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Fertility and Mothers' Labor Supply: New Evidence Using Time-to-Conception

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Abstract
We analyze the impact of children on their mothers' labor market outcomes in the UK. We use time-to-conception of the first child as an exogenous variation in the probability of having more children. We find that having more children decreases the propensity to work in long part-time jobs but does not reduce participation for high- and intermediate-skilled mothers. For low skilled women, the impact on participation is large and negative. We show that the selection into having a second child is positive for for low-skilled mothers and negative for high-skilled and intermediate-skilled mothers. Women most attached to the labor market are also those that tend to have only one child among high- and intermediate-skilled women. The reverse is true for low-skilled women: those least attached to the labor market are also less likely to have a second child. This appears to be driven by unobserved attributes that negatively affect both labor market outcomes and the likelihood to remain in a relationship with the father of the first child, which in turn negatively affects the probability to have a second child.

Keywords: labor force supply of women, infertility shocks, time0ti-conception, causal impact
JEL codes: J13; J21; J22

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1 Introduction

Women's increasing participation in the labor market has been a major trend in the second half of the 20th century (Blau and Kahn, 2007; Goldin, 2006). This has been accompanied by a decrease in the gender pay gap, as women's education has caught up with that of men's and they increasingly work in once male-dominated jobs. Another well-documented phenomenon is that the process of convergence between male and female labor market outcomes has slowed down in many countries over the past decades (see for instance Kleven et al. (2015)).

Recent evidence suggests that a large part of the remaining wage gap can be attributed to changes in work behavior after the arrival of children. Most empirical work on the impact of motherhood on the labor market outcomes of women has found that mothers experience worse outcomes than childless women. They work fewer hours and they are less likely to work for pay (Blundell et al., 2011; RAND, 2014), they are more likely to work part time (Joshi et al., 1996, 1999), have lower earnings (Waldfogel, 1998; Fernández-Kranz et al., 2013; Viitanen, 2014), which could be related to the occupational segregation due to their higher propensity to work part-time (Manning and Petrongolo, 2008), and are less likely to be promoted to manager and more likely to work in lower level occupations (Kleven et al., 2015). The same correlation has been observed for higher parities: the more children women have, the lower their labor force participation rate (Blundell et al., 2011).

The interpretation of the relationship between children and their mothers' labor market outcomes is not straightforward due to the potential bias that comes from negative (or positive) selection on unobservables into motherhood or larger families.[1]

[1]In general the bias is thought to work in the direction that the negative labor market impact of children is overstated by simple correlations and that women with children would have worked or earned less than childless women, even if they had decided not to have children (Browning, 1992).

In this paper, we analyse the impact of children on their mother's labor force supply in the UK. In particular, we focus on a specific margin: we estimate the impact of having more than one child on labor supply outcomes of women in comparison to women having only one child.

To identify the effect of having more than one child on the labor force supply of mothers, we use an exogenous shock on fertility based on the time-to-conception of the first child. Experiencing infertility when conceiving the first child, measured as a time-to-conception larger than 12 months, is associated with a decrease in the probability of having subsequent children. In our data, women who experienced infertility when conceiving their first child are 15 percentage points less likely to have a second child. Time-to-conception can be interpreted as a signal for the unobserved biological ability of the couple to conceive a child, and carry it to term.

Infertility is often discovered by couples when they decide to try for a child, and it is mostly related to gynaecological factors in the woman such as ovulatory disorders or damage to the fallopian tubes. Increasingly, male factors also cause infertility in couples (Carlsen et al., 1992). Time-to-conception is not related to preferences of parents and observed labor histories of women. It introduces exogenous variation in the number of children a woman has and can be used to estimate the causal effect of having an additional child on female labor supply.[2]

Other sources of exogenous variation in the number of children have been used in the empirical literature. The most common ones are positive shocks on fertility: having twins (Rosenzweig and Wolpin, 1980; Bronars and Grogger, 1994) and the sex-composition of the

[2]While Miller (2011) uses the time-to-conception for the first birth as an instrument for the age of the mother at first birth to study its effect on wages, this instrument has not been used to study the effect of the number of children on labor force participation.

first two children (Angrist and Evans, 1998). More recently, negative shocks on fertility have also been used as sources of variation in the number of children: self-reported infertility (Aguero and Marks, 2011) or miscarriage (Hotz et al., 2005). Recent papers use success in infertility treatment as a random shock on comparable women (Lundborg et al., 2014). These instruments allow to analyse the impact of having an additional child in the labor market at a specific parity: having three children for the sex-composition of the first two children, having a first child for successful infertility treatment method.

Few papers study the specific margin of having more than one child, though 2-child families are now very common in industrialized countries. They all use the twin instruments and they find small to strong impact of the second child: Bronars and Grogger (1994) find that having more than one child does not impact the participation to the labour market for married white mothers but decreases the labor force participation for black unmarried women by 10 percentage points. Frenette (2011) finds that having more than one child is associated with a decrease in 3 to 5 weekly hours worked in Canada and Moschion (2013) finds that having more than one child decreases the labor force participation of mothers by 10 percentage points in Australia[3]. In this paper, we identify the impact of children at the same margin as papers based on the twin instrument. However, we estimate a different Local Average Treatment Effect (LATE) as our source of variation is a negative shock on fertility whereas having twins is a positive shock on fertility.

We show that the impact of having more than one child is heterogeneous in the UK population. An additional child reduces the propensity to work full-time among all women, but it does not impact participation in the labor market of high- and intermediate-skilled

[3]Table A.1 in the online appendix provides a non exhaustive summary of the main results on the causal impact of children on mothers' labor supply.

women in the long-run. However, it is large and persistent for low-skilled women. By exploring heterogeneous effects, we shed light on a different source of endogeneity. We expect the OLS estimates to overstate the negative effect on labor force participation because women who are less attached to the labor market are more likely to have children and to retreat from the labor market. The expected sign of the bias is observed for high- and intermediate- skilled women but the reverse is true for low-skilled women: here OLS understates the negative labor market effect of children. This appears to be driven by unobserved attributes that negatively affect both labour market outcomes and the likelihood to remain in a relationship with the father of the first child, which in turn negatively affects the probability to have a second child..

The paper is structured as follows: section 2 introduces the UK context, section 3 presents the data, section 4 describes the empirical strategy, section 5 provides the results and section 6 gives a discussion of the results. Section 7 concludes.

2 The UK context

Since 1975, the employment rate of 20-54 year-old women, especially of married mothers, has increased fast in the UK. The employment rate of 20-54 year-old married mothers jumped from 40% to 70%, while the employment rate of 20-54 year-old lone mothers remained stable at 60%. Among 25-54 year-old mothers of young children, the increase is even steeper, from 25% to 60% (Blundell et al., 2011).

This increase in the employment rate of mothers is related to the increase in the educational level of women, as well as a movement to promote equal opportunity and equal treatment of women. In the 1980s, childcare services were not available or very expensive, but the expansion in part-time employment made family life compatible with work (Fagan and Norman, 2012).

Using data from the British 1958 Cohort Study, Joshi et al. (1996) show that part-time work was the major way to reconcile family life and labour market participation in the UK during the 1980's. In the 1990, the Labour government initiated a series of work-family reconciliation policies, encouraging women to go back to work (Burgess et al., 2008). Since the 2000s, policymakers have devoted increasing attention to the challenge of enabling parents to access high-quality, cost-effective early childhood education and introduced two major policies: increased public provision of childcare services and support with childcare costs (Brewer et al., 2014). The increase in the provision of childcare services resulted in over 920,000 childcare places being created since 1998, following the launch of the National Childcare Strategy. Support with childcare costs is provided through employer-provided vouchers that are tax advantaged; support for low-income working families via tax credits; and access to a free part-time nursery place for all 3- and 4-year-olds and disadvantaged 2-year-olds.

This special attention to low-income families is related to the polarized social context in the UK: demographic behavior and employment conditions are different for low-skilled people compared to high-skilled people. Rendall et al. (2009) highlight the polarization of age at first birth in Britain: women in low-skilled occupations have their first child primarily in their late teens and early 20s, and women in other occupations have their first child increasingly later in life. Ní Bhrolcháin and Beaujouan (2013) show that in recent cohorts, low-educated people in a partnership are more likely to be cohabiting rather than being married than high-educated people. Low-educated women are also more likely to have children while cohabiting, as they are younger when they have their first child. Cohabitation in turn is associated with higher levels of family break-up, putting both mothers and children of cohabiting families at higher risk of poverty (Berrington, 2015).

Moreover, working part-time reinforces the polarization of women across the type of occupations they have (Manning and Petrongolo, 2008), which has been boosted by technological changes (Goos and Manning, 2007). This polarization calls for studying heterogenous effects of children, depending on the type of occupation a woman has.

3 Data

3.1 The Millennium Cohort Study

We use data from the Millennium Cohort Study (University of London. Institute of Education. Centre for Longitudinal Studies, 2012, 2015a,b), a sample of babies born between September 2000 and November 2001 in the UK. In the first wave, the data contains detailed information on the babies' parents' education, labor force participation and wages, as well as family information including data on the pregnancy with the cohort baby and time-to-conception (TTC). In the following waves, the data also includes variables on the child's development. To date, five waves of the MCS have been collected, observing the mothers, their partners and the cohort child or children in case of multiple births at about 10 months, 3 years, 4-5 years, 6-7 years and 10-12 years of age. In the first wave, almost 19,000 families were interviewed. About 14,000 families were interviewed at wave 2 and 3, implying an attrition of about 22%. At wave 4 and 5, about 12,500 families were interviewed, which means an attrition rate of about 33% [4].

We select a sub-sample of relevant families to study the impact of having subsequent

[4] Attrition is related to country, education and age of the mother. We use weights provided in the data that correct for attrition and oversampling of certain groups (Hansen, 2012). Restricting the sample to individuals who are present in all waves reduces our sample size and the power of our estimates for high- and intermediate-skilled, but it increases the power of our results for low skilled women. It does not change our results. See online appendix.

children on their mother's labor market outcomes. First of all, we select mothers for whom the millennium cohort child is the first child. We keep women aged 20 and up to and including 36 years old at birth of their first child because we want to exclude teenage pregnancies and we want to keep mothers who are at risk of having a second child. That is, we keep those who are not too old at the birth of the first child, as the likelihood of women above that age having a second child is low.[5] As the infertility[6] history measured through TTC is linked to both the mother and the father, we exclude single mothers and those whose relationship status is unknown when the first child is on average 10 months old. This is because first, single mothers are significantly less likely to have a second child, regardless of whether or not they experienced infertility, and second, because infertility can be due to both female and male factors. Because infertile couples who eventually managed to have a child and remain together are more likely to be stable couples, and relationship stability is related to labor market outcomes, we restrict our sample to stable couples before the birth of the child.[7] We use the duration between moving in and the decision to have a child as a proxy for the stability of the couple. We keep women who moved in with their partner between 10 years before the decision to have a child and 1 year after the decision to have a child. By doing so, we are able to observe fertile and infertile women for each duration of having lived together, for both low, intermediate and high-skilled women. We also exclude mothers whose pregnancy resulted in twins because this means that they already have two children when the survey starts. We use women who have no more than 3 children in total, as those who have more than 3 children might have very different unobserved characteristics than other women. Finally, we exclude

[5]In the MCS, only 10% of children are born to mother's aged 37 and above.

[6]As a simplification, from now on we will refer to secondary infertility as simply infertility because all the women in our sample have had a child and we do not study primary infertility in this paper.

[7]See Schmidt et al. (2005) and Martins et al. (2014).

individuals for whom we do not have information on basic characteristics such as education, their age, and on whether or not they had a severe illness because we need this information to control for characteristics that are likely to be correlated with infertility.

We end up with a sample of 2,917 women when the first child is 6-7 years old and 2,774 women when the first child is between 10-12 years old. As we pool both waves, we end up with a sample of 5,691 observations.

In the following, we consider heterogeneous effects by splitting our sub-sample into two groups: high- and intermediate-skilled women, and low-skilled women. The occupational group is defined using the occupation women have at wave 1 or the occupation they had *during* or *before* pregnancy for those who are on leave, inactive or unemployed at wave 1 using the Standard Occupational Classification 2000 framework (SOC 2000). High- and intermediate-skilled women include women whose occupation is classified as large employer, high manager, higher professional, low professional/high technical, lower managers, high supervisory and intermediate. Never employed women who are in education during pregnancy are also classified as high- and intermediate-skilled women. Low-skilled women include women whose occupation is classified as small employers, self-employed non profitable, lower supervisors, lower technical, semi-routine, and routine. Women who are not in education and whose occupation before pregnancy is not known are excluded from our sample. They would represent about 2% of the weighted sample if we were to include them. The occupation women have is likely to change over time. However, more than 80% of our sample of low-skilled women do not change from a low-skilled occupation to a high or intermediate skilled occupation more than once. More than 90% of our sample of high- and intermediate-skilled women do not change from a high or intermediate skilled occupation to a low-skilled occupation. So the type of occupation a

woman has is quite stable over time.

3.2 Descriptive statistics

We study various measure of labor supply at the extensive and intensive margin: being active (i.e. being employed, on leave or looking for a job at the date of the interview), being employed or on leave (vs. inactive or unemployed), working strictly more than 15 hours per week (vs. being inactive, unemployed, or working less than 15 hours per week), working strictly more than 20 hours per week (vs. being inactive, unemployed, or working less than 20 hours per week), working strictly more than 30 hours per week (vs. being inactive, unemployed, or working less than 30 hours per week) and the number of hours worked per week (we set the number of hours worked for inactive and unemployed women at zero). The means of the different outcomes are given in table 4. The participation rate is high, with 82% of women participating in the labor market when the first child is 6-12 years old. The rate is lower when it comes to more restrictive measures of labor supply: 63% of women work more than 15 hours per week, 47% work more than 20 hours per week and only 23% work more than 30 hours per week when the first child is 6-12 years old. High- and intermediate-skilled women are more likely to participate in the labor market and be employed, and work more hours than low-skilled women.

Descriptive statistics on the labor market outcomes we study are given in table 1. Our key endogenous variable is a dummy variable indicating if the mother has had at least one additional child after the cohort child at the time of the interview. About 78% of women had at least one additional child by the time their first child was 6-12 year-old: 59% only had only one additional child and 19% had two additional children. The proportion is higher for high-

and intermediate-skilled women: 79% of them have had at least one additional child, while this number is 75% for low-skilled women. When they had an additional child, the youngest child is on average 5.3 year-old for high- and intermediate-skilled women, and 5.2 for low-skilled women and the cohort child is on average 8.7 year-old for both groups.

Table 1 also gives some descriptive statistics on the control variables. Time-invariant characteristics include a dummy for being employed during pregnancy, for being non-white, the highest level of education of mothers, the country of residence at wave 1 and the relationship status between the parents at wave 1. The main difference between high- and intermediate-skilled and low-skilled women is that low-skilled women are less educated and more likely to be cohabiting than high- and intermediate-skilled women. Time-varying characteristics include the relationship status of the mother and the mother's age. The proportion of single or cohabiting mothers is higher among low-skilled than among high- and intermediate-skilled women. Low-skilled women tend to be younger than high- and intermediate-skilled women.

4 Empirical strategy

4.1 Time-to-conception of the first child

In the medical literature infertility corresponds to the failure to conceive and carry to term a baby after one year of regular intercourse without contraception. The risk of infertility in women increases with age and other health conditions (obesity, chronic illnesses like diabetes). Apart from those obvious characteristics, infertility is related to limited physical ability to conceive and carry a baby to term, and this limited ability is often unknown to the woman until it tries to conceive a child. Our data includes information on the cause for infertility for

a sub-sample of women who experienced difficulties to conceive. The main causes of infertility for women in our data are: ovulatory disorders (25%), damaged fallopian tubes (20%), factors in the male causing infertility (30%), and uterine or peritoneal disorders such as endometriosis (10%). For the remaining 25% of cases, no additional investigations were carried out and the reason for infertility remained unknown. Infertility can be assumed to be randomly assigned in the population. Our measure of infertility can be interpreted as a signal for the unobserved underlying biological ability of the couple to have a child.

In order to measure if a couple is likely to experience difficulty to conceive, we can mimic the medical literature and use information on the time-to-conception for the first child. The measure of time-to-conception we have is reconstructed from answers to two questions asked in wave 1.

(i) "Were you planning to get pregnant at that time or was it a surprise?"

When they answer they were planning to get pregnant at that time, women are asked:

(ii) "How long did it take you to get pregnant with *name of the cohort member*?"

An additional module surveys women who received assisted fertility to get pregnant. We construct a variable *time-to-conception* taking 6 values as described in Table 2. We consider that a woman suffers from infertility if the time-to-conception for the first child is strictly larger than 12 months or if she received assisted fertility treatment. Using our definition, we estimate that about 9.6% of our sample of first time mothers can be considered as infertile[8]. The share of infertile women is a bit higher among high- and intermediate-skilled women than among low-skilled women, especially because high- and intermediate-skilled women are more

[8]We check the robustness of our results against other definitions of infertility. We considered as infertile all women who took 12 months or more to conceive. The results are similar to the results with this stricter definition of infertility, but the strength of the instrument is lower. Defining infertility as taking 9 months or more to conceive results in a weak instrument.

likely to have received fertility treatment. This could be explained by the high cost of fertility treatment.[9] This is an issue here as it could mean that there is a selection of high- and intermediate-skilled women into pregnancy if among two equally (in)fertile women, high- and intermediate-skilled women are more likely to end up with a child because they are more likely to receive fertility treatment. We provide robustness checks excluding women who received assisted fertility treatment in section 6.2.

Although the share of women experiencing infertility is difficult to measure, our estimate of the population of infertile women is similar to different benchmarks in the literature. The medical literature suggests that 10.5% of women world-wide can be considered as suffering from infertility while 1.9% of women world-wide suffer from sterility (Mascarenhas et al., 2012), that is, they are unable to conceive altogether. Using data from English parishes during the Industrial Revolution in England, Klemp and Weisdorf (2011) show that about 20% of women had not conceived a child one year after their wedding. This estimation can be used as a broad measure of infertility as delaying pregnancy after marriage was uncommon in historical England.

Our time-to-conception variable is self-declared, thus it is prone to misreporting of the actual duration and to misunderstanding of the question. Being surprised could be interpreted as an unplanned pregnancy but also as an unexpectedly short time-to-conception. This misunderstanding of the question is not an issue here: in both cases, women will be considered as fertile women. It would be a problem if women were surprised if they were not expecting to get pregnant anymore because they started to try a long time before getting pregnant. This

[9]However, in the UK, public health services provide up to three cycles of fertility treatment free of charge for women below the age of 35. Long waiting times and ineligibility of older women may mean that those who can afford private treatment are more likely to get it than those who cannot afford it. Statistics for 2013 show that about 40% of fertility treatments undertaken in the UK were publicly funded, with the remainder being privately funded (HFEA, 2014).

would be an issue as we would classify women as fertile that are infertile and it would reduce the strength of our instrument as it would reduce the observed likelihood of having a second child among women classified as fertile. We assume that this type of misunderstanding, if it happens, is low enough to be negligible.

4.2 Time-to-conception as an instrument

Our empirical strategy relies on using infertility, measured by a dummy variable indicating if the couple took strictly more than 12 months to conceive the first child, as an instrument for having a second child.

The conditional correlation between the probability of having subsequent children and the dummy for infertility is given by the first stage regression presented in the Table 4. Women who experienced infertility at the conception of their first child are 15.2 percentage points less likely to have an additional child, measured at the time their first child is 6-7 and 10-12 years old. Infertile low-skilled mothers (respectively high- and intermediate-skilled women) are 19.1 percentage points (respectively 13.8 percentage points) less likely to have an additional child. This difference might be related to a better access to infertility treatment among high- and intermediate-skilled mothers or to a higher level of stability of their relationships. The instrument is strong: the F-stat is larger than 39 on the whole sample, larger than 24 for the high- and intermediate-skilled group, and larger than 16 for the group of low-skilled mothers.

We then check if the instrument is as good as randomly assigned in our population by performing balancing tests between the fertile and infertile population. Infertility is related to some characteristics we observe: being overweight (Brewer and Balen, 2010) and having long standing illnesses, and the age at the decision to conceive the child. However, as we

only keep women aged 20 to 36 at birth of their first child (i.e. the oldest are around 35 at the time of conception) in our sample, they are too young to experience infertility problems due to age (Madankumar et al., 2003). So infertility should be as good as randomly assigned conditionally on the variables "being overweight" and "having a long standing illness". We use the same strategy as in Aguero and Marks (2011) to test for conditional independence and we estimate the following model:

$$V_i = \beta_1(1 - Infertile_i) + \beta_2 Infertile_i + \rho_2 BMI_i + \rho_3 Illness_i + \epsilon_i$$

where V_i is a characteristic of woman i, BMI_i is an indicator for being overweight before pregnancy, $Illness_i$ is a dummy variable indicating long-standing illness before pregnancy. Results for the balancing tests[10] are given in Table 3. It shows that being infertile is not related to important characteristics such as the mother's degree and being employed while pregnant. However, among high- and intermediate-skilled women, non-white mothers tend to be more fertile. Infertile mothers tend to be younger at conception but this is mechanically due to our age restriction at the date of birth. Infertile women's partners tend to be more educated, but only among high- and intermediate-skilled women. Moreover, infertile women are less likely to be cohabiting than fertile women, especially among low-skilled women. This could reflect the fact that couples in the process of conceiving a child are likely to marry, indicating that those who took longer to conceive are more likely to be married at the birth of their first child. We provide tests for the exclusion restriction in section 6.1.

[10]We estimate the same equation adding age at the decision to have the first child and results are similar.

4.3 Estimation strategy

We pool the last two waves of the survey. So, we analyse an average impact of having an additional child when the first child is 6-7 year-old or 10-12 year-old. Among those who have additional children, the youngest child is on average 5.3 years old.

We estimate the following model:

$$Outcome_i = \alpha + \beta K_i + X_i'\gamma_1 + H_i'\delta + \epsilon_i \tag{1}$$

where the subscript i refers to the individual. $Outcome_i$ denotes the labor force outcome we study, K_i is a dummy variable indicating the mother had subsequent children after the first child and is potentially endogenous. X_i' are variables controlling for time-varying variables such as the relationship status and the education of the partner, which is changing if the partner changes, and time-invariant controls, such as demographic characteristics and the level of education of the mother when their first child was born. H_i' are variables controlling for health at the time of birth of the first child. We estimate the model by 2SLS, using a dummy for infertility as an instrument for having subsequent children. First, we estimate the model on the complete sample of mothers. Then, we estimate it on the subsample of high- and intermediate-skilled women and on the sample of low-skilled women separately, assessing the heterogeneity of the impact among the two sub-populations.

5 Results

The results of the estimation of equation 1 are shown in Table 4, which is split into different panels that refer to the different sub-populations. For each panel, the first line corresponds

to the OLS estimation of the model 1. The second line gives the IV estimation of the model 1. The third line presents the estimation of the reduced form, and represents an estimation of the Intention-to-treat (ITT) parameter. It is obtained by replacing K_i by the dummy variable indicating if the woman is infertile. The columns provide the results for the different outcomes.

The OLS regressions show that having at least one additional child is associated with a 10.8 percentage point decrease in the labor force participation for all mothers, and it is lower for high- and intermediate-skilled (8.6 percentage point decrease) compared to low-skilled women (15.2 percentage point decrease). Considering all women together, the causal impact of having an additional child shown in the IV estimates of Panel A is very close to 0. But for high- and intermediate-skilled women, the estimated impact is positive while it is negative for low-skilled women, although not significant for both sub-groups. Iacovou (2001) found similar results for the impact of the third child in the UK, using British Household Panel Survey (BHPS) data and the sex-composition of the first two children as an instrument for having a third child. Results on the employment status (being employed or on leave, rather than unemployed or inactive) are very similar to the results on the participation status, indicating that mothers of young children are not more likely to be unemployed.

Turning to different measures of working hours, the impact of having additional children exhibits interesting non-linearities. The OLS estimations shows that the decrease in the number of hours worked associated with having additional children is U-shaped: having more children is associated with a large decrease in the labor force supply for an intermediate number of hours worked (approx. 15 to 30 hours per week), but not for a small number of hours nor a large number of hours. Having subsequent children is associated with a 11.7 percentage points decrease in being employed, with a 20.0 percentage points decrease in being employed

more than 15 hours per week, a 24.5 percentage points decrease in being employed more than 20 hours per week, but a 21.7 percentage points decrease in being employed more than 30 hours per week. We provide a more complete picture of this phenomenon in fig. 1, which gives the OLS and IV estimates, when the outcome is defined as "working more than X hours per week", making X varies from 0 to 50. The outcomes being employed, working more than 15, 20 or 30 hours per week are specific examples of these constructed outcomes.

The U-shaped decrease is not as pronounced for high- and intermediate-skilled women before 30 hours per week, but the gap between mothers with more children and mothers with one child narrows for working more than 35 hours per week, i.e. working full time. For low-skilled mothers, the U-shaped decrease is more pronounced, low-skilled mothers with 2 or 3 children are 29 percentage points less likely to work more than 20 hours per week than mothers of one child, but the gap narrows to 19.6 percentage points when it comes to working more than 30 hours per week. Women who had only one child as well as women who had more than one child tend to participate in the labor market and to be employed, but not to work full-time. So the OLS does not point out large differences between these two groups. However, women with two or more children have shorter part-time jobs, they work 7.5 hours less per week than women with one child. The difference is 6.7 hours for high and intermediate-skilled women, and 9.1 hours for low-skilled women.

The IV estimates tend to confirm this U-shape relationship. We estimate that women who had additional children are respectively 15.1, 20.6 and 25.5 percentage points less likely to be working more than respectively 15, 20 and 30 per week, but only the estimate for working more than 30 hours per week is significant. Having subsequent children decreases the number of hours worked by 8.8 (significant). The impact of having more children is not

found to impact significantly high- and intermediate-skilled women. However, the estimates show that the impact of subsequent children is more negative when the outcomes is working more hours. Figure 1 indicates that the impact is U-shaped: the magnitude of the difference increases with the number of hours worked considered, it is the strongest when the outcome is defined as working more than 27, 28 or 29 hours per week, and the magnitude of the difference decreases afterward. Concerning low-skilled mothers, the impact of having subsequent children is larger and stronger than for high and intermediate-skilled women: low-skilled women who had subsequent children are about 40 percentage points less likely to work more than 15 hours per week (non significant) and 47.4 percentage points less likely to work more than 20 hours per week, than women who had only one child. The impact is smaller when the outcome is working more than 30 hours per week. Figure 1 shows that although not always significant, the impact of having subsequent children is 40 to 50 percentage points, and stable with the number of hours considered, between 5 and 30 hours per week. Low-skilled women decrease their labor force supply by 18 hours when they have additional children. The results are consistent with Joshi et al. (1996) and Del Boca et al. (2009): the availability of part-time jobs supports the labor force participation of mothers.

The IV results suggest the OLS coefficients tend to be downwardly biased for high- and intermediate-skilled women, and upwardly biased for low-skilled women. The sign of the bias for the high-skilled population is consistent with selection into larger families of less career oriented women. When we compare those that had two children with those that had only one child because they were infertile, we can control for the selection of the highly ambitious women into having a smaller sized family. The average participation among one-child women is contaminated by the presence of women with unobserved characteristics that make them

more likely to participate in the labor market and have less children. This is the same type of selection that most papers find (to cite a few: Angrist and Evans, 1998; Aguero and Marks, 2011; Goodman et al., 2004). With respect to low-skilled mothers, the bias works in the opposite direction. This is driven by the fact that the observed labor force supply of women with only one child is contaminated by the presence of a large amount of mothers who have broken up with the fathers of the first child in this group. Table 5 shows that low-skilled women are more likely to break up (column 1 of Table 5). This is highly correlated with the relationship status at birth of the first child, as the coefficient on low-skilled tend to be not significant when the relationship status at wave 1 is controlled for (column 3 of Table 5). Table 5 also shows that women who break up are less likely to have an additional child. As a consequence, being more likely to be single, low-skilled mothers are also less likely to have additional children. Sorting into stable couples that do not break up is likely to be (positively) correlated with unobservable characteristics that also affect labor force participation. This result sheds light on a different source of endogeneity and exhibits the nature of the population of compliers: couples reacting to the IV are more stable couples than the couples who may not have an additional child whatever their fertility status, the never-takers. Yet, couples reacting to the IV might be less stable couples as compared to couples who may have a child, whatever their fertility status, the always-takers. The same sign of the bias has been found in Angrist and Evans (1998) (Table 10) for women who did not graduate from high school.

Following Angrist and Pischke (2009) and as described in the web appendix, we can identify some characteristics of the population of compliers. First, the population of compliers represent 15% of high and intermediate-skilled women and 21% of the population of low-skilled women. Among women who did not have an additional child, about 7% are compliers, i.e.

they did not have an additional child because they experienced infertility problems. Among high and intermediate-skilled women, mothers of a non-white child are less likely to comply, as well as mothers whose partners' qualification is lower than an A-level. Mothers whose partner has no qualification and who are cohabiting at birth are more likely to comply to their infertility status. Among low-skilled women, younger mothers, mothers of a non-white child or whose partner has no degree are the least likely to comply. Mothers who have an A-level or more degree and cohabiting couples at birth are most likely to comply. This analysis reveals that compliance with the fertility status is indeed related the the cohabitation status at birth, suggesting that it is related to the stability of the couple. It might also be related to cultural factors.

We also look at the impact of having an additional child on household income and earnings, and labour market outcomes of partners. Results can be found in Table A9 of the online appendix. OLS estimates suggest that gross weekly household income goes up for those who have an additional child: by 13.4 percentage points for the whole sample, 11.8 percentage points for households of high-skilled mothers and 15.3 percentage points for households of low-skilled mothers. This seems to be driven by an increase in hourly earnings, both for mothers and their partners. On average, mothers' hourly gross wages increase by around 0.7, which is mainly driven by high-skilled mothers. For partners, hourly gross wages go up by approximately 1.8 for the whole sample (2 for partners of high-skilled mothers, and 1.5 by partners of low-skilled mothers). Causal estimates of the impact of an additional child on household income and hourly earnings do not show significant effects. The exception is the IV estimate of the impact of an additional child on the employment probability of partners of low-skilled mothers, which goes down by 14.7 percentage points.

To sum up, women with one child among the high- and intermediate-skilled are more likely to be women who choose to have one child, maybe for career reasons, whereas low-skilled women with one child are disproportionately those who break up with the fathers of their first child.

6 Discussion of results

In this section we discuss potential threats to the identification strategy and present tests and robustness checks.

6.1 Exclusion restriction

Our results give the causal impact of having an additional child on the labor supply of mothers if the instrument can be considered as good as randomly assigned. In order to interpret our results as causal impacts, the instrument should impact the labor outcomes of the mother only through its impact on the probability of having additional children. In this section we do some tests to check whether the assumption is likely to hold.

First, we test if mothers' attitudes toward family and work balance tend to shift as a result of experiencing infertility. The results are presented in Table 6. Data in wave 1 include information on values related to family and professional life. We consider how women observed in wave 4 or 5 in our sample answered to these questions in wave 1, controlling for their characteristics at wave 1. Notice that in wave 1, some women are still on maternity leave, while others have returned to work. Among women who returned to work, infertile women are not more likely to cite their career as the main reason to return to work, indicating that experiencing infertility did not impact their attachment to the labor force. Among women who

have not returned to work, infertile women are not more likely to state that they prefer taking care of their child as the main reason for not returning to work among high- and intermediate-skilled women. We were not able to conduct the same test for low-skilled women as very few low-skilled infertile women had not returned to work at the time of the first interview (9 to 10 months after giving birth). Low-skilled infertile women tend to be less likely to agree with the statement that the "Family is happier if the mother works". However, they are not more likely to agree with the statement that the "Family suffers if the mother works". So, while infertile women are not strongly in favor of mothers working, they do not make a strong case against it. Being infertile does not change mothers' plans to have more children and they are not more likely to agree with the statement that a "Couple should not separate if they have children". To sum up, it seems that being infertile is not related to large changes in the mother's attitudes toward family and working for high- and intermediate-skilled women.

Then, we test if family life after the birth of the child of infertile women tends to be different from that of fertile women. We test if the duration between the first and the second child tend to be larger for infertile women in comparison to fertile women, among women who had more than one child. If the timing is different, say that infertile women take more time to have their second child, it would mean that what we interpret as the effect of the second child is related to the fact that infertile women have younger children. We estimate a Cox duration model, controlling for family characteristics at wave 1 and report the coefficient on infertile women in the first panel of Table 7. The duration between the first and the second child tends to be lower, although not significantly, for high and intermediate-skilled infertile women, compared to high and intermediate-skilled fertile women. Among the low-skilled, there is no difference in the distance between first and second children for infertile and fertile women.

Infertility can be a stressful experience for a couple, so it could be related to a higher risk of divorce. However, the medical and psychological literature shows that infertility tends to have a positive impact on the couple's stability (Schmidt et al., 2005). Unsuccessful fertility treatment could lead to a higher risk of divorce (Martins et al., 2014) but in our sample, all couples managed to have their first child. Indeed, we find that infertile women are not more likely to break up after the birth of the first child (second Panel of Table 6. We further test whether infertility is likely to have an effect on relationship quality. We find that infertile low-skilled women are slightly more likely to state that they are happy in their relationship, and that they feel closer to their partners, after the birth of the first child. For high-skilled women the relationship is slightly negative for the former outcome and zero for the latter outcome. However, none of the coefficients for either low- or high-skilled mothers is significant.[11]

In the third Panel of Table 6 we test if infertility is related to attrition. We find that infertile women, both high- and intermediate skilled and low-skilled, are not more likely to drop out of the sample. To conclude, the behavior of infertile women after the birth of their first child does not seem to be different from the behavior of fertile women.

Finally, we test if infertile women tend to exhibit different attachment to the labor market around the birth of the first child. Indeed, infertility tends to increase pre-birth experience (Miller, 2011), so it could increase labor market attachment as women have something better to go back to. If this were the case, we would interpret the impact of a different attachment to the labor market as the impact of having additional children. Results are presented in Table 7. We find that infertile women are equally likely to be employed during pregnancy as fertile women. Among women who were employed during pregnancy, the probability of having returned to work at wave 1 is slightly higher for infertile low-skilled women as compared to

[11]These additional results are available upon request from the authors.

fertile low-skilled women. However, among women who have returned to work by wave 1, the length of the maternity leave taken as well as wages are similar between fertile and infertile women.

To conclude, we tend to reject alternative explanations for our results. First, being infertile does not seem to change dramatically mothers' attitudes toward work and family. Our estimates do not result from a shift in mothers' priorities in life subsequent to discovering they are infertile. Second, being infertile is not related to different life events after the birth of the first child. So it seems that the any potential stress related to the conception period does not strongly affect family events afterwards. Lastly, being infertile does not seem to be related to a stronger or weaker attachment to the labor market.

6.2 Robustness checks

The selection of mothers in a stable relationship into the sample explains part of the bias of the OLS estimates. In this section, we test the robustness of our results on different subsamples of women who are more likely to be in stable relationships.

The selection into the observed sample is related to attrition. Indeed, leaving the sample can be related to events correlated with the birth of a second child or labor supply, such as moving to a bigger apartment or getting a better job. First, we restrict our sample to women present at all waves, in order to check if more stable women exhibit different behaviors.[12] When restricting our sample, we find that the impact of infertility on having additional children is very similar. We find that the estimates of additional children on labor market outcomes are similar to the estimates on the whole sample, although the magnitudes tend to be lower for high- and intermediate-skilled women. Attrition is not related to the fertility status of women.

[12]Results are given in the web appendix.

As a second check we exclude mothers who state they had been surprised by their pregnancy from our sample, as the fact that they did not plan their first pregnancy could suggest that they are also less likely to plan their career.[13] Surprised women are more likely to cohabit at wave 1, to break up later in life and to have only one child. On this new subsample - excluding "surprised" women - the first stage is stronger: the F-stat are larger (except for low-skilled mothers) despite the smaller sample size and the magnitude of the coefficient is similar. The results are very similar to the results on the whole sample. This is consistent with the assumption that surprised women are similar to fertile women once we control for education.

We noted in section 4 that high- and intermediate-skilled women could have better access to assisted fertility treatments. Thus, there could be a selection of infertile high- and intermediate-skilled women into motherhood. We restrict our sample to women who did not receive a fertility treatment[14]. Not surprisingly, this sample restriction weakens our instrument, especially for low-skilled women. The F-stat is about 25 for high-and intermediate-skilled women, but it falls to 8 for low-skilled women. The estimates of the impact of an additional child on labor force outcomes of high- and intermediate-skilled women are not much affected by the sample restriction. However, for the low-skilled, the IV estimate indicates that the negative impact of an additional child is stronger for low levels of labor force supply, but it is lower for high level of labor force supply, though none of these estimates are significant. This interesting result can be interpreted as a consequence of a weaker instrument. But it could also reveal that among infertile women, those who received a fertility treatment are the most attached to the labor market.

[13]Results are given in the web appendix.
[14]Results are given in the web appendix.

6.3 Other dimensions of heterogeneity

We expand our analysis to other sources of heterogeneity. First, we distinguish couples living in a disadvantaged neighborhood at birth of the first child from other couples[15]. The disadvantaged neighborhoods correspond to the oversampled neighborhoods in the survey, based on neighborhood rates of child poverty and high concentration of ethnic minorities. Interestingly, the results are very similar as the results based on the occupation strata. The OLS estimates exhibit the same U-shape impact of having additional children on the labor force supply of mothers, both for mothers living in advantaged and disadvantaged neighborhoods. The instrument remains strong on the sub-population of women living in advantaged neighborhoods, but the F-stat is only 9 for the sub-population of couples living in disadvantaged neighborhood. The IV estimates are very similar to the estimates on occupation strata, but they are not significant. The similarities in the results indicate that low-skilled women may also live in disadvantaged neighborhoods or that low-skilled women and women living in disadvantaged neighborhoods share the same difficulties in conciliating family life and working hours. It could be related to a lower provision of childcare services in these disadvantaged neighborhoods or a supply of childcare service which is not adapted to the working conditions of low-skilled women who are more likely to work in shift and to have inflexible working schedules.

Then, we split our sample between women who have a A-levels or higher levels of education and women whose degree is lower than A-level. The instrument is quite strong on both sub-populations, and infertile women are 16 percentage points (resp. 14) less likely to have an additional child among high-educated women (resp. low-educated). Interestingly, the results are similar across both sub-populations. It indicates that the differences in the impact of

[15]Results are presented in the online appendix.

having more children on the labor supply of mothers is not driven by education, but by the type of occupation women hold and the neighborhood they live in.

7 Conclusion

By using the Millennium Cohort Study (MCS) data for the UK, this paper studies the impact of having two or more children compared to only one on the mother's labour force participation and employment. To solve the problem of omitted variable bias, we use the time to conceive the first child as a source of variation in family size. A time to conceive a first child larger than one year is associated with a decrease in the probability of having additional children. As with previous evidence for developed countries, the findings indicate that the impact of having more children is not as strong as the OLS estimates suggest. However, when investigating the heterogeneity in the population, the results diverge. For high- and intermediate-skilled women, the findings reveal that family size does not impact employment. Therefore, for this sub-population, the decrease in labor supply associated with having a second child observed in OLS estimates is due to the selection of less career-oriented women into larger families. For low-skilled women, we find that the probability of working an intermediate number of hours (long part-time jobs) is strongly reduced when a woman has subsequent children, and more so than suggested by simple OLS regressions. This result indicates that the selection into larger family sizes goes in the other direction for this sub-population: women less attached to the labor market are also more likely to break up and to have only one child. These results reveal that attention should be paid to the type of couples affected by fertility shocks. Our results also show that the impact of having more than one child is non-linear in the number of hours worked: it does not strongly impact the participation in the labour market (which is affected

by the third child) nor the propensity to work full-time (which is already affected by the first child) but it impacts the propensity to have a long part-time job. This shows that the impact of children varies a lot according to their parity.

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Tables and Figures

Table 1: Descriptive statistics

	All women		High and interm.		Low skilled	
	Mean	s.d.	Mean	s.d.	Mean	s.d.
Endogenous variable						
Has add. child	0.78	(0.41)	0.79	(0.41)	0.75	(0.43)
Has 2 children	0.59	(0.49)	0.60	(0.49)	0.57	(0.49)
Has 3 children	0.19	(0.39)	0.19	(0.39)	0.18	(0.39)
Time-invariant mother's characteristics						
Employed while pregnant	0.95	(0.22)	0.97	(0.17)	0.89	(0.31)
Non white	0.06	(0.24)	0.06	(0.23)	0.08	(0.27)
Above High School	0.43	(0.50)	0.52	(0.50)	0.20	(0.40)
A levels	0.13	(0.33)	0.14	(0.35)	0.09	(0.29)
Below A Levels	0.41	(0.49)	0.33	(0.47)	0.62	(0.49)
No qualifications	0.03	(0.18)	0.01	(0.11)	0.09	(0.29)
Married at wave 1	0.72	(0.45)	0.76	(0.43)	0.61	(0.49)
Cohabiting at wave 1	0.28	(0.45)	0.24	(0.43)	0.39	(0.49)
England	0.82	(0.38)	0.82	(0.38)	0.84	(0.37)
Wales	0.05	(0.21)	0.05	(0.21)	0.06	(0.23)
Scotland	0.10	(0.30)	0.11	(0.31)	0.07	(0.26)
Northern Ireland	0.03	(0.17)	0.03	(0.17)	0.03	(0.18)
Mother's characteristics when first child is 6-7 or 10-12						
Married	0.70	(0.46)	0.75	(0.44)	0.59	(0.49)
Cohabiting couple	0.15	(0.35)	0.12	(0.33)	0.21	(0.40)
Single	0.15	(0.36)	0.13	(0.34)	0.21	(0.41)
Age of the youngest child (if >1 child)	5.28	(2.52)	5.33	(2.50)	5.17	(2.58)
Age of oldest child (MC)	8.72	(1.97)	8.72	(1.97)	8.72	(1.96)
Mother's age	38.40	(4.44)	39.15	(4.10)	36.42	(4.66)
Observations	5,691		3,975		1,716	

Source: Millennium Cohort Study - Waves 4 and 5.
Notes: Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children.

Table 2: Time to conception - Mothers observed in wave 4 or wave 5

	All women		High and interm.		Low skilled	
	N	%	N	%	N	%
None, pregnancy was a surprise	1,635	26.7	972	23.1	663	36.0
> 0 and ≤ 6 months	2,913	52.3	2,191	55.4	722	44.1
> 6 and ≤ 12 months	615	11.4	433	11.7	182	10.7
> 12 months	370	6.3	250	6.0	120	7.1
Assisted fertility	158	3.3	129	3.7	29	2.1
	5,691		3,975		1,716	

Source: Millennium Cohort Study - Wave 1.
Notes: Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children.

Table 3: Balancing test

	All mothers				*High and Interm. skilled*				*Low skilled*			
	Fertile	Infertile	Test		Fertile	Infertile	Test		Fertile	Infertile	Test	
Characteristic	β_1	β_2	$\beta_1 - \beta_2 = 0$		β_1	β_2	$\beta_1 - \beta_2 = 0$		β_1	β_2	$\beta_1 - \beta_2 = 0$	
Mother's characteristics												
Age at decision to try for 1st baby	28.409	27.551	0.858	[0.000]	29.103	28.107	0.996	[0.000]	26.378	25.683	0.695	[0.045]
Employed while pregnant	0.949	0.949	-0.000	[0.994]	0.972	0.968	0.004	[0.676]	0.882	0.887	-0.005	[0.856]
Non white	0.068	0.043	0.025	[0.024]	0.059	0.031	0.029	[0.021]	0.091	0.078	0.013	[0.573]
No qualifications	0.033	0.042	-0.010	[0.239]	0.014	0.020	-0.006	[0.280]	0.088	0.113	-0.025	[0.297]
Below A Levels	0.382	0.373	0.009	[0.690]	0.309	0.314	-0.006	[0.821]	0.597	0.570	0.027	[0.514]
A-levels or more	0.585	0.585	0.001	[0.972]	0.677	0.666	0.012	[0.639]	0.315	0.316	-0.001	[0.973]
Partner's characteristics												
Age at decision	31.121	31.126	-0.005	[0.982]	31.621	31.387	0.235	[0.368]	29.654	30.147	-0.494	[0.284]
Working at wave 1	0.965	0.959	0.006	[0.508]	0.971	0.955	0.016	[0.075]	0.947	0.966	-0.019	[0.357]
No degree	0.085	0.080	0.005	[0.682]	0.054	0.076	-0.022	[0.079]	0.177	0.104	0.073	[0.022]
Below A-level	0.408	0.334	0.074	[0.001]	0.373	0.263	0.110	[0.000]	0.514	0.550	-0.036	[0.386]
A-levels or more	0.507	0.586	-0.080	[0.000]	0.573	0.661	-0.088	[0.001]	0.310	0.346	-0.036	[0.336]
Couple's characteristics												
Cohabiting at wave 1	0.287	0.109	0.179	[0.000]	0.251	0.121	0.130	[0.000]	0.393	0.093	0.300	[0.000]
Time btw move in and birth	2.932	3.163	-0.231	[0.040]	3.109	3.326	-0.217	[0.101]	2.411	2.602	-0.191	[0.346]
England	0.823	0.802	0.021	[0.220]	0.817	0.799	0.017	[0.398]	0.841	0.811	0.030	[0.330]
Wales	0.049	0.051	-0.003	[0.779]	0.045	0.057	-0.012	[0.283]	0.060	0.038	0.022	[0.259]
Scotland	0.097	0.118	-0.021	[0.123]	0.109	0.119	-0.010	[0.562]	0.063	0.112	-0.049	[0.025]
N. Ireland	0.031	0.028	0.002	[0.760]	0.029	0.025	0.004	[0.639]	0.036	0.039	-0.003	[0.847]
Observations	5,162	529			3,596	380			1,566	149		

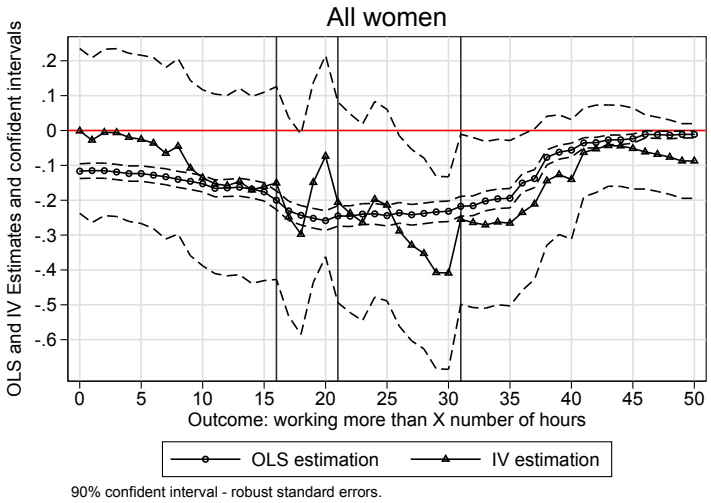
Standard errors in parenthesis and p-values in brackets.
Source: Millennium Cohort Study - Wave 1.
Notes: Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children.
Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness. Infertile: mothers whose time-to-conception of the first child $>$ 1 year.

Table 4: Impact of having an additional child on labor market outcomes

	(1) Active	(2) Employed	(3) Works > 15h/week	(4) Works > 20h/week	(5) Works > 30h/week	(6) Nb of hours worked
Panel A: All mothers						
OLS	-0.108**	-0.117**	-0.200**	-0.245**	-0.217**	-7.534**
	(0.012)	(0.013)	(0.016)	(0.018)	(0.017)	(0.526)
IV	-0.008	-0.001	-0.151	-0.206	-0.255+	-8.846+
	(0.137)	(0.144)	(0.168)	(0.175)	(0.148)	(5.199)
ITT	0.001	0.000	0.023	0.031	0.039+	1.342+
	(0.021)	(0.022)	(0.026)	(0.027)	(0.023)	(0.796)
1^{st} stage			-0.152**	(0.018)		
F-stat			39.1			
Mean	0.817	0.794	0.627	0.47	0.235	19.77
	(0.387)	(0.404)	(0.484)	(0.499)	(0.424)	(14.55)
Observations	5691	5691	5691	5691	5691	5691
Panel B: High- and intermediate skilled mothers						
OLS	-0.086**	-0.091**	-0.178**	-0.224**	-0.222**	-6.747**
	(0.014)	(0.015)	(0.019)	(0.022)	(0.021)	(0.621)
IV	0.143	0.153	-0.058	-0.115	-0.282	-5.390
	(0.181)	(0.190)	(0.214)	(0.224)	(0.193)	(6.611)
ITT	-0.020	-0.021	0.008	0.016	0.039	0.744
	(0.024)	(0.025)	(0.030)	(0.031)	(0.027)	(0.930)
1^{st} stage			-0.138**	(0.022)		
F-stat			24.4			
Mean	0.843	0.823	0.66	0.509	0.262	20.989
	(0.363)	(0.382)	(0.474)	(0.5)	(0.44)	14.364
Observations	3974	3974	3974	3974	3974	3974
Panel C: Low-skilled mothers						
OLS	-0.152**	-0.167**	-0.253**	-0.290**	-0.196**	-9.132**
	(0.025)	(0.026)	(0.030)	(0.031)	(0.028)	(0.981)
IV	-0.317	-0.315	-0.393	-0.474+	-0.265	-18.065*
	(0.225)	(0.233)	(0.266)	(0.273)	(0.212)	(8.485)
ITT	0.060	0.060	0.075	0.090+	0.051	3.449*
	(0.041)	(0.043)	(0.051)	(0.050)	(0.040)	(1.520)
1^{st} stage			-0.191**	(0.036)		
F-stat			16.4			
Mean	0.751	0.719	0.540	0.368	0.167	16.596
	(0.433)	(0.45)	(0.499)	(0.482)	(0.373)	(14.554)
Observations	1717	1717	1717	1717	1717	1717

Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.
Source: Millennium Cohort Study - Waves 4 and 5.
Notes: High and intermediate skilled: mother's occupation before birth classified as: large employer, high manager, higher prof., low prof/high tech., lower managers, high supervisory, intermediate. Low skilled: mother's occupation before birth classified as: small employers, self-emp non profl, lower supervisors, lower technical, semi-routine, routine. Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness, mother's educational level, educational level of the partner at birth of 1^{st} child, dummy for cohabiting couple at birth of 1^{st} child, mother's relative age group, country, being employed before pregnancy, dummy if non white child. Instrument: time to conception for the first child > 1 year.

Figure 1: OLS and IV estimation with different definition of labor force supply



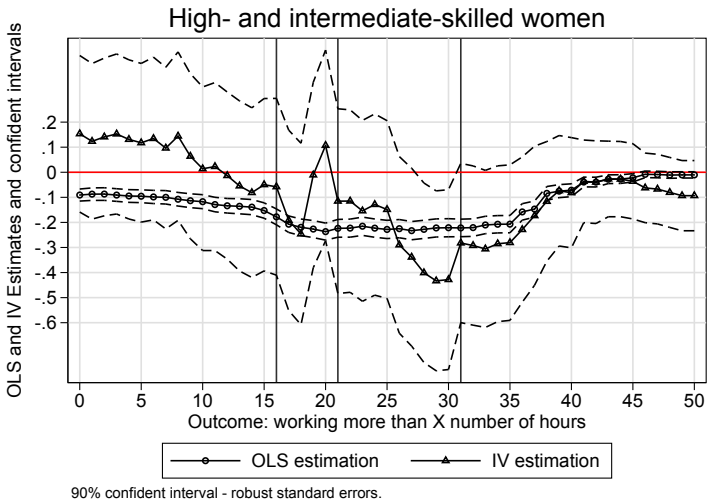


Table 5: Probability of separation and probability of having a child if separation

	(1)		(2)		(3)	
Probability of having broken up when the first child is 6 to 12 year-old						
Low skilled	0.060**	(0.012)	0.031**	(0.012)	0.028*	(0.012)
Cohabiting couple at birth					0.127**	(0.011)
Mean	0.166	(0.372)	0.166	(0.372)	0.166	(0.372)
Observations	5691		5691		5691	
Control for:						
Education, Health	Y		Y		Y	
Mother's age, country, work while preg	N		Y		Y	
Cohabitants at birth	N		N		Y	
Probability of having an extra child if separation						
	All women		High and interm.		Low skilled	
Separation in the period	-0.276**	(0.021)	-0.280**	(0.027)	-0.275**	(0.035)
Low skilled	-0.020	(0.018)				
Mean	0.792	(0.406)	0.803	(0.398)	0.765	(0.424)
Observations	2917		2033		884	

Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Source: Millennium Cohort Study - Waves 1, 4 and 5.

Notes: High and intermediate skilled: mother's occupation before birth classified as: large employer, high manager, higher prof., low prof/high tech., lower managers, high supervisory, intermediate. Low skilled: mother's occupation before birth classified as: small employers, self-emp non profl, lower supervisors, lower technical, semi-routine, routine. Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness, mother's educational level, educational level of the partner at birth of 1^{st} child, dummy for cohabiting couple at birth of 1^{st} child, mother's relative age group, country, being employed before pregnancy, dummy if non-white child. Instrument: time to conception for the first child $>$ 1 year.

Table 6: Infertility shock and mothers' attitudes and mental health

	All women		High and interm.		Low skilled	
Outcome: career as main reason to return to work						
Infertile	0.006	(0.031)	0.002	(0.035)	0.018	(0.068)
Mean	0.142	(0.349)	0.140	(0.347)	0.148	(0.355)
Observations	2287		1696		591	
Outcome: prefers taking care of child as main reason not to return to work						
Infertile	0.095+	(0.053)	0.050	(0.078)	0.203**	(0.070)
Mean	0.735	(0.442)	0.742	(0.438)	0.724	(0.448)
Observations	688		376		312	
Outcome: agrees on "family happier if the mother works"						
Infertile	-0.044*	(0.018)	-0.032	(0.022)	-0.065**	(0.023)
Mean	0.101	(0.301)	0.102	(0.302)	0.098	(0.297)
Observations	3066		2130		936	
Outcome: agrees on "family suffers if the mother works"						
Infertile	-0.011	(0.034)	-0.013	(0.040)	-0.013	(0.067)
Mean	0.311	(0.301)	0.311	(0.463)	0.311	(0.463)
Observations	3066		2130		936	
Outcome: plan to have more children						
Infertile	-0.050	(0.034)	-0.035	(0.038)	-0.094	(0.070)
Mean	0.744	(0.436)	0.753	(0.431)	0.722	(0.448)
Observations	2945		2040		905	
Outcome: agrees on "couple should not separate if they have children"						
Infertile	-0.012	(0.031)	-0.015	(0.038)	-0.003	(0.050)
Mean	0.236	(0.425)	0.239	(0.426)	0.229	(0.420)
Observations	3064		2128		936	
Outcome: answers "Yes" to "Do you often feel miserable or depressed?"						
Infertile	-0.003	(0.020)	0.016	(0.023)	-0.056	(0.037)
Mean	0.091	(0.287)	0.077	(0.2671)	0.126	(0.332)
Observations	3067		2132		935	

Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Source: Millennium Cohort Study - Wave 1.

Notes: High and intermediate skilled: mother's occupation before birth classified as: large employer, high manager, higher prof., low prof/high tech., lower managers, high supervisory, intermediate. Low skilled: mother's occupation before birth classified as: small employers, self-emp non profl, lower supervisors, lower technical, semi-routine, routine. Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness, mother's educational level, educational level of the partner at birth of 1^{st} child, dummy for cohabiting couple at birth of 1^{st} child, mother's relative age group, country, being employed before pregnancy, dummy if non white child. Infertile: mothers whose time to conception for the first child > 1 year.

Table 7: Test of exclusion restrictions

	(1)		(2)		(3)	
	All women		High and interm.		Low skilled	
Distance of second birth (if any) to first birth in months - Cox duration model						
Infertile	-0.073	(0.092)	-0.102	(0.110)	0.029	(0.164)
Mean	39.3	(19.5)	38.8	(18.9)	40.5	(20.9)
Observations	2438		1707		731	
Probability of separation						
Infertile	-0.009	(0.027)	-0.007	(0.030)	-0.009	(0.061)
Mean	0.204	(0.403)	0.171	(0.376)	0.288	(0.453)
Observations	3096		2142		954	
Leaves the sample						
Infertile	0.001	(0.025)	0.006	(0.030)	-0.019	(0.045)
Mean	0.177	(0.381)	0.166	(0.372)	0.204	(0.403)
Observations	3096		2142		954	
Is employed during pregnancy						
Infertile	-0.013	(0.017)	-0.011	(0.016)	-0.022	(0.044)
Mean	0.944	(0.229)	0.968	(0.175)	0.882	(0.322)
Observations	3096		2142		954	
Returned to work at wave 1 (among working women during pregnancy)						
Infertile	-0.018	(0.023)	-0.036	(0.028)	0.054*	(0.024)
Mean	0.928	(0.259)	0.922	(0.268)	0.947	(0.224)
Observations	2508		1885		623	
Length of maternity leave in weeks (among returned to work at wave 1)						
Infertile	0.393	(0.824)	0.479	(0.925)	0.725	(1.751)
Mean	24.94	(9.289)	25.936	(9.055)	21.619	(9.297)
Observations	2327		1752		575	
Log of wage at wave 1 (among working women at wave 1)						
Infertile	-0.027	(0.062)	-0.002	(0.069)	-0.043	(0.086)
Mean	2.217	(0.660)	2.330	(0.598)	1.780	(0.703)
Observations	1815		1399		416	

Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.

Source: Millennium Cohort Study - Waves 1, 4 and 5.

Notes: High and intermediate skilled: mother's occupation before birth classified as: large employer, high manager, higher prof., low prof/high tech., lower managers, high supervisory, intermediate. Low skilled: mother's occupation before birth classified as: small employers, self-emp non profl, lower supervisors, lower technical, semi-routine, routine. Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness, mother's educational level, educational level of the partner at birth of 1^{st} child, dummy for cohabiting couple at birth of 1^{st} child, mother's relative age group, country, being employed before pregnancy, dummy if non white child. Infertile: time to conception for the first child > 1 year.

Table 8: Compliers-characteristics ratio for infertile instrument

	All mothers			**High and interm. skilled**			**Low skilled**		
Proportion of compliers among women:									
who had add. children:	19.3%			17.3%			25.4%		
who did not have add. children:	7.3%			7.1%			7.9%		
Compliers' characteristics									
	$E(x)$	$E(x\|D_0 > D_1)$	$\frac{P(x\|D_0>D_1)}{P(x)}$	$E(x)$	$E(x\|D_0 > D_1)$	$\frac{P(x\|D_0>D_1)}{P(x)}$	$E(x)$	$E(x\|D_0 > D_1)$	$\frac{P(x\|D_0>D_1)}{P(x)}$
Mother's characteristics									
Working dur. pregnancy	0.9480	0.8987	0.95	0.9705	0.9330	0.96	0.8895	0.8301	0.93
Non white	0.0635	0.0280	0.44	0.0571	0.0195	0.34	0.0801	0.0500	0.62
A-levels or more	0.5595	0.5773	1.03	0.6629	0.6430	0.97	0.2898	0.4518	1.56
Below A Levels	0.4067	0.4223	1.04	0.3256	0.3400	1.04	0.6184	0.5772	0.93
No qualifications	0.0337	0.0035	0.10	0.0115	0.0118	1.02	0.0918	-0.0114	-0.12
33% youngest mothers	0.2568	0.1262	0.49	0.1735	0.1222	0.70	0.4742	0.1542	0.33
33% to 66% youngest mothers	0.3736	0.2604	0.70	0.4004	0.2331	0.58	0.3037	0.2113	0.70
33% oldest mothers	0.3696	0.4130	1.12	0.4260	0.4537	1.06	0.2221	0.3222	1.45
Partner's characteristics									
Working at wave 1	0.9612	1.0002	1.04	0.9710	0.9870	1.02	0.9356	1.0162	1.09
No degree	0.0899	0.1164	1.29	0.0584	0.1242	2.13	0.1719	0.0269	0.16
Below A-level	0.4304	0.2916	0.68	0.3854	0.0849	0.22	0.5477	0.5865	1.07
A-levels or more	0.4798	0.5944	1.24	0.5562	0.7315	1.32	0.2803	0.3363	1.20
Couple's characteristics									
Cohabiting couple at birth	0.2797	0.5246	1.88	0.2372	0.4741	2.00	0.3906	0.6354	1.63
England	0.8251	0.7522	0.91	0.8204	0.7337	0.89	0.8374	0.7927	0.95
Wales	0.0484	0.0540	1.12	0.0453	0.0481	1.06	0.0565	0.0834	1.48
Scotland	0.0974	0.1348	1.38	0.1062	0.1504	1.42	0.0744	0.0900	1.21
Northern Ireland	0.0291	0.0467	1.60	0.0281	0.0608	2.16	0.0317	0.0215	0.68

Source: Millennium Cohort Study

Notes: High and intermediate skilled: mother's occupation before birth classified as: large employer, high manager, higher prof., low prof/high tech., lower managers, high supervisory, intermediate. Low skilled: mother's occupation before birth classified as: small employers, self-emp non profl, lower supervisors, lower technical, semi-routine, routine. Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Infertile: time to conception for the first child > 1 year.

$E(x)$ gives the share of the population having the characteristics x. $E(x|D_0 > D_1)$ represents the share of compliers having the characteristics x. If $\frac{P(x|D_0>D_1)}{P(x)} > 1$ (resp. < 1), the characteristic x is more (resp. less) common among compliers than among the general population.

A Online Appendix

A.1 The complier population

Let D_i be the treatment variable. $D_i = 1$ if the mother had an additional child and $D_i = 0$ otherwise. Let Z_i be the instrument. $Z_i = 1$ if the women is infertile and $Z_i = 0$ otherwise. The complier population is the population of mothers who comply to the instrument. In other words, it is the mother such that $D_{0i} > D_{1i}$. Following Angrist and Pischke (2009), we can identify some characteristics of this population.

The size of the population of compliers is given by:

$$P(D_{0i} > D_{1i}) = E(D_i|Z_i = 0) - E(D_i|Z_i = 1)$$

The proportion of compliers among treated is given by:

$$P(D_{0i} > D_{1i}|D_i = 1) = \frac{(1 - P(Z_i = 1))[E(D_i|Z_i = 0) - E(D_i|Z_i = 1)]}{P(D_i = 1)}$$

The proportion of compliers among untreated is given by:

$$P(D_{0i} > D_{1i}|D_i = 0) = \frac{P(Z_i = 1)[E(D_i|Z_i = 0) - E(D_i|Z_i = 1)]}{P(D_i = 0)}$$

The proportion of compliers having the characteristic x compared to the proportion of the population having the characteristic x is given by:

$$\frac{P(x_i|D_{0i} > D_{1i})}{P(x_i = 1)} = \frac{E(D_i|Z_i = 0, x_i = 1) - E(D_i|Z_i = 1, x_i = 1)}{E(D_i|Z_i = 0) - E(D_i|Z_i = 1)}$$

Table A1: Summary of related papers

Paper	Country	Data	Sample	Dependent variable	Endogenous variable	Parity of child	Instrument	Results
Angrist and Evans (1998)	US	1970, 1980 and 1990 Census Public Use Micro Samples (PUMS)	Mothers aged 21 35 (N = 394,835)	Worked for pay, Weeks worked, Hours per week, Labor Income, Family income	Having a third child	Impact of the third child	Sex-composition of the two first children	Decrease labor force participation by 10pp, decrease the number of weeks worked by 5 and the number of hours/week by 5, decrease labor income by USD 1300 (in 1980) and USD 2000 in 1990. No impact on husbands. Stronger results for low-educated mothers and bottom of income distribution husbands
Moschion (2009)	France	Labor Force Survey 1990-2002	Women aged 21 to 35, who had at least 2 kids at the interview date. (N = 71,542)	Women's labor force participation, number of hours worked/week, working part-time and wage	Having a third child	Impact of the third child	Sex-composition of the two first children	Decrease in the participation to the labor force by 50pp., decrease in the number of hours/week by 7 hours, no significant impact on part-time job and wage
Cruces and Galiani (2007)	Mexico and Argentina	Mexico 2000 and Argentina 1991 censuses	Women between 21 and 35 years old, with at least two children, and whose oldest child was at most 18 years old at the time of the census (N = 599,941 for A and 458,849 for M)	Labor force participation (Worked for pay)	Having a third child	Impact of the third child	Sex-composition of the two first children	Having a third child decreases maternal labor supply by 5 to 10pp in both countries.
Iacovou (2001)	UK	National Child Development Study and the British Household Panel Study	Mothers aged 33 (N = 3,188) / Mothers aged 21 49 (N = 1,374)	Labour market participation and number of hours worked (conditional on being employed)	Having a third child	Impact of the third child	Sex-composition of the two first children	No significant impact of the third child
Hirvonen (2009)	Sweden	1980-2005 Swedish register data	Women who were 23-35 years old in 1980 (N = 103,966)	Labour force participation and level of earnings	Having a third child	Impact of the third child	Sex-composition of the two first children	No significant impact of the third child on the labour market participation, strong negative short-term impact on labour earnings
Angelov and Karimi (2012)	Sweden	Population-wide administrative registers	Mothers with exactly two children by the end of 1989 (N = 212,994)	Female labour earnings	Having a third child	Impact of the third child	Sex-composition of the two first children	Negative impact of third child on earnings in the short-term (0-1 year after birth)
Frenette (2011)	Canada	2006 Census of Population	Couples (N = 326,184)	Hours of paid work per week, Hours of unpaid childcare per week, Hours of unpaid housework per week	Having an additional child	Second or third child (undistinguished)	Sex-composition of the two first children and multiple births	Decrease hours of paid work per week by 3-5 hours, Increase hours of unpaid childcare per week by 4-6 hours, Increase Hours of unpaid housework per week by 3-4 hours
Bronars and Grogger (1994)	US	Public Use Microdata Samples (PUMS) of the 1970 and 1980 Censuses	Unwed mothers (N = 4463), Married mothers (N = 26226)	Demographic outcomes: currently married, ever married, years of education. Economic outcomes: labor-force participation, mother's earnings, Family earnings, Received welfare, Poverty status	Having a second child	Second child	Twin at first birth	Decrease labor force participation, decrease mother earnings (especially for black mothers), and for black women: less likely to be married, decrease years of education, increase risk of poverty and welfare dependency
Moschion (2013)	Australia	2006 Census 5 per cent sample,	Women aged 2140, with at least one child (having at least one child: N = 59,573 ; having at least two children : N = 40,962)	Labor market participation, Hours paid work, Hours domestic work	Having more than one child, having more than 2 children	All (but subsample of mothers according to the number of children)	Twin birth and sex-composition of the two first children	Having more than 1 child = decrease by 10pp in the LMP, decrease the number of hours of paid work by 5 and increase the number of domestic work by 4. Having more than 2 child = decrease by 10pp to 20pp in the LMP, decrease the number of hours of paid work by 3 to 9 and increase the number of domestic work by 0 to 4.
Jacobsen et al. (1999)	US	Public Use Microdata Samples (PUMS) of the 1970 and 1980 Censuses	Married women who at the time of their first birth (N = 489,436 in 1970 ; N = 1,210,215 in 1980)	Women's labor force participation, number of weeks worked/year, number of hours worked/week and earnings	Number of children	All	Twin births	Decrease labor force participation by 15% to 20% when the first child is 1-2 year-old in 1969, by 11 to 13% when the first child is 1-2 year-old in 1979. Deacrese the number of weeks worked by 13 in 1969 and by 9 in 1979. Decreases the number of hours worked per week. Deacreses earnings by USD 1000. Stronger impact for black women.

Table A2: Summary of related papers (continued)

Paper	Country	Data	Sample	Dependent variable	Endogenous variable	Parity of child	Instrument	Results
Griffen et al. (2015)	Japan	Cohort data "Longitudinal Survey of Newborns in the 21st Century" (babies born in 2001)	(N = 45,503)	Labor force participation	Number of children	All	Twin births	No impact of an additional child, slight positive impact in the mid-term (6 to 7 years after the birth)
Cáceres-Delpiano (2012)	40 developing countries	Demographic and Health Surveys (DHS)	Women aged 18 to 40 who had their first birth between age 15 and 35, oldest child is younger than 14 years (N = 105,428)	Mother currently working, mother worked during the previous 12 months, usual number of days per week worked, works at home, works away from home, unpaid job, paid in cash job, salaried job, self-employed, works full year, seasonal or occasional work	Number of children	All (but subsample of mothers according to the number of children)	Multiple births	Decrease labor force participation, decrease probability of working away from home (but not for working from home), decrease probability of being self-employed. Results larger for low-educated mothers and rural neighborhoods.
Cristia (2008)	US	National Survey of Family Growth (NSFG)	Women who sought help to become pregnant when aged 1938 (N = 499)	Employment	Have a child	First child	Fertility treatments were successful	Having a child is associated to a 25pp decrease in the employment rate
Lundborg et al. (2014)	Denmark	IVF register (1994-2005)	(N = 18,538)	Female labour earnings, labor force participation, full time work, hourly wage, job change	Have a child	First child	IVF Fertility treatment was successful	Earnings : Large decrease in earnings in the short-run, partial catch-up in the long-run, Participation : decrease by 5pp. until the child is 4, large decrease in hourly wage (no catch-up)
Aguero and Marks (2008)	Peru, Guatemala, Colombia, Bolivia, Nicaragua and Dominican Republic (1994-1998)	Demographic and Health Surveys (DHS)	Women between the ages of 20 and 44 (N = 24,131)	Labor force participation	Number of children, number of children under the age of 6, binary for having more children	All	Self-reported infertility	No significant impact of children
Rondinelli and Zizza (2011)	Italy	Survey of Household Income and Wealth (2008)	Women who are at least 39 years old (N = 1,358)	Being employed	Number of children	All	Self-reported infertility	No significant impact of children
Aguero and Marks (2011)	26 developing countries	Demographic and Health Surveys (DHS)	Women between the ages of 20 and 44 (N = 149,539)	Labor force participation (paid or unpaid) (having worked at all in the last 12 months), work intensity (works year around), Paid work	Number of children (alternative definition are tested)	All	Self-reported infertility	No significant impact of children of labor market participation and work intensity, negative impact on paid work or low-income countries
Hotz et al. (2005)	US	National Longitudinal Survey of Youth (NLSY79)	Women aged 14-21 in 1979, pregnant before age 18 (N = 1,042)	Demographic Outcomes: had some children, number of kids born, married, single mothers, Annual hours worked, Hourly wage rate, Annual Earnings, Annual Earnings of Spouse, Living in Poverty , AFDC, Food Stamps, Public Assistance Benefits	Having a child as teenager (aged 13-17)	First child	Miscarriage	No significant impact of children on labour supply, higher earnings in the long run, less likely to be on Food Stamps on the long-run, more likely to receive public assistance benefits on the short-run.
Goodman et al. (2004)	UK (Britain)	British Cohort Study (BCS)	Women who got pregnant before age 20 (N = 1,068)	15 outcomes : Family Income and Composition Variables, Benenfit Variables, Wage Variables, Partner Variables, Education Variables	Having a child as teenager (aged 13-19)	First child	Miscarriage	No significant impact
Markussen and Strom (2015)	Norway	Administrative data	Women aged 18-45, who either gave birth or sickness absence spell because of miscarriage, July 2001 - Dec. 2004, employed in the last 4 weeks (N = 401,955)	Unconditional on employment: earnings, employment, number of hours worked, benefits ; Conditional on employment: hours and absence	6 fertility outcomes: first child, second child, third child, pregnancy, having a child less than 1, having a child 1-3 year-old.	Evaluate the impact of first, second and third child	Miscarriage	About 15% decrease of children on earnings, about 5% decrease in earnings due to young children, decrease in employment by 5%, small impact on the number of hours worked

Table A3: Impact of having an additional child on labor market outcomes - Women observed in all waves

	(1) Active	(2) Employed	(3) Works > 15h/week	(4) Works > 20h/week	(5) Works > 30h/week	(6) Nb of hours worked
			All mothers			
OLS	-0.105**	-0.114**	-0.191**	-0.236**	-0.206**	-7.088**
	(0.013)	(0.014)	(0.018)	(0.019)	(0.019)	(0.554)
IV	0.005	-0.048	-0.151	-0.209	-0.256	-10.067+
	(0.151)	(0.154)	(0.184)	(0.193)	(0.163)	(5.752)
ITT	-0.001	0.007	0.022	0.031	0.037	1.474+
	(0.022)	(0.023)	(0.027)	(0.028)	(0.024)	(0.841)
1^{st} stage			-0.146**	(0.019)		
F-stat			33.3			
Mean	0.821	0.800	0.631	0.472	0.232	19.807
	(0.383)	(0.340)	(0.482)	(0.499)	(0.422)	(14.345)
Observations	4980	4980	4980	4980	4980	4980
			Panel B: High and intermediate skilled mothers			
OLS	-0.081**	-0.086**	-0.166**	-0.208**	-0.202**	-6.103**
	(0.015)	(0.016)	(0.021)	(0.023)	(0.023)	(0.653)
IV	0.181	0.146	-0.021	-0.136	-0.279	-6.351
	(0.212)	(0.215)	(0.247)	(0.257)	(0.223)	(7.632)
ITT	-0.023	-0.019	0.003	0.017	0.036	0.809
	(0.026)	(0.027)	(0.032)	(0.033)	(0.028)	(0.984)
1^{st} stage			-0.127**	(0.022)		
F-stat			19.0			
Mean	0.843	0.825	0.662	0.508	0.256	20.897
	(0.364)	(0.380)	(0.473)	(0.500)	(0.437)	(14.209)
Observations	3541	3541	3541	3541	3541	3541
			Panel C: Low skilled mothers			
OLS	-0.156**	-0.168**	-0.249**	-0.291**	-0.197**	-8.998**
	(0.027)	(0.028)	(0.033)	(0.034)	(0.031)	(1.033)
IV	-0.297	-0.382+	-0.430	-0.425	-0.265	-18.340*
	(0.219)	(0.230)	(0.266)	(0.270)	(0.213)	(8.359)
ITT	0.060	0.077+	0.087	0.086	0.054	3.721*
	(0.043)	(0.044)	(0.054)	(0.053)	(0.043)	(1.583)
First stage			-0.203**	(0.038)		
F-stat			17.1			
Mean	0.762	0.735	0.550	0.373	0.168	16.870
	(0.426)	(0.441)	(0.498)	(0.484)	(0.374)	(14.3043)
Observations	1439	1439	1439	1439	1439	1439

Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.
Source: Millennium Cohort Study - Waves 4 and 5.
Notes: High and intermediate skilled: mother's occupation before birth classified as: large employer, high manager, higher prof., low prof/high tech., lower managers, high supervisory, intermediate. Low skilled: mother's occupation before birth classified as: small employers, self-emp non profl, lower supervisors, lower technical, semi-routine, routine. Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness, mother's educational level, educational level of the partner at birth of 1^{st} child, dummy for cohabiting couple at birth of 1^{st} child, mother's relative age group, country, being employed before pregnancy, dummy if non white child. Instrument: time to conception for the first child > 1 year.

Table A4: Impact of having an additional child on labor market outcomes - exclude surprised mothers

	(1) Active	(2) Employed	(3) Works > 15h/week	(4) Works > 20h/week	(5) Works > 30h/week	(6) Nb of hours worked
			All mothers			
OLS	-0.099**	-0.110**	-0.182**	-0.224**	-0.203**	-6.846**
	(0.014)	(0.015)	(0.020)	(0.022)	(0.021)	(0.621)
IV	0.032	0.037	-0.122	-0.217	-0.256+	-8.300+
	(0.127)	(0.134)	(0.157)	(0.163)	(0.137)	(4.807)
ITT	-0.005	-0.006	0.020	0.036	0.042+	1.377+
	(0.021)	(0.022)	(0.026)	(0.027)	(0.023)	(0.807)
1^{st} stage			-0.166**	(0.019)		
F-stat			45.9			
Mean	0.824	0.803	0.630	0.468	0.229	19.738
	(0.381)	0.398)	(0.483)	(0.499)	(0.420)	(14.288)
Observations	4056	4056	4056	4056	4056	4056
			Panel B: High and intermediate skilled mothers			
OLS	-0.098**	-0.105**	-0.181**	-0.216**	-0.209**	-6.520**
	(0.016)	(0.017)	(0.023)	(0.026)	(0.025)	(0.715)
IV	0.119	0.128	-0.078	-0.163	-0.325+	-6.973
	(0.160)	(0.168)	(0.191)	(0.200)	(0.172)	(5.882)
ITT	-0.019	-0.020	0.012	0.026	0.051+	1.097
	(0.024)	(0.026)	(0.031)	(0.032)	(0.027)	(0.944)
1^{st} stage			-0.157**	(0.021)		
F-stat			31.1			
Mean	0.838	0.819	0.652	0.494	0.243	20.436
	(0.368)	(0.385)	(0.477)	(0.500)	(0.429)	(14.133)
Observations	3003	3003	3003	3003	3003	3003
			Panel C: Low skilled mothers			
OLS	-0.103**	-0.124**	-0.200**	-0.256**	-0.186**	-7.908**
	(0.032)	(0.033)	(0.039)	(0.040)	(0.037)	(1.261)
IV	-0.191	-0.188	-0.324	-0.447+	-0.179	-13.831+
	(0.217)	(0.227)	(0.265)	(0.269)	(0.209)	(8.079)
ITT	0.037	0.037	0.063	0.087+	0.035	2.696+
	(0.042)	(0.044)	(0.052)	(0.051)	(0.041)	(1.534)
1^{st} stage			-0.195**	(0.037)		
F-stat			16.3			
Mean	0.779	0.751	0.561	0.385	0.185	17.550
	(0.415)	(0.432)	(0.496)	(0.487)	(0.388)	(14.554)
Observations	1053	1053	1053	1053	1053	1053

Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.
Source: Millennium Cohort Study - Waves 4 and 5.
Notes: High and intermediate skilled: mother's occupation before birth classified as: large employer, high manager, higher prof., low prof/high tech., lower managers, high supervisory, intermediate. Low skilled: mother's occupation before birth classified as: small employers, self-emp non profl, lower supervisors, lower technical, semi-routine, routine. Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness, mother's educational level, educational level of the partner at birth of 1^{st} child, dummy for cohabiting couple at birth of 1^{st} child, mother's relative age group, country, being employed before pregnancy, dummy if non white child. Instrument: time to conception for the first child > 1 year.

Table A5: Impact of having an additional child on labor market outcomes - Exclude assisted fertility

	(1) Active	(2) Employed	(3) Works > 15h/week	(4) Works > 20h/week	(5) Works > 30h/week	(6) Nb of hours worked
			All mothers			
OLS	-0.108**	-0.116**	-0.204**	-0.250**	-0.220**	-7.598**
	(0.012)	(0.013)	(0.016)	(0.018)	(0.018)	(0.535)
IV	-0.041	0.019	-0.199	-0.298	-0.305+	-10.315+
	(0.142)	(0.154)	(0.176)	(0.186)	(0.161)	(5.703)
ITT	0.007	-0.003	0.034	0.051	0.052+	1.747+
	(0.024)	(0.026)	(0.030)	(0.032)	(0.027)	(0.959)
1^{st} stage			-0.169**	(0.022)		
F-stat			33.2			
Mean	0.817	0.794	0.627	0.469	0.235	19.745
	(0.387)	(0.405)	(0.484)	(0.499)	(0.424)	(14.542)
Observations	5533	5533	5533	5533	5533	5533
			Panel B: High and intermediate skilled mothers			
OLS	-0.083**	-0.087**	-0.179**	-0.226**	-0.224**	-6.791**
	(0.014)	(0.015)	(0.020)	(0.022)	(0.022)	(0.637)
IV	0.157	0.232	-0.049	-0.198	-0.453*	-8.452
	(0.168)	(0.185)	(0.199)	(0.208)	(0.199)	(6.670)
ITT	-0.028	-0.042	0.009	0.036	0.082*	1.524
	(0.029)	(0.031)	(0.036)	(0.038)	(0.034)	(1.207)
1^{st} stage			-0.180**	(0.026)		
F-stat			25.8			
Mean	0.843	0.823	0.661	0.510	0.264	21.30
	(0.364)	(0.382)	(0.473)	(0.500)	(0.441)	(14.407)
Observations	3845	3845	3845	3845	3845	3845
			Panel C: Low skilled mothers			
OLS	-0.155**	-0.172**	-0.258**	-0.299**	-0.196**	-9.108**
	(0.025)	(0.026)	(0.030)	(0.031)	(0.029)	(0.972)
IV	-0.565	-0.540	-0.649	-0.650	0.028	-17.426
	(0.360)	(0.366)	(0.401)	(0.413)	(0.270)	(11.312)
ITT	0.082+	0.078+	0.094+	0.094+	-0.004	2.531+
	(0.043)	(0.047)	(0.056)	(0.056)	(0.039)	(1.510)
1^{st} stage			-0.145**	(0.039)		
F-stat			7.98			
Mean	0.751	0.718	0.539	0.366	0.162	16.44
	(0.433)	(0.450)	(0.499)	(0.482)	(0.369)	(14.37)
Observations	1688	1688	1688	1688	1688	1688

Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.
Source: Millennium Cohort Study - Waves 4 and 5.
Notes: High and intermediate skilled: mother's occupation before birth classified as: large employer, high manager, higher prof., low prof/high tech., lower managers, high supervisory, intermediate. Low skilled: mother's occupation before birth classified as: small employers, self-emp non profl, lower supervisors, lower technical, semi-routine, routine. Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness, mother's educational level, educational level of the partner at birth of 1^{st} child, dummy for cohabiting couple at birth of 1^{st} child, mother's relative age group, country, being employed before pregnancy, dummy if non white child. Instrument: time to conception for the first child > 1 year.

Table A6: Impact of having an additional child on labor market outcomes - Married women at birth

	(1) Active	(2) Employed	(3) Works > 15h/week	(4) Works > 20h/week	(5) Works > 30h/week	(6) Nb of hours worked
			All mothers			
OLS	-0.117**	-0.127**	-0.197**	-0.228**	-0.211**	-7.337**
	(0.014)	(0.015)	(0.020)	(0.022)	(0.021)	(0.642)
IV	0.052	0.070	-0.087	-0.195	-0.293	-8.843
	(0.171)	(0.181)	(0.209)	(0.215)	(0.183)	(6.405)
ITT	-0.007	-0.009	0.012	0.026	0.039	1.176
	(0.023)	(0.024)	(0.028)	(0.029)	(0.024)	(0.865)
1^{st} stage			-0.133**	(0.019)		
F-stat			27.2			
Mean	0.820	0.797	0.625	0.472	0.239	19.874
	(0.384)	(0.402)	(0.484)	(0.499)	(0.426)	(14.584)
Observations	4049	4049	4049	4049	4049	4049
			Panel B: High and intermediate skilled mothers			
OLS	-0.108**	-0.119**	-0.186**	-0.206**	-0.213**	-6.792**
	(0.016)	(0.017)	(0.023)	(0.026)	(0.025)	(0.734)
IV	0.153	0.196	0.035	-0.043	-0.347	-6.149
	(0.239)	(0.255)	(0.288)	(0.294)	(0.252)	(8.681)
ITT	-0.018	-0.022	-0.004	0.005	0.040	0.703
	(0.026)	(0.027)	(0.033)	(0.034)	(0.029)	(1.017)
1^{st} stage			-0.114**	(0.022)		
F-stat			15.4			
Mean	0.835	0.814	0.646	0.497	0.255	20.657
	(0.371)	(0.389)	(0.478)	(0.500)	(0.436)	(14.481)
Observations	3015	3015	3015	3015	3015	3015
			Panel C: Low skilled mothers			
OLS	-0.135**	-0.145**	-0.232**	-0.287**	-0.190**	-8.591**
	(0.033)	(0.033)	(0.040)	(0.042)	(0.040)	(1.324)
IV	-0.176	-0.201	-0.453	-0.643*	-0.330	-18.410*
	(0.243)	(0.254)	(0.295)	(0.318)	(0.245)	(9.388)
ITT	0.033	0.037	0.084	0.119*	0.061	3.419*
	(0.045)	(0.047)	(0.055)	(0.055)	(0.044)	(1.593)
1^{st} stage			-0.186**	(0.037)		
F-stat			13.5			
Mean	0.772	0.743	0.553	0.389	0.185	17.315
	(0.420)	(0.437)	(0.497)	(0.488)	(0.389)	(14.634)
Observations	1034	1034	1034	1034	1034	1034

Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.
Source: Millennium Cohort Study - Waves 4 and 5.
Notes: High and intermediate skilled: mother's occupation before birth classified as: large employer, high manager, higher prof., low prof/high tech., lower managers, high supervisory, intermediate. Low skilled: mother's occupation before birth classified as: small employers, self-emp non profl, lower supervisors, lower technical, semi-routine, routine. Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness, mother's educational level, educational level of the partner at birth of 1^{st} child, dummy for cohabiting couple at birth of 1^{st} child, mother's relative age group, country, being employed before pregnancy, dummy if non white child. Instrument: time to conception for the first child > 1 year.

Table A7: Impact of having an additional child on labor market outcomes - Heterogenous effects on the types of neighborhoods

	(1) Active	(2) Employed	(3) Works > 15h/week	(4) Works > 20h/week	(5) Works > 30h/week	(6) Nb of hours worked
All mothers						
OLS	-0.108**	-0.117**	-0.200**	-0.245**	-0.217**	-7.534**
	(0.012)	(0.013)	(0.016)	(0.018)	(0.017)	(0.526)
IV	-0.008	-0.001	-0.151	-0.206	-0.255+	-8.846+
	(0.137)	(0.144)	(0.168)	(0.175)	(0.148)	(5.199)
ITT	0.001	0.000	0.023	0.031	0.039+	1.342+
	(0.021)	(0.022)	(0.026)	(0.027)	(0.023)	(0.796)
1^{st} stage			-0.152**	(0.018)		
F-stat			39.1			
Mean	0.817	0.794	0.627	0.47	0.235	19.77
	(0.387)	(0.404)	(0.484)	(0.499)	(0.424)	(14.550)
Observations	5691	5691	5691	5691	5691	5691
Panel B: Women living in advantaged neighborhoods						
OLS	-0.107**	-0.112**	-0.207**	-0.248**	-0.227**	-7.702**
	(0.016)	(0.017)	(0.022)	(0.024)	(0.023)	(0.695)
IV	0.074	0.079	-0.132	-0.177	-0.244	-8.304
	(0.160)	(0.167)	(0.193)	(0.200)	(0.165)	(5.875)
ITT	-0.012	-0.013	0.022	0.029	0.040	1.374
	(0.026)	(0.027)	(0.033)	(0.034)	(0.027)	(0.987)
1^{st} stage			-0.165**	(0.024)		
F-stat			30.7			
Mean	0.822	0.803	0.615	0.456	0.219	19.515
	(0.383)	(0.398)	(0.487)	(0.498)	(0.413)	(14.359)
Observations	2993	2993	2993	2993	2993	2993
Panel C: Women living in disadvantaged neighborhoods						
OLS	-0.107**	-0.123**	-0.175**	-0.222**	-0.183**	-6.805**
	(0.018)	(0.018)	(0.022)	(0.024)	(0.024)	(0.726)
IV	-0.415	-0.390	-0.285	-0.354	-0.416	-13.954
	(0.270)	(0.286)	(0.326)	(0.352)	(0.334)	(10.851)
ITT	0.048+	0.045	0.033	0.041	0.049	1.628
	(0.029)	(0.032)	(0.038)	(0.041)	(0.037)	(1.223)
1^{st} stage			-0.117**	(0.030)		
F-stat			9.4			
Mean	0.806	0.774	0.656	0.502	0.276	20.399
	(0.396)	(0.418)	(0.475)	(0.500)	(0.447)	(14.988)
Observations	2698	2698	2698	2698	2698	2698

Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.
Source: Millennium Cohort Study - Waves 4 and 5.
Notes: Disadvantaged neighborhoods: children living in the 25% poorest wards or in wards where ethnic minorities represent at least 30% of the population (see MCS documentation). Advantaged neighborhoods: children living in wards that do not fall in the category of disadvantaged neighborhoods. Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness, mother's educational level, educational level of the partner at birth of 1^{st} child, dummy for cohabiting couple at birth of 1^{st} child, mother's relative age group, country, being employed before pregnancy, dummy if non white child. Instrument: time to conception for the first child > 1 year.

Table A8: Impact of having an additional child on labor market outcomes - Heterogenous effects on education

	(1) Active	(2) Employed	(3) Works > 15h/week	(4) Works > 20h/week	(5) Works > 30h/week	(6) Nb of hours worked
Panel A: All mothers						
OLS	-0.108**	-0.117**	-0.200**	-0.245**	-0.217**	-7.534**
	(0.012)	(0.013)	(0.016)	(0.018)	(0.017)	(0.526)
IV	-0.008	-0.001	-0.151	-0.206	-0.255+	-8.846+
	(0.137)	(0.144)	(0.168)	(0.175)	(0.148)	(5.199)
ITT	0.001	0.000	0.023	0.031	0.039+	1.342+
	(0.021)	(0.022)	(0.026)	(0.027)	(0.023)	(0.796)
1^{st} stage			-0.152**	(0.018)		
F-stat			39.1			
Mean	0.817	0.794	0.627	0.47	0.235	19.77
	(0.387)	(0.404)	(0.484)	(0.499)	(0.424)	(14.55)
Observations	5691	5691	5691	5691	5691	5691
Panel B: Mothers with A-levels or higher education						
OLS	-0.101**	-0.102**	-0.158**	-0.235**	-0.252**	-7.068**
	(0.017)	(0.018)	(0.022)	(0.024)	(0.026)	(0.728)
IV	-0.024	-0.062	-0.199	-0.036	-0.418+	-7.793
	(0.172)	(0.176)	(0.200)	(0.215)	(0.220)	(6.597)
ITT	0.004	0.010	0.033	0.006	0.069*	1.282
	(0.028)	(0.029)	(0.034)	(0.036)	(0.034)	(1.093)
1^{st} stage			-0.165**	(0.024)		
F-stat			26.5			
Mean	0.831	0.814	0.659	0.513	0.267	21.079
	(0.375)	(0.389)	(0.474)	(0.500)	(0.442)	(14.644)
Observations	3138	3138	3138	3138	3138	3138
Panel C: Mothers with education lower than A-levels						
OLS	-0.101**	-0.102**	-0.186**	-0.231**	-0.224**	-7.068**
	(0.017)	(0.018)	(0.022)	(0.025)	(0.025)	(0.728)
IV	-0.024	-0.062	-0.235	-0.118	-0.185	-7.793
	(0.172)	(0.176)	(0.203)	(0.216)	(0.191)	(6.597)
ITT	0.004	0.010	0.039	0.019	0.030	1.282
	(0.028)	(0.029)	(0.034)	(0.036)	(0.031)	(1.093)
1^{st} stage			-0.141**	(0.029)		
F-stat			14.3			
Mean	0.800	0.770	0.586	0.415	0.195	18.114
	(0.400)	(0.421)	(0.493)	(0.493)	(0.397)	(14.260)
Observations	2553	2553	2553	2553	2553	2553

Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.
Source: Millennium Cohort Study - Waves 4 and 5.
Notes: Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness, mother's educational level, educational level of the partner at birth of 1^{st} child, dummy for cohabiting couple at birth of 1^{st} child, mother's relative age group, country, being employed before pregnancy, dummy if non white child. Instrument: time to conception for the first child > 1 year.

Table A9: Additional results on the impact of having an additional child on income, wage and labor market outcomes of partners

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Log of Household Weekly Income		Mother's hourly gross wage		Partner's outcomes		
	Gross	Equivalized	=0 if no wage	only if wage > 0	Employed	Nb. hours worked	Hourly gross wage
Panel A: all households							
OLS	0.134**	-0.034	-1.193**	0.736+	-0.002	0.250	1.860**
	(0.025)	(0.024)	(0.359)	(0.406)	(0.007)	(0.675)	(0.588)
IV	0.064	-0.048	0.285	0.284	-0.025	-4.757	2.392
	(0.223)	(0.216)	(4.111)	(4.945)	(0.058)	(5.514)	(6.652)
ITT	-0.010	0.007	-0.043	-0.043	0.004	0.733	-0.381
	(0.034)	(0.032)	(0.625)	(0.743)	(0.009)	(0.836)	(1.060)
1^{st} stage	-0.151	-0.151	-0.152	-0.150	-0.154	-0.154	-0.159
	(0.018)	(0.018)	(0.018)	(0.024)	(0.019)	(0.019)	(0.023)
F-stat	36.7	36.7	39.3	24.5	36.1	36.1	25.3
Mean	6.508	5.779	9.070	13.701	0.967	40.228	20.160
	(0.654)	(0.634)	(10.729)	(10.508)	(0.179)	(15.377)	(15.192)
Observations	5455	5454	5683	3765	4808	4808	3292
Panel B: households of high- and interm.- skilled women							
OLS	0.118**	-0.046	-1.043*	0.912*	-0.001	0.353	2.002**
	(0.029)	(0.028)	(0.428)	(0.445)	(0.007)	(0.765)	(0.702)
IV	0.072	-0.033	1.650	2.369	0.047	-2.359	5.034
	(0.291)	(0.284)	(5.282)	(5.063)	(0.077)	(7.227)	(10.452)
ITT	-0.010	0.004	-0.229	-0.373	-0.007	0.329	-0.629
	(0.040)	(0.039)	(0.731)	(0.802)	(0.011)	(1.000)	(1.296)
1^{st} stage	-0.136	-0.136	-0.138	-0.157	-0.139	-0.139	-0.125
	(0.022)	(0.022)	(0.021)	(0.027)	(0.022)	(0.022)	(0.027)
F-stat	22.9	22.9	24.6	20.5	22.6	22.6	11.9
Mean	6.635	5.902	10.6	15.163	0.978	40.746	21.731
	(0.619)	(0.6)	(11.525)	(10.992)	(0.148)	(14.618)	(15.687)
Observations	3835	3834	3969	2829	3453	3453	2426
Panel C: households of low-skilled women							
OLS	0.153**	-0.023	-1.841**	-0.392	-0.008	-0.278	1.527
	(0.044)	(0.043)	(0.623)	(0.816)	(0.018)	(1.395)	(1.064)
IV	0.015	-0.103	-5.082	-11.527	-0.147+	-7.869	-2.628
	(0.315)	(0.297)	(6.334)	(12.788)	(0.087)	(7.966)	(7.013)
ITT	-0.003	0.020	0.968	1.704	0.027+	1.467	0.682
	(0.061)	(0.056)	(1.220)	(1.884)	(0.015)	(1.504)	(1.822)
1^{st} stage	-0.190	-0.190	-0.190	-0.148	-0.186	-0.186	-0.259
	(0.037)	(0.037)	(0.036)	(0.050)	(0.037)	(0.037)	(0.045)
F-stat	15.0	15.0	16.3	5.9	13.7	13.7	18.0
Mean	6.17	5.450	5.074	8.979	0.936	38.745	15.304
	(0.623)	(0.605)	(6.837)	(6.903)	(0.244)	(17.289)	(12.351)
Observations	1620	1620	1714	936	1355	1355	866

Robust standard errors in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.
Source: Millennium Cohort Study - Wave 4 and 5.
Notes: High and intermediate skilled: mother's occupation before birth classified as: large employer, high manager, higher prof., low prof/high tech., lower managers, high supervisory, intermediate. Low skilled: mother's occupation before birth classified as: small employers, self-emp non profl, lower supervisors, lower technical, semi-routine, routine. Sample includes non twin pregnancies, first time mothers, aged between 20-36 at birth, having a partner at birth who moved in 10 years before to 1 year after the decision to have a child, who had up to 2 additional children. Controls: dummy for being overweight before pregnancy and dummy for having longstanding illness, mother's educational level, educational level of the partner at birth of 1^{st} child, dummy for cohabiting couple at birth of 1^{st} child, mother's relative age group, country, being employed before pregnancy, dummy if non white child. Instrument: time to conception for the first child > 1 year.

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