4-19-2021

Pregnancy Loss and Female Labor Market Outcomes

Priti Kalsi
Rochester Institute of Technology

Maggie Y. Liu
Smith College, yliu77@smith.edu

Pregnancy Loss and Female Labor Market Outcomes

Priti Kalsi, Maggie Y. Liu*

April 19, 2021

(*Preliminary draft*)

Abstract

As many as 20% of all pregnancies end in a miscarriage — a random event that any expecting woman is susceptible to, yet the economic effects of this prevalent fertility shock have not been directly studied. In this paper, we use data from the National Longitudinal Survey of Youth 1997 (NLSY97) and address a critical empirical question: how do miscarriages affect women's labor market outcomes, such as income and labor supply? We find that a miscarriage is associated with about $2,500 loss in annual income post-loss. Our findings suggest the negative effect on female labor market outcomes associated with a pregnancy loss outweighs any positive effect of delaying childbirth.

JEL Classification: J13, J16

Keywords: fertility, pregnancy loss, miscarriage, income

*Kalsi: Rochester Institute of Technology, Economics Department, 92 Lomb Memorial Drive, Rochester, NY 14623 (email: pkalsi@mail.rit.edu). Liu: Smith College, Department of Economics, Wright Hall, 5 Chapin Drive, Northampton, MA 01063-6317 (email: yliu77@smith.edu).

1 Introduction

As many as 20% of all pregnancies end in a miscarriage — largely a random event that any expecting woman is susceptible to. Women who experience these unexpected losses endure physical and emotional pain, yet the economic effect of this prevalent fertility shock has not been directly studied. On the one hand, pregnancy losses necessarily delay childbirth, therefore miscarriages could delay any negative income and labor supply responses associated with child bearing, and even increase the economic potential if such delays translate to higher educational attainment for schooling age women. On the other hand, while varying in duration and degree, the emotional and the physical costs could lower productivity and ambition at work as well as the woman's labor supply. In this paper, we address a critical empirical question: how do miscarriages affect women's labor market outcomes, such as income and labor supply? Our findings indicate that pregnancy loss negatively impacts a woman's earnings and potentially their labor supply, suggesting that costs associated with a pregnancy loss outweigh any benefits that could have been realized from delaying childbirth.[1]

While we are not the first to study miscarriages and economic outcomes, our contribution is to focus on the direct effect of pregnancy loss rather than indirectly. Taking advantage of the fact that the occurrence of a miscarriage is medically random, a large literature has has utilized a miscarriage as an instrument for the endogenous timing of childbirth. The instrument of miscarriage has been used to study the effect of childbirth, teen childbirth, number of children, birth spacing, and more. However, the literature is relatively silent on studying the effect of miscarriage directly. By finding a direct impact of miscarriage on income loss, our results threaten the exclusion restriction for the validity of using miscarriage as an instrumental variable. However, the direction of the bias is such that previous literature's findings are likely lower bounds on the effect of delaying childbirth on female labor market participation. That is, using miscarriage as an instrument likely underestimates the

[1]The literature on fertility and female labor market outcomes has documented that delaying childbirth could improve a women's income potential since miscarriages necessarily delay childbirth — an event that discounts labor productivity (Bratti and Cavalli, 2014; Fletcher and Wolfe, 2009; Miller, 2011).

positive effect of preventing teenage childbirth (or delaying adult childbirth) on labor market outcomes, as the miscarriage itself negatively impacts labor market outcomes.

We rely on the medical literature which supports that, conditional on a few risk factors, miscarriages are random events. Most miscarriages are associated with extra or missing chromosomes, which result by chance when the embryo divides and grows. Additionally, most women (87%) who experience a miscarriage have subsequent natural pregnancies. Only 1% of women suffer repeat miscarriages (three or more).[2] Even amongst women who suffer repeat miscarriages, 50% of them could be explained by random chance (Regan and Rai, 2000). In addition to relying on the medical literature, we also document evidence supporting the randomness of miscarriage occurrence in our data. We show that women that go on to have miscarriages in our sample are not systematically different from women who do not prior to the pregnancy loss.

Our analysis utilizes the National Longitudinal Survey of Youth 1997 (NLSY97), which include 18 rounds of panel data that follow 8,984 individuals from the ages of 12 and 18 till the age of 32 and 38. The panel data allow us to estimate an individual fixed effect model which help remove all unobservable characteristics that vary at the individual level but are constant over time, such as the individual's motivation, behavior, family background, or ability. Though individual fixed effects help remove a lot of confounding factors, our estimates would be biased if the timing of pregnancy loss is correlated with other economic shocks or health shocks that co-determine labor market outcomes. We include several robustness checks that suggest that our effects are not determined by such shocks over time.

We find four main results. First, our preferred specification indicates that, everything else equal, an occurrence of miscarriage is associated with an average loss of $2,495 to $2,518 in annual income post-miscarriage, and this effect is robust to various sample restrictions. Second, we find that the average income loss is mostly driven by women who experienced

[2]Much of the data discussed here are from the Cleveland Clinic overview article on miscarriages. https://my.clevelandclinic.org/health/diseases/9688-miscarriage

miscarriages after they have married, and married women who already have children. Third, we do not detect a consistently significant labor supply effect from miscarrying. This suggests that women reducing their labor supply is not the primary mechanism explaining the decline in income and that they might also experience a loss in labor productivity after a miscarriage. Finally, our heterogeneity results suggest that the costs associated with pregnancy loss and its impacts on the post-loss labor market outcomes are not equal among women — the effects appear to be more severe for women who experienced loss between ages 23-28, and women with less education.

These findings shed light on the economic consequences of a common event suffered by as many as 20% of all childbearing women. The negative effects documented in this paper suggest that a random fertility shock — in our particular setting, a miscarriage — is an additional determinant of women's labor market outcomes. Our findings also bear policy implications for labor laws, since the significant income loss due to miscarriage highlights a blind-spot in workplace leave policies, as most employers do not recognize pregnancy loss as a reason for bereavement leave. Not given a chance to rest and recover, women are forced to go back to work after a pregnancy loss with reduced productivity, which not only leads to long lasting income loss, but may also negatively affect future career advancement.

The rest of the paper is organized as follows. We introduce the context and discuss relevant literature in Section 2. We describe the data in Section 3. Section 4 outlines the empirical specification, and Section 5 presents our main findings, robustness checks, and heterogeneous analysis. Section 6 concludes.

2 Context and related literature

This paper is related to a large and growing literature examining the effect of childbearing on female labor market outcomes. Since the decision to have children is often co-determined with other factors that concurrently affect income and labor supply, it is difficult to to identify the

causal effect of childbearing from a direct comparison of women with and without children. Therefore, this literature has exploited exogenous factors such as medical advancements, policy, or fertility events that alter the timing or the the number of births. The findings vary from a modest impact of an additional child due to biological events on women's labor supply (Angrist and Evans, 1998; Bronars and Grogger, 1994; Hotz et al., 1997; Jacobsen et al., 1999), to a more significant loss in female labor participation, education attainment, or earnings (Bailey, 2006; Goldin and Katz, 2002; Miller, 2011; Lundborg et al., 2017).

More related to our paper is the strand of literature that examines the consequences of teenage childbearing. To deal with adverse selection of teen pregnancy, studies have used as an instrument a particular fertility event which exogeneously alters the timing of childbearing — miscarriage (Bratti and Cavalli, 2014; Fletcher and Wolfe, 2012; Hotz et al., 2005).[3] The exclusion restriction is justified by the fact that a miscarriage is biologically random, and therefore unlikely to be correlated with unobserved variables that directly influence outcomes such as education or income. The relevance comes from the fact that miscarriage necessarily delays childbirth. Recent studies have questioned the validity of miscarriage as an instrument because although biologically random, it is not economically random (Fletcher and Wolfe, 2009; Ashcraft et al., 2013). In particular, if a women decides to abort her pregnancy, miscarriage would not have been observed. A further complication comes from the fact that abortion is not randomly assigned — rather, it is related to family background and neighborhood, both of which influence labor market outcomes. Notably, Ashcraft et al. (2013) show that estimates derived using a miscarriage as an instrument tend to underestimate the adverse effect of teen motherhood.

Despite the careful examination of these studies, there is one important but overlooked threat to the validity of the miscarriage instrument in studies that examine female labor market outcomes. That is, emotional pain associated with pregnancy loss is common and can cause significant anxiety and grief. This, in turn, could directly affect a woman's labor

[3]Other studies have used similar events such as age of menarche and school leaving age as instruments. See Ashcraft et al. (2013) for a survey on the literature.

market potential and threaten the exclusion restriction. To the best of our knowledge, we are the first to directly examine the potential effect of miscarriage on adult women's income. We consider this the main contribution of our paper. At the same time, we build upon the insights from previous studies that miscarriage is not economically randomly and is censored by abortion. Specifically, we take advantage of a longitudinal data that allows us to remove confounding economic factors identified in previous studies, such as neighborhood and family background. In addition, we address the concern of non-random assignment of miscarriage by carefully restricting our sample such that the treated group includes only miscarriages from plausibly planned pregnancies by women who have married.[4]

The medical literature which extensively documents adverse impact of pregnancy loss on women's mental and physical health suggests that there may be a direct effect of miscarriage on labor market outcomes. Brier (2008) provides a review of the literature on grief after a miscarriage and suggests that the grief is similar to grief associated with other major losses though symptoms lessen over time. Geller et al. (2004) provides a literature review on anxiety associated with pregnancy loss and argues that women experience increased anxiety that persists for at least 4 months. Other studies argue that the symptoms of grief can be severe and last a longer term.[5] Kersting and Wagner (2012) provides a review of the literature focusing on pregnancy loss and an heightened state of grief known as "complicated grief" or "prolonged grief disorder". Depending on the procedure and circumstances involved, many women also need time recovering from the physical pain associated with a miscarriage.[6] Even though grief and pain associated with pregnancy loss can be significant, many women return to work soon after experiencing a miscarriage. Knowing that unexpected pregnancy

[4]We focus on married women also because they are least likely to underreport abortions. The bias associated with abortion-related censoring of pregnancy could be large if the propensity to utilize abortions is large. However, abortion is a much less common occurrence amongst married women and the best estimates on all induced abortions in the United States between 1997 and 2001 suggest that 83% of all abortions were to unmarried women (Jones and Kost, 2007). In addition, there is no evidence that misreporting of abortions as miscarriages is common among surveys (Jones and Forrest, 1992).

[5]Lin and Lasker (1996) is a longitudinal study that followed women after an unexpected pregnancy loss grief continued in 59% of the women in a two year follow up.

[6]https://hbr.org/2019/12/going-back-to-work-after-a-pregnancy-loss

loss is a painful experience which lasts for months and sometimes years, it is possible that women's experience in the workforce also suffers. Moreover, it is a shock that many women experience when they are at a point of their careers where a setback could be significant.

3 Data

To carry out our analysis, we use data from the National Longitudinal Survey of Youth 1997 (NLSY97). It consists of a nationally representative sample of youths born between 1980 and 1984 in the United States. Participants were ages 13 – 17 during the initial survey in 1997, and they were followed annually until 2011, and biannual until 2017. We utilize a total of 17 rounds of NLSY97, spanning the years 1997 to 2015.[7] The NLSY data contains detailed information on demographic characteristics, education, fertility, and labor market outcomes such as income and weeks worked in a year. We rely on questions regarding non-live births in the "Pregnancy and fertility" module to identify women who have had a pregnancy that ended in a loss. Furthermore, the dates, participant's age, gestational age, and how pregnancy ended (stillbirth, miscarriage, or abortion) are recorded for each loss.

Since we are interested in studying the potential effect of miscarriages on female labor market outcomes, we make a few restrictions on the sample. First, we focus on female participants in the survey. There were 4,385 teenage women in the initial survey in 1997, and 3,579 of them remained in the last round in our sample. These women are between the ages 31 and 35 in the last survey year, 2015. We restrict the sample to include only women-year observations who are older than 18 at the time of survey — this allows us to focus on observations that are legally allowed to marry and more likely to be fully engaged in the labor market. The age restriction also allows us to focus on adult pregnancies for which a miscarriage is more likely to be a random event that is not affected by selective abortions.[8]

[7] We are unable to use the most recent survey from 2017-18 because the data do not include the fertility information we use in our analysis.

[8] (Ashcraft et al., 2013) show that pregnant teens that choose to abort are positively selected.

Next, we exclude from the sample women who became pregnant before their first marriage. The justification for this sample restriction also comes from concerns over underreporting of abortions. While we do not have the information in NLSY to infer whether a pregnancy is intentional or accidental, we make the assumption that post-marital pregnancies are more likely planned.[9]

Finally, since the goal of our analysis is to examine the impact of an exogenous pregnancy loss on labor market outcomes, we focus on miscarriages. Although understanding how other forms of pregnancy loss – i.e., abortions and stillbirths – are equally important, a clean identification is more challenging since both events are likely correlated with factors that might explain the pregnancy loss as well as the labor market outcomes. Abortions could come from an endogenous decision that aims to prioritize education or career advancement. Stillbirths, on the other hand, are pregnancy losses that occur after 20 weeks of pregnancy. Although largely random, these events could be correlated with socioeconomic and health conditions which influence both the likelihood of a stillbirth and the labor market outcomes. Therefore, we exclude from our sample women who suffered losses from abortions or stillbirths.

The final sample consist of 2,067 women in the initial round. Table 1 summarizes their characteristics. They are about equally distributed among 5 birth years between 1980 and 1984. 34.5% of the sample are Black, Hispanic, or mixed race, and 65.5% of the sample is white. Roughly 40% of individuals in our sample do not have a high school diploma by the age of 18. Of the 60% who have a high school diploma by the age of 18, 40% are enrolled in college. Fertility events are common in our sample and 46.5% of the women have children, and the share of women who have experienced at least one miscarriage is 13.1%.

Table 2 provides similar tabulations based on whether a women has experienced a miscarriage. Women who suffer a miscarriage look similar to women who do not in terms of their demographics. The data supports the medical literature's argument that miscarriages are random events. Table 2 shows that women who go on to experience miscarriages are

[9]Literature suggests that abortion is least common amongst married women (Jones and Kost, 2007).

not observationally different from women who do not. The two groups are of similar age, race, and educational attainment at age 18 — when they enter the sample and before any pregnancy loss.[10] This suggests that women who miscarry are not systematically different from those who do not. Women who have had a miscarriage are more likely to have children, since women without partners or intentions to bear child may not have pregnancies to begin with.

On the other hand, when we look at labor market outcomes which are observed observed throughout the sample period, women without miscarriages fare better in income, work more weeks during a year, especially on employer-type jobs. The differences across the means are large and statistically significant. The group difference could be driven by parenting responsibilities since women with miscarriages most likely also have children (86% to be exact). Nevertheless, motivated by the striking patterns, we proceed to rigorously test whether miscarriages have significant impacts on labor market outcomes, using the empirical specification described in the next section.

4 Empirical specification

We investigate the effect of experiencing a miscarriage on various female labor market outcomes. Our main empirical specification is given in equation 1.

$$Y_{it} = \beta_0 + \beta_M \cdot M_{it} + \beta_X \cdot X_{it} + \delta_i + \delta_t + \epsilon_{ijt} \tag{1}$$

The dependent variable, Y_{it} is woman i's labor market outcome in year t, which can be income, or labor supply measures, such as total weeks worked on all jobs, total weeks worked for an employer, and total weeks worked being self-employed. The key independent variable is whether or not a woman has ever experienced a miscarriage, M_{it}, which takes the value of

[10] The differences across the means are small and statistically indistinguishable from zero.

one if the woman is observed after she has reported a miscarriage and zero otherwise.[11] Importantly, we include individual fixed effects which help remove time-invariable unobservable factors that explain a woman's economic outcomes or her health outcomes; we also include year fixed effects to tease out time and macro economic factors that affect all women in a certain year.

Furthermore, we control for age, education attainment, school enrolment status, and number of children, all of which enter the estimation as categorical variables to allow minimum distributional assumptions on these variables. Finally, standard errors are clustered at the woman level to allow serial correlation across years for the same individual. Our identifying assumption is that, conditional on the inclusion of individual, year fixed effects, as well as various demographic controls, the occurrence of pregnancy loss – miscarriages in our case – is essentially random. This allows us to interpret the β_M coefficient as the causal effect of miscarriage on labor market outcomes Y_{it}.

5 Results

5.1 Main Effects

Table 3 presents the estimated effects of miscarriage on annual income. The independent variable of interest is `Had miscarriage` — a binary variable, which is 1 for having experienced miscarriages and post-miscarriage. In Column 1, we use the most parsimonious specification with only year and individual fixed effects. In the other columns, we add one additional control variable at a time: Column 2 includes age fixed effects to control life cycle effects on income; Columns 3 controls for educational attainment and enrollment status; Column 4 includes two family characteristics: number of children as a categorical variable

[11] In our data, the year prior to a miscarriage is coded as zero, and the year during which during a miscarriage took place as well as subsequent years are coded as one. We do so because we do not observe the month of the loss for the majority of losses. Therefore we allow for negative effects of miscarriages to be captured immediately after the loss. As a robustness check, we relax this assumption and assume that miscarriages only affect subsequent years' labor market outcomes, and the estimates are almost identical.

to control for any negative effect from parenting responsibilities; marital status to control for the effects of household composition on labor supply and income. We consider the specification presented in Column 4 as our preferred specification. Our findings indicate that an occurrence of miscarriage is associated with a $2,495 loss in annual income post-miscarriage. In Column 5, we aim to further tease out any confounding effects from time varying health shocks. In Column 6, we further restrict the sample to exclude women who dropped out of the labor force after having their first child.[12]

Next, in Table 4, we show results using comparable specifications but explore heterogeneous effects of miscarriage. The labor market effects of a miscarriage could be modulated or intensified by events such as marriage and childbearing. For example, the emotional pain of a pregnancy loss for a woman without children could be more severe if she associates the loss with future childbearing possibilities; on the other hand, the emotional trauma of a loss for woman with children could be more severe perhaps because she has a more concrete perception of loss from parenting experience, and the physical trauma of a miscarriage could be more damaging and harder to recover from due to time constraints of being a parent.

In Panel A, we explore whether effects of a miscarriage differ based on whether the loss occurred before or after a women's first child. A loss due to miscarrying is coded as two variables: `First miscarriage before first child` takes on the value of 1 for women-year observations post a women's first miscarriage that took place *before* the birth of her first child; `First miscarriage before first child` takes on the value of 1 women-year observations post a woman's first miscarriage that took place *after* her first child. This allows us to separately identify the income effect of a miscarriage on women already with children. Focusing on our preferred specifications in Columns 4, we find that experiencing a miscarriage before child bearing has a negative effect on income though this effect is not

[12]We create a dummy variable that indicates whether a respondent drops out the labor force after having their first child. Women who drop out of the labor force after bearing the first child may have different labor market responses to losses if they had planned to stop working to begin with. We restrict the sample to women who continue to participate in the labor force after child rearing since they will likely to be most affected by losses.

statistically significant; on the other hand, experiencing a miscarriage after child bearing has a statistically significant effect on annual income – an average of $3,893 decline in annual income post-loss, all else equal. Our most strict specification in Column 6 confirm the magnitude and significance of this effect.

In Panel B, we explore whether income effects of a miscarriage differ based on marital status at the time of loss. To do so, we interact the binary loss variable (`Had miscarriage`) with a marital status dummy that indicates whether a woman has never married.[13] This interaction creates four mutually-exclusive groups: women who have married with no miscarriages (the reference group), women who have married with miscarriages, women who have never married and have no miscarriages, and women who have never married with miscarriages. The estimated coefficient on `Have married, had miscarriage` identifies the income effect post-loss for women who were or had been married at the time of miscarrying. The difference between coefficients on `Not married, no miscarriage` and `Not married, had miscarriage` identifies the post-loss income effect for women who had not been married at the time of miscarrying. Focusing again on Column 4 in Panel B, compared to the reference group, women who have married but without loss, we find a negative effect of miscarriage on women who have married — a miscarriage is associated with $2,323 less in annual income post-loss. Turning to the other two coefficients on women who have not married, the significant and negative estimates indicate that, on average, they annually make $3,527 to $3,029 less than the reference group, women who have married without loss, this is consistent with the marriage premium documented in the literature. However, the income difference between the loss and no loss group among women who have not married is relatively small ($498) and statistically indistinguishable from zero (p-value 0.494). Similarly, estimates from our most strict specification in Column 6 agree with the effects detected in Column 4.

[13]Women who are married, separated, divorced, widowed are considered "have been married"

5.2 Robustness Checks

Several potential confounding factors threaten the validity of our identification strategy. In Table 5, we explore the robustness of our results and address these concerns. All five columns use the preferred specification (Table 3, Column 4) and set of controls. They show robustness of our results to 5 different restrictions on our sample and definition of miscarriage. First, since our main sample excludes pre-marital pregnancies, our treatment group is married women with loss, while the control group consists of single women without pregnancies and married women without loss. It is possible that single women with no fertility events do not make a valid counterfactual, especially if single women are fundamentally different from married women in income. If for example there is a marriage premium — married women make more than single women, then our estimates could be biased if single women with no pregnancy are included in the control group. The individual fixed effects in our specification largely addressed this concern. However, to show that our results are not driven by the makeup of the control group, we exclude women who have never married by 2015 — the last wave in our sample, and present the results in Column 1. With this sample restriction, the treatment group is married women with loss, and the control group is married women without loss. The estimates are quantitatively and qualitatively similar to those from the main specification, Columns 4 in Tables 3 and 4.

Second, recurrent miscarriages (loss of two or more pregnancies) may not be medically random. According to Mayo Clinic, women who have had three or more consecutive miscarriages are at higher risk of miscarriage.[14] Underlying health condition is one of the explanations for recurrent pregnancy loss, and our estimates could be biased if underlying health conditions lead to lower income levels and repeated miscarriages at the same time. We investigate this potential explanation by excluding from our sample women with (self-reported) poor health conditions and more than 2 miscarriages. The results are shown in

[14] https://www.mayoclinic.org/diseases-conditions/pregnancy-loss-miscarriage/symptoms-causes/syc-20354298.

Column 2, and they indicate that the estimated coefficients and significance levels are largely with these sample restrictions.

Third, misreporting of miscarriages may confound our estimates. Pregnancy losses were first documented in the first survey following these events, and women were asked to recall these fertility events in later rounds. Some losses in our sample were initially reported as miscarriages, but were later "switched" as abortions or stillbirths, and vice versa. To test the robustness of our results to misreporting, we exclude women with any switched reporting to eliminate any intentional misreporting. The results are shown in Column 3, and again they are very similar to the main estimates in Column 1.

Fourth, unpaid maternity leave granted by the FMLA could also negatively affect income, since the start of our sample period follows the passing of FMLA in 1993. If we observe a subsequent child birth immediately following a miscarriage, it would be difficult to disentangle that the miscarriage-related negative effects from birth-related effects due to taking unpaid maternity leave. To address this concern, we drop from our sample the year of miscarriage and the following year if there was a birth, since this sample restriction eliminates the possibility of detecting a FMLA-related income and labor supply responses. The results reported in Column 4 indicate that the negative income effects are not driven by FMLA granted maternity leaves.

Finally, subsequent childbearing following a miscarriage could also bring negative effects on income; in other words, the intention of having more children could lead to both a loss and more children eventually. While controlling for the number of children in our main specification can address most of this concern, nevertheless, we drop women-year observations of any additional births following a miscarriage. Doing so teases out any subsequent effect on income due to childcare responsibilities, and therefore any change in income post-loss (but before the next child) should be explained solely by miscarriage-related effects. This is the most demanding sample restriction we impose, and we report the estimates in Column 5. All else equal, we find that on average a miscarriage is associated with $1,935 loss in annual

income post-miscarriage, although the p-value is 0.139. When we look at the estimates in Panels B and C, the negative effects on income from miscarriages occurring after the first child and to women who have been married are still statistically significant and of comparable sizes.

Our robust findings on income loss due to miscarriage could be explained by a reduction in labor supply due to the physical and emotional costs. To explore this potential mechanism, we examine the responses in labor supply, measured by number of weeks worked in a year, in Table 6. We look at three annual labor supply outcomes: total weeks worked in Columns 1 and 2, weeks worked on employer-type (ET) jobs in Columns 3 and 4, and weeks worked on self-employment (SE) in Columns 5 and 6. Following Tables 3 and 4. Estimates in Panel A show the average effects of a miscarriage, while those in Panels B and C show the effects based on child-bearing and marital status. With the exception of women who have married with miscarriages, we do not detect statistically significant labor supply effects from miscarrying. This suggests the income loss we is likely due to both a productivity loss and a labor supply decline.

Finally, as we mentioned in the Data Section, we focus on losses that occur to women after they are married and exclude from our sample women with pre-marital pregnancies (whether they resulted in losses or births). To show that our findings are not driven by this sample criteria, we replicate our estimations using a sample that *includes* women with pre-marital pregnancies in Table 12. Among this sample, miscarriage is also associated with a negative ans significant effect on income, although the loss in income appear to be smaller than that estimated using the main sample. There also seems to be a significant loss in number of weeks worked on employer-type jobs, especially among married women and women who experienced her first miscarriage after the first child.

5.3 Heterogeneous Effects

We explore the heterogeneity in the effects of pregnancy loss along two dimensions: age and education. In Table 7, we focus on the age of women when the first miscarriage took place. Specifically, we code the timing of the first miscarriage by age and create three dummy variables: `First miscarriage between 18 and 23` is 1 if a women had her first miscarriage when she was between 18 and 23, and the women-year observation is post-loss; `First miscarriage between 23 and 28` and `First miscarriage after 28` are defined similarly. We present the estimated coefficients on five outcomes: income in Column 1, log income in Column 2, total weeks worked in Column 3, weeks worked on employer-type jobs in Column 4, and weeks worked on self-employment in Column 5. We use the sample that excludes any women who had pre-marital pregnancies — this is the main sample used in Table 3. The results reveal that miscarriages that happened during ages 23-28 has the largest effect on income — experiencing a miscarriage between ages 23 and 28 is associated with a loss of $3,981 in annual income after the pregnancy loss. We document a more muted effect for women who were at least 28 years old at the time of miscarriage and the effect is not statistically significant. Lack of statistical significance for that group could be explained by the more limited number of years those women are observed post-loss.[15] While the effect for women experiencing a miscarriage between ages 23 and 28 may be explained partially by a decline in number of weeks worked, the estimated coefficients on the three labor supply variables are not statistically significant.

In Table 8, we focus on the heterogeneous effects on five outcomes based on the level of education achieved by a woman when her first miscarriage took place: no high school degree, with a high school degree but without a college degree, and with a college degree. Similar to the previous table, the sample excludes women with pre-marital pregnancies. Both panels reveal the following pattern: miscarriages occurred to women without a high school degree have the most severe impact on their post-loss income; miscarriages that took place after

[15] Women exit our sample at 35 years of age.

high school but before women acquired her college degree also have a negative and significant impact on income, but such impacts are smaller in magnitude; finally, miscarriages that occurred to women with a college degree have no detectable income effect. These patterns indicate that the costs associated with pregnancy loss and its impacts on the post-loss labor market outcomes are not equal among women — the effects appear to be more severe for women with less education and college-educated women seem to be able to weather the shock much better perhaps due to their access to work- or health-related support.

6 Conclusion

While the economics literature has paid great attention to the economic consequences of childbearing, it has remained silent on studying the direct labor markets effects of pregnancy loss — a common occurrence for women who have children. As many pregnancy losses can be argued to be random events, a large literature within economics has emerged utilizing miscarriages as instrument for childbirth and its timing. What remains missing from the literature is how a miscarriage, which often has emotional and physical stress associated with it, directly alters a woman's labor market outcomes. Our findings shed light on this important question. We find that a miscarriage is associated an annual income loss of roughly $2500. Our results show that a loss experienced when the woman is between 23 and 28 can have the largest effects, suggesting that where a woman is in her career path is important in determining the size of the effect. Finally, women who are least educated appear to have the most to lose in terms of future income potential after suffering a pregnancy loss. We find weak but negative effects of miscarriage on labor force participation, which in combination with the income loss being greatest for women who miscarry between 23 and 28 years of age, suggests that a miscarriage negatively impacts a woman's career trajectory.

Table 1: Summary Statistics

Variables	mean	sd	min	max
Birth year				
1980	0.187	0.390	0	1
1981	0.206	0.405	0	1
1982	0.201	0.401	0	1
1983	0.203	0.402	0	1
1984	0.202	0.402	0	1
Race				
Black	0.146	0.353	0	1
Hispanic	0.193	0.395	0	1
Mixed Race (Non-Hispanic)	0.007	0.083	0	1
Non-Black / Non-Hispanic	0.654	0.476	0	1
Education status at 18				
No High school diploma	0.397	0.489	0	1
High school diploma, not enrolled in college	0.200	0.400	0	1
High school diploma, enrolled in college	0.403	0.491	0	1
Had miscarriage				
No miscarriage	0.869	0.338	0	1
Had miscarriage	0.131	0.338	0	1
Have children				
No child	0.535	0.499	0	1
Have children	0.465	0.499	0	1
Labor market outcomes				
Annual income (USD)	25092.857	17746.461	0	149262.3
Weeks worked on all jobs in a year	41.390	12.343	0	53
Weeks worked on employer-type jobs in a year	39.616	13.519	0	53
Weeks worked on self-employment in a year	3.213	7.911	0	52.33333
Observations				2067

Note: Table presents descriptive statistics of our sample. The full sample includes 2,067 women, 1857 of which report income information for at least one year. Birth year, race, and education status at 18 are categorical variables and the mean reports the share of the sample belonging to a certain category. "Had miscarriage" and "Have children" are binary variables that indicate whether a woman had experienced miscarriage, whether a women have had children as of the last wave of survey. Labor market outcomes measure women-level averages of annual income and labor supply.

Table 2: Summary Statistics by Miscarriage

	No Miscarriage		Had Miscarriage		
Variables	mean	sd	mean	sd	difference
Birth year					
1980	0.178	0.382	0.227	0.420	-0.050
1981	0.207	0.405	0.216	0.412	-0.009
1982	0.202	0.402	0.180	0.385	0.022
1983	0.198	0.399	0.220	0.415	-0.021
1984	0.215	0.411	0.157	0.364	0.058*
Race					
Black	0.151	0.358	0.114	0.318	0.037
Hispanic	0.192	0.394	0.196	0.398	-0.004
Mixed Race (Non-Hispanic)	0.008	0.088	0.004	0.063	0.004
Non-Black / Non-Hispanic	0.650	0.477	0.686	0.465	-0.037
Education status at 18					
No High school diploma	0.400	0.490	0.434	0.497	-0.034
High school diploma, not enrolled in college	0.186	0.389	0.221	0.416	-0.036
High school diploma, enrolled in college	0.414	0.493	0.344	0.476	0.070*
Have children	0.384	0.486	0.855	0.353	-0.471***
Labor market outcomes					
Annual income (USD)	25705.548	18836.986	22994.527	15692.354	2711.022*
Weeks worked on all jobs in a year	41.290	13.047	38.094	12.994	3.196***
Weeks worked on employer-type jobs in a year	39.655	14.026	35.896	14.377	3.758***
Weeks worked on self-employment in a year	3.005	7.695	3.552	8.027	-0.548
Observations	1812		255		2067

Note: Table presents descriptive statistics of women with no miscarriages and women who had miscarriages, respectively. The difference in mean between the 2 groups are reported in the last column, and stars indicate the significance of the difference. The full sample includes 2,067 women, 1812 of which have not had a miscarriage as of the last wave of survey, and 255 of them had experienced miscarriage. Birth year, race, and education status at 18 are categorical variables and the mean reports the share of the sample belonging to a certain category. "Have children" is a binary variable that indicates whether a women have had children as of the last wave of survey. Labor market outcomes measure women-level averages of annual income and labor supply. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Effect of Miscarriages on Income

Annual Income	(1)	(2)	(3)	(4)	(5)	(6)
Had miscarriage	-5264.1***	-5249.5***	-4280.7***	-2495.4**	-2547.1**	-2518.2**
	(1292.8)	(1286.9)	(1152.2)	(1157.7)	(1170.0)	(1205.9)
Year FE	Y	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y
Age controls		Y	Y	Y	Y	Y
Education controls			Y	Y	Y	Y
Number of children				Y	Y	Y
Marital status controls				Y	Y	Y
General health condition					Y	Y
After-child labor force restriction						Y
Observations	20514	20514	20514	20490	20005	19324

Note: Table presents the baseline income effect of miscarriage. Dependent variable is the level of annual wage income. Sample excludes women with abortions, stillbirths, and women with pregnancies before ever getting married. In other words, sample includes women with no loss PLUS women with miscarriages after getting married. `Had miscarriage` is a 0/1 loss variable, which is 1 for having experienced miscarriages AND post-miscarriage. SEs are clustered at individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Effect of Miscarriages on Income by Timing of Miscarriages

Panel A: Child birth	(1)	(2)	(3)	(4)	(5)	(6)
First miscarriage before first child	-1367.5	-1317.0	-1582.7	-1632.4	-1706.5	-1552.4
	(1682.2)	(1679.5)	(1487.6)	(1529.1)	(1573.6)	(1657.3)
First miscarriage after first child	-10716.8***	-10729.0***	-8152.0***	-3893.4**	-3879.3**	-3942.1**
	(1726.7)	(1700.8)	(1628.0)	(1608.1)	(1619.7)	(1621.2)
Year FE	Y	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y
Age controls		Y	Y	Y	Y	Y
Education controls			Y	Y	Y	Y
Number of children				Y	Y	Y
Marital status controls				Y	Y	Y
General health condition					Y	Y
After-child labor force restriction						Y
Observations	20514	20514	20514	20490	20005	19324

Panel B: Marriage	(1)	(2)	(3)	(4)	(5)	(6)
Have married, had miscarriage	-5429.9***	-5376.8***	-3762.0***	-2323.1***	-2243.8***	-2284.4***
	(948.9)	(943.9)	(855.1)	(845.4)	(855.6)	(875.9)
Not married, no miscarriage	-4364.5***	-4205.9***	-2870.8***	-3527.3***	-3719.6***	-3809.9***
	(515.4)	(519.3)	(454.3)	(440.0)	(444.8)	(456.9)
Not married, had miscarriage	-5286.4***	-5368.7***	-2844.2***	-3029.6***	-3640.8***	-3723.7***
	(923.8)	(919.4)	(832.2)	(812.7)	(685.0)	(699.1)
P-val: Not married; loss - no loss	0.262	0.155	0.972	0.494	0.894	0.887
Year FE	Y	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y
Age controls		Y	Y	Y	Y	Y
Education controls			Y	Y	Y	Y
Number of children				Y	Y	Y
Marital status controls				N	N	N
General health condition					Y	Y
After-child labor force restriction						Y
Observations	32626	32626	32626	32626	31782	30850

Note: Table presents the income effect of miscarriage based on timing of miscarriage. Dependent variable is the level of annual wage income. Sample in Panels A excludes women with abortions, stillbirths, and women with pregnancies before ever getting married. In other words, sample includes women with no loss PLUS women with miscarriages after getting married. In Panel B, we include women with pre-marital pregnancies, and interact the loss variable with time-varying marital status. `Had miscarriage` is a 0/1 loss variable, which is 1 for having experienced miscarriages AND post-miscarriage. `Had miscarriage` is interacted with marital status dummy that indicates whether a woman has never married (women who are married, separated, divorced, widowed are considered "have been married"). The interaction yields 4 groups: women who are or were married with no miscarriages (this is the reference group), women who are never married and have no miscarriages, women who are or were married with miscarriages, and women who are never married with miscarriages. SEs are clustered at individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Robustness Checks: Effect of Miscarriages on Income with Alternative Sample Restrictions

Panel A	(1)	(2)	(3)	(4)	(5)
Had miscarriage	-2423.3**	-2495.4**	-2519.5**	-2647.0**	-1934.9
	(1162.0)	(1157.7)	(1204.1)	(1233.1)	(1308.2)
Observations	14169	20490	20334	19067	19902
Panel B	(1)	(2)	(3)	(4)	(5)
First miscarriage before first child	-1621.2	-1632.4	-1401.1	-1802.0	-274.4
	(1535.7)	(1529.1)	(1585.6)	(1625.3)	(1916.8)
First miscarriage after first child	-3744.2**	-3893.4**	-4272.5**	-4017.2**	-5058.0***
	(1612.4)	(1608.1)	(1682.3)	(1740.9)	(1294.4)
Observations	14169	20490	20334	19067	19902
Panel C	(1)	(2)	(3)	(4)	(5)
Have married, had miscarriage	-2161.3**	-2323.6***	-2199.9**	-2458.1***	-1754.6*
	(882.7)	(848.4)	(888.7)	(907.1)	(999.9)
Not married, no miscarriage	-3142.0***	-3519.8***	-3514.8***	-3581.0***	-3344.6***
	(421.0)	(440.1)	(443.5)	(462.7)	(440.7)
Not married, had miscarriage	-464.5	-2988.0***	-3176.9***	-3779.0***	-2604.9***
	(1398.7)	(824.6)	(856.8)	(756.3)	(744.1)
P-val: Not married; loss - no loss	0.0470	0.473	0.663	0.767	0.257
Year FE	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y
Age controls	Y	Y	Y	Y	Y
Education controls	Y	Y	Y	Y	Y
Number of children	Y	Y	Y	Y	Y
Marital status controls in Panels A & B	Y	Y	Y	Y	Y
General health condition	N	N	N	N	N
After-child labor force restriction	N	N	N	N	N
Observations	19946	32558	32074	30409	30939
Excl. women who have never married	✓				
Excl. poor health and >2 miscarriages		✓			
Excl. switched reporting of miscarriages			✓		
Excl. year of birth immediately after miscarriage				✓	
Excl. years of additional birth after loss					✓

Note: Table presents robustness checks using various restrictions on sample. Dependent variable is the level of annual wage income. Sample in Panel A and B excludes women with abortions, stillbirths, and women with pregnancies before ever getting married. In other words, sample includes women with no loss PLUS women with miscarriages after getting married. In Panel C, we include women with pre-marital pregnancies, and interact the loss variable with time-varying marital status. `Had miscarriage` is a 0/1 loss variable, which is 1 for having experienced miscarriages AND post-miscarriage. `Had miscarriage` is interacted with marital status dummy that indicates whether a woman has never married (women who are married, separated, divorced, widowed are considered "have been married"). The interaction yields 4 groups: women who are or were married with no miscarriages (this is the reference group), women who are never married and have no miscarriages, women who are or were married with miscarriages, and women who are never married with miscarriages.SEs are clustered at individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Effect of Miscarriages on Labor Supply

	Total weeks worked		ET weeks worked		SE weeks worked	
Panel A	(1)	(2)	(3)	(4)	(5)	(6)
Had miscarriage	-0.957	-1.261	-1.317	-1.804	-0.366	-0.177
	(1.114)	(1.130)	(1.179)	(1.212)	(0.665)	(0.721)
Observations	26058	22885	26092	22915	26312	23071
	Total weeks worked		ET weeks worked		SE weeks worked	
Panel B	(1)	(2)	(3)	(4)	(5)	(6)
First miscarriage before first child	-0.792	-0.867	-0.760	-0.882	-0.877	-0.763
	(1.344)	(1.346)	(1.431)	(1.470)	(0.791)	(0.949)
First miscarriage after first child	-1.161	-1.698	-2.011	-2.833	0.273	0.482
	(1.653)	(1.783)	(1.741)	(1.879)	(1.019)	(1.087)
Observations	26058	22885	26092	22915	26312	23071
	Total weeks worked		ET weeks worked		SE weeks worked	
Panel C	(1)	(2)	(3)	(4)	(5)	(6)
Have married, had miscarriage	-1.521*	-1.840**	-1.934**	-2.420***	-0.0383	0.0541
	(0.838)	(0.850)	(0.872)	(0.893)	(0.493)	(0.539)
Not married, no miscarriage	2.602***	2.467***	2.703***	2.559***	-0.241	-0.233
	(0.438)	(0.441)	(0.456)	(0.463)	(0.253)	(0.276)
Not married, had miscarriage	2.175**	1.951**	2.144**	1.767*	-0.451	-0.104
	(0.855)	(0.881)	(0.902)	(0.946)	(0.538)	(0.551)
P-val: Not married; loss - no loss	0.588	0.530	0.505	0.372	0.677	0.802
Year FE	Y	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y
Age controls	Y	Y	Y	Y	Y	Y
Education controls	Y	Y	Y	Y	Y	Y
Number of children	Y	Y	Y	Y	Y	Y
Marital status controls in Panels A & B	Y	Y	Y	Y	Y	Y
General health condition	N	Y	N	Y	N	Y
After-child labor force restriction	N	Y	N	Y	N	Y
Observations	43841	38255	43904	38311	44315	38598

Note: Dependent variables are three measures of annual labor supply: total weeks worked, weeks worked on employer-type (ET) jobs, and weeks worked on self-employment (SE). Sample in Panels A and B excludes women with abortions, stillbirths, and women with pregnancies before ever getting married. In other words, sample includes women with no loss PLUS women with miscarriages after getting married. In Panel C, we include women with pre-marital pregnancies, and interact the loss variable with time-varying marital status. `Had miscarriage` is a 0/1 loss variable, which is 1 for having experienced miscarriages AND post-miscarriage. `Had miscarriage` is interacted with marital status dummy that indicates whether a woman has never married (women who are married, separated, divorced, widowed are considered "have been married"). The interaction yields 4 groups: women who are or were married with no miscarriages (this is the reference group), women who are never married and have no miscarriages, women who are or were married with miscarriages, and women who are never married with miscarriages. SEs are clustered at individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Effect of Miscarriages: Heterogeneity by Age at First Miscarriage

	income	log income	Total weeks worked	ET weeks worked	SE weeks worked
	(1)	(2)	(3)	(4)	(5)
First miscarriage between 18 and 23	-1129.2	-0.380	-2.973	-4.798	1.905
	(2586.7)	(0.252)	(2.993)	(3.362)	(1.699)
First miscarriage between 23 and 28	-3980.7***	-0.140	-1.040	-1.751	-0.194
	(1449.3)	(0.0895)	(1.612)	(1.584)	(1.021)
First miscarriage after 28	-876.1	0.0766	-0.139	0.507	-1.403
	(2090.0)	(0.0968)	(1.618)	(1.861)	(0.882)
Year FE	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y
Age controls	Y	Y	Y	Y	Y
Education controls	Y	Y	Y	Y	Y
Number of children	Y	Y	Y	Y	Y
Marital status controls	Y	Y	Y	Y	Y
General health condition	N	N	N	N	N
After-child labor force restriction	N	N	N	N	N
Observations	20490	20490	26058	26092	26312

Note: Table shows heterogeneous effects based on age when first miscarriage happened. Dependent variable is the level of annual wage income. Sample in Panel A excludes women with abortions, stillbirths, and women with pregnancies before ever getting married. In other words, sample includes women with no loss PLUS women with miscarriages after getting married. In Panel B, we include women with pre-marital pregnancies, and interact the loss variable with time-varying marital status. `Had miscarriage` is a 0/1 loss variable, which is 1 for having experienced miscarriages AND post-miscarriage. `Had miscarriage` is interacted with marital status dummy that indicates whether a woman has never married (women who are married, separated, divorced, widowed are considered "have been married"). The interaction yields 4 groups: women who are or were married with no miscarriages (this is the reference group), women who are never married and have no miscarriages, women who are or were married with miscarriages, and women who are never married with miscarriages. SEs are clustered at individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: Effect of Miscarriages: Heterogeneity by Education at First Miscarriage

	income	log income	Total weeks worked	ET weeks worked	SE weeks worked
	(1)	(2)	(3)	(4)	(5)
First miscarriage, no HS degree	-10795.3***	-0.711***	-0.337	-1.981	1.470
	(1773.8)	(0.225)	(4.795)	(6.036)	(2.682)
First miscarriage after HS degree, no college	-4538.6***	-0.0610	-1.778	-2.186	-0.351
	(1186.3)	(0.0989)	(1.659)	(1.697)	(0.861)
First miscarriage after college degree	1201.4	0.00584	0.340	0.671	-1.186
	(2081.6)	(0.0961)	(1.490)	(1.641)	(0.956)
Year FE	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y
Age controls	Y	Y	Y	Y	Y
Education controls	Y	Y	Y	Y	Y
Number of children	Y	Y	Y	Y	Y
Marital status controls	Y	Y	Y	Y	Y
General health condition	N	N	N	N	N
After-child labor force restriction	N	N	N	N	N
Observations	20356	20356	25890	25924	26144

Note: Table shows heterogeneous effects based on educational attainment when first miscarriage happened. Dependent variable is the level of annual wage income. Sample in Panel A excludes women with abortions, stillbirths, and women with pregnancies before ever getting married. In other words, sample includes women with no loss PLUS women with miscarriages after getting married. In Panel B, we include women with pre-marital pregnancies, and interact the loss variable with time-varying marital status. `Had miscarriage` is a 0/1 loss variable, which is 1 for having experienced miscarriages AND post-miscarriage. `Had miscarriage` is interacted with marital status dummy that indicates whether a woman has never married (women who are married, separated, divorced, widowed are considered "have been married"). The interaction yields 4 groups: women who are or were married with no miscarriages (this is the reference group), women who are never married and have no miscarriages, women who are or were married with miscarriages, and women who are never married with miscarriages. SEs are clustered at individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

References

Angrist, J. and Evans, W. (1998). Children and their parents' labor supply: Evidence from exogenous variation in family size. *American Economic Review*, 88(3):450–77.

Ashcraft, A., Fernández-Val, I., and Lang, K. (2013). The consequences of teenage childbearing: Consistent estimates when abortion makes miscarriage non-random. *The Economic Journal*, 123(571):875–905.

Bailey, M. J. (2006). More power to the pill: The impact of contraceptive freedom on women's life cycle labor supply. *The quarterly journal of economics*, 121(1):289–320.

Bratti, M. and Cavalli, L. (2014). Delayed first birth and new mothersâ labor market outcomes: Evidence from biological fertility shocks. *European Journal of Population*, 30(1):35–63.

Brier, N. (2008). Grief following miscarriage: a comprehensive review of the literature. *Journal of Women's Health*, 17(3):451–464.

Bronars, S. G. and Grogger, J. (1994). The economic consequences of unwed motherhood: Using twin births as a natural experiment. *The American Economic Review*, pages 1141–1156.

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

Fletcher, J. M. and Wolfe, B. L. (2012). The effects of teenage fatherhood on young adult outcomes. *Economic inquiry*, 50(1):182–201.

Geller, P. A., Kerns, D., and Klier, C. M. (2004). Anxiety following miscarriage and the subsequent pregnancy: a review of the literature and future directions. *Journal of psychosomatic research*, 56(1):35–45.

Goldin, C. and Katz, L. F. (2002). The power of the pill: Oral contraceptives and womenâs career and marriage decisions. *Journal of political Economy*, 110(4):730–770.

Hotz, V. J., McElroy, S. W., and Sanders, S. G. (2005). Teenage childbearing and its life cycle consequences exploiting a natural experiment. *Journal of Human Resources*, 40(3):683–715.

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

Jacobsen, J. P., Pearce III, J. W., and Rosenbloom, J. L. (1999). The effects of childbearing on married women's labor supply and earnings: using twin births as a natural experiment. *Journal of Human Resources*, pages 449–474.

Jones, E. F. and Forrest, J. D. (1992). Underreporting of abortion in surveys of us women: 1976 to 1988. *Demography*, 29(1):113–126.

Jones, R. K. and Kost, K. (2007). Underreporting of induced and spontaneous abortion in the united states: an analysis of the 2002 national survey of family growth. *Studies in family planning*, 38(3):187–197.

Kersting, A. and Wagner, B. (2012). Complicated grief after perinatal loss. *Dialogues in clinical neuroscience*, 14(2):187.

Lin, S. X. and Lasker, J. N. (1996). Patterns of grief reaction after pregnancy loss. *American journal of orthopsychiatry*, 66(2):262–271.

Lundborg, P., Plug, E., and Rasmussen, A. W. (2017). Can women have children and a career? iv evidence from ivf treatments. *American Economic Review*, 107(6):1611–37.

Miller, A. R. (2011). The effects of motherhood timing on career path. *Journal of population economics*, 24(3):1071–1100.

Regan, L. and Rai, R. (2000). Epidemiology and the medical causes of miscarriage. *Best practice & research Clinical obstetrics & gynaecology*, 14(5):839–854.

A Appendix

Table 9: Effect of Miscarriages on Log Income

Annual Income	(1)	(2)	(3)	(4)	(5)	(6)
Had miscarriage	-0.346***	-0.307***	-0.253***	-0.0884	-0.0931	-0.0913
	(0.0745)	(0.0727)	(0.0679)	(0.0691)	(0.0694)	(0.0681)
Year FE	Y	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y
Age controls		Y	Y	Y	Y	Y
Education controls			Y	Y	Y	Y
Number of children				Y	Y	Y
Marital status controls				Y	Y	Y
General health condition					Y	Y
After-child labor force restriction						Y
Observations	20514	20514	20514	20490	20005	19324

Note: Table presents the baseline income effect of miscarriage. Dependent variable is the natural logarithm of annual wage income. Sample excludes women with abortions, stillbirths, and women with pregnancies before ever getting married. In other words, sample includes women with no loss PLUS women with miscarriages after getting married. `Had miscarriage` is a 0/1 loss variable, which is 1 for having experienced miscarriages AND post-miscarriage. SEs are clustered at individual level. * p < 0.10, ** p < 0.05, *** p < 0.01

Table 10: Effect of Miscarriages on Log Income by Timing of Miscarriages

Panel A: Child birth	(1)	(2)	(3)	(4)	(5)	(6)
First miscarriage before first child	-0.237***	-0.197**	-0.201**	-0.126	-0.139	-0.132
	(0.0902)	(0.0922)	(0.0854)	(0.0870)	(0.0885)	(0.0851)
First miscarriage after first child	-0.502***	-0.462***	-0.333***	-0.0404	-0.0357	-0.0436
	(0.117)	(0.107)	(0.103)	(0.103)	(0.105)	(0.105)
Year FE	Y	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y
Age controls		Y	Y	Y	Y	Y
Education controls			Y	Y	Y	Y
Number of children				Y	Y	Y
Marital status controls				Y	Y	Y
General health condition					Y	Y
After-child labor force restriction						Y
Observations	20514	20514	20514	20490	20005	19324
Panel B: Marriage	(1)	(2)	(3)	(4)	(5)	(6)
Have married, had miscarriage	-0.305***	-0.283***	-0.199***	-0.109**	-0.111**	-0.115**
	(0.0572)	(0.0555)	(0.0533)	(0.0530)	(0.0528)	(0.0524)
Not married, no miscarriage	-0.0934***	-0.0720**	-0.00638	-0.0678**	-0.0740***	-0.0744***
	(0.0303)	(0.0297)	(0.0274)	(0.0269)	(0.0274)	(0.0275)
Not married, had miscarriage	-0.0685	-0.101*	0.0231	0.00357	-0.00967	-0.00845
	(0.0643)	(0.0613)	(0.0594)	(0.0585)	(0.0592)	(0.0600)
P-val: Not married; loss - no loss	0.683	0.617	0.604	0.202	0.255	0.250
Year FE	Y	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y	Y
Age controls		Y	Y	Y	Y	Y
Education controls			Y	Y	Y	Y
Number of children				Y	Y	Y
Marital status controls				N	N	N
General health condition					Y	Y
After-child labor force restriction						Y
Observations	32626	32626	32626	32626	31782	30850

Note: Table presents the income effect of miscarriage based on timing of miscarriage. Dependent variable is the natural logarithm of annual wage income. Sample in Panels A excludes women with abortions, stillbirths, and women with pregnancies before ever getting married. In other words, sample includes women with no loss PLUS women with miscarriages after getting married. In Panel B, we include women with pre-marital pregnancies, and interact the loss variable with time-varying marital status. `Had miscarriage` is a 0/1 loss variable, which is 1 for having experienced miscarriages AND post-miscarriage. `Had miscarriage` is interacted with marital status dummy that indicates whether a woman has never married (women who are married, separated, divorced, widowed are considered "have been married"). The interaction yields 4 groups: women who are or were married with no miscarriages (this is the reference group), women who are never married and have no miscarriages, women who are or were married with miscarriages, and women who are never married with miscarriages. SEs are clustered at individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Robustness Checks: Effect of Miscarriages on Log Income with Alternative Sample Restrictions

Panel A	(1)	(2)	(3)	(4)	(5)
Had miscarriage	-0.0750	-0.0884	-0.0746	-0.121*	-0.102
	(0.0694)	(0.0691)	(0.0706)	(0.0724)	(0.0825)
Observations	14169	20490	20334	19067	19902
Panel B	(1)	(2)	(3)	(4)	(5)
First miscarriage before first child	-0.116	-0.126	-0.0796	-0.175*	-0.134
	(0.0867)	(0.0870)	(0.0894)	(0.0932)	(0.0952)
First miscarriage after first child	-0.0229	-0.0404	-0.0726	-0.0512	-0.0578
	(0.104)	(0.103)	(0.105)	(0.105)	(0.149)
Observations	14169	20490	20334	19067	19902
Panel C	(1)	(2)	(3)	(4)	(5)
Have married, had miscarriage	-0.0867	-0.107**	-0.0774	-0.150***	-0.0779
	(0.0554)	(0.0532)	(0.0548)	(0.0556)	(0.0604)
Not married, no miscarriage	-0.102***	-0.0674**	-0.0682**	-0.0666**	-0.0568**
	(0.0300)	(0.0269)	(0.0270)	(0.0278)	(0.0270)
Not married, had miscarriage	0.0247	0.00750	0.0333	-0.0412	0.0304
	(0.0749)	(0.0595)	(0.0595)	(0.0619)	(0.0640)
P-val: Not married; loss - no loss	0.0858	0.188	0.0761	0.668	0.153
Year FE	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y
Age controls	Y	Y	Y	Y	Y
Education controls	Y	Y	Y	Y	Y
Number of children	Y	Y	Y	Y	Y
Marital status controls in Panels A & B	Y	Y	Y	Y	Y
General health condition	N	N	N	N	N
After-child labor force restriction	N	N	N	N	N
Observations	19946	32558	32074	30409	30939
Excl. women who have never married	✓				
Excl. poor health and >2 miscarriages		✓			
Excl. switched reporting of miscarriages			✓		
Excl. year of birth immediately after miscarriage				✓	
Excl. years of additional birth after loss					✓

Note: Table presents robustness checks using various restrictions on sample. Dependent variable is the natural logarithm of annual wage income. Sample in Panel A and B excludes women with abortions, stillbirths, and women with pregnancies before ever getting married. In other words, sample includes women with no loss PLUS women with miscarriages after getting married. In Panel C, we include women with pre-marital pregnancies, and interact the loss variable with time-varying marital status. `Had miscarriage` is a 0/1 loss variable, which is 1 for having experienced miscarriages AND post-miscarriage. `Had miscarriage` is interacted with marital status dummy that indicates whether a woman has never married (women who are married, separated, divorced, widowed are considered "have been married"). The interaction yields 4 groups: women who are or were married with no miscarriages (this is the reference group), women who are never married and have no miscarriages, women who are or were married with miscarriages, and women who are never married with miscarriages.SEs are clustered at individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Effects of Miscarriages: for Sample Including Women with Pre-marital Pregnancies

	income	log income	Total weeks worked	ET weeks worked	SE weeks worked
Panel A	(1)	(2)	(3)	(4)	(5)
Had miscarriage	-1347.1**	-0.0443	-1.377**	-1.843**	0.0841
	(651.3)	(0.0444)	(0.685)	(0.725)	(0.430)
Observations	30850	30850	38255	38311	38598
	income	log income	Total weeks worked	ET weeks worked	SE weeks worked
Panel B	(1)	(2)	(3)	(4)	(5)
First miscarriage before first child	-501.9	-0.0643	-1.136	-1.342	-0.264
	(983.3)	(0.0607)	(0.910)	(0.989)	(0.628)
First miscarriage after first child	-2351.9***	-0.0227	-1.513	-2.204**	0.393
	(794.3)	(0.0616)	(0.972)	(1.012)	(0.579)
Observations	30850	30850	38255	38311	38598
	income	log income	Total weeks worked	ET weeks worked	SE weeks worked
Panel C	(1)	(2)	(3)	(4)	(5)
Have married, had miscarriage	-2284.4***	-0.115**	-1.840**	-2.420***	0.0541
	(875.9)	(0.0524)	(0.850)	(0.893)	(0.539)
Not married, no miscarriage	-3809.9***	-0.0744***	2.467***	2.559***	-0.233
	(456.9)	(0.0275)	(0.441)	(0.463)	(0.276)
Not married, had miscarriage	-3723.7***	-0.00845	1.951**	1.767*	-0.104
	(699.1)	(0.0600)	(0.881)	(0.946)	(0.551)
P-val: Not married; loss - no loss	0.887	0.250	0.530	0.372	0.802
Year FE	Y	Y	Y	Y	Y
Individual FE	Y	Y	Y	Y	Y
Age controls	Y	Y	Y	Y	Y
Education controls	Y	Y	Y	Y	Y
Number of children	Y	Y	Y	Y	Y
Marital status controls in Panels A & B	Y	Y	Y	Y	Y
General health condition	Y	Y	Y	Y	Y
After-child labor force restriction	Y	Y	Y	Y	Y
Observations	30850	30850	38255	38311	38598

Note: Sample in all three panels excludes women with abortions or stillbirths, but *includes* women with pregnancies before ever getting married. In Panel C, we interact the loss variable with time-varying marital status. `Had miscarriage` is a 0/1 loss variable, which is 1 for having experienced miscarriages AND post-miscarriage. `Had miscarriage` is interacted with marital status dummy that indicates whether a woman has never married (women who are married, separated, divorced, widowed are considered "have been married"). The interaction yields 4 groups: women who are or were married with no miscarriages (this is the reference group), women who are never married and have no miscarriages, women who are or were married with miscarriages, and women who are never married with miscarriages. SEs are clustered at individual level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$