The Labor Market Returns to Delaying Pregnancy*

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Abstract

We estimate the effect of children on the careers of women in two settings with quasi-random variation in the timing of the pregnancy. First, we study the impact of unplanned pregnancies identified from failures of long-acting reversible contraceptives. Second, we study the impact of planned pregnancies among women receiving fertility treatments, identified from the success of the first treatment. Estimating the relative impact of planned and unplanned births is complicated by the combination of dynamic compliance (i.e., later pregnancies in the control group) and dynamic treatment effects. We develop an estimation strategy to compare these impacts and account for differences in the timing of children in the control groups. Using linked health and labor market data from Sweden, we find that planned pregnancies have an initially large and negative effect on income but this dissipates by five years after birth with no detrimental effect on occupation progression. In contrast, unplanned pregnancies halt women's career progression resulting in income losses of 30% by six years after the initial contraceptive failure. The detrimental effects of unplanned pregnancies are larger for women younger than 30, suggesting that unplanned births are particularly disruptive early in the career.

Keywords: labor market costs of motherhood; fertility; unplanned pregnancy

JEL Codes: J13; J22; J24; J31

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1 Introduction

Over the past fifty years, the lives of women have transformed dramatically. In 1970, a woman having her first child was on average 21 years old. By 2020, giving birth at age 21 would put a woman in the 20th percentile of the age-at-first-birth distribution and the average mother is 27 when she has her first child (Osterman et al., 2022). With access to better birth control, women gained time to find a better partner and to increase their educational attainment and labor market attachment (Bailey, 2006; Goldin and Katz, 2002). Despite a voluminous literature on the impact of motherhood, the labor market returns to delaying children through family planning are little understood because exogenous variation at the individual level is rare.

In this paper, we study the labor market outcomes of childless Swedish women who become pregnant while using long-acting reversible contraceptives (LARC), in particular, intrauterine devices (IUDs) and birth control implants. These methods of birth control work passively and are effective, but not perfect. About 0.5% of women using a LARC will get pregnant in a year, resulting in a natural experiment in which women who had planned to delay childbirth become pregnant earlier than they desired. First, we study the impact of unplanned pregnancy on women’s labor market outcomes using an “intent-to-treat” (ITT) analysis comparing the labor market trajectories of women who experience a LARC failure to those who took out a LARC prescription in the same year and at the same age. Before the prescription, the paths of women who eventually become pregnant are identical to those who do not. After the unplanned pregnancy, we see divergence in labor market outcomes on a variety of measures. Seven years after the LARC prescription, earnings are 15% lower and the probability of working in a skilled occupation is almost 20% lower than if the unplanned pregnancy had not occurred.

Next we investigate the role of pregnancy intentions and how intentions interact with the impact of children. In particular, by delaying pregnancy and giving birth when they are ready, do women reduce the impact of children on their careers? To answer this question, we use fertility treatments as an alternative source of quasi-random variation in the timing of childbirth. Following Lundborg et al. (2017), we estimate the impact of “planned” pregnancies from success in the first in vitro fertilization (IVF) procedure of women without children to date. The two settings—LARC failures and IVF successes—differ in the intentions of women at the time of pregnancy. In one case, women would like to avoid becoming pregnant and are using highly effective contraceptives. In the other case, women would like to become pregnant and are seeking fertility treatments. While we find large short-term impacts of planned pregnancies on earnings, our ITT estimates show that women’s labor market outcomes completely recover three years after the initial IVF procedure.
Comparison of the planned and unplanned ITT estimates is complicated by differences in the timing of births in the control group (dynamic compliance with treatment assignment). More than 50% of women who have a first IVF failure will go on to conceive within three years of the initial procedure. In contrast, fewer than 15% of women who avoid an unplanned pregnancy conceive within three years of a LARC prescription. Furthermore, the ITT estimates give the impact of pregnancy rather than the impact of childbirth. Women who have an unplanned pregnancy may have an abortion and more than 20% do. In order to understand the impact of children—rather than pregnancies—on women’s careers, we use pregnancy as an instrument for childbirth. In addition to assuming that LARC failures and IVF successes are as good as randomly assigned conditional on age, these instrumental variable strategies require an exclusion restriction. In the case of unplanned pregnancy, we assume that abortion does not directly impact a woman’s career. In the case of IVF success, we assume that failure to become pregnant after fertility treatments does not impact a woman’s career.¹

We develop an estimation strategy in order to identify the impact of a planned child relative to an unplanned child from random variation in the timing of childbirth and accounting for differential timing of birth in the counterfactual. Intuitively, when we account for dynamic non-compliance, we remove differences in income between the treatment and control group which are caused by later childbirths and keep only the differences in income generated by the focal childbirth. These estimates yield the impact of first birth in period zero relative to no first births in later periods, and we refer to them as “treatment on treated” (TT) estimates. Our results suggest that an unplanned birth is associated with income reductions of 30-40% relative to not having children one to six years after first childbirth. In contrast, planned births imply smaller reductions in earnings in every year after childbirth relative to unplanned birth, and point estimates are around ten percent of pre-birth income six years after childbirth. We can reject the null that children who are unplanned have the same impact on women’s careers as children who are planned.

The negative impacts of unplanned birth on earnings and occupation trajectory are largest for younger women. Among women undergoing IVF, the negative earnings impact of planned children is also larger for younger women than for older women, but the impacts are smaller when compared with unplanned births. The TT estimates suggest that younger women who give birth to an unplanned child are twenty percentage points less likely to be in high-skilled occupations four to six years after the birth, and have earnings losses fifty percent larger than women undergoing IVF procedures (planned births) who are of a similar age. This finding that children, especially the ones who come as a surprise, have the largest impact on women’s careers when women are early in their career is consistent with a large body of literature suggesting that early career decisions and opportunities have long term effects. For example, Kahn (2010) and Oreopoulos et al. (2012)

¹We provide some evidence supporting these assumptions, although they are naturally not directly testable.
document the lasting impact of graduating in a recession. Early theoretical work (Neal, 1999) and more recent structural work (Bagger et al., 2014) provide models in which individuals discover their talents early in life and then specialize later. In these models, having a child early in the career is particularly costly as it makes it more difficult to search for ones’ comparative advantage or accumulate skills. The large difference between planned and unplanned births we find is also consistent with models in which women choose careers considering the future impacts of children. Seminal work by Polachek (1981) and later work by Adda et al. (2017) and Bronson (2014) suggest that precisely because children have a large impact on careers, women may alter their career paths to minimize this impact. Our finding that planned births are associated with small impacts on careers may reflect the fact that women who intend to have children early in their life-cycle may adjust their careers so that children are not particularly costly.

Our comparison of the effects of planned and unplanned births is complicated by the fact that the characteristics of women who would like to avoid pregnancy differ substantially from the characteristics of women undergoing fertility treatments. Though first IVF treatments are free in Sweden, women in this group have higher earnings and are older than women in the LARC subsample. Comparing the same women in a planned pregnancy and an unplanned pregnancy is impossible—their fertility intentions are presumably not random—but we implement a re-weighting of the samples in order to better understand the relative role of observable characteristics in our comparisons between planned and unplanned births. When we re-weight women receiving IVF to have characteristics similar to those using LARCs (the "unplanned" sample), we find that planned births are associated with larger earnings declines relative to the estimates without the propensity score re-weighting (about 17% vs. 10%), but this is half the size of the impact of unplanned birth. This means that unplanned birth has career consequences not only because unplanned births happen earlier in life or to women in different income groups than planned births, but also potentially because they happen at times which are unobservably suboptimal from a career perspective. Overall, our results suggest that unplanned children can have large impacts on women’s careers by reducing earnings and dampening occupational upgrading, but these impacts are not ubiquitous and are largely avoided by women who plan their first birth.

Methodologically, we contribute to the literature on how to deal with dynamic non-compliance when estimating dynamic treatment effects, most closely related to Cellini et al. (2010). Our setting is complicated by the fact that we treat planned and unplanned births as potentially having different effects on labor market outcomes, and those who do not have an initial contraception failure (the control group for unplanned pregnancy) may go on to have planned children later. We account for dynamic non-compliance with multiple treatments and develop an IV-GMM approach to obtain treatment effect estimates, in contrast with Cellini.

Our strategy is a propensity score re-weighting similar to DiNardo et al. (1996).
et al. (2010) who focus on regression discontinuity design for identification and ultimately estimates TT
effects directly using the never-treated as a control group.

Our paper is related to the literature studying the impact of unplanned pregnancy through the lens of
abortion access, to the extent that the effects of unplanned pregnancy are similar to the effects of unwanted
pregnancy. Recent work in this area includes Miller et al. (2020), Miller et al. (2022), and Brooks and Zohar
(2020).³ The average women exposed to laws which change abortion access differ substantially from the
LARC users in our sample. Abortions are most common among women in their early 20s. In contrast, the
subset of LARC users are on average 32 years old, which is also the average age of women in our Swedish
sample. Beyond these population differences, there are additional differences in our compliers compared to
compliers in abortion access studies. In abortion access identification strategies, compliers are women who
would have an abortion but cannot due to changes in access rules (cutoffs based on weeks of gestation, for
example) or changes in price. We capture the impact of unplanned pregnancy for women who would like to
delay childbirth but choose to give birth when they become pregnant. Our estimates are local to compliers:
women who are marginal on the decision to delay childbirth because they do not have an abortion when they
become pregnant even though it is an option available to them. We cannot extrapolate from our complier
population to women who choose to have an abortion when they have an unplanned pregnancy. Women who
have abortions as a result of unplanned pregnancy in our setting are different from compliers on a number
of labor market characteristics.

Our paper also contributes to a large literature utilizing “natural experiments” in fertility to shift the
timing of childbirth. Notable papers in this literature include Hotz et al. (2005) and later Bíró et al. (2019)
and Miller (2011) who use miscarriage as a shifter of birth timing. Other notable papers include Rosenzweig
and Wolpin (1980), Angrist and Evans (1998), Grogger and Bronars (2001), and Black et al. (2005) who
use family composition as an instrument for family size, and Lundborg et al. (2017) who use initial IVF
success or failure to shift the timing of first birth. To our knowledge, this is the first paper to focus on
unplanned pregnancies among LARC users to shift the timing of first birth. Among these related strategies,
ours uniquely focuses on the subset of women who intended to delay pregnancy, rather than those who
planned to have children but faced obstacles. Many women use LARCs or other forms of birth control to
delay pregnancy. In work focused on the introduction of the birth control pill, Goldin and Katz (2002) and
Bailey (2006) argue that the advent of reliable contraception raised women’s age at first marriage, increased

³A number of additional papers study the impact of abortion access on children’s labor market outcomes, finding that children
born when abortion was available are less likely to live in poverty (Gruber et al., 1999), use controlled-substances (Charles and
Stephens, 2006), are less likely to commit crimes (Donohue and Levitt, 2001), and are less likely to be teen-mothers (Donohue
et al., 2009). Pop-Eleches (2006) studies the removal of abortion access in Romania under dictator Nicolae Ceausescu and finds
that children born in these cohorts had worse outcomes than would be predicted by their mothers’ education on a variety of
dimensions.
women’s education, and increased female labor force participation. In this paper, we ask whether LARC use for the purposes of delaying childbirth among women without children continues to improve the labor market opportunities available to women. A question we are able to ask in our setting, but which cannot be asked using natural experiments such as miscarriage or IVF success, is whether delaying and planning first birth mitigates the labor market costs of motherhood.

Our paper contributes to a large literature on the costs of motherhood in Sweden (Angelov et al., 2016) and beyond (Kleven et al., 2019a,b; Chung et al., 2017; Eichmeyer and Kent, 2021; Nix and Andresen, 2019) which compare the earnings trajectories of mothers before and after they have their first child to women who have different first-birth timing using event-studies. These strategies reveal that motherhood is associated with large and persistent earnings declines (about 30% in the long term in Sweden) and other adverse life outcomes, such as increased rates of homelessness among low-SES women in the US. Our novel use of prescription data to identify the pregnancy intentions of women yields several insights beyond what is possible with data connecting births to mothers’ outcomes.

2 Data

2.1 Swedish Administrative Data

We merge several administrative registers via a unique individual identifier. Labor market data are collected and administered by Statistics Sweden (SCB) (“Statistiska Centralbyrån”). The primary source of labor market data is the longitudinal integration database for health insurance and labour market studies (LISA) that contains yearly observations during the period 1990-2013 on earnings, disposable income (gross income - all taxes + all transfers), employment, sector, and occupation. We use the first digit of the Swedish occupation code to construct an indicator for whether women are in jobs which require managerial responsibilities, “High” theoretical special competence or “Medium” (at least a short university degree) competence. These data also include the level and field of highest completed education, age, civil status, family status, and some information on household composition (such as the number of children in various age-groups and the identity of the partner for married couples and for unmarried couples cohabiting with common children).

We merge labor market data with health data collected and administered by the National Board of Health and Welfare (“Socialstyrelsen”). This includes the Medical Birth Registry (MFR), containing all births between 1973 and 2012; the Prescribed Drug Register (LMED), which incudes all prescriptions from July 2005 through 2013; and the National Patient Register (NPR), which includes all in-patient care (1987-4

4The first 3-digits of the Swedish occupation code (SSYK96) have an almost one-to-one mapping to the international ISCO88 code that we use to merge with the O*Net data to construct measures of workplace flexibility, tasks, and required competencies.
2013) and outpatient doctor visits including day surgery and psychiatric care from both private and public
caregivers (2001-2013), but not primary care.

Our sample includes all women who are born in 1965-83 and reside in Sweden. These cohorts of women
are 22-47 years old when we observe their contraceptive prescriptions. Although we do not include women
over age 44 in our main analysis as we do not observe any unplanned pregnancy for women age 45-47.

2.2 Summary Statistics

Table 1 shows summary statistics of our data. Women are on average 31.6 years old, LARC users are slightly
older on average while IVF users are older still on average. There is also variation in age within LARC users:
IUD users are on average 34.73 years old, while implant users are 28.46 years old on average. These age and
cohort differences are also the primary driver of the differences we see in education between LARC users and
the population of women, as well as within the two types of LARC users. 71% of all women are employed the
last week in November and 36% are employed in occupations requiring medium-high-managerial skills. For
employment, these numbers are 68% and 86% for LARC and IVF users, respectively, and 28% and 50% for
occupational level. Thus, there are stark differences between the samples in terms of job type. Furthermore,
the samples also differ in terms of spousal presence and potentially support. 22% of LARC users are married
compared to 48% of IVF users. In fact, it is a requirement for receiving publicly provided IVF treatment
that a woman is in a stable union. When comparing births resulting from LARC failures to those resulting
from IVF, we explore the role of differences in pre-birth characteristics in generating our results by using a
propensity-based reweighting in order to adjust the sample of IVF recipients to have characteristics similar
to women using LARCs, as described in Section 4.

We next describe differences in outcomes between these groups, conditional on birth. Table 4 presents
data on the characteristics of women who give birth to a first child in seven categories (columns). In the first
column we consider the characteristics of all women having their first child in our sample period, then the
characteristics of all women who used LARCs before their first birth, the characteristics of women who had
an unplanned pregnancy while using a LARC (the details of this definition are provided in the next section),
the characteristics of all women who underwent an IVF procedure before their first birth, the characteristics
of all women who had their first child as a result of a successful initial IVF procedure, and finally, we reweight
the last two groups according to the characteristics of women who experience an unplanned pregnancy while
using a LARC using a propensity score procedure described in the next section. Children born to women
undergoing IVF and women using LARCs are similarly unhealthy relative to the overall population of births,
though mothers using LARCs are substantially more likely to be smokers to to be snuffing, while women
giving birth through IVF are older. In measures of gestational age, size for gestational age, APGAR, and days in the hospital after birth, children born to women are slightly less healthy than the overall population and slightly more healthy than children born as a result of IVF success, even when the IVF population is re-weighted. Mothers giving birth to unplanned children also take less pregnancy and sickness leave than women giving birth through IVF.

Table 4 also presents the characteristics of fathers. One meaningful difference between women who have unplanned children and women who have planned children is the probability that they cohabit with or are married to the father of the child. In our data, two unmarried individuals is only recorded as cohabiting if they are cohabiting and share common children. This means that we cannot look at how cohabitation evolves over time for women who experience a LARC failure and a control group who does not because we would not know whether women in the control group are cohabiting as they do not have children. Nonetheless, we can compare the difference in the propensity to live with or be married to the father of the child for women who give birth as a result of unplanned pregnancy and women who give birth as a result of a planned (IVF) pregnancy and to the population of women having children overall. As in Table 4, seventy nine percent of women who give birth to an unplanned child have a partner present at birth and one year later, either due to cohabiting with the child’s father or because they are married. This number is ninety-five percent for women with a planned pregnancy due to an IVF success (blue line in figure ??). One reason why the impact of unplanned pregnancy may differ from the impact of planned pregnancy is the potential for support from the child’s father. While there is a 15 percentage point difference in this propensity to have a partner present between the two groups, even women who give birth to an unplanned child are very likely to have a partner present. Thus, this is not likely to create large differences in earnings between planned and unplanned pregnancies.

Overall, children born as a result of LARC failures are not too dissimilar to children born to women through IVF at birth, if anything they are more healthy. However, women who undergo IVF are older than women who become pregnant while using LARCs (and these women are actually similarly aged to the population overall). Another important difference between these women is the propensity to have a partner present after the child is born.
3 Empirical Strategy

3.1 Defining Unplanned Pregnancies

Unplanned Pregnancies while using LARCs  We define unplanned pregnancies as pregnancies that occur soon after getting an IUD or implant contraception. LARCs are attractive to women who do not want to get pregnant in the near future. LARCs last at least three years and have failure rates of less than one percent per year (Trussell, 2004; Sundaram et al., 2017). Unlike most Short Acting Reversible Contractives (SARCs), LARCs work passively and do not require the women to take any action until they wish to have them removed. While some doctors and midwives schedule regular checkups, the efficacy of the contraception does not depend on the actions of the women. IUDs are typically given to older women who have completed their fertility. Only about five percent of the IUDs we observe are taken out by women who have not yet had a child. The average IUD user is about 35 years old. Implants on the other hand are given to younger women (on average 28 years old) and about a quarter of them have not yet had a child.

While we do observe some insertions and removals of LARCs in the outpatient data, we are missing a large fraction of these procedures as they often take place at a primary care or midwife office. Because of this, we do not rely on outpatient procedure records to identify which women get a LARC. Instead, we focus our analysis on women who have prescriptions for LARCs. We observe the date at which a woman paid for and received her LARC device from a pharmacy. In Sweden, a woman with a hormonal birth control prescription must physically pick up the prescription at the pharmacy and then take the prescription to a doctor, women’s clinic, or midwife to insert it. IUD and implant prescriptions cost about USD$100 for the women in our sample.\footnote{There are discounts for younger women outside of the age range in our sample.}

To be more precise about our definition, we consider the universe of women who get a LARC prescription filled at the pharmacy. We then check to see if the women conceive within a certain number of months of the date the prescription was filled. We consider conceptions that end in childbirth or in an abortion. The birth registry gives us information about pregnancies that end in childbirth. The birth registry also contains information about the last period both calculated from the first ultrasound and the date reported by the mother. We assume that conception occurred two weeks after the last period. The outpatient data contains information about the initial meeting a woman has with a doctor in the process of having an abortion. If we observe an abortion meeting and no record of a childbirth, we assume the woman had an abortion. We calculate the average time from conception to the first abortion meeting using data from the fraction of women who go on to have the child.

Our preferred specification for “unplanned pregnancies” is when conception which occur within nine
months of filling a LARC prescription. In the sample of LARC users who have no children, we observe 335 unplanned pregnancies using a nine-month window. When we use the full sample of LARC users and calculate our best estimate of 1-year failure rates using our best definition of unplanned pregnancies (a three month failure window after getting a prescription), we estimate 0.38% failure rate for IUDs and 0.72% failure rate for implants. Our measured failure rates are similar to the observed failure rates reported in the medical literature (Sundaram et al., 2017).\footnote{Note that LARC failure rates in clinical trials are about 0.1% when insertion is consistently done (Trussell, 2004). In addition, most LARC users are older and hence have lower fertility. This suppresses the observed failure rate of LARC users and is the main reason our best estimate of the failure rate for all women is lower than the failure rate in our sample of younger women who have no children (1.2%).}

There are three primary potential concerns with our definition of unplanned pregnancies. First, failures are more common among women who are more fertile or who have more frequent intercourse. To overcome the potential challenges this selection poses for identification, we match women based on age and fertility history, focusing only on women without children. We also match on civil status in some specifications and do not find that matching on civil status (in addition to age and prescription date) affects our estimates of the labor market impacts of unplanned pregnancy. Second, we may also be concerned that women choose to not use or remove LARC, despite purchasing it. We estimate our model using various windows between the LARC prescription and conception under the assumption that women are less likely to have it removed soon after getting it inserted. In addition, if many women were not using the LARC they purchased, we would find higher failure rates. From the perspective of \textit{intentions}, women who we define as having an unplanned pregnancy all paid a substantial amount of money to receive extremely effect and long term birth control. We view this as a marker that these women intended to avoid pregnancy.

To further allay these concerns, Table 2 shows the balance in pre-prescription characteristics, comparing women who get pregnant in the first nine months after taking out a LARC prescription and those who do not. We match women based on their age and year of the LARC prescription. The balance between the two groups is quite good except when it comes to civil status. Married and divorced women are more likely to have an unplanned pregnancy than single women, possibly due to more sexual activity. We also show the balance matching additionally on civil status. In both specifications, there are only small insignificant differences in labor market outcomes between the two groups. We conclude that the likelihood of an unplanned pregnancy is unlikely to be related to labor market outcomes.

Ultimately, our research design rests on the fact that the outcomes of women in the control group captures the counterfactual for women in the treatment group. In Section 4, we will present differences between the two groups over time and find that there are no differences in labor market trends between these women before the LARC prescription. The strongest evidence we provide for our research design is the fact is that
these two groups are identical in both levels and trends in the seven years leading up to a birth control prescription and only diverge after treatment assignment.

Finally, to understand the difference between compliers and the population of women who experience an unplanned pregnancy overall, Table 3 shows the balance in pre-LARC observables of unplanned pregnancies between women who choose to have an abortion and those that give birth. While we don’t see any significant differences at the five percent level, the comparisons in Table 3 lack statistical power. If we interpret the point estimates, women who get abortions have on average fifteen percent higher income and are much less likely to be married. These women are those who do not change their decision of whether or not to have a child when they become accidentally pregnant. In the language of instrumental variables, they are the never-takers and we do not estimate the effects of children on these women’s careers. Instead, we estimate the impact of children on the careers of women who are marginal enough on the decision to have children that they do not have an abortion when they become accidentally pregnant. Because our research question is ultimately whether delaying pregnancy mitigates the career impact of childbirth, we are less interested in the impacts of children for women who are certain they do not want children.

3.2 Defining Planned Pregnancies

Planned Pregnancies from In Vitro Fertilization (IVF) treatment. We define planned pregnancies as pregnancies from the first IVF treatment. This definition focuses on women who would like to have a child, but have trouble conceiving a child naturally. IVF treatment extracts eggs from a woman, fertilizes them in a lab and then re-inserts a viable embryo. Since 2003 (i.e. for our entire sample), Swedish policy is to insert only one viable embryo (Bhalotra et al., 2022). In Sweden, health care is heavily subsidized and extends to IVF treatment. Residents only pay a small amount annually (besides taxes) to access up to three rounds of egg extractions, conditional on a few eligibility criteria. These criteria require that women undergoing IVF procedures are in a stable relationship (married or cohabiting through two years), do not have prior children and recommends that they are below 40 years old at the time of the first treatment.\footnote{Other criteria includes a BMI within the normal range, no evidence of risky behavior and an assessment of the mental and physical health in general (Bhalotra et al., 2022).}

Women undergoing IVF must take several prescription drugs with hormones as a part of IVF treatment. First, a woman takes a hormone to stimulate the development of the eggs. Second, she takes a “trigger” or “ovulation” shot that fixes the time of ovulation. Finally, she takes hormone supplements after the egg has been inserted to improve the chances of a successful pregnancy.\footnote{Specifically, we use the ATC codes G03GA01, G03GA02, G03GA05, G03GA06, G03GA08.} The procedure can take place at both public and private fertility clinics, but we only observe procedures from public clinics.

We restrict our attention to first IVF procedures because after this initial treatment, persistence in seeking
IVF may be endogenous to personal characteristics and may also be affected by labor market shocks. To validate that this is a woman’s first IVF procedure, we check that this sequence of fertility drugs has never been prescribed before for a given women. We also check that we do not observe any prior IVF treatments in the public sector, since our data on procedures goes back farther (2001) than our prescription data (2005). To ensure that we are not missing data on prior treatments, as robustness, we discard fertility treatments from women with the first fertility treatment in a private clinic.

The IVF definition above leaves us with a sample of 9,571 first IVF treatments. From this, we separate the treatments into successful treatments that leads to a childbirth within 322 days (identified from childbirths in the birth registry) and failed treatments that do not lead to a childbirth within this window. We identify 2,272 planned IVF birth resulting from the first IVF treatment. The main concern with this definition is that women take actions to increase the probability of a success. Especially, it is a concern that women with higher earnings take actions to secure a successful treatment (actions we do not observe). In this case, successful treatments are not random and the post-IVF treatment outcomes does not only reflect a childbirth, but also prior labor market behavior. We do find that this is partly the case in the data. For earnings we observe that women with a successful first fertility treatment also have higher pre-treatment earnings, and that they are slightly more likely to be employed and work in higher-skilled occupations. We discuss these issues in detail in Section 4.2.

3.3 Dynamic Intent to Treat Effects of Unplanned Pregnancy

We estimate the impact of a plausibly randomly-timed pregnancy on earnings and related labor market outcomes. We first estimate the ITT impact of unplanned pregnancy on labor market earnings in the years following a LARC prescription. We match women who have an unplanned pregnancy with women who get a LARC at the same age and year. Our primary specification performs the matching using a fully-saturated regression model:

$$Y_{ist} = \sum_{\tau=-7}^{7} \alpha_{\tau}^LARC \mathbf{1}[\tau = t] LARCFailure_i + \sum_{\tau=-7}^{7} \sum_{j} \sum_{y} \delta_{\tau,y}^LARC \mathbf{1}[\tau = t] \mathbf{1}[y = year_{i,t} = 0] \mathbf{1}[j = age_{i,t} = 0] + \varepsilon_{it}$$

where $Y_{ist}$ is the outcome of interest (for example, labor market earnings), in year $s$ for woman $i$, $t$ years after birth control prescription. $LARCFailure_i$ indicator =1 if woman $i$ had an unplanned pregnancy, and the last term controls for the interaction between $t$ years after birth control prescription and all values of
We can implicitly test identifying assumption as $Y_{ist}$ observed for all women. If unplanned pregnancies are as good as randomly assigned conditional on age and year of prescription, then we would expect that $\alpha_{-7}^{LARC} = \ldots = \alpha_{-1}^{LARC} = 0$. The parameters $\alpha_{\tau}^{LARC}$, $\tau \geq 0$ give the impact of an unplanned pregnancy on labor market outcomes.

We are interested in understanding the effect of unplanned birth on labor market outcomes, but equation (1) yields the effect of an unplanned pregnancy on labor market outcomes. Since women who have an unplanned pregnancy may have an abortion and a subsequent birth, and women in the control group may have subsequent pregnancies, $\alpha_{\tau}^{LARC}$ is not the effect of treatment (childbirth). Figure 1a shows a diagram of these dynamics of compliers. Instead, $\alpha_{\tau}^{LARC}$ is analogous to an intent to treat estimate of the effect of childbirth, when treatment is an unplanned birth. In section 3.5, we describe a procedure to extract the dynamic effect of an unplanned birth on labor market outcomes.

### 3.4 Dynamic Intent to Treat Effects of “Planned” Childbirth

Following a procedure similar to Lundborg et al. (2017), we can also document the effect of the success of a woman’s first IVF treatment on labor market outcomes, relative to a woman of the same age in the same year whose first IVF treatment is not successful. We can estimate

$$Y_{ist} = \sum_{\tau=-7}^{7} \alpha_{\tau}^{IVF} \mathbf{1}[\tau = t] IVFSuccess_i + \sum_{\tau=-7}^{7} \sum_{j} \sum_{y} \delta_{\tau,j}^{IVF} \mathbf{1}[\tau = t] \mathbf{1}[y = year_{i,t=0}] \mathbf{1}[j = age_{i,t=0}] + \varepsilon_{it}$$

where $Y_{ist}$ is the outcome of interest (for example, labor market earnings), in year $s$ for woman $i$, $t$ years after her first IVF procedure. $IVFSuccess_i$ indicator $=1$ if woman $i$ had her first child as a result of her first IVF procedure, and the last term controls for the interaction between $t$ years after first IVF procedure and all values of $age$ at procedure and year $t$ of procedure. The ITT estimates for the IVF approach also has the additional complication of women seeking additional fertility treatments and potentially getting pregnant as early as one month after the “successful” group. Figure 1b shows a diagram of the dynamics of the compliers in this setting.

### 3.5 Dynamic Treatment Effect Estimates

We causally identify the impact of shifting the timing of children in two ways. First, and most novel, we study the impact of an unplanned birth due to birth control failure. Second, we follow Lundborg et al. (2017)
and estimate the impact of planned birth due to IVF procedure success. To do this, we must make additional assumptions. First, we assume that unplanned pregnancy is a valid instrument for unplanned birth when studying the impact of unplanned birth on labor market outcomes. Second, we assume that IVF success is a valid instrument for planned birth when studying the impact of planned birth on labor market outcomes. Finally, we assume that the impact of children on labor market outcomes over time is summarized by

\[ Y_{it} = \alpha + \sum_{\tau=0}^{T} \rho_u^\tau 1[\tau = t - t^b_i, b_i = u] + \sum_{\tau=0}^{T} \rho_p^\tau 1[\tau = t - t^b_i, b_i = p] + \beta X_{it} + \eta_{it} \]  

(3)

where \( b_i = u \) when the firstborn child of person \( i \) is unplanned and \( b_i = p \) when the firstborn child of person \( i \) is planned. \( X_{it} \) is a vector of characteristics which affect productivity, including age and year but also potentially including unobservable labor market inputs such as effort. In this model, \( \rho_u^\tau \) is the impact of children resulting from an unplanned pregnancy on \( Y \) relative to no children, \( \tau = t - t^b_i \) years after childbirth. Similarly \( \rho_p^\tau \) is the impact of children resulting from a planned pregnancy on \( Y \) relative to no children, \( \tau = t - t^b_i \) years after childbirth.

The focus of this paper is the labor market impact of unplanned birth. Is it interesting also to know how our estimates of the impact of unplanned children compare to planned children, but even if we are not interested in explicitly making this comparison, we still must to account for potential differences in the impact of planned birth on labor market outcomes. This is because women in the control group go on to have planned, rather than unplanned children. In order to learn the impact of an unplanned five year old on a mother’s labor market outcomes compared to a situation in which she had no children, we must adjust our estimates for the impact of planned children in the control group.\textsuperscript{9}

**Identification**  
As discussed in Section 2, we identify the date of an IVF attempt as the date of the insertion of a fertilized embryo. We label a procedure successful if a woman gives birth approximately nine months after her first IVF procedure and has no additional procedures nor takes out any IVF-related prescriptions in those nine months. Consider the set of women without children who undergo their first IVF attempt in year \( 0 \). Assuming that the probability of success is independent of \( X_{i0} \), the observed mean difference between

\textsuperscript{9}A separate question is the impact of having an unplanned five year old relative to not having a unplanned child but (with some probability) having a planned two year old since this is the true counterfactual for women who have an unplanned child. The causal impact of unplanned birth in period \( t^b_i \) is obtained by scaling the ITT estimates by the inverse of the fraction who are compliers (in our baseline, about \( \frac{1}{3.78} \)). It is not reasonable to compare the dynamic impacts of planned and unplanned birth on labor market outcomes using this IV strategy because any differences could simply be driven by differences in birthrates in the control group, which are very different in the case of planned and unplanned birth. We argue that all of these estimates—ITT, IV, and the dynamic TTE we describe are interesting, and examining them all helps to deepen our understanding of the impact of children on labor market outcomes.
women who experience a success \((Z_i^p = 1)\) and those who do not \((Z_i^p = -1)\) is given by:\(^{10}\)

\[
[Y_{i0}\mid X_{i0}, Z_i^p = 1] - E[Y_{i0}\mid X_{i0}, Z_i^p = -1] = \rho_0^p P(t_i^b = 0, b_i = p\mid X_{i0}, Z_i^p = 1) - \rho_0^p P(t_i^b = 0, b_i = p\mid X_{i0}, Z_i^p = -1) \\
= \rho_0^p \Delta P(t_i^b = 0, b_i = p)
\]

(4)

Where \(\Delta P(t_i^b = 0)\) is the difference in the probability that a woman has a child in period 0 between those who had an IVF success in their first IVF attempt in period 0 (treatment) and those who had an IVF failure in their first IVF attempt in period 0 (control).\(^{11}\) In period 1, more women in both the treatment and control group may give birth to their first child, and women who gave birth in period 0 now experience the year-one impact of motherhood \(\rho_1^p\):

\[
E[Y_{i1}\mid X_{i1}, Z_i^p = 1] - E[Y_{i1}\mid X_{i1}, Z_i^p = -1] = \rho_1^p \Delta P(t_i^b = 0, b_i = p) + \rho_0^p \Delta P(t_i^b = 1, b_i = p)
\]

(5)

and, in general, \(t\) periods after the baseline year of initial IVF procedure,

\[
E[Y_{it}\mid X_{it}, Z_i^p = 1] - E[Y_{it}\mid X_{it}, Z_i^p = -1] = \sum_{k=0}^{t} \rho_t^p \Delta P(t_i^b = k, b_i = p)
\]

(6)

For brevity, in what follows let \(ITT_t^p = E[Y_{ik}\mid X_{ik}, Z_i^p = 1] - E[Y_{ik}\mid X_{ik}, Z_i^p = -1]\) and \(\Delta P_t^p = P(t_i^b = k, b_i = p\mid X_{ik}, Z_i^p = 1) - P(t_i^b = k, b_i = p\mid X_{ik}, Z_i^p = -1)\). Cellini et al. (2010) discuss identification of treatment-on-treated effects (\(\rho_t^p\) in our notation) in the setting of municipal bond issues. Applying the same approach to our setting, we note that \(\rho_t^p\) is identified recursively:

\[
\rho_t^p = \frac{ITT_t^p}{\Delta P_t^p}
\]

(7)

Then, given \(\rho_0^p\) we can solve for \(\rho_1^p\) according to

\[
\rho_1^p = \frac{ITT_1^p - \rho_0^p \Delta P_1^p}{\Delta P_0^p}
\]

(8)

Continuing in this way, for \(t \geq 1\) we obtain

\[
\rho_t^p = \frac{ITT_t^p - \sum_{k=0}^{t-1} \rho_k^p \Delta P_{t-k}^p}{\Delta P_0^p}
\]

(9)

\(^{10}\)We define \(Z_i = -1\) here as we need to use a non-zero value for the GMM estimator below.

\(^{11}\)Note that it is possible for a woman to give birth in calendar year 0 even when her initial IVF attempt was not successful. This happens when a second IVF a few months after the initial attempt results in childbirth. We discuss how we deal with the difference in the predicted effect of childbirth for children born later vs. earlier in the calendar year in the next subsection.
Now we consider the women who take out a LARC prescription in period 0. The observed mean difference in outcomes between women who experience an unexpected LARC pregnancy \((Z_u^i = 1)\) and those who do not \((Z_u^i = -1)\) is given by:

\[
ITT_0^u = \mathbb{E}[Y_{i0}|X_{i0}, Z_u^i = 1] - \mathbb{E}[Y_{i0}|X_{i0}, Z_u^i = -1] = \rho_0^u \Delta P^u(t^b_i = 0)
\]  

(10)

where \(\Delta P^u(t^b_i = 0)\) is the first stage, or the effect of an unplanned pregnancy on the probability of having a child in period 0 among LARC users. Note that this is the usual IV formula, where \(\rho_0^u\) is the LATE estimate equal to the \(ITT\) divided by the fraction of compliers. Note also that there are no planned births in the year of the LARC purchase given our definition of unplanned pregnancy. This is not true after period 0. In later periods, among women who do not experience an unplanned pregnancy in year 0, some fraction of them will have a planned pregnancy in period \(t\). In addition, some fraction of women who do experience an unplanned pregnancy in period 0 (but who subsequently have an abortion) may also decide to have a baby in period \(t\). Due to our definition of unplanned pregnancy and the length of gestation, we observe unplanned births in years 0, 1, and 2 after LARC prescription.\(^{12}\) We refer to the fraction of unplanned births in year \(t\) as \(P(t^b_i = t, b_i = p)\).

In year 1 after LARC purchase, we observe:

\[
ITT_1^u = \rho_0^u \Delta P^u(t^b_i = 1, b_i = u) + \rho_1^u \Delta P^u(t^b_i = 0, b_i = u) + \rho_p^0 \Delta P^u(t^b_i = 1, b_i = p)
\]  

(11)

where the \(u\) superscript indicates that this is the subset of women with a birth from a LARC failure (i.e. an unplanned birth).

Proceeding analogously to (6) but allowing for both planned and unplanned births in years after 0 in the treatment and control group, we observe in year \(t\) after LARC purchase:

\[
ITT_t^u = \rho_0^u \Delta P^u(t^b_i = 1, b_i = u) + \sum_{k=0}^{t-1} \rho_{t-k}^u \Delta P^u(t^b_i = k, b_i = u) + \sum_{k=1}^{t} \rho_k^p \Delta P^u(t^b_i = k, b_i = p)
\]  

(12)

The effects of planning, \(\{\rho_k^p\}_{k=0}^{t}\), can be identified from the subset of women undergoing IVF procedures. Given this, we then can use a similar recursive calculation to identify \(\{\rho_k^u\}_{k=0}^{t}\):

\[
\rho_t^u = \frac{ITT_t^u - \sum_{k=0}^{t-1} \rho_{k}^u \Delta P^u_{t-k} - \sum_{k=0}^{t} \rho_k^p \Delta P^u_t}{\Delta P_0^u}
\]  

(13)

**Estimation**

Having shown identification of the parameters for planned and unplanned births, we estimate Equation 3 using IV-GMM, where we define a moment that corresponds with each \(ITT_t\) estimate.

\(^{12}\)For example, a woman can get a LARC in December 2006, conceive in August 2007, and give birth in May 2008. Likewise, a woman can get a LARC in January, conceive in February, and give birth in November of the same year.
$$2(T + 1)$$ moment conditions ($$t \in \{0, 1, ..T\}$$) are:

$$g_i(\theta) = \begin{cases} Z_i^p \eta_{it} \\
Z_i^u \eta_{it} \end{cases}$$

$$= \begin{cases} Z_i^p \left( Y_{it} - \sum_{\tau=0}^{T} \rho^p_{\tau} 1[\tau = t - t^b_i, b_i = p] - \beta X_{it} \right) \\
Z_i^u \left( Y_{it} - \sum_{\tau=0}^{T} \rho^u_{\tau} 1[\tau = t - t^b_i, b_i = u] - \sum_{\tau=0}^{T} \rho^p_{\tau} 1[\tau = t - t^b_i, b_i = p] - \beta X_{it} \right) \end{cases}$$

where the first (second) set of moments use data from the IVF (LARC) setting. In the traditional just-identified IV-GMM estimator there are as many equations as instruments. In our setting, we have two instruments (planned and unplanned pregnancies), but we have multiple observations of $$Y_{it}$$. Due to the dynamic effects of pregnancy on outcomes, the different $$\rho^u_{\tau}$$, $$\rho^p_{\tau}$$ are identified, as described above.

4 Results

In this section we document the ITT effect of unplanned pregnancy on labor market outcomes among LARC users. We next compare these effects with the ITT effects of early success (pregnancy) among women undergoing IVF procedures. In order to make sense of the patterns we see and meaningfully compare the career impact of planned vs. unplanned births, we next present TT estimates of the impact of children on labor market outcomes, which we allow to differ by whether the child was planned or unplanned. Finally, we adjust our estimates to understand the role of observable differences in characteristics in any differences we find between planned and unplanned births and allow heterogeneity in the estimates by age at first birth. We focus our main results on three outcome variables: earnings, employment, and the propensity to work in skilled occupations. We present additional results on disposable income, other job attributes such as flexibility in setting schedules, household composition, mental health, and overall fertility in order to understand the drivers of the patterns we see.

4.1 Effect of Unplanned Pregnancy on Earnings and Occupation

In this subsection, we restrict attention to women who had a LARC prescription. Figure 2b plots the first stage effect: women who have an unplanned pregnancy are about 70% more likely than women who do not
have an unplanned pregnancy to have a child by two years after their LARC prescription. However, between years three and seven after the prescription, many women in the control group go on to have planned births. By year seven after LARC prescription, 40% of women who did not have an unplanned pregnancy (women in the “control” group) have become mothers.

Unplanned pregnancy has a large impact on earnings and is not predicted by pre-earnings conditional on age and date of prescription. The first panel in Figure 3 plots the evolution of earnings around the year of LARC prescription for women who had an unplanned pregnancy relative to women of the same age who did not have an unplanned pregnancy but purchased a LARC at the same time. The left hand side presents raw means, re-weighting the control group (women who do not experience an unplanned pregnancy) to have the same age and year-of-prescription distribution as the treatment group (women who experience an unplanned pregnancy). The right hand side presents the coefficients on unplanned pregnancy, estimated using equation (1), along with 95% confidence intervals. Prior to the LARC prescription, women who experience an unplanned pregnancy are on the same earnings trajectory as those who do not. After an unplanned pregnancy, women experience large earnings declines. The difference shrinks over time but is economically meaningful throughout our window and is equal to about 25,000 SEK (USD 2,700) seven years after prescription.

Figure 3 also plots the difference in employment and the probability of working in an occupation requiring medium or high skills or being a manager between women with an unplanned pregnancy and similar women without an unplanned pregnancy (estimated as in Equation (1)). We see that women who have an unplanned pregnancy have a lower probability of being employed 2 years after LARC prescription, but have the same probability of being employed several years after the pregnancy as the control group.

However, an unplanned pregnancy substantially reduces the likelihood that women advance in the career ladder, as measured by the skill requirements of their job. Women experiencing an unplanned pregnancy are less likely to be working in occupations requiring medium, high, or management skills relative to the control group. Figure 3e show that seven years after LARC prescription almost 50 percent of women without an unplanned pregnancy are employed in occupations requiring medium, high, or management skills. Experiencing an unplanned pregnancy reduces the probability of being in occupations requiring medium, high, or management skills by 20 percentage points. It is not the case that women who experience an unplanned pregnancy move into lower-skilled occupations. Instead, women who experience an unplanned pregnancy do not advance in the career ladder at the same rate as the control group does.

Furthermore, we present mean outcomes for women who have an abortion (“never-takers”) and those who have a birth (“compliers”) as a result of unplanned pregnancy. Appendix Figure 7 presents means over time relative to LARC prescription for earnings, employment, and occupation for women who do not have an
unplanned pregnancy, women who have an unplanned pregnancy resulting in a birth, and women who have an unplanned pregnancy resulting in an abortion. First, it is clear that women who have an abortion have lower earnings and are in lower-skilled occupations at the time of LARC prescription. Thus, the complier population differs from the rest of the population and any statements about the effect of childbirth are local to this complier population. In addition, we do not observe any discontinuities in earnings, employment, or occupation among women who have an abortion around the time of the abortion (year zero and one). We view this as supportive of the exclusion restriction, that the only effect of an unplanned pregnancy on labor market outcomes is through an unplanned birth. That is, an abortion have no effect on labor market outcomes in itself.

The large impact of unplanned pregnancy on earnings are explained by parental leave-taking in the short run. Appendix Figure 6a and 6b presents ITT results and conditional means for disposable income which includes transfers such as parental leave payments, sickness leave payments, as well as taxes. Except from year 2, there is only a small and insignificant difference in disposable income between women experiencing an unplanned pregnancy and those who do not in both the short and long run. Long-run differences are not driven by the direct effect of going on parental leave after the birth of a child, but may reflect changes in the types of jobs that women have after having an unplanned child. Women with unplanned pregnancies are more likely to work in occupations which offer flexibility as measured by the Bang (2022) extension of the Goldin (2014) flexibility index (though this contrast is only significant at the 10 percent level). More flexible jobs feature less time-pressure, less interaction with clients, and are more structured for the worker (so that presumably there are more coworker substitutes). These results suggest that women experiencing an unplanned pregnancy move to jobs which require lower skills but are more compatible with the demands of motherhood.

We note that the labor market differences between women with and without unplanned pregnancies are robust both to the window we use in defining unplanned pregnancies, adding controls to the regressions, and the type of contraception failures we identify. Appendix Figure 9 presents the difference between women who have an pregnancy within three, six, nine, and twelve months of purchasing a LARC, where nine months is our baseline specification. We find that while using more restrictive definitions of unplanned pregnancy decreases our count of unplanned pregnancies (and so increases our standard errors), the point estimates are similar.

Appendix Figure 10 sequentially adds controls for educational attainment, civil status, number of people in the household, indicators of mental health, and earnings measured in the year before the LARC prescription.

14See Goldin (2014) for a detailed description of these measures.
15The indicators we use are whether or not a woman had a prescription for antidepressants, number of days on sick leave, and whether the woman had a diagnosis of depression or anxiety disorder in the year before the LARC prescription.
scription. The controls do not meaningfully shift any of our estimates of the effects of unplanned pregnancy.

Table 2 showed imbalance between women who have an unplanned pregnancy and women who do not on the probability of being married. Thus, Appendix Figure 11 additionally match on civil status in order to compare the trajectories of more similar women. We find that this additional matching variables do not affect our estimates of the effect of unplanned pregnancy.

4.2 Effect of Planned Pregnancy on Earnings and Occupation

In this section, we restrict attention to women who sought fertility treatments in order to have a child, as described in Section 3.2. Figure 2c plots the first stage effect: women who have a successful first IVF treatment are about 70% more likely than women who do not have an unplanned pregnancy to have a child by the first year after their initial IVF treatment. However, within the next two years almost 40% of women who had an initial IVF failure go on to have their first child. Few first births happen more than three years after the initial IVF treatment.

IVF success has a large, negative but fleeting impact on earnings. The first panel in Figure 4 plots the evolution of earnings around the year of initial IVF procedure for women who have successful IVF relative to women of the same age who do not have a successful initial IVF procedure. The left hand side presents means in the two groups, where the "control" group is re-weighted to be of the same age and getting IVF in the same year on average as the treatment group. The right hand side presents regression coefficients on IVF success from equation 2, along with 95% confidence intervals.

Because the probability of IVF success is high and our data include almost ten thousand IVF procedures (for childless women), our standard errors allow us to reject even small differences in earnings. In the years before the first IVF procedure, women with a successful first treatment have slightly higher earning (figure 4a and 4b) and are about two percentage points more likely to be employed (figure 4c and 4d). In addition, women with a successful first treatment are also more likely to be in occupations requiring high, medium, or management skills (figure 4e and 4f). Half of this difference is explained by the employment difference. It is a concern that the differences reflect the fact that wealthier women seek out better doctors or hospitals with a higher probability of a success. We note though, the differences are very small and unlikely to generate large differences in earnings after the initial IVF treatment.

We find that women who experience an initial IVF success have large earnings declines in the year of birth. Since our earnings measure does not include parental leave benefits and most Swedish women take about one year of parental leave after giving birth, this initial drop is expected. The difference in earnings between women who have an initial IVF success and those who have an initial IVF failure shrinks to zero.
three years after the procedure. Given the high rate of pregnancy in years 1-2 in the control group (see Figure 2c), the lack of a difference does not necessarily imply that the labor market impact of planned motherhood is zero as these births presumably generate large earnings declines in the year of birth. This makes inference about the impact of children on careers difficult, and motivates our focus on TT impacts in the next section.

Figure 4 suggests that there are no longer-run employment or occupation effects of IVF success. Ap pendix Figure 8 presents estimates for disposable income, job flexibility, and probability of a second child. We see no impact on disposable income. In addition, we do not see women moving into more flexible occupations after a childbirth, as was the case for unplanned pregnancies. We also note that a successful initial IVF procedure is unlikely to result in twins. Swedish procedure is to only implant one embryo during our data window (cite). However, women who have successful IVF procedures are likely to go on to have more children, though the longer term difference between treatment and control in the probability of having two children (or more) is completely explained by women who do not have any children. This means that women in the control group who eventually have children have similar fertility to women in the treatment group.

The results suggest substantial differences between the impact of pregnancies arising from IVF successes relative to pregnancies arising from LARC failures. Is this because unplanned children have a different impact on labor market outcomes relative to planned children, or does it simply reflect differences in births in the comparison groups? To answer this question, we turn to estimating the impacts of children on labor market outcomes.

### 4.3 Dynamic Impacts of Planned and Unplanned Births on Earnings

In this section, we disentangle the effect of birth on outcomes and compare the causal impact of planned births (using IVF success as an instrument) to the causal impact of unplanned births (using unplanned pregnancy while on LARC as an instrument). This differs from the estimates presented in the sections above because we compare the earnings path of women who have a child in period 0 to what their earnings would have been if they had not had a child in periods 0 through t.

First, we assume that LARC failure is a valid instrument for an unplanned birth, and that IVF success is a valid instrument for planned birth. These assumptions are not trivial. In the case of unplanned pregnancy, we must assume that experiencing an unplanned pregnancy does not affect labor market outcomes except through its effect on the probability of an unplanned birth. If women who have an abortion experience labor market impacts from their abortion, this would violate this assumption. The earnings, employment, and occupation paths of women who have abortions after an unplanned pregnancy are plotted in Appendix

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16Half of women undergoing IVF procedures are already in occupations requiring medium, high, or management skills, so it is possible that this variable is not well suited to capturing career advancement for these women. However, we note that we also do not see longer term earnings effects.
Figure 7. We do not see any discontinuities at the time of abortion. In a more qualitative account among a somewhat different population—women on the margin of being denied an abortion, Foster (2020) concludes that abortion does not have lasting impacts on women, while children do. Perhaps most compelling, in recent work Janys and Siflinger (2021) study the mental health of Swedish women around the time of an abortion and find a precisely estimated null effect of abortion on all measures of mental health.

In the case of IVF success and failure, the exclusion restriction means that IVF failure does not itself affect labor market outcomes of women. In the conditional means in Figure 4a, we do see discontinuities at the time of IVF failure, but these arise because most women who have a failure in their first attempt go on to try again and many become pregnant in their second attempt.

Finally, in this exercise we assume that the impact of children $\rho_t^p, \rho_t^u$ does not depend on anything except whether the child is planned ($p$) or unplanned ($u$), and the years since birth. This means that we assume the impact of children is constant by age of mother. We relax this assumption somewhat and allow the effect to vary for women younger than 30 relative to women 30 and older. We find that age affects estimates substantially more for unplanned relative to planned births.

Figure 5 plots three estimates of the TT impact of children on women’s earnings over seven years, estimated as in equation (14). The left hand side presents year-by-year estimates of $\rho_t^u$, in red, and $\rho_t^p$, in purple, alongside standard errors. The right hand panel presents estimates of $\rho$ which vary by the age of women at the time of birth (29 and below vs. 30 and above).

We find that the impact of planned children on careers is small relative to the impact of unplanned children. Figure 5a shows that unplanned births lead to earnings losses of about 75k SEK in year 1-6 after birth. This represents a 35% reduction in earnings relative to the age-adjusted mean earnings in the control group (Figure 3a). In contrast, we reject impacts of this size among planned births in years 2-6 post birth. The point estimates for the effect of planned birth are less than half the size of the unplanned birth effect. As a percentage of counterfactual earnings, the estimates suggest that planned births are associated with about a 15% reduction in earnings in years 2-6 post birth. These estimates are similar to what Lundborg et al. (2017) conclude as the effect of planned birth.

One potential reason that planned births, as estimated from initial IVF success, have a small impact on earnings relative to unplanned births is that women who undergo IVF procedures already want children and the impacts of children on their careers occur before treatment assignment in both the treatment and control group. For example, women may move to the public sector, move closer to work, or move closer to their parents once they decide to start trying to have children. The impact of these decisions on women’s careers would not be picked up in the comparison of women who have an initial IVF success or failure because women attempting IVF have already made changes in their life conducive to having children. Alternatively,
all women who decide to undergo IVF may have experienced income shocks which led them to plan to have children. For this reason, it is difficult to directly compare estimates of “planned” and unplanned children.

The TT point estimates suggest that unplanned children also have a more negative impact on employment and a significant and substantial negative impact on the propensity to be in occupations requiring medium, high, or management skills. We can reject anything smaller than a 15 percentage point reduction in the propensity to be in a medium skill, high skill, or management occupation as a result of an unplanned birth.

In the right hand side of Figure 5, we plot estimates of the impact of children by age of the mother. Due to the small number LARC failures, we estimate only three $\rho$s: one in the year of birth, another for years 1-3 after birth, and another in years 4-6 after birth. We now allow these $\rho$s to vary by mother’s age and by whether the birth was planned vs. unplanned. Adjusting by age is potentially important because the median woman experiencing a LARC failure is under 30, but a woman under 30 undergoing IVF is in the 10th percentile. Does age completely explains the differences in the effects of planned and unplanned birth? Our estimates suggest that after the year of birth, unplanned birth is associated with larger earnings losses than planned birth, even among women of similar ages.

The impact of unplanned pregnancy on occupation trajectory is almost entirely driven by younger women. Planned birth is not associated with changes in the propensity to work in jobs requiring medium, high, or management skills. In contrast, younger women who give birth as a result of unplanned pregnancy are substantially less likely to work in these jobs, and the longer-term estimates are twice as large as for older women experiencing an unplanned birth.

Beyond age, women giving birth to unplanned children have different characteristics than those undergoing IVF. Some of these characteristics, of course, are endogenous to planning, but we still may be interested in exploring whether the (substantial) age and occupation differences between the LARC and IVF groups drive the results. We use a DiNardo et al. (1996) propensity score re-weighting to compare estimates while holding characteristics fixed. In particular, we reweight a women undergoing IVF procedures by the relative probability that a person with her characteristics appears in the set of women receiving LARCs relative to the set of women undergoing IVF.\footnote{The characteristics we use to form this relative propensity are: age indicators, occupation indicators, earnings, and civil status indicators all as measured in period $-1$.} Table 5 displays the unweighted and weighted versions of the estimates over time, using the GMM procedure as before. When we re-weight women receiving IVF to have characteristics similar to those using LARCs (the "unplanned" sample), we find that planned births are associated with larger earnings declines relative to the estimates without the propensity score re-weighting (about 17\% vs. 10\% in terms of period $-1$ earnings), but this is half the size of the impact of unplanned birth. This means that unplanned birth has career consequences not only because unplanned births happen earlier in
life or to women in different income groups than planned births, but also potentially because they happen at times which are unobservably suboptimal from a career perspective.

5 Conclusion

In this paper we investigate a natural experiment in which women who were using long-acting reversible contraceptives (IUDs and implants) became pregnant. This setting is ideal for studying the impacts of unplanned pregnancy because LARCs are effective and work passively, so our counterfactual is not confounded with choices (such as not taking the birth control pill regularly) which make identification challenging. We document that empirically there are no labor market differences between women who become pregnant while taking a LARC and those who do not in the years before they purchased the LARC, conditional only on age and year of prescription. However, after a LARC failure, a woman’s career trajectory changes dramatically. Unplanned children lead to substantially lower earnings for many years following birth, and women who have unplanned births are also less likely to advance to more skilled occupations.

These impacts are not similar to what we find in another setting with exogenous timing in births: success or failure in the first IVF treatment. Women taking LARCs and women undergoing IVF fertility treatments differ in their intentions concerning childbirth. In one case, a woman would like to avoid becoming pregnant, in the other case, a woman would like to have a child. These differences in intention, more so than the differences in characteristics of women with different intentions (such as age), lead to very different impacts of childbirth on women’s careers. The impact of a unplanned birth is about twice as large as the impact of a planned birth, and the impact of unplanned birth is substantially greater among younger women.

Our results suggest that unplanned births have large impacts on labor market outcomes, especially when first-time mothers are young. First-time mothers younger than thirty years old who give birth to an unplanned child are 20 percentage points less likely to move into occupations requiring medium, high, or management skills by 6 years after childbirth, relative to not having a child. These negative impacts of unplanned pregnancy, especially for women early in their career, strengthen the case for ensuring access to high-quality contraceptives.
References


Bronson, Mary Ann, “Degrees are forever: Marriage, educational investment, and lifecycle labor decisions of men and women,” *Unpublished manuscript*, 2014, 2.


Figures
Figure 1: Dynamics of Compliers

Note: This figure displays the dynamics of compliers for a hypothetical group of women who get a LARC at age 26 in panel a and another group of women who start fertility treatment at age 30. There are non-compliers in the treated group of women who experience a LARC failure and then get an abortion. There are also non-compliers in the control group when women later remove the LARC and get pregnant. Likewise, there are non-compliers in the IVF control group who later get pregnant.
Figure 2: ITT Analysis: Effect of Planned and Unplanned Pregnancies on Childbirth

Note: This figure displays the impact of unplanned pregnancy and 95% confidence interval (y-axis) by time since LARC prescription (x-axis) in panel a. Panel b shows the impact of unplanned pregnancy and 95% confidence interval (y-axis) by time since first IVF treatment (x-axis). The vertical dashed line marks the year of LARC prescription or IVF treatment ($t = 0$). Controls include a fully saturated model with indicators for year and age of LARC prescription or IVF treatment. Control group: Women who do not conceive within one year of LARC prescription (panel a) and women who do not conceive with the first IVF treatment. Treatment group: Women who conceive first child within nine months of LARC prescription and women who conceive with first IVF treatment. Sample: Women born in 1965-83 with no prior child births at the time of LARC prescription or fertility treatment.
Figure 3: Matching Analysis: ITT Estimates of Unplanned Pregnancy (LARC) on Income, Employment, and Occupation.

Note: This figure displays the impact of unintended pregnancy and 95% confidence interval (y-axis) by time since LARC prescription (x-axis). The vertical dashed line marks the year of LARC prescription ($t = 0$). Income is measured in hundred thousands real 2010 SEK. Controls include a fully saturated model with indicators for year of LARC prescription and age. Control group: Women who do not conceive within one year of LARC prescription. Treatment group: Women who conceive the first child within nine months of LARC prescription. Sample: Women born in 1965-83 with no prior child births at the time of LARC prescription.
Figure 4: Matching Analysis: ITT Estimates of Planned Pregnancy (IVF) on Income, Employment, and Occupation.

Note: This figure displays the impact of successful IVF procedure and 95% confidence interval (y-axis) by time since IVF procedure as measured by fertility drug prescriptions (x-axis). The vertical dashed line marks the year of fertility prescription ($t = 0$). Income is measured in hundred thousands real 2010 SEK. Controls include a fully saturated model with indicators for year of IVF procedure and age. Control group: Women who do not conceive as a result of their first IVF procedure. Treatment group: Women who conceive as a result of their first IVF procedure. Sample: Women born in 1965-83 with no prior child births at the time of IVF procedure.
Figure 5: Treatment on the treated

(a) Earnings

(b) Earnings by age

(c) Employed as indicated by employment status in the last week of November

(d) Employed as indicated by employment status in the last week of November by age

(e) Occupation requires medium-high-managerial skills

(f) Occupation requires medium-high-managerial skills by age

Note: This figure displays the impact of first child and 95% confidence interval (y-axis) by time since birth (left-hand side, x-axis) and by age (right-hand side, x-axis) on earnings, employment and occupation. Two estimates of the impact of first child are displayed: the effects estimated in a subsample of women who wanted and planned for children (women undergoing IVF), in purple; the effects estimated in a subsample of women who wanted to delay children (LARC users), in red.
### Table 1: Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>All (2008)</th>
<th>LARC</th>
<th>IVF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>31.58</td>
<td>31.92</td>
<td>32.20</td>
</tr>
<tr>
<td>Basic Schooling</td>
<td>0.08</td>
<td>0.11</td>
<td>0.06</td>
</tr>
<tr>
<td>College Degree or Higher</td>
<td>0.48</td>
<td>0.37</td>
<td>0.56</td>
</tr>
<tr>
<td>Yearly Earnings (1000s)</td>
<td>189.83</td>
<td>171.10</td>
<td>253.70</td>
</tr>
<tr>
<td>Yearly Disposable Income (1000s)</td>
<td>174.74</td>
<td>175.14</td>
<td>209.97</td>
</tr>
<tr>
<td>Employment Status</td>
<td>0.71</td>
<td>0.68</td>
<td>0.86</td>
</tr>
<tr>
<td>Med.-High Skill Occ., or Manager</td>
<td>0.36</td>
<td>0.28</td>
<td>0.50</td>
</tr>
<tr>
<td>Flexibility</td>
<td>0.10</td>
<td>0.01</td>
<td>0.21</td>
</tr>
<tr>
<td>Any Psychiatric Diagnosis</td>
<td>0.01</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>Any Childbirths to Date</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Married</td>
<td>0.21</td>
<td>0.22</td>
<td>0.48</td>
</tr>
<tr>
<td>Divorced</td>
<td>0.05</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>Any Sickness Benefit</td>
<td>0.08</td>
<td>0.12</td>
<td>0.11</td>
</tr>
<tr>
<td>Observations</td>
<td>412,540</td>
<td>28,190</td>
<td>9,583</td>
</tr>
</tbody>
</table>

Note: This table displays average characteristics of all women in 2008, as well as LARC users without children in the year before they take out their LARC prescription and IVF treated women for the first fertility treatment. We focus on 2009 for the overall population because this is the midpoint of our prescription data. For LARC users, we randomly select a focal prescription year by choosing a random prescription between 2005 and 2013. Yearly earnings are measured in thousands of 2010 SEK and do not include any leave payments. Disposable income includes parental leave benefits as well as other transfers and taxes, also measured in thousands of 2010 SEK. Employment Status is measured in November of a given year.
Table 2: Balance Between Treatment and Control

<table>
<thead>
<tr>
<th>Outcome in Year Before Prescription</th>
<th>Control Mean</th>
<th>Year Prescription × Age</th>
<th>Year Prescription × Age × Civil Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coefficient</td>
<td>P-Val</td>
</tr>
<tr>
<td>Yearly Earnings (000s)</td>
<td>171.32</td>
<td>0.403</td>
<td>0.962</td>
</tr>
<tr>
<td>Yearly Disposable Income (000s)</td>
<td>175.31</td>
<td>1.276</td>
<td>0.879</td>
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<tr>
<td>Married</td>
<td>0.22</td>
<td>0.091</td>
<td>0.000</td>
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<td>Divorced</td>
<td>0.07</td>
<td>0.028</td>
<td>0.047</td>
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<tr>
<td>Employment Status</td>
<td>0.68</td>
<td>-0.014</td>
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</tr>
<tr>
<td>Employee - Medium or Highest Qual., or Manager</td>
<td>0.28</td>
<td>-0.015</td>
<td>0.533</td>
</tr>
<tr>
<td>Basic Schooling</td>
<td>0.11</td>
<td>0.029</td>
<td>0.083</td>
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<tr>
<td>College Degree or Higher</td>
<td>0.37</td>
<td>-0.035</td>
<td>0.188</td>
</tr>
<tr>
<td>Any Psychiatric Diagnosis</td>
<td>0.02</td>
<td>0.002</td>
<td>0.747</td>
</tr>
<tr>
<td>Any Sickness Benefit</td>
<td>0.12</td>
<td>0.017</td>
<td>0.328</td>
</tr>
</tbody>
</table>

N 28,190

Note: This table presents the results of our primary matching specification in equation (1), with the variables listed in the first column as outcomes. We display the results with and without matching on civil status in addition to prescription year and age. Yearly earnings are measured in thousands of 2010 SEK and do not include any leave payments. Disposable income includes parental leave benefits as well as other transfers and taxes, also measured in thousands of 2010 SEK. Employment Status is measured in November of a given year.

Table 3: Difference between Compliers and Never-Takers in Unplanned Pregnancies (Births vs. Abortions)

<table>
<thead>
<tr>
<th>Outcome in Year Before Prescription</th>
<th>Control Mean</th>
<th>Year Prescription × Age</th>
<th>Year Prescription × Age × Civil Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coefficient</td>
<td>P-Val</td>
</tr>
<tr>
<td>Yearly Earnings (000s)</td>
<td>154.45</td>
<td>22.95</td>
<td>0.233</td>
</tr>
<tr>
<td>Yearly Disposable Income (000s)</td>
<td>161.02</td>
<td>17.54</td>
<td>0.111</td>
</tr>
<tr>
<td>Married</td>
<td>0.26</td>
<td>-0.106</td>
<td>0.065</td>
</tr>
<tr>
<td>Divorced</td>
<td>0.06</td>
<td>-0.008</td>
<td>0.803</td>
</tr>
<tr>
<td>Employment Status</td>
<td>0.65</td>
<td>0.062</td>
<td>0.381</td>
</tr>
<tr>
<td>Employee - Medium or Highest Qual., or Manager</td>
<td>0.25</td>
<td>-0.053</td>
<td>0.334</td>
</tr>
<tr>
<td>Basic Schooling</td>
<td>0.11</td>
<td>0.064</td>
<td>0.204</td>
</tr>
<tr>
<td>College Degree or Higher</td>
<td>0.35</td>
<td>-0.010</td>
<td>0.884</td>
</tr>
<tr>
<td>Any Psychiatric Diagnosis</td>
<td>0.01</td>
<td>0.051</td>
<td>0.033</td>
</tr>
<tr>
<td>Any Sickness Benefit</td>
<td>0.11</td>
<td>-0.009</td>
<td>0.858</td>
</tr>
</tbody>
</table>

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Note: This table presents the results of a matching specification similar to equation (1), with the variables listed in the first column as outcomes and defining treatment as women who give birth and control as women who terminate their unplanned pregnancy. We display the results with and without matching on civil status in addition to prescription year and age. Yearly earnings are measured in thousands of 2010 SEK and do not include any leave payments. Disposable income includes parental leave benefits as well as other transfers and taxes, also measured in thousands of 2010 SEK. Employment Status is measured in November of a given year.
Table 4: Characteristics at birth

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All 1st births 2005-2012</th>
<th>LARC before 1st birth</th>
<th>LARC failures before 1st birth</th>
<th>IVF before 1st birth</th>
<th>IVF successes before 1st birth</th>
<th>IVF before 1st birth (reweighted)</th>
<th>IVF successes before 1st birth (reweighted)</th>
</tr>
</thead>
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<tr>
<td><strong>Mother at 1st birth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>age</td>
<td>31.09</td>
<td>30.83</td>
<td>30.53</td>
<td>33.81</td>
<td>33.13</td>
<td>30.07</td>
<td>29.84</td>
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<td><strong>Prenatal environment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Gestational Age (GA) at 1st prenatal visit (weeks)</td>
<td>11.24</td>
<td>10.23</td>
<td>10.85</td>
<td>10.95</td>
<td>11.21</td>
<td>10.84</td>
<td>10.99</td>
</tr>
<tr>
<td>Mother’s height (cm)</td>
<td>166.57</td>
<td>166.94</td>
<td>166.07</td>
<td>166.98</td>
<td>167.10</td>
<td>166.42</td>
<td>166.16</td>
</tr>
<tr>
<td>Mother’s weight at 1st prenatal visit (kg)</td>
<td>67.27</td>
<td>69.84</td>
<td>69.47</td>
<td>68.15</td>
<td>67.73</td>
<td>68.18</td>
<td>67.16</td>
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<tr>
<td>Mother’s BMI at 1st prenatal visit</td>
<td>24.23</td>
<td>25.06</td>
<td>25.22</td>
<td>24.43</td>
<td>24.24</td>
<td>24.62</td>
<td>24.35</td>
</tr>
<tr>
<td>Mother smoking?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 months prior to conception</td>
<td>0.15</td>
<td>0.18</td>
<td>0.26</td>
<td>0.09</td>
<td>0.09</td>
<td>0.15</td>
<td>0.16</td>
</tr>
<tr>
<td>at 1st prenatal visit</td>
<td>0.05</td>
<td>0.05</td>
<td>0.09</td>
<td>0.02</td>
<td>0.02</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>at 30-32 weeks of child GA</td>
<td>0.03</td>
<td>0.04</td>
<td>0.06</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>Mother smoking?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 months prior to conception</td>
<td>0.03</td>
<td>0.05</td>
<td>0.07</td>
<td>0.02</td>
<td>0.03</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>at 1st prenatal visit</td>
<td>0.01</td>
<td>0.02</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>at 30-32 weeks of child GA</td>
<td>0.00</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Mother’s health during pregnancy</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>any psychological diagnosis</td>
<td>0.02</td>
<td>0.03</td>
<td>0.05</td>
<td>0.02</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>any pregnancy leave</td>
<td>0.19</td>
<td>0.24</td>
<td>0.22</td>
<td>0.22</td>
<td>0.23</td>
<td>0.25</td>
<td>0.27</td>
</tr>
<tr>
<td>net days on pregnancy leave</td>
<td>6.78</td>
<td>5.70</td>
<td>7.80</td>
<td>6.35</td>
<td>6.67</td>
<td>6.00</td>
<td>9.64</td>
</tr>
<tr>
<td>any sickleave</td>
<td>0.43</td>
<td>0.50</td>
<td>0.50</td>
<td>0.52</td>
<td>0.52</td>
<td>0.52</td>
<td>0.52</td>
</tr>
<tr>
<td>net days on sickleave</td>
<td>16.66</td>
<td>13.67</td>
<td>23.57</td>
<td>18.34</td>
<td>18.18</td>
<td>22.65</td>
<td>23.30</td>
</tr>
<tr>
<td>total pregnancy- and sickleave income (SEK 1000s)</td>
<td>14.18</td>
<td>17.96</td>
<td>21.36</td>
<td>18.90</td>
<td>19.38</td>
<td>19.36</td>
<td>21.16</td>
</tr>
<tr>
<td><strong>Childbirth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>planned c-section</td>
<td>0.06</td>
<td>0.06</td>
<td>0.05</td>
<td>0.09</td>
<td>0.08</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>emergency c-section</td>
<td>0.13</td>
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<td>0.19</td>
<td>0.17</td>
<td>0.15</td>
<td>0.14</td>
</tr>
<tr>
<td>days in hospital</td>
<td>3.52</td>
<td>3.50</td>
<td>3.42</td>
<td>4.27</td>
<td>4.09</td>
<td>3.67</td>
<td>3.61</td>
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<td></td>
</tr>
<tr>
<td>healthy</td>
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<td>0.76</td>
<td>0.72</td>
<td>0.72</td>
<td>0.73</td>
<td>0.72</td>
<td>0.75</td>
</tr>
<tr>
<td>any congenital anomalies</td>
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<td>0.04</td>
<td>0.05</td>
<td>0.04</td>
<td>0.05</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>APGAR score 1 minute after birth (0-10)</td>
<td>8.61</td>
<td>8.62</td>
<td>8.43</td>
<td>8.56</td>
<td>8.62</td>
<td>8.59</td>
<td>8.65</td>
</tr>
<tr>
<td>APGAR score 5 minutes after birth (0-10)</td>
<td>9.68</td>
<td>9.66</td>
<td>9.59</td>
<td>9.66</td>
<td>9.68</td>
<td>9.70</td>
<td>9.71</td>
</tr>
<tr>
<td>birthweight (g)</td>
<td>3,435</td>
<td>3,446</td>
<td>3,407</td>
<td>3,355</td>
<td>3,318</td>
<td>3,355</td>
<td>3,289</td>
</tr>
<tr>
<td>Low Birth Weight (LBW) birthweight ≤ 2500g</td>
<td>0.05</td>
<td>0.05</td>
<td>0.07</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
<td>0.10</td>
</tr>
<tr>
<td>Small for Gestational Age (SGA) birthweight &lt; P10 for GA</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.04</td>
<td>0.04</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Large for Gestational Age (LGA) birthweight &gt; P90 for GA</td>
<td>0.02</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.02</td>
<td>0.03</td>
<td>0.02</td>
</tr>
<tr>
<td>GA when born (weeks)</td>
<td>39.34</td>
<td>39.27</td>
<td>39.08</td>
<td>39.03</td>
<td>38.97</td>
<td>38.99</td>
<td>38.77</td>
</tr>
<tr>
<td>premature (GA &lt; 34 weeks)</td>
<td>0.02</td>
<td>0.02</td>
<td>0.05</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>preterm (34 weeks ≤ GA &lt; 37 weeks)</td>
<td>0.05</td>
<td>0.05</td>
<td>0.02</td>
<td>0.06</td>
<td>0.06</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>Days in hospital</td>
<td>3.99</td>
<td>3.89</td>
<td>3.80</td>
<td>4.84</td>
<td>4.71</td>
<td>4.54</td>
<td>4.89</td>
</tr>
<tr>
<td><strong>Father living with mother and child at birth</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 1 year after birth</td>
<td>0.90</td>
<td>0.87</td>
<td>0.79</td>
<td>0.94</td>
<td>0.93</td>
<td>0.91</td>
<td>0.89</td>
</tr>
<tr>
<td>2 years after birth</td>
<td>0.92</td>
<td>0.89</td>
<td>0.79</td>
<td>0.95</td>
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<td>3 years after birth</td>
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<td>4 years after birth</td>
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<td>net days on parental leave</td>
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<td>18.03</td>
<td>29.57</td>
<td>30.23</td>
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<td>total parental leave compensation (SEK 1000s)</td>
<td>42.14</td>
<td>45.57</td>
<td>36.03</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>(64.220)</td>
<td>(21.860)</td>
<td>(64.174)</td>
<td>(32.813)</td>
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| Earnings in period −1 | 147.84 | 253.83 | 147.84 | 150.01 |

Note: This table presents results of our IV-GMM estimation of the dynamic effects of childbirth. Columns (1) and (2) give the estimates in Figure 5a, while Columns (3) and (4) present estimates of the same model but where observations for women undergoing IVF procedures are re-weighted by their relative propensity to be in the LARC subsample based on period −1 characteristics.
A Appendix Figures and Tables
Figure 6: Matching Analysis: ITT Estimates of Unplanned Pregnancy (LARC) on Disposable Income, Occupation Flexibility, and 2nd Child.

Note: This figure displays the impact of unintended pregnancy and 95% confidence interval (y-axis) by time since LARC prescription (x-axis). The vertical dashed line marks the year of LARC prescription ($t=0$). Income is measured in hundred thousands real 2010 SEK. Controls include a fully saturated model with indicators for year of LARC prescription and age. Control group: Women who do not conceive within one year of LARC prescription. Treatment group: Women who conceive the first child within nine months of LARC prescription. Sample: Women born in 1965-83 with no prior child births at the time of LARC prescription.
Figure 7: Conditional Means, Separating Abortion and Unplanned Birth

Note: This figure displays the impact of unintended pregnancy and 95% confidence interval (y-axis) by time since LARC prescription (x-axis). The vertical dashed line marks the year of LARC prescription (t = 0). Income is measured in hundred thousands real 2010 SEK. Controls include a fully saturated model with indicators for year of LARC prescription and age. Control group: Women who do not conceive within one year of LARC prescription. Treatment group: Women who conceive the first child within nine months of LARC prescription. Sample: Women born in 1965-83 with no prior child births at the time of LARC prescription.
Figure 8: Matching Analysis: ITT Estimates of Planned Pregnancy (IVF) on Disposable Income, Occupation Flexibility, and 2nd Child.

Note: This figure displays the impact of successful IVF procedure and 95% confidence interval (y-axis) by time since IVF procedure as measured by fertility drug prescriptions (x-axis). The vertical dashed line marks the year of fertility prescription ($t = 0$). Income is measured in hundred thousands real 2010 SEK. Controls include a fully saturated model with indicators for year of IVF procedure and age. Control group: Women who do not conceive as a result of their first IVF procedure. Treatment group: Women who conceive as a result of their first IVF procedure. Sample: Women born in 1965-83 with no prior child births at the time of IVF procedure.
Figure 9: Matching Analysis: Robustness to Unplanned Pregnancy Window

Note: This figure displays the impact of unintended pregnancy and 95% confidence interval (y-axis) by time since LARC prescription (x-axis). The vertical dashed line marks the year of LARC prescription (t = 0). Income is measured in hundred thousands real 2010 SEK. Controls include a fully saturated model with indicators for year of LARC prescription and age. Control group: Women who do not conceive within one year of LARC prescription. Treatment group: Women who conceive the first child within 3, 6, 9, or 12 months of LARC prescription. Sample: Women born in 1965-83 with no prior child births at the time of LARC prescription.
Figure 10: Matching Analysis: Robustness to Pre-Treatment Controls

Note: This figure displays the impact of unintended pregnancy and 95% confidence interval (y-axis) by time since LARC prescription (x-axis). The vertical dashed line marks the year of LARC prescription ($t = 0$). Income is measured in hundred thousands real 2010 SEK. Controls include a fully saturated model with indicators for year of LARC prescription and age. We compare to models that additionally include controls for civil status, education, household composition, health outcomes, and employment outcomes the year before the LARC prescription. Control group: Women who do not conceive within one year of LARC prescription. Treatment group: Women who conceive first child within nine months of LARC prescription. Sample: Women born in 1965-83 with no prior child births at the time of LARC prescription.
Figure 11: Matching Analysis: Robustness to Matching on Civil Status

Note: This figure displays the impact of unintended pregnancy and 95% confidence interval (y-axis) by time since LARC prescription (x-axis). The vertical dashed line marks the year of LARC prescription ($t = 0$). Income is measured in hundred thousands real 2010 SEK. Controls include a fully saturated model with indicators for year of LARC prescription and age. We compare to models that additionally match on marital status and whether the women were divorced the year before the LARC prescription. Control group: Women who do not conceive within one year of LARC prescription. Treatment group: Women who conceive first child within nine months of LARC prescription. Sample: Women born in 1965-83 with no prior child births at the time of LARC prescription.
B Data Appendix

We merge several administrative registers via the unique Swedish individual identifier. The primary data sources are the Prescribed Drug Register (MLED), the Medical Birth Registry (MFR) and the National Patient Register (NPR) that are administered by the National Board of Health and Welfare (Socialstyrelsen).

The Medical Birth Registry contains measures of the child’s in-utero environment and health status at birth; incl. maternal diagnosis and complications during pregnancy and delivery, child birth weight, indicators for whether the child is heavy or light for gestational age, APGAR score (Apgar, 1952) at 1, 5, and 10 minutes after birth, and child diagnosis at birth for the cohorts born in 1973-83.

We merge these registers with several registers administered by Statistics Sweden (SCB). For example, our measures of education choices and outcomes: the 9th grade registry (incl. grades in individual courses), the High School registry (incl. grades in individual courses, grade point average (GPA), track and specialization choices), and the Higher Education registry (incl. detailed educational codes for all enrollment spells, course credits accumulated during enrollment, and acquired degrees).

The Multigeneration registry allows us to link children to their parents. It also contains information on family size and composition. Additional background variables are obtained from the longitudinal integration database for health insurance and labour market studies (LISA) from which we have yearly observations during the period 1990-2013. The background variables we observe include age, civil status, highest completed education, employment, earnings, and disposable income. We supplement this with earnings information from the Register Based Labor Market Statistics (RAMS) for the years 1986-89 and information on disposable income from the Income and Tax registry (IoT) for the years 1978-89.

B.1 Income Measures

Our main income measure is earnings, which is the yearly gross labor income from all employment spells (based on the LISA variable LoneInk). We also analyze an individual’s disposable income which equals the individual’s earnings plus the net of all government transfers (based on the LISA variable DispInk for 1990-2003 and DispInk04 for 2004-2013). For example, parental leave benefits are added and income taxes are subtracted. Parents have the right to take full-time parental leave with a duration until their child is up to 18 months old. Parental leave benefits consist of two components: a federal parental allowance and a parental salary. The basic parental allowance amounts to SEK 180 per day for children born on or after July 1, 2006, which is double the daily parental allowance of SEK 90 per day for children born before July 1, 2006. The parental allowance is basically the same amount as the sick leave benefit. On top of the parental allowance, there is a parental salary that depends on unemployment insurance fund membership and the collective agreement the individual is subject to. Most of the largest funds provide a parental salary such that the total parental benefits replace up to 90% of the parents’ salary for the first six months of leave. Many employers also top this up such that many parents face an effective replacement rate of up to 95% for the duration of a year. Parents may also choose to take part-time leave such that they are on leave 75%, 50%, 25%, or 12.5% of the time, respectively, and get paid that same fraction of the parental allowance.18

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18 See the Parental Leave Act (1995:584) for the complete law text and its changes over time, available in the Swedish digital law archives. The law was enacted in 1995 and modified in 2006 (2006:442) and 2018 (after our sample period).
B.2 Family

Each family is identified by a family ID (FamId). The family ID is based on the family definition in the Total Population Register (RTB). It equals the individual ID number of the oldest person of a maximum of two generations that have relationships with each other and have a registered address on the same property.\textsuperscript{19} When more than two generations live together, the family ID is based on the youngest generation if unmarried. Only unmarried singles who have the same registered address as their parents relate to the same family. An individual can only be part of one family. Unmarried adults who are registered on the same address/property and have common children are part of the same family regardless of the child’s registered address. Cohabitants who do not have children in common cannot be connected to the same family. Statistics Sweden (SCB) estimates that there are at least 500,000 people who are cohabiting, but cannot be connected to the same family. Cohabiting families may also be misclassified when a property contains several apartments. Those who are classified as cohabiting with common children can possibly live in different apartments in the same property. This type of misclassification is more prevalent for larger properties. However, more than 75 percent of the population lives in properties with fewer than 100 people. About 50 percent of the population lives in properties with fewer than 10 people.

B.3 Childcare

Local governments are required by law to provide childcare for children aged 1 to 12 years that fulfills certain quality standards. Consequently, enrollment rates are as high as around 70\% for children ages 1-2 years old and 90\% for children ages 3-6 years old. Childcare is highly subsidized and parents pay a percent of household income but with a cap. The cap is low as the intention in the law is that no parent refrain from childcare due to economic reasons. Child care is offered during regular work hours (for more details see (Mork et al., 2013)).

B.4 Abortion

Swedish abortion law has not changed during our sample period and abortion access is relatively unrestricted. Abortion is legal in Sweden until the 18th week of pregnancy. However, abortions after 18 weeks are allowed only if the fetus is deemed unable to survive Socialdepartementet (1974).

We observe whether a woman discussed abortion due to an unwanted pregnancy, code, diagnosis code Z640. This is similar to the definition used by Janys and Siflinger (2021) except that we do not take the intersection with the actual abortion procedure. We assume all women who had such a meeting had an unplanned pregnancy, though we do observe that some of these women go on to give birth later. We categorize all women who do not give birth and who had such a meeting as having an abortion, though it is possible that some of these abortions were spontaneous.

\textsuperscript{19}The relationships include spouse, registered partner, cohabitant who has children together (biological / adoptive), biological parent, adoptive parent, guardian (for children under 18 years of age) and parent other than guardian (foster parent).