duration of the spell out of the labour force due to child rearing (τ) and potential schooling (S^p)[17] that would have been achieved without early motherhood.

$$F_i = U_i(\text{child}) + B - C - E\left[\sum_{t=0}^{\tau}(1+r_i)^{-t} w_{it}(S_i^p)\right] \qquad (1)$$

Teenagers with a higher preference for the present (lower discount rate) are more likely to become pregnant as they attach a greater value to current benefits and a lower value

[16] The discrepancy between women who miscarried and those who aborted is important (not reported due to a small sample size). Women who miscarried have characteristics similar to those who gave birth whereas women who aborted are more like those who did not get pregnant.

[17] Observed schooling S is less than or equal to potential schooling (unobservable) S^p.

to future costs[18]. This model of decision-making reflects the individual's assessment of the benefits and costs of motherhood vis-à-vis the schooling decision.

Empirically, the model of teenage motherhood is simply defined as a linear function of personal, sociological background and economic characteristics (X_F) and an error term (e_{Fi}) accounting for personal and environmental unobservable characteristics. e_{Fi} is assumed to be normally distributed.

$$F_i^* = b_F X_{Fi} + e_{Fi} \tag{2}$$

The observed fertility outcome can then be modelled as:

$$\begin{cases} F_i = 1 \text{ if } F_i^* > 0 \\ F_i = 0 \text{ if } F_i^* < 0 \end{cases} \tag{3}$$

Hence, a teenager enters motherhood when the perceived utility gains are higher than some threshold. Similarly, the decision to invest in post-compulsory education (S) can be modelled as a dummy, which takes the value of unity when the underlying schooling variable (S^*) is greater than a threshold S_c, where S^* is a function of personal, sociological and economic characteristics (X_S).

$$S_i^* = b_S X_{si} + e_{Si}$$
and
$$\begin{cases} S_i = 1 \text{ if } S_i^* > S_{ic} \\ S_i = 0 \text{ if } S_i^* \le S_{ic} \end{cases} \tag{4}$$

The error terms from the motherhood and schooling equations (ε_S and ε_F) may not be independent if schooling and fertility decisions are both affected by some unobservable family or social characteristics. For example, individual discount rate is unobserved but affects teenage motherhood (Leibowitz *et al.*, 1986 or Wolfe *et al.*, 2001) and schooling (Card, 1999). The correlation between ε_S and ε_F leads to biased estimates of the effect of teenage pregnancy. To deal with this unobserved heterogeneity, we rely on instrumental variable estimates and matching estimates (see below).

4.2 Labour market choices

Teenage motherhood affects early work experience but also adult attachment to the labour market. As 6% of the women in the sample have no work experience, we estimate labour

[18] The interested reader is referred to the extensive discussion in O'Donoghue and Rabin (2000) on rational

market experience by a Tobit model, with left censoring at 0 and right censoring at 210[19]. Teenage motherhood can be instrumented to account for possible unobserved individual heterogeneity.

Teenage motherhood may also have long-term consequences on pay, either directly or indirectly through its effect on education and work experience. A two-sided Roy model is estimated, where the wages of teenage mothers and other women are given by (5).

$$\begin{aligned} w_{0i} &= \delta_0 X_{0i} + \eta_{0i} \quad \text{if} \quad F_i = 0 \\ w_{1i} &= \delta_1 X_{1i} + \eta_{1i} \quad \text{if} \quad F_i = 1 \end{aligned} \tag{5}$$

For each individual, wages are a function of observable characteristics (X_{ji}), returns (δ_j) which may differ between the two groups of women, and normally distributed error terms (η_{ji}). The effect of teenage motherhood on earnings could be estimated as the difference between wages that teenage mothers obtained in later life and those that they would have obtained had they not been teenage mothers. This is widely known as the effect of the treatment on the treated.

$$TT = E(Y_i \mid X, D = 1) - E(Y_0 \mid X, D = 1) \tag{6}$$

This estimation is nevertheless impossible since the second term in (6) is not observed[20]. Instead, one can estimate $E(Y_1 \mid X, D = 1) - E(Y_0 \mid X, D = 0)$ but as the two populations are self-selected, this simple differential is biased. The bias introduced by the self-selection is traditionally corrected by adding a correction term (inverse Mills ratio) in the earnings equation.

Earnings are only observed for participants to the labour market; hence the data at our disposal is affected by another self-selection. Similarly to (2) and (4), we assume that the decision to participate in the labour marked is determined by the following latent equation.

$$P_i^* = \beta_P X_{Pi} + \varepsilon_{Pi} \tag{7}$$

where ε_{Pi} is distributed as a *N(0,1)*. Individuals for whom P^* is greater than a threshold, participate in the labour force.

An accurate estimate of the effect of teenage motherhood on earnings must correct for the selections into teenage motherhood and participation in the labour force. Following Tunali (1986), we assume that the double selection process has the following stochastic specification:

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behaviour and the effect of impatience on the discount rate.

[19] 29 observations with more than 210 months in the labour market were top coded.

[20] See Manski (1995) for an introduction to the identification problem.

$$\begin{bmatrix} h_{0i} \\ h_{1i} \\ e_{Fi} \\ e_{Pi} \end{bmatrix} \sim N \left[0; \begin{bmatrix} s^2_{h_0} & 0 & s_{h_0 e_F} & s_{h_0 e_P} \\ & s^2_{h_1} & s_{h_1 e_F} & s_{h_1 e_P} \\ & & 1 & s_{e_F e_P} \\ & & & 1 \end{bmatrix} \right] \quad (8)$$

This general form allows for the possible correlation between the error terms of the two selection processes. Depending on this correlation, sample selection terms are calculated (see Tunali, 1986 for details).

This cumbersome estimation may nevertheless be inefficient as most of the determinants of earnings would have been either affected by teenage motherhood (schooling, labour market experience) or correlated with its determinants (schooling). We therefore re-estimate the effect of teenage motherhood on the various outcomes of interest with alternative estimates. As seen in (6), the relation of interest can be seen as the effect of the treatment (teenage motherhood) on the treated (teenage mother). One solution to overcome the non-observability of $E(Y_0|X, D=1)$ in (6) is to rely on experimental data, where due to the random allocation of the subjects $E(Y_0|X, D=1) = E(Y_0|X, D=0)$. In the absence of experimental data, Rosenbaum and Rubin (1983) have proposed to match each treated individual with a non-treated individual having identical observable characteristics. The match does not need to be on each characteristic as Rosenbaum and Rubin (1983) have shown that it is equivalent to match on the estimated probability of being in the treated group (teenage mother); individuals whose predicted probability are similar are matched. Following Smith and Todd (2001) notations, we define the probability of following as: $P = Pr(D=1|X)$. If conditional on their observed characteristics, individuals can be paired then the effect of following is simply the mean difference in earnings between all pairs.

$$TT = E(Y_1 \mid X, D=1) - E_{P|D=1}(E_Y(Y \mid D=0, P)) \quad (9)$$

This strategy relies on the conditional independence assumption; conditional on their observed characteristics, the decision to follow is random. Dehejia and Wahba (1999) show empirically that the matched estimates are not particularly sensitive to the specification of the probit but this is in contradiction with Heckman *et al*. (1998) and Smith and Todd (2001). The remaining difficulty is to define pairs; two main methods exist. First the one-to-one match in which individuals, for whom the difference in scores is less than an ad-hoc fixed limit, are matched. A larger bandwidth increases the likelihood of a match (reducing bias) but at the price of the match quality (increasing standard errors). Individuals from the control group may be matched to more than one person from the treated group. The second method

relies on creating a synthetic individual for each teenage mother, which is based on the kernel-weight average of the characteristics of the nearest control persons (Heckman *et al.* (1997).

5. Results

5.1 Post-compulsory education

Two measures of education are used: attendance in post-compulsory schooling and highest qualification obtained at the age of 33. In the first case, the dependent variable is a dummy coded as one when the teenager invested in post-compulsory schooling[21]. Following the previous literature, the determinants of the decision to invest in education include: (1) family characteristics such as parental education, family structure, number of siblings, parental ethnicity (approximated by country of birth), social class of the father, mother's interest in child's schooling; and financial situation at age 16; (2) child's characteristics: test score in English and Maths at age 7, use of public libraries at age 10; and (3) social characteristics, approximated by the type of school attended, and the socio-economic background of the area[22]. Respondents who report themselves as suffering from a long-term illness are dropped (48 observations) as well as those who did not participate in the third wave of the study at age 16 (1416), which leaves us with a sample of 4233 women. To avoid dropping more observations, we include dummies for missing observations of the specified variables; they are never significant.

Table 3 reports the marginal effects, estimated at the sample mean, of these covariates on education choice. Parental education, maternal attention, foreign-born parents and a better social class are associated with more schooling, whereas non-intact family and a large number of siblings reduce educational investment. Surprisingly, financial hardship at age 16 does not affect the educational choice. Personal characteristics of the child also have the expected effect: better test scores, and the use of a public library, improve the likelihood of post-compulsory schooling attendance. Peer effects appear to be important in determining

[21] The NCDS cohort was the first cohort to experience an increase in the school leaving age in England and Wales from 15 to 16.

[22] This is measured as the proportion of fathers in non-manual occupation in the school attended by the respondent. We define 5 quintiles with the fifth one describing a school were more than 80% of fathers are in a non-manual occupation.

post-compulsory schooling decisions: the social environment, as measured by the social class of the fathers of the child's schoolmates, has a significant effect. Being in a school where less than 20% of fathers are in a non-manual occupation reduces the probability of post-compulsory education by 15% compared to a school where more than 80% of fathers are in a non-manual occupation. Also, teenagers who are not in a secondary modern school (the omitted category) are more likely to attend post-compulsory education[23]. The effect is the strongest for grammar and privately funded schools (+22%). Without accounting for the endogeneity of the motherhood decision, a teenage mother is 24% less likely to have invested in post-compulsory education compared to other teenagers. This result is comparable to American evidence; Ribar (1994) estimates that in the US teenage childbearing reduces the chances of completing high school by 23%. Teenage motherhood therefore appears to have a strong negative impact on schooling attainment, however, as previously discussed, this relationship may be over-estimated due to the endogeneity of the fertility decision.

In the second column of Table 3, the instrumental variable estimates are reported (the first stage is reported in Table A1). As no information on the regional provision of family planning[24] is available, the choice of instruments is limited to the personal characteristics of the teenager. Having a teenage mother has been shown to be a strong determinant of teenage motherhood (Kiernan, 1997) but as this is likely to have directly affected the child's upbringing and her educational choices, this characteristic cannot be used as an instrument. Instead, we rely on age at menarche: the younger the age at first menstruation, the longer the spell of potential sexual activity (see Voydanoff and Donnelly, 1990, for evidence). The distribution of age at menarche is shifted to the left for teenage mothers (Figure 1). Age at menarche has been used in numerous research on teenage motherhood (Klepinger *et al*, 1999, for example). Cameron and Taber (2000) propose to regress the instrument on the exogenous variables to provide support for the use of the instrument. Table A1 reports this regression. Only two covariates, mother's education and the number of siblings, are significant. Thus, age at menarche appears to be a valid instrument. Age at menarche is negatively correlated with teenage motherhood (see Table A1), but is thought not to affect schooling on its own[25];

[23] Schooling is separated between state and privately funded schools (known as public schools). Within the state sector, most pupils attend comprehensive schools while some local authorities have maintained the previous system and distinguish between "grammar schools", which after selection, provide an academic education and "secondary modern schools" that are typically more vocationally oriented.

[24] We could have used whether the child benefited from sexual education. This instrument was rejected on two grounds. First, it was badly reported; second, Oettinger (1999) shows that sex education has an ambiguous effect on teenage pregnancy.

[25] Age at menarche is mostly determined by nutrition (Eveleth, 1986) hence it is possible that differences in diet between rich and poor children leads to a correlation between age at menarche and schooling attainment.

adolescents with an age at menarche of 11 are 1.4 percentage point more likely to be teenage mothers than those whose first period started at 13. The other main determinants of teenage motherhood are mothers education and interest in her child, number of siblings, living in an intact family and different measures of the social background of the family: fathers social class, attendance to a grammar school and financial hardship. Each significant variable has the expected effect on teenage motherhood. Accounting for the endogeneity of the teenage motherhood decision does not affect the estimate of its effect on schooling decision. The IV estimate is similar to the probit estimate but less precise. A test of endogeneity (Smith and Blundell, 1986) confirms that similarly to Klepinger *et al.* (1999), endogeneity is not a major issue.

Matched estimates are presented in Table 4 for two bandwidths and two matching techniques. The probability of being a teenage mother is estimated using the same specification as in the first step of the IV estimation. The distribution of these estimated probabilities are reproduced in Figure 2 for matched teen mothers and other women. With the tighter bandwidth, 10 teenage women (out of 229) cannot be matched and are dropped from the analysis. Increasing the bandwidth to 0.01 reduces the dropout for non-match to 3 observations. The fit of the model is not very good; only a handful of teenage mothers are correctly predicted, which could suggest that teenage motherhood mostly stem from non-observable characteristics and thus undermine the results obtained by matched estimates.

Table 4 reports the mean attendance in post-compulsory education for teenage mothers and matched non-teen mothers and the difference between the two groups of women. Reducing the control population to women who have similar characteristics to teenage mothers reduces the negative effect substantially compared to parametric estimates. Relying on one to one match estimates, the differences in educational attainment are halved, while kernel-matches lead to an estimated difference of 17%.

Furstenberg *et al* (1987) report anecdotic evidence that some education takes place as the children of teenage mothers reach school age. In the NCDS, qualifications obtained are reported at age 33 and five categories are defined. An ordered probit is estimated with a specification identical to the one used for the post-compulsory schooling decision. The marginal effects and coefficients, reproduced in Table 5, are similar to those obtained on post-compulsory schooling; children with a more favourable family background, better test scores and peers from more favourable backgrounds are more qualified. Teenage

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However, we do not find a relationship between age at menarche and social class nor financial hardship (see Table A1).

motherhood has a negative effect on qualifications obtained. The marginal effects are calculated for each qualification category. Teenage mothers are more likely than other women to have no, or a low, qualification and are 10 percentage points less likely than other women to have a university or equivalent qualification.

Teenage motherhood has a substantial negative effect on schooling, and reduces the chances of post-compulsory education by 24%. This estimate does not seem to be biased by the endogeneity of the teenage motherhood decision. However, matched estimates reduce this differential to a still substantial 12%-17%. Teenage mothers suffer from a permanent education gap, and by age 33 they are less qualified than other women. These results reflect the difficulty in successfully attending education while taking care of a young child and the lack of adult education opportunities.

5.2 Teenage motherhood and employment experience

The presence of children, by increasing the value of domestic work, increases women's reservation wages and hence inflicts a negative impact on labour force spells. However, the effect of teenage motherhood on experience is ambiguous. Women who do not bear a child as a teenager mostly defer their motherhood decision, thus over the lifetime teenage motherhood could be neutral to work experience[26]. Alternatively, as wages increase throughout the life cycle, forgone earnings at a later point in life are larger than during adolescence. Thus, it is likely that for adult mothers, reservation wages are lower than potential wages, which is typically not the case for teenage mothers. Therefore, we expect teenage motherhood to have a permanent negative effect on work experience. On a sample of slightly younger women, Klepinger *et al.* (1999) estimate that the negative impact of teenage motherhood can reach up to two years of work experience.

The sample is restricted to mothers only (2514 observations). Labour market experience is measured as the total number of months worked since age 16; spells of part-time work are given a weight of 0.5. Figure 3 reports for each number of children, the mean labour market experience for teenage mothers and other mothers. At each family size, teenage mothers have significantly less work experience than other mothers. Multivariate

[26] Differences in age when observed may partially explain the mixed results obtained in the American literature on the effect of teenage motherhood on labour market experience. The negative impact of teenage motherhood picks up early in life but as other women start taking their fertility decision, the differences in work experience between the two groups fades away.

results are presented in Table 6; the specification includes dummies for qualification at the age of 33, ability measures, and number of children.

In general greater qualification is associated with a longer spell in the work force but this is not the case for women with a degree, which may stem from the length of their education spell. The presence of a second child reduces the employment spell of mothers by nearly two years. Mothers of more than two children have about 5 years less labour market experience than mothers of a single child. Teenage motherhood has a permanent effect on labour market experience and is associated with a reduction in employment experience of two and half years. As 6% of the sample is observed to have never worked, we re-estimate the previous model by Tobit, which accounts for the spike in the left tail of the distribution (Column 2). The results are similar to those obtained by ordinary least squares. Finally, the decision to have a child as a teenager and labour market participation may not be exogenous if, unobservable characteristics explaining teenage motherhood and labour market attachment are correlated. Then, the least squares estimate of the effect of teenage motherhood on labour force experience would be biased upwards, as it includes the effect of teenage motherhood and the effect of a lower likelihood to work. Accounting for the endogeneity should reduce the negative effect associated with adolescent motherhood. Work experience is estimated by an instrumental variable where the identifying variables are age at menarche, financial situation at age 16 and birth order; older siblings play a role model and thus may affect the decision taken by teenagers but not participation in the labour market. Results are reported in the third column of Table 6; accounting for endogeneity, the negative effect associated with teenage motherhood on labour force experience disappears. However as the standard error on this estimate is large, we have to reject the endogeneity of the childbearing decision (prob F=0.331). This estimate suggests that teenage mothers have unobserved characteristics that make them less attached to the labour market, when accounting for it the negative effect of teenage motherhood disappears.

The main determinant of female labour market participation is usually found to be the number of children (Joshi *et al.*, 1996). However the decision to participate in the labour market and the choice of the number of children are endogenous. Furthermore, as noted previously, women who experienced teenage motherhood have on average more children at age 33 than other mothers. Thus, the number of children should not be included in our previous regression. Results for estimates obtained without the inclusion of number of children lead to similar results for OLS and Tobit estimates and can be obtained from the authors. However, IV estimates presented in the last column of Table 6 are substantially

different from previous IV estimates. Since teenage mothers have on average more children by the age of 33 than non-teen mothers, the teen mother dummy also partially captures the children effect. Hence, the estimated effect of teen motherhood rises and is in line with least squares estimates.

As with the schooling decision, we also calculate matched estimates of the impact of teenage motherhood on labour market experience. Relying on the first step of the IV estimates (with and without children), teenage mothers are matched to other mothers. The difference in labour market experience between teen mothers and the control group ranges from 30 to 39 months (Table 7A and 7B). The matching estimates are dependent on the assumption of conditional independence, which as argued previously may not be fulfilled.

Depending on the assumptions, the effect of teen motherhood on labour market experience ranges from 0 up to three years. These figures are within the range of estimates reported by American studies but the imprecision prevents any policy recommendations to be made. Our favoured estimates (IV with children) would support the idea that teenage motherhood mostly shift participation to the labour force from the early years of adulthood to later on in life.

5.3 Teenage motherhood and adult wages

Adult wages are observed at the age of 33 and the log of hourly gross wage is computed. The sample size drops to 1918 mothers with complete information on earnings and working status, out of which 1196 work. Only 134 women who experienced teenage childbearing are present in this reduced sample, out of which 99 are working. This is a significantly larger proportion of employment than for mothers who did not experience a teenage birth (61% working).

As a benchmark, least squares regression estimates are reported in the first column of Table 8. The model includes highest qualifications obtained by age 33, years of labour force participation split between teenage participation (before the age of 20), and adult participation and measures of ability at age 7. Some characteristics of the job are also included such as the size of the firm, and two dummies for sector and part-time work[27]. The personal and job covariates have the expected effects. More educated mothers with greater ability, especially in English, earn more than other mothers. Teenage participation in the

[27] The decision to work part-time is likely to be endogenous but we do not deal with this issue here.

labour force has a negative effect as it typically captures the effect of leaving school early, while the effect of adult work experience is less clear. This is typical of cohort data, where variation in experience is mostly captured by length of education and for women, the number of children. A firm size effect is observed and so is the penalty for working part-time. Mothers working in the private sector earn 10% less than mothers working in the public sector; this rather surprising result probably reflects differences in union status between the two sectors. Teenage motherhood has an effect on adult wages over and above the education and labour force experience. Accounting for differences in educational attainment and early labour force participation, women who experienced early motherhood are paid 12% less than other women.

The least square estimates are biased upward due to selection into employment. Estimates of the participation decision are reproduced in Table A2. This decision is identified by variables representing preference for work (previous participation, mother's participation). Women whose mother was working when they were 7 are more likely to be working at the age of 33, which could reflect a role model played by the mother. Previous participation has a mixed effect on current labour market attachment. Mothers who were working at the age of 16 are 8% more likely to be working but those who did work at age 23 are 13 % less likely to be working. This could reflect differences in the timing and age of children. Mothers who were working at the age of 23 may have postponed childbearing longer and have younger children at age 33 than other mothers. Variables capturing the opportunity cost of labour market participation, number of children and marital status, are also included. These variables are often assumed to be endogenous to the decision to participate and may be correlated with teenage motherhood. Teen mothers have significantly more children by the age of 33 than other mothers but no difference in marital status is observed. Having 2 children (more than 2) reduces the probability of participation by 6% (19%) compared to having only 1 child whereas having a partner or husband increase this probability by 8.5%. A second selection equation, excluding number of children and marital status is also presented in column 2 of Table A2. Interestingly, teenage motherhood is associated with a greater likelihood of working at the age of 33. Similarly, participating teenage mothers are more likely to do so full-time (49% vs. 35%). By the age of 33, women who have been teenage mothers are more likely to have completed their fertility and thus work full-time than other mothers who typically have to cope with younger children. Thus, the pay differential between women who experienced teen motherhood and other mothers cannot be explained by the so-called "part-time wage gap" (Joshi *et al*. 1999). The selection

term is positive and significant; women more likely to work are also those with the highest potential earnings. Accounting for selection, the effect of teenage motherhood on pay is halved and becomes insignificant (column 2, Table 8). Similar results are obtained with the second selection model (column 4).

These estimates may still be biased if the decision to have a child as a teenager and the decision to participate in the labour force have correlated error terms (8). Hence, these two decisions are estimated by a bivariate probit. Results for labour market experience are similar to those reproduced in Table A2. The decision to become a teenage mother is estimated with a parsimonious specification (Table A3). The main determinants are the social class of the family and whether the teenager lives with both parents at age 16. Three instruments are also included and have the expected effects. Teenagers with an older age at menarche reduce their risk of teenage motherhood by nearly 1% a year, whereas, teenagers whose families are in financial trouble and those with a larger number of older siblings are significantly more at risk. The hypothesis that the two selection equations are independent is rejected at the 1% level; some unobserved characteristics are common to both decisions.

Correction terms for the selection into teenage childbearing and labour force participation are included in the log wage regression. In column 3 of Table 8, results for the selection including children and marital status, are presented. Most of the estimates are similar to the values obtained by least squares and Heckman two steps. The selection terms are both positive and significant; working teenage mothers have higher potential wages than non-working teenage mothers. Accounting for the double selection in teenage motherhood and labour force participation, the effect of teenage pregnancy on pay doubles and reaches the least squares level. Women, who experienced teenage motherhood, are paid 10% less than other mothers even after accounting for selection. Surprisingly, accounting for both selection into teenage motherhood and participation in the labour market, increase the pay penalty associated with being a teenage mother. This phenomenon may be due to the interaction of both decisions. When the selection equation does not include children and marital status, the estimates obtained by double selection (column 5) remain similar. The correction terms are substantially higher and the negative impact of teenage motherhood is reduced by about 20%.

Teenagers who experience child bearing suffer from a pay penalty ranging from 5% to 12%. Teenage motherhood appears to have permanent scarring effects on the wages commended by women, but those may have been previously over-stated. These estimates are in line with results from the US but may still be biased as educational choice, work

experience, labour force participation and wage are interacted decisions that should be estimated simultaneously. The difficulty of such an approach would be to find enough valid exclusion variables. In Table 9, results obtained with matching estimates are presented. The matching is based on the expected probabilities of teenage motherhood, as estimated in the previous IV results (Table A3). As these estimates do not account for selection in the labour market, they are expected to be biased upwards. Teenage mothers suffer from a pay penalty ranging from 14% to 22%, which is significantly larger than the parametric estimates previously presented.

6. Conclusion

We started this study by quoting the Prime Minister warning the general public about the disastrous long-term consequences of teenage childbearing. We also find that teenage motherhood has a negative effect on education, labour market attachment and pay, but the negative impact of teenage motherhood might have been previously over-stated. Teenagers who carry a child are not the same as those who do not. Accounting for this unobserved individual heterogeneity largely reduces but does not eliminate the negative effects associated with teenage motherhood. On the other hand, matched estimates, which rely on the assumption that selection into teenage motherhood is based on observable characteristics, are much higher. These estimates may be biased, as the assumption of conditional independence is not fulfilled. To summarise, we find that having a child as a teenager reduces the chances of post-compulsory schooling by 12% to 24%. The long-term consequences on labour market outcomes are also dire. Labour market experience of teenage mothers is reduced by up to 3 years and the pay differential between women who bore a child as a teenager and other women ranges from 5% to 22%. Teenage motherhood appears to have long-term consequences on the career development of women and hence is likely to lead to the transmission of poverty from one generation to the next. It would thus appear that policies preventing the long-term consequences of teenage motherhood should attach focus first on helping teenage mothers to achieve their potential schooling. The effect of teenage motherhood may be substantial even after accounting for educational differential, which suggests that teenage mothers have difficulties combining labour market participation and child rearing. A second type of intervention should aim to ease the integration into the labour

market. Easy access to childcare and Working Families Tax Credit are promising strategies to fight against the permanent negative effects of early childbearing. The efficiency of such policies and their cost efficiency would have to be examined in the future.

Table 1: First pregnancy outcomes

	Never pregnant	Currently pregnant	Birth	Miscarriage	Abortion	Total
Pregnant by 16	-	-	58	4	35	*97*
Pregnant by 18	-	-	333	25	48	*406*
Other	1070	60	3444	416	204	*5194*
Total	*1070*	*60*	*3835*	*445*	*287*	*5697*

Table 2: Outcome by age 33 by teen fertility group

	Birth before 18	Conception, no birth	No conception before 18
Attending post-compulsory education	0.094 [328]	0.322 [87]	0.446 [4528]
No qualification by age 33	0.149	0.051	0.045
Other and CSE	0.236	0.119	0.125
O level and low vocational	0.308	0.373	0.254
A-level and medium vocational	0.231	0.220	0.279
Degree and high vocational	0.077	0.237	0.297
Months in labour force	55.10 (51.05) [328]	104.45 (59.60) [87]	109.8 (58.15) [4528]
Working	0.625 [328]	0.713 [87]	0.700 [4528]
Pay per hour	3.933 (1.595) [168]	5.047 (2.729) [50]	5.718 (2.977) [2493]
Number of children if greater than 1	2.699 (1.174) [328]	2.227 (0.837) [66]	2.052 (0.828) [3299]

Note: Mean (Standard deviation) (Number of observations).

Table 3: Post-compulsory education (marginal effects)

	Probit	IV
Teen mother	-0.238	-0.231
	(0.036)	(0.389)
Father Education	0.021	0.021
	(0.006)	(0.006)
Mother Education	0.054	0.053
	(0.008)	(0.008)
Both parents @16	0.074	0.077
	(0.029)	(0.030)
nbr of sibling @16	-0.032	-0.033
	(0.006)	(0.008)
Mother foreign born	0.133	0.132
	(0.052)	(0.053)
Father foreign born	0.182	0.181
	(0.053)	(0.053)
use of library @10	0.087	0.087
	(0.023)	(0.023)
Mother interest @7	0.089	0.088
	(0.020)	(0.022)
Math test @7	0.040	0.040
	(0.011)	(0.011)
English test @7	0.086	0.086
	(0.013)	(0.014)
Comprehensive	0.096	0.097
	(0.024)	(0.024)
Grammar	0.222	0.223
	(0.037)	(0.037)
Other LEA supported	0.073	0.069
	(0.078)	(0.076)
Private	0.237	0.238
	(0.058)	(0.058)
Father SOC professional & manager	0.266	0.260
	(0.054)	(0.059)
Father SOC 3 non manual	0.176	0.169
	(0.058)	(0.061)
Father SOC 3 manual	0.128	0.121
	(0.052)	(0.054)
Father SOC 4 n m	0.112	0.101
	(0.091)	(0.090)
Father SOC 4 manual	0.058	0.052
	(0.057)	(0.062)
Financial trouble @16	-0.039	-0.042
	(0.037)	(0.042)
Peers: quintile 1	-0.147	-0.147
	(0.047)	(0.048)
Peers: quintile 2	-0.103	-0.104
	(0.048)	(0.049)
Peers: quintile 3	-0.096	-0.096
	(0.048)	(0.048)
Peers: quintile 4	-0.016	-0.017
	(0.055)	(0.055)
Observations	3757	3757
R^2 / pseudo R^2	0.2288	0.2216
Instrument		Menarche
Smith-Blundell Chi^2		Pr=.493

Note: Also includes dummies for the observations missing on the following variables: parental education and location of birth, number of siblings, use of library, ability test missing, type of school, social class of fathers and social class of peers' fathers. Standard error corrected for heterogeneity.

Table 4: Matched estimates of differences in post compulsory education

	One to One		Kernel	
	Bandwidth=0.01	Bandwidth=0.001	Bandwidth=0.01	Bandwidth=0.001
Teen mother (T=1)	0.097	0.100	0.096	0.097
Other women (T=0)	0.221	0.228	0.263	0.272
P(T=1)-P(T=0)	-0.124 (0.035)	-0.128 (0.036)	-0.167 (0.024)	-0.175 (0.027)

Note: Standard error for Kernel-based estimates are obtained by bootstrap (500 replications).

Table 5: Qualifications at age 33: Ordered probit (marginal effects)

	No qualification	CSE and other	Low voc and Acad.	Med. voc and acad	High voc and acad	Coeff	St.Err
Teen mother	0.028	0.066	0.049	-0.040	-0.102	-0.359	(0.091)
Dad education	-0.002	-0.007	-0.007	0.003	0.014	0.043	(0.013)
Mother education	-0.005	-0.014	-0.014	0.006	0.027	0.082	(0.015)
Both parents @16	-0.006	-0.017	-0.017	0.008	0.032	0.101	(0.064)
Nbr siblings	0.003	0.010	0.011	-0.004	-0.020	-0.063	(0.013)
Mother foreign born	-0.010	-0.034	-0.040	0.009	0.075	0.219	(0.112)
Dad foreign born*	-0.004	-0.013	-0.014	0.005	0.026	0.079	(0.110)
library*	-0.011	-0.031	-0.030	0.015	0.057	0.183	(0.050)
interest*	-0.008	-0.026	-0.027	0.010	0.050	0.155	(0.044)
Math test	-0.007	-0.021	-0.021	0.009	0.040	0.123	(0.024)
English test	-0.012	-0.037	-0.037	0.016	0.071	0.220	(0.027)
Comprehensive	0.000	0.000	0.000	0.000	0.000	-0.001	(0.049)
Grammar	-0.017	-0.059	-0.076	0.011	0.141	0.403	(0.078)
Other LEA	0.015	0.039	0.033	-0.022	-0.065	-0.218	(0.170)
Private school	-0.011	-0.035	-0.043	0.009	0.080	0.232	(0.122)
Father prof & manager	-0.024	-0.080	-0.102	0.014	0.192	0.551	(0.119)
Father SOC 3 non man	-0.017	-0.061	-0.081	0.008	0.151	0.428	(0.124)
Father SOC 3 manual	-0.015	-0.047	-0.051	0.017	0.096	0.293	(0.111)
Father SOC 4 n m	0.008	0.022	0.020	-0.011	-0.038	-0.124	(0.183)
Father SOC 4 manual	-0.012	-0.038	-0.046	0.011	0.085	0.250	(0.119)
Financial trouble	0.010	0.028	0.026	-0.015	-0.050	-0.163	(0.083)
Peers: quintile 1	0.013	0.035	0.032	-0.017	-0.061	-0.199	(0.115)
Peers: quintile 2	0.003	0.009	0.009	-0.004	-0.018	-0.056	(0.113)
Peers: quintile 3	0.001	0.004	0.004	-0.002	-0.007	-0.023	(0.113)
Peers: quintile 4	0.001	0.003	0.003	-0.001	-0.005	-0.016	(0.118)

Note: Also includes dummies for the observations missing on the following variables: parental education and location of birth, number of siblings, use of library, ability test missing, type of school, social class of fathers and social class of peers' fathers. Standard error corrected for heterogeneity.

Table 6: Work experience in months at age 33

	OLS	Tobit	IV1	IV2
Teen birth	-31.555	-32.942	-0.097	-37.764
	(3.427)	(3.836)	(34.330)	(31.764)
Other qual.	4.621	6.120	8.944	5.061
	(17.759)	(17.258)	(18.577)	(18.798)
CSE	21.228	24.328	22.782	21.134
	(5.786)	(5.468)	(6.107)	(6.458)
Vocational	26.375	29.545	28.446	27.125
	(5.660)	(5.311)	(6.222)	(6.638)
O levels	26.126	29.499	29.405	26.143
	(7.003)	(7.237)	(8.001)	(8.788)
Voc. Medium	26.654	30.110	29.835	27.109
	(5.649)	(5.315)	(6.815)	(7.250)
A levels	28.806	32.350	31.107	30.941
	(7.250)	(7.355)	(7.910)	(8.204)
Voc. High	29.319	32.862	32.792	32.403
	(5.932)	(5.564)	(7.168)	(7.588)
Degree	0.742	4.112	4.649	3.584
	(6.104)	(6.193)	(7.610)	(8.039)
Math test	2.112	2.234	2.260	2.939
	(1.118)	(1.176)	(1.151)	(1.196)
English test	3.585	4.016	3.974	4.160
	(1.239)	(1.221)	(1.320)	(1.353)
2 children	-27.162	-27.169	-27.316	
	(2.596)	(2.477)	(2.608)	
Children >2	-48.252	-48.913	-50.696	
	(2.882)	(2.836)	(3.910)	
Constant	106.423	102.743	102.504	79.689
	(5.796)	(5.137)	(7.360)	(7.746)
Observations	2514	2514	2514	2514
z-value in 1st step			Mena:-2.94	Mena:-3.23
			birth: 4.04	Birth:4.45
R^2 pseudo R^2	0.21	0.02	0.18	0.19
Exogeneity test			P=0.331	P=0.993
Over identification			P=0.050	P=0.048

Note: Also includes dummies for the observations missing on the following variables: ability tests and qualifications. Standard error corrected for heterogeneity.

Table 7A: Matched estimates of differences in labour market experience: including control for children

	One to One		Kernel	
	Bandwidth=0.01	Bandwidth=0.001	Bandwidth=0.01	Bandwidth=0.001
Teen mother (T=1)	57.812	59.006	57.536	57.812
Other mother (T=0)	89.565	89.128	90.378	90.272
P(T=1)-P(T=0)	-31.754 (5.869)	-30.123 (6.009)	-32.841 (3.737)	-32.461 (4.524)

Note: Standard error for Kernel-based estimates are obtained by bootstrap (500 replications).

Table 7B: Matched estimates of differences in labour market experience: excluding control for children

	One to One		Kernel	
	Bandwidth=0.01	Bandwidth=0.001	Bandwidth=0.01	Bandwidth=0.001
Teen mother (T=1)	57.568	59.125	57.536	57.568
Other mother (T=0)	95.184	97.017	96.670	95.772
P(T=1)-P(T=0)	-37.617 (5.828)	-37.892 (5.792)	-39.134 (3.938)	-38.205 (4.593)

Note: Standard error for Kernel-based estimates are obtained by bootstrap (500 replications).

Table 8: Log hourly pay at age 33

	OLS	Heckman	Double selection	Heckman	Double selection
		Selection (1)		Selection (2)	
Teen mother	-0.118	-0.053	-0.102	-0.045	-0.084
	(0.037)	(0.042)	(0.040)	(0.041)	(0.040)
Other Qual.	0.122	0.129	0.117	0.132	0.121
	(0.148)	(0.161)	(0.155)	(0.164)	(0.155)
CSE	0.025	0.038	0.027	0.041	0.040
	(0.048)	(0.052)	(0.055)	(0.053)	(0.055)
Vocational	0.086	0.112	0.090	0.116	0.117
	(0.048)	(0.052)	(0.054)	(0.053)	(0.055)
O-levels	0.164	0.173	0.159	0.179	0.169
	(0.076)	(0.082)	(0.079)	(0.083)	(0.079)
Vocational medium	0.094	0.111	0.093	0.112	0.105
	(0.048)	(0.052)	(0.055)	(0.053)	(0.055)
A-levels	0.096	0.100	0.090	0.104	0.096
	(0.066)	(0.072)	(0.075)	(0.073)	(0.075)
Vocational high	0.427	0.484	0.441	0.492	0.495
	(0.056)	(0.062)	(0.060)	(0.062)	(0.063)
Degree	0.590	0.621	0.588	0.625	0.614
	(0.073)	(0.079)	(0.072)	(0.080)	(0.072)
Experience 16-20	-0.095	-0.088	-0.091	-0.084	-0.090
	(0.039)	(0.039)	(0.035)	(0.039)	(0.034)
(Exp 16-20)^2	0.015	0.016	0.015	0.015	0.016
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Experience 20-33	-0.002	-0.004	-0.003	-0.005	-0.004
	(0.007)	(0.007)	(0.008)	(0.007)	(0.008)
(Exp 20-33)^2	0.002	0.002	0.002	0.002	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Math test	0.010	0.020	0.010	0.021	0.019
	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)
English test	0.036	0.030	0.028	0.030	0.023
	(0.011)	(0.012)	(0.013)	(0.013)	(0.013)
Private/public	-0.108	-0.108	-0.108	-0.112	-0.110
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Size <25	-0.206	-0.206	-0.203	-0.210	-0.200
	(0.030)	(0.029)	(0.030)	(0.029)	(0.030)
Size 25-99	-0.122	-0.118	-0.119	-0.121	-0.118
	(0.030)	(0.029)	(0.033)	(0.029)	(0.033)
Size 100-499	-0.061	-0.057	-0.057	-0.060	-0.054
	(0.033)	(0.032)	(0.034)	(0.031)	(0.034)
Part time	-0.125	-0.134	-0.131	-0.131	-0.133
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
IMR: Participation		0.260	0.139	0.296	0.411
		(0.045)	(0.093)	(0.034)	(0.131)
IMR: Teen mother			0.067		0.074
			(0.035)		(0.034)
Constant	1.642	1.454	1.445	1.432	1.278
	(0.072)	(0.084)	(0.116)	(0.079)	(0.129)
Observations	1196	1918/1196	1918/1196	1918/1196	1918/1196
R-squared/ log like	0.49	-1576.7	0.49	-1587.7	0.49

Note: Standard error for Kernel-based estimates are obtained by bootstrap (500 replications).

Table 9: Matched estimates of differences in log hourly pay: include control for children

	One to One		Kernel	
	Bandwidth=0.01	Bandwidth=0.001	Bandwidth=0.01	Bandwidth=0.001
Teen mother (T=1)	1.294	1.293	1.284	1.294
Other mother (T=0)	1.515	1.528	1.456	1.437
P(T=1)-P(T=0)	-0.220 (0.057)	-0.234 (0.060)	-0.172 (0.044)	-0.143 (0.054)

Note: Standard error for Kernel-based estimates are obtained by bootstrap (500 replications).

Table A1: IV first step - Education choice at 16 and Cameron and Taber Test

	Teen motherhood	Teen motherhood (mfx)	Menarche
Menarche	-0.081	-0.007	
	(0.025)	(0.002)	
Father Education	-0.009	-0.001	-0.006
	(0.028)	(0.002)	(0.015)
Mother Education	-0.092	-0.008	0.035
	(0.036)	(0.003)	(0.018)
Both parents @16	-0.179	-0.017	-0.086
	(0.096)	(0.010)	(0.071)
nbr of sibling @16	0.094	0.008	0.098
	(0.019)	(0.002)	(0.015)
Mother foreign born	-0.187	-0.014	-0.176
	(0.232)	(0.014)	(0.120)
Father foreign born	-0.052	-0.004	-0.235
	(0.205)	(0.016)	(0.122)
use of library @10	-0.018	-0.002	-0.008
	(0.085)	(0.007)	(0.058)
Mother interest @7	-0.263	-0.021	0.019
	(0.089)	(0.007)	(0.051)
Math test @7	-0.036	-0.003	-0.033
	(0.044)	(0.004)	(0.027)
English test @7	-0.052	-0.004	-0.046
	(0.040)	(0.003)	(0.030)
Comprehensive	0.013	0.001	-0.004
	(0.090)	(0.008)	(0.060)
Grammar	-0.407	-0.026	-0.066
	(0.195)	(0.009)	(0.093)
Other LEA supported	0.063	0.006	-0.117
	(0.263)	(0.025)	(0.192)
Private	0.060	0.005	-0.087
	(0.317)	(0.029)	(0.126)
Father SOC 1&2	-0.579	-0.037	0.023
	(0.173)	(0.009)	(0.124)
Father SOC 3 non manual	-0.321	-0.022	0.028
	(0.189)	(0.010)	(0.131)
Father SOC 3 manual	-0.196	-0.016	-0.064
	(0.131)	(0.010)	(0.112)
Father SOC 4 n m	0.027	0.002	-0.077
	(0.250)	(0.022)	(0.217)
Father SOC 4 manual	-0.398	-0.026	-0.018
	(0.150)	(0.008)	(0.122)
Financial trouble @16	0.291	0.030	-0.052
	(0.103)	(0.013)	(0.088)
Peers: quintile 1	0.282	0.028	-0.056
	(0.328)	(0.037)	(0.116)
Peers: quintile 2	0.331	0.032	-0.049
	(0.329)	(0.036)	(0.114)
Peers: quintile 3	0.173	0.016	0.059
	(0.333)	(0.035)	(0.114)
Peers: quintile 4	0.098	0.009	-0.049
	(0.352)	(0.034)	(0.119)
Constant	0.892		12.138
	(0.716)		(0.310)
Observations	3757	3757	3757
Pseudo R^2	0.121	0.121	0.026

Note: Also includes dummies for the observations missing on the following variables: parental education and location of birth, number of siblings, use of library, ability test missing, type of school, social class of fathers and social class of peers' fathers. Standard error corrected for heterogeneity.

Table A2: Determinant of labour force participation (Marginal effects)

	Selection 1	Selection 2
Teen mother	0.135	0.110
	(0.040)	(0.042)
Other Qual.	0.024	0.038
	(0.175)	(0.171)
CSE	0.022	0.019
	(0.063)	(0.063)
Vocational	0.064	0.067
	(0.060)	(0.059)
O-levels	0.035	0.043
	(0.085)	(0.083)
Vocational medium	0.036	0.042
	(0.061)	(0.061)
A-levels	0.008	0.024
	(0.084)	(0.082)
Vocational high	0.152	0.158
	(0.057)	(0.057)
Degree	0.048	0.063
	(0.071)	(0.070)
Math test	0.021	0.024
	(0.013)	(0.013)
English test	-0.014	-0.011
	(0.014)	(0.014)
2 children	-0.055	
	(0.028)	
More than 2 children	-0.190	
	(0.034)	
Partner	0.086	
	(0.039)	
Working at 16	0.081	0.078
	(0.027)	(0.027)
Working at 23	-0.134	-0.100
	(0.024)	(0.024)
Mother working	0.058	0.058
	(0.024)	(0.024)
Observations	1918	1918

Robust standard error in parentheses .

Table A3: Double selection: Teenage mother (marginal effects)

	Teen motherhood
Math test	-0.009
	(0.006)
English test	-0.009
	(0.006)
Parents	-0.026
	(0.017)
Father SOC prof & manager	-0.057
	(0.012)
Father SOC 3 non manual	-0.034
	(0.015)
Father SOC 3 manual	-0.012
	(0.018)
Father SOC 4 non manual	0.007
	(0.038)
Father SOC 4 manual	-0.040
	(0.013)
Menarche	-0.009
	(0.004)
Financial trouble @16	0.080
	(0.026)
Birth order	0.008
	(0.003)
Constant	-0.299
	(0.478)
Observations	1918
Pseudo R^2	0.092

Note: Also includes dummies for the observations missing on father social class. Standard errors are corrected for heterogeneity.

Figure 1: Distribution of age at menarche for teen-mothers and other teenagers

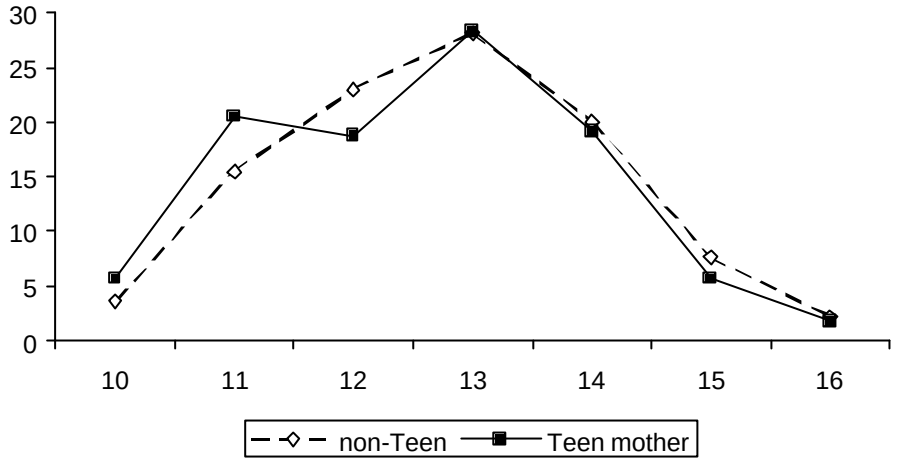
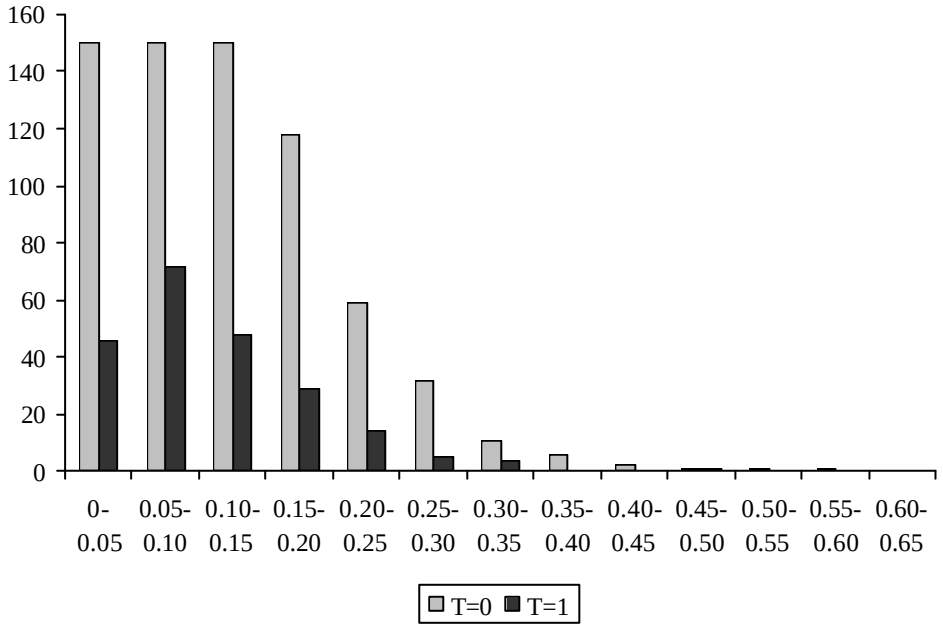
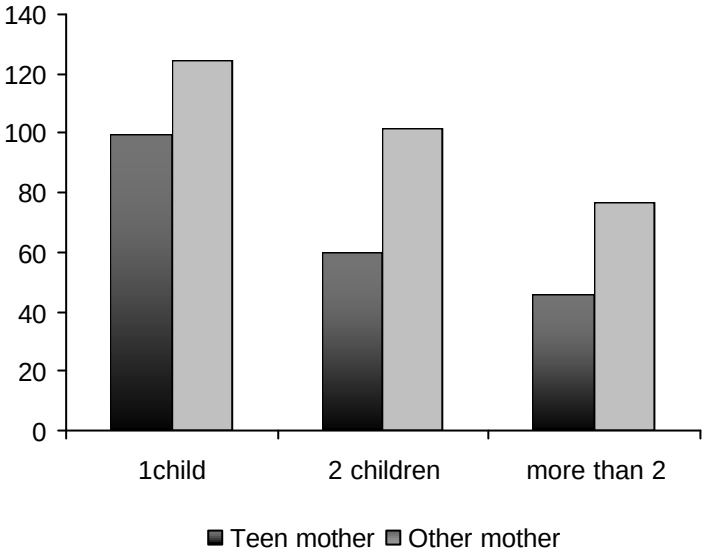


Figure 2: Distribution of propensity scores on educational choices for matched observations:



Note: The first three bounds are truncated for presentation purposes. The number of control observations are 1999, 975, 323 respectively. The matched observations were obtained using bandwidth (0.001) and one to one match. Distributions obtained with other bandwidths were similar.

Figure 3: Months of participation in the labour market by age 33



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