Family Formation and Crime

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Abstract

While economists typically study the effects of punishments and taxes on crime and drug use, sociologists have emphasized "turning points" which reduce deviant behavior by strengthening social bonds. We use administrative data from Washington State to perform a large-scale study of childbirth and marriage as turning points. Our event studies indicate that pregnancy triggers sharp declines in crime rivaling any known intervention. For mothers, criminal arrests drop precipitously in the first few months of pregnancy, stabilizing at half of pre-pregnancy levels three years after the birth. Men show a sustained 25 percent decline in crime that begins at the onset of pregnancy, although arrests for domestic violence spike at birth. Men's employment increases during pregnancy and peaks at birth. A design using stillbirths suggests that children play a causal role in these findings. Marriage, in contrast, is not associated with any sudden changes, although it marks the completion of a substantial 50 percent decline in arrests for both men and women.

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1 Introduction

Researchers have long sought to understand the drivers of crime. Economists traditionally study rational models where forward-looking agents consider factors such as the certainty and severity of punishment when choosing whether to offend (Becker, 1968). In this vein, several studies focus on the impacts of expected punishments using discrete changes in sentencing regimes (Chalfin and McCrary, 2017). These efforts suggest that dissuading offenders is difficult: prominent quasi-experiments suggest small deterrence effects, consistent with extreme rates of discounting or myopia (Lee and McCrary, 2005; Helland and Tabarrok, 2007).

Sociologists have emphasized different determinants of criminal behavior and drug use, positing that "turning points" such as marriage and childbirth have the potential to spur dramatic life improvements, independent of past circumstances, by strengthening social bonds (Sampson and Laub, 1992). Low-income parents often report in interviews that, without their children or spouse, they would be in prison or on drugs (Edin and Kefalas, 2011; Edin and Nelson, 2013; Sampson and Laub, 2009). However, previous quantitative studies have been limited to the relatively small samples that are feasible for surveys.

In this paper we use administrative data on over a million births to take an unprecedentedly close look at criminal arrests around key turning points related to family formation. We implement a novel match between Washington state records covering the universe of criminal arrests, births, marriages, divorces, and a more limited sample of quarterly wage records, the largest such study ever conducted in the United States. Our comprehensive data allow us to highlight sharp changes in both the timing and types of arrests, control flexibly for key confounds such as age, and explore important differences across subgroups. Wage records allow us to study how these events affects substitution between licit and illicit activity.

We begin our investigation with mothers. An event study analysis shows that pregnancy triggers enormous positive changes: drug, alcohol, and economic arrests decline precipitously at the start of the pregnancy, bottoming out in the months just before birth. Shortly after birth, criminal arrests recover, ultimately stabilizing at 50 percent below pre-pregnancy levels. The sharpness of the response suggests that these declines reflect the impact of pregnancy rather than the onset

of a romantic relationship or the decision to form a family. We find similar positive long-term impacts on teen mothers, for whom the vast majority of pregnancies are unanticipated (Mosher et al., 2012). These effects are notable given that previous studies have found no or negative effects of teen childbearing on conventional economic outcomes such as income and education (Hotz et al., 2005, 1997; Fletcher and Wolfe, 2009; Kearney and Levine, 2012).

Men provide a stronger test of the turning points hypothesis in that they experience none of the physical effects of pregnancy and are typically less involved in childcare (Drago, 2009). We find that new fathers exhibit substantial, if quantitatively smaller, impacts. Male arrests decrease sharply at the start of the pregnancy and remain at lower levels following the birth, with reductions around 25 percent for economic and drug crimes. The timing of the fathers' response shows that pregnancy, not childbirth, is the primary inducement to decrease criminal behavior.

The positive changes during pregnancy are mirrored in fathers' labor market outcomes, which we observe for a smaller sample of men sentenced to probation or incarceration between 1992 and the present. We find that first-time fathers show an increase in employment that coincides with the onset of pregnancy. This result is consonant with survey research on how men respond to pregnancy (Edin and Nelson, 2013). However, the increase is not sustained. One year after the birth, male employment is back at its pre-pregnancy levels. This could be due to the fact that unmarried parents are highly likely to separate; five years after childbirth, only 18 percent are co-residing (Tach et al., 2010).

Despite these positive changes, we find that men exhibit a large spike in domestic violence arrests at birth. Some of this increase is likely due to an increase in cohabitation. However, these offenses are strongly related to our administrative information on divorces. Within married parents, domestic violence is much more common among those who eventually divorce, and, using the exact divorce date from our data, we find that divorce filings clearly coincide with increases in arrests for these offenses.

Taken together, the results for men provide a more complex picture of childbirth as a turning point (Laub and Sampson, 2001). Instead of a broad decline in crime, a large share of men's offending shifts to violence within the household. And men's employment over the long run is

essentially flat, suggesting that fatherhood does not permanently change fathers' calculus about the gains from legal activity. An alternative explanation closer to economic models of crime is that the news a partner is expecting spurs a temporary increase in earnings and desistance from crime. This temporary shock severs ties with criminal networks and opportunities outside the household, decreasing returns from these activities well after the birth. But over time, couples dissolve and cohabitation declines, decreasing incentives to work. Previous evaluations of temporary interventions such as summer jobs (Heller, 2014; Gelber et al., 2015) or behavioral therapies (Heller et al., 2016) have shown similar patterns of persistent effects on crime, supporting the idea that temporary shocks to criminal capital may promote desistance.

Throughout, we find differences by marital status at birth. First, long-run declines in arrests are much larger for unmarried parents. Second, unmarried parents are arrested at much higher rates than married couples throughout the sample period, echoing previous work on the positive correlates of marriage (e.g. Akerlof, 1998; Waite and Gallagher, 2001). This latter finding raises the question of whether marriage plays a direct role in decreasing crime. Some sociological research suggests that, compared to birth, marriage may have qualitatively different effects: according to interviews with low-income mothers, marriage is "reserved for couples who have already 'made it'" (Edin and Kefalas, 2011).

Our analysis supports this view. To study arrests around marriage, we augment our data with the state marriage index, matching over two hundred thousand marriages to the parents in our sample and applying a similar event study methodology that controls flexibly for age. We find that marriage is preceded by a substantial multi-year period of desistance: both men and women exhibit a 50 percent decrease in criminal arrests across categories in the 3 years prior to the marriage. After marriage, arrest rates are flat or increasing. This suggests that, while romantic partnership may be a turning point, marriage itself does not cause meaningful changes in criminal behavior.

Theoretical accounts in economics and sociology argue that the patterns should be different for marriages ending in divorce (Becker et al., 1977; Laub and Sampson, 2001). We combine our data with statewide divorce records to study effects for unsuccessful marriages. Despite showing

similar trends prior to the birth, couples and especially fathers headed toward divorce show a relative increase in arrests afterwards. While not dispositive, these findings are consistent with predictions from two prominent theories of marital quality: An economic theory that divorces result from negative surprises about the expected gains from the match (Becker et al., 1977), and Laub and Sampson's turning points argument that desistance is more likely in the presence of strong social bonds.

We next turn to robustness. An important concern is whether sample attrition may be responsible for some of the observed decreases in arrests around turning point events, as we observe administrative outcomes only within the state of Washington. One piece of evidence against such sample attrition for fathers is the earlier observation that despite the declines in other crime categories, domestic violence arrests increase substantially. We also address this important concern explicitly in two ways. First, we use traffic arrests as a proxy for presence in the state and find that they are stable after births. Second, we find similar crime declines when we restrict to two subsamples with greater attachment to Washington: men who eventually have a second child and men for whom we observe a ticket for a traffic arrest in Washington state 4-5 years after birth.

An additional concern is that the decrease in arrests for women may reflect a decreased likelihood of apprehension among pregnant women. While all analyses use the recorded date of the alleged offense, not the date of the arrest, this channel could explain some of the decrease during pregnancy. However, it does not explain its persistence in the years following childbirth. A separate concern for women is that drug use may shift indoors following birth. Yet, we find that driving-related arrests gradually increase for mothers following birth, which is inconsistent with a broad decrease in activities outside of the home.

Finally, while much of the effects are concentrated during the pregnancy, we isolate the effect of having a child by building a control group using 3,281 stillbirth records, reported when gestation exceeds 20 weeks. The results reinforce the qualitative findings from the main analyses: fathers of liveborn children have increased domestic violence following the birth, and mothers and fathers of liveborn children show decreased rates of drug arrests. This suggests that having a child, and

not just making the decisions that produce one, decreases criminal behavior.

These empirical findings help complement a large literature based primarily on small, selected (i.e., at-risk) samples with conflicting findings, which we review in Table B.1. Most papers find no or minimal effects of motherhood on crime, and results for fathers have been similarly mixed.[1] Further, the marriage results qualify a large literature that argues for a negative causal effect of marriage on crime.[2] Also novel to our context is the ability to separate out key types of offenses and study the precise timing of the arrest reductions, which helps rule out the possibility for long-term coincident changes that may have also played a role in desistance. The two most comparable studies, on the effects of marriage and childbirth on arrest for men and women (Skardhamar et al., 2014; Skarhamar and Lyngstad, 2009), use Norwegian register data and find broadly similar trends at an annual level but lack these important advantages.

Taken together, the results suggest that pregnancy is a strong inducement to reduce crime and drug use for both mothers and fathers. In contrast, marriage itself not have any immediate effects on crime despite its strong association with the levels of offending. While teen and out-of-wedlock births correlate with higher baseline levels of offending among parents and worse outcomes for children, policies exclusively focused on reducing these forms of childbearing may undervalue the large desistance effects for new parents. In contrast, the documented spike in domestic violence arrests may be important in informing policies targeting new parents.

2 Data

Our core analysis is based on two administrative data sources from Washington state: the Washington State Institute for Public Policy's criminal history database, a synthesis of data from the Administrative Office of the Courts (AOC) and the Department of Corrections (DOC); and still- and live-birth certificates from the Department of Health (DOH). We augment these the Washington marriage and divorce indexes, acquired from the Washington State Archives.

The criminal history data covers every criminal charge made from 1992 to 2015, including the

[1] For another recent review on mothers, see Giordano et al. (2011); for fathers, see Mitchell et al. (2018).
[2] For a critique and detailed review of the marriage effect, see Skardhamar et al. (2015).

date of the alleged offense, the criminal code, and the name and date of birth of the defendant.[3] We refer to a record in this data as an "arrest" for concision, although some events may not involve apprehension by a police officer and jail booking (e.g., a citation for reckless driving). For people who were ever incarcerated or on probation (4% of our sample of parents), the data also includes quarterly wage records.

The birth certificates span 1980 to 2009. We restrict to births after 1996 so that all parents are visible in the arrest data five years before and after the birth, a dataset we refer to as the "fully-balanced sample." The data includes the names and dates of birth of the mother and father, their races, the residential zip code of mother, and an indicator for whether the mother was married at birth. An average of 80 thousand births happen every year in the sample period, for about 1 million births in total.

We drop 5 percent of the birth certificates in the sample with the father missing. Washington is unusually good at recording fathers as it was one of the first states to implement in-hospital voluntary paternity establishment for unmarried mothers (Rossin-Slater, 2017). Similar data in Michigan has both parents on the birth certificate only 65 percent of the time (Almond and Rossin-Slater, 2013).

We match arrest records to birth certificates by implementing a fuzzy name match across parents and arrestees with the same date of birth. We drop parents who are strongly matched to multiple people in the arrest data, but we include parents who have no matches at all in the arrest data. The never-arrested sample is kept to help identify age controls in the regression analysis, and so that the count results presented below can be interpreted as population averages. The drops of ambiguously matched names constitute 5 percent of the birth certificates with fathers.

The crime categories in the data range from traffic infractions to murder. In most analyses, we group arrests based on categories constructed by the Washington State Institute for Public Policy. Arrests that we call economic consist primarily of 3rd degree theft, 2nd degree burglary, trespassing, and forgery. Drug crime categories include furnishing liquor to minors and possessing a controlled substance. Driving under the influence, the most common arrest in the data, is

[3]We attain similar results using a dataset covering all arrests from the Washington State Patrol Computerized Criminal History Database.

treated as its own category. Destruction includes vandalism and property damage more broadly. The most common domestic violence related arrest is for fourth degree assault, which is the least severe assault charge.

These five categories account for more than half of the arrests in the data. The bulk of the remaining arrests are either driving-related (e.g., reckless driving, driving with a suspended license), which we omit from the main analyses because they are conflated with driving activity; minor assault charges, which, because of patterns in their timing, appear to often be domestic-violence related due to inconsistent coding in the administrative data; and obstructing a police officer.

In the main analyses, we restrict to the parent's first birth as measured by matching parents within the birth records using the father's full name and date of birth and the mother's full (maiden) name and date of birth as reported on the birth certificates. Since the birth certificates begin in 1980, this means we will mislabel births as firsts if someone in our sample had their first child in 1979 or earlier.

We combine state marriage and divorce records with our sample by merging them to birth certificates using a fuzzy string match of the combined names of the spouses. This match comes with the caveat that only couples who at some point have a child together will be included. Since the marriage certificates do not contain birth dates, married couples could not be linked to the arrest data without first linking to the birth certificates.

In Table 1, we show how the sample characteristics change as we impose the restrictions mentioned above, starting with the entire sample of DOH births in column (1). Column (2) restricts to births where the mothers are clearly matched (or not matched) to the arrest data; column (3) adds the restriction that the birth is the mother's first child; and column (4) shows the characteristics for our sample of stillbirths, including the restrictions made in (2)-(3). Analogous descriptive statistics with the father as the focal parent are shown in Table B.2.

3 Event study evidence

3.1 Mothers

We start by showing the raw monthly arrest rates of mothers in the three years before and after the birth of their first child, using the main analysis sample of 480,111 mothers described above. Importantly, all of the analyses are constructed using the date of the alleged offense, not the date of arrest, which partially addresses the concern that arrest is less likely for visibly pregnant women. In this setup, t=0 marks the 30-day period beginning with the date of birth.

Figure 1(a) shows these arrest rates for mothers for four different categories of crimes. The plots show three consistent patterns: flat or slight positive trends leading up to the approximate date of the pregnancy (i.e., nine months before birth), large declines during pregnancy and especially in the first few months, and a sharp rebound in arrests following the birth. Property and non-DUI drug arrests are lower than the pre-pregnancy averages three years after the birth, while DUI and property destruction arrests show less of a long-term decline.

To remove age effects, we present similar plots displaying the event-time coefficients from regressions of the following form:

$$\mathbb{1}(arrest)_{it} = \alpha_i + \sum_{k \in S} \delta_k \mathbb{1}(t = k) + \mathbf{X}'_{it}\beta + \epsilon_{it} \tag{1}$$

where $\mathbb{1}(arrest)_{it}$ is equal to 1 if person i was arrested in month t, α_i denotes person fixed effects and $\mathbf{X}'_{it}$ includes a 4th-order polynomial in age and dummies for being above age 18 and 21. The set S runs three years in either direction from the birth, or -36 to 36. We bin up periods before -36 or after 36 into two separate dummy variables (i.e., $\mathbb{1}(t < -36)$ and $\mathbb{1}(t > 36)$), which allows us to estimate age effects, person fixed effects, and the event-time dummies without introducing collinearity. Standard errors are clustered at the person level, and in some specifications, we group event time indicators at the quarterly level to smooth out the arrest patterns.

In this event study setup, the effects of childbirth δ_k are identified by changes in arrests controlling for time-varying covariates. Effectively, the specification compares two women of the same age who have children at different times. Differences in their arrest rates are measured by the

event-time indicators. These differences will capture the causal effects of pregnancy and childbirth if the onset of pregnancy does not coincide with other time varying-shocks (e.g., the beginning of a romantic relationship) that also affect arrests.

As we show below, we find limited evidence that pregnancy coincides with other arrest-reducing life changes for the mothers and fathers in our sample. Most importantly, there is no anticipation of the pregnancy. Any anticipation might reflect the impact of mothers meeting potential fathers and reducing their criminal activity as a result. Instead, decreases in arrests coincide exactly with the onset of pregnancy.

This implies that it is also unlikely that the patterns reflect the *decision* to try to become pregnant rather than pregnancy itself. If decisions were playing a role, we would expect at least some couples to fail to become pregnant quickly, generating dips in arrests before t=-9. Moreover, survey evidence suggests that the majority of births to unwed mothers, who drive our results, are unplanned (Mosher et al., 2012). We also obtain very similar results among teen mothers, for whom 78% of pregnancies are unintended (Mosher et al., 2012).

We present results for the event study specification with the outcome, $\mathbb{1}(arrest)_{it}$, equal to one in any month that the mother was arrested for any of the four crime categories. These estimates, shown in Figure 1(b), closely match the simple averages given in the raw figure, suggesting a sustained 50 percent decrease in arrest rates. We report a subset of the event-time coefficients for the four different crime categories in Table 3. The decline during pregnancy is substantial, with the four crime categories decreasing by 70-95 percent relative to pre-pregnancy levels. These effects also capture the considerable rebound following pregnancy, with, for example, DUI arrests going from practically zero in the month of birth to only 48 percent lower than pre-pregnancy levels in the third month following birth. In the Appendix, we show how the shape of the rebound in the drug-related offenses is consistent with a simple formulation of a habit formation model, as in Becker et al. (1991).

These event study specifications similarly show no evidence of anticipation. There are small declines in t=-8, when many mothers learn they are pregnant, and the largest decline in t=-7, by which time almost all mothers know (Branum and Ahrens, 2017). This is consistent with evidence,

based on self-report, that pregnancy intention does not predict alcohol cessation (Terplan et al., 2014).

3.1.1 Alcohol offenses

Contrary to the other three categories, the raw averages of DUI arrests in Figure 1(a) show an eventual increase after birth. This appears to due to the fact that women are more likely to be driving. Partial evidence for this is that more innocuous arrests related to driving, such as driving without a license, are increasing over the sample period (Figure B.1).

For more insight into drinking behavior, we turn to the most common alcohol-related arrests for people under the age of 21: alcohol possession. We perform this analysis for women who become mothers at or before the age of 20 or younger and plot results until age 21 in order to remove the confounding effect of reaching the legal drinking age, which brings the sample size down to 67,899 mothers. The plot of these alcohol arrests is given in Figure B.2. Similar to the non-alcohol drug arrests in the previous plot, the figure suggests a sharp, largely sustained desistance at the beginning of pregnancy.

3.1.2 Teen mothers

Economists still debate the consequences of teen pregnancy. Influential research using miscarriages as a control finds minor negative and even some positive effects of teen childbearing (Hotz et al., 2005, 1997; Ashcraft et al., 2013).[4] However, Fletcher and Wolfe (2009) use a similar design with different data and find strictly negative effects on education and income, leading to a recent summary that the "[n]egative consequences of teen childbearing are well documented" (Yakusheva and Fletcher, 2015).

We next turn our attention to these women, defined as those who give birth before turning 20. We plot the coefficients from the event study specification for the four main crime categories in Figure B.3, where the coefficients are normalized by the pre-pregnancy average to give the

[4]For an overview of the causal effects of teen childbearing, see Kearney and Levine (2012), who conclude that "most rigorous studies on the topic find that teen childbearing has very little, if any, direct negative economic consequence."

fractional change in arrest rates. Motherhood remains a large driver of desistance for this subgroup. As in the full sample, drug and property crimes show a sharp and largely sustained decrease to half of the pre-pregnancy levels. These plots are also meaningful because 78% of teen mothers report that their births resulted from unintended pregnancies (Mosher et al., 2012). The results provide perhaps the clearest evidence to date that childbearing is a turning point for even very young women.

3.2 Fathers

We next turn to first-time fathers. Figure 2(a) shows the average monthly arrest rate for fathers for the same four crime categories as mothers. While less sharp than the effects for mothers, large drops are visible in these raw averages, especially for drug arrests. Between pregnancy and three years after birth, drug arrests fall from 17 to 11 for every 10,000 men.

These effects are broadly similar when measured using the event study specification. As with the analysis for mothers, we estimate the event study specification combining these four categories of arrests and plot the results in Figure 2(b). The results show clear evidence of a steep decline, stabilizing at 30 percent less than the arrest rates at the start of the pregnancy. Point estimates for a subset of the event-time coefficients are reported in Table 4.

The declines in arrests compare favorably to the deterrent effects of exceptionally harsh punishments. Under California's three-strikes law, offenders with two strikes faced almost 20 years of additional prison time and exhibited a decrease in annual felony offenses of 15 to 20 percent (Helland and Tabarrok, 2007). In Italy, Drago et al. (2009) find that an increase in expected sentences among recently released prisoners by 25 percent would decrease re-arrests in 7 months by 18 percent. Our results on arrest rates are not directly comparable to estimates of recidivism for people recently released from prison. However, the probability of any arrest in a longer period shows the same large decline: among all of the first-time fathers in our sample, the share arrested for any drug offense goes from 1.7 percent in the year before pregnancy to 1.2 percent in the year after birth.

3.2.1 Employment

We next turn to employment. We estimate a similar event study specification as in Equation 1, with key changes to the sample and the controls $\mathbf{X}'_{it}$. The sample is restricted to men who were ever on probation or incarcerated. We further restrict to first-time fathers who ended their initial probation or incarceration spell in the four years before the pregnancy in order to not implicitly condition on a crime outcome that occurs after the pregnancy. To account for recidivism patterns inherent in the sample and that differ across offense type due to differential treatment by the Department of Corrections post-release, we include in $\mathbf{X}'_{it}$ fixed effects for year of admission by offense type by time since release.

The event study specification for the crime offenses for this group replicates the patterns for all fathers. In Figure 3(a), we plot the coefficients for event study specification with an indicator for any economic, drug, DUI, or destruction offense as the outcome. Next, we measure formal employment as having quarterly wages over $1000, about equal to minimum wage earnings. The results for this employment outcome are given in Figure 3(b). They show an increase in the probability of employment of 5 percentage points, an increase in 14 percent from a base of 36 percent. This peaks at birth and decreases sharply in the years after.

While these results show an eventual decrease in employment for fathers, some of this may be due the fact that we only observe outcomes in Washington state, an issue that we explore more fully in Section 6. As evidence of this, we restrict the sample further to fathers who are at any point recorded as having a second child in the birth certificate sample in Figure B.4, grouping event time indicators every three months to increase precision. This plot shows the same spike at birth but a less pronounced decline in the three years following.

Taken together, the results for first-time fathers suggest large positive changes concentrated during pregnancy, despite the fact that men do not directly experience any of the physical effects of pregnancy. While new to the quantitative literature, this response is consistent with qualitative research asking at-risk fathers how they reacted when they learned about a partner's pregnancy. Edin and Nelson (2013) note that, "Men are drawn in—usually after the fact of conception...[and] usually work hard to forge a stronger bond around the impending birth" (Edin and Nelson, 2013,

p. 203).

However, increases in work are not sustained. One year after the birth, male employment is back at its pre-pregnancy levels. This could be due to the fact that unmarried parents are highly likely to separate; five years after childbirth, only 18 percent are co-residing (Tach et al., 2010). As co-residence declines, fathers may also be less motivated to provide financial support. More research is needed, however, on how changes in family structure impact fathers' incentives to work.

3.3 Heterogeneity

3.3.1 Second births

The results for childbirth are consistent with two broad explanations. First, childbirth could initiate a permanent change in preferences. For instance, having a child could cause people to derive less utility from drug use or crime, or make them more future-regarding. However, an alternative explanation is that childbearing affects crime purely through its effect on the time budget. The presence of a young child could create a temporary incapacitation effect due to childcare or housework. We attempt a comparison of these two theories by comparing the first to the second birth. The first theory predicts that most changes should be concentrated in the first birth, while the incapacitation channel suggests similar effects regardless of birth order.

In Figure 4, we show the same event study coefficients split by birth order. In order to use a consistent sample, the underlying data retains all mothers and fathers whose first and second children are both born in the fully-balanced sample period. The plots show that, for both mothers and fathers, the bulk of the desistance happens at the first birth. Three years after their second birth, mothers are arrested at levels similar to before the pregnancy. Fathers experience a 10 percent decrease in arrests compared to 30 percent for the first birth. That second births could still spur a sustained decrease for fathers could be due to the fact that some men only start investing in children for later births, while this is less common for women (Edin and Nelson, 2013).

3.3.2 Birth effects by marital status

Next we split the fathers and mothers by marital status. Marital status at birth has long been a focal metric of policy makers, and the descriptives in Table 2 show clear differences in the probability of arrest and incarceration across the two samples. Unmarried fathers are twice as likely to have ever been arrested, and seven times as likely to have had an incarceration spell. Since married couples are already less prone to crime, the additional effect of childbirth may have a less stabilizing effect. On the other hand, an unmarried childbirth may present a significant income shock, leading to increased economic offenses.

Figure 5 presents similar event study plots by the mother's marital status as reported on the birth certificate, showing effects on the monthly arrest rate for any of the four main crime categories. In these plots, we add the omitted-period average in order to display the stark level differences in arrest rates between the two groups. Both unmarried and married mothers exhibit a large "incapacitation" effect during the pregnancy. However, childbirth presents less of a permanent change for married mothers. By the end of our sample window, they are arrested at similar levels to before the pregnancy.

Similar to the main results, there are no signs of anticipation ahead of the pregnancy for either group. This might be expected for unmarried women, where more than half of all births are unintended. However, for married women only 23 percent of births are unintended (Mosher et al., 2012, Table 2), and many couples spend months trying to conceive (Keiding et al., 2002). This could be further evidence that the decision to have a child does not influence criminal activity. However, it could also be that the criminally-active married women who drive the estimates are much more likely to have unintended pregnancies.

Figure 6 plots the same event study estimates for married and unmarried fathers. Similar to mothers, unmarried fathers have much higher arrest rates, but this discrepancy shrinks somewhat following the birth. Unmarried fathers show some increase in arrests leading up to the birth, which could be due an increased level of activity in Washington correlated with the timing of their relationship with the mother. As a robustness check, we show in Figure B.5 that, among unmarried fathers, two groups with stronger attachment to the state display flat pre-trends leading

up to the pregnancy but similar sharp declines in arrests at pregnancy: those born in Washington state and those with at least one juvenile criminal charge.

4 The role of marriage

4.1 Arrests around marriage

A clear finding of the previous section is that there are large level differences in criminal arrests by the parents' marital status at birth. Marriage itself is a prominent feature of the turning points framework. In qualitative studies, formerly delinquent men often attribute considerable weight to marriage: "If I hadn't met my wife at the time I did, I'd probably be dead. It just changed my whole life...that's my turning point right there" (Sampson and Laub, 2009, p. 41). Married men also earn more: in economics, a long literature debates the content of the male marriage wage premium (e.g. Antonovics and Town, 2004).

To analyze criminal arrests around marriage, we produce plots of the event study coefficients in specifications analogous to Equation 1 in Figure 7, where $t = 0$ corresponds the 30 day period starting with the date of marriage. Marriage is preceded by a long decline in arrests; for male drug and economic arrests, the decrease amounts to a more than 50 percent decrease from three years before the marriage. The decline continues until the month of marriage, where all crime categories either stabilize or increase slightly. These event study plots closely match the raw averages, shown in Figure B.6.

These figures add important nuance to the qualitative literature, which has largely interpreted the marriage effect as causal.[5] For instance, in recent work, Sampson and Laub (2009) write: "Selection into marriage appears to be less systematic than many think...[m]any men cannot articulate why they got married or how they began relationships, which often just seemed to happen by chance." The plots suggest clearly that romantic partnerships are important, demarcating a large decrease in arrests, but the association could be either because of the relationship or other factors simultaneously decreasing crime and increasing the probability of marriage.

[5]However, see Skardhamar et al. (2015) for a critical assessment.

4.2 Good marriages, bad marriages

Economic models going back to Becker et al. (1977) posit that divorces happen in response to negative information about the expected gains from the union (for a more recent example see Charles and Stephens, 2004), and in sociology a core tenet of turning points theory is that marriage itself does not guarantee desistance—relationships are salutary to the extent that they are characterized by high attachment (Sampson and Laub, 1992). The turning points theory plainly predicts that desistance should be less pronounced for bad marriages. The model in Becker et al. (1977) implies that divorce should be preceded by some negative surprise.

In order to probe these ideas, we combine our data with statewide divorce data from Washington. We plot descriptive statistics for married and eventually divorced couples in Table 5. This sample includes all births where the parents were married and it was a first birth for either the mother or father. Parents who get divorced are younger, reside in poorer zipcodes, and are more likely to be white or black (and less likely to be Hispanic or Asian). Perhaps most importantly, men and women who are headed for divorce are both about twice as likely to have any arrest.

We show the raw averages in Figure 8, but to account for these level differences we subtract and divide by the pre-pregnancy averages in the raw plots. We compare couples still married in five years to those who have divorced by that time. The outcome is an indicator for any of the four main categories of arrest (results look similar for any of these categories separately). Compared to their past levels of arrest rates, women headed for divorce have slightly higher rates of arrests post-birth, despite broadly similar trends leading up to the pregnancy. These same effects are present and much more pronounced for men.[6]

These results are consistent with the idea that "spousal attachment" is pivotal to maintaining desistance, although the parallel trends leading up to the birth suggest that preparation for a child can be just as impactful for couples who will eventually divorce (Laub and Sampson, 2001). The results are also broadly consistent with economic conceptions of marital dissolution as in Becker et al. (1977) arguing that divorce occurs in reaction to unexpected changes to the gains from the union. Of course, unobserved variables—for example, income—related to crime and divorce could

[6]The results are very similar using marriages as the focal event, and controlling for age effects in the event study specification.

be driving these results. Still, the figures show clearly that, relative to past levels, increases in arrests precede dissolution.

5 Domestic violence

The previous analyses on turning points leave out a critical caveat that, to our knowledge, has not received any explicit mention in the host of quantitative studies on crime and family formation. The results for men around marriage and childbirth coincide with a large increase in domestic violence arrests.

Figure 9(a) shows raw averages for domestic violence arrests among fathers in the full first birth sample. Domestic violence arrests increase up until the start of the pregnancy, decrease sharply, and then markedly spike on the month of the birth. The increase leading up to t=-9 may reflect the selection of our sample, as relationships increasingly form ahead of the pregnancy. The decrease during pregnancy appears consistent with norms against assaulting pregnant women, when violence may also harm the developing fetus (Currie et al., 2018). Finally, the spike at birth might help explain why recent studies found ambiguous effects of fatherhood on overall arrest rates (e.g. Mitchell et al., 2018). In Figure 9(b), we show, also using the raw averages, that a similar spike is visible around marriage.

Our data measure arrests with a high degree of accuracy, but the connection between arrests and violent behavior over the sample period is less certain if the propensity to report domestic violence changes around pregnancy and childbirth. Victimization surveys, which may be more accurate compared to measures based on police involvement, confirm the qualitative finding that domestic violence is more likely after the pregnancy than during: in a nationally representative survey, 1.7 percent of mothers reported physical violence during the pregnancy compared to 3.1 percent in the first post-partum year (Charles and Perreira, 2007).[7]

These domestic violence arrests also give a strong indication of the likelihood of divorce.

[7]Further, in an interview, a Seattle police officer said that the presence of children would not affect the likelihood of an arrest due to Washington's strict mandatory arrest law. However, the evidence here is indirect, and a recent meta-analysis concluded that "the research community still does not know for sure whether pregnant women are at higher or lower risk of being physically abused" (DeKeseredy et al., 2017).

Figure B.7(a) shows father's domestic violence arrests split by divorce status five years later, normalized by pre-pregnancy means to account for large level differences between the two groups. Despite similar pre-trends, men destined for divorce show a much larger spike in domestic violence following the birth. Figure B.7(b) focuses on these divorced men, grouping them based on whether they divorced 1, 2, 3 or 4 years after the birth. (Importantly, this uses the date that the divorce was finalized, which is at least 90 days after the date of filing.) The plot shows clearly that domestic violence spikes ahead of the divorce decree.

6 Robustness

6.1 Outmigration

The biggest potential confound in our setting is outmigration. Defining our sample around birth imposes selection: men are most likely to be physically present in Washington at the time of conception. Since our data only cover arrests in Washington, it is possible that the arrest patterns reflect migrations out of the state—and therefore unobservable attrition—following pregnancy or birth.[8] The most immediate argument against this threat is the clear increase in domestic violence following the birth. For migration to explain the decrease in drug arrests, the men accounting for the spike in domestic violence would need to have a much lower propensity to be arrested for drug offenses. However, arrests are correlated across offense types: men with more drug arrests tend to have more domestic violence arrests.

To have a proxy of residence less correlated with drug use and criminal propensity, we look at the most innocuous offense in our data: traffic arrests, consisting primarily of driving with a suspended license and not displaying a license on command. Figure B.8 shows that in both the raw averages and event study specification controlling for age men do not exhibit a decreased risk of arrest for these offenses after the pregnancy or birth, so any explanation centered on outmigration would hinge on higher-risk men selectively leaving the state.

Finally, we focus on men with greater attachment to the state in the post-birth period by

[8]Incarceration poses an analogous attrition problem as men in our sample are least likely to be in prison ten months before the birth; results using only never-incarcerated fathers are identical.

restricting the sample to the 69,900 fathers who commit a DUI or traffic offense in the endpoints of our sample, i.e., 4-5 years after the birth. In Figure B.9, we show that this sample, which should be much less contaminated by migration attrition, shows a similar 25 percent decrease in drug arrests. If migration were affecting the results and fathers physically present in Washington had stable levels of arrest rates, we would expect the decrease for this group to be much smaller.

These findings are reassuring that migration is not impacting the analyses around pregnancy and birth. As for the marriage findings, migration-based attrition would bias the results in the opposite direction: marriage applicants typically need to be physically present to attain a marriage license. The results, therefore, may even understate the decline ahead of marriage if people are less likely to be in Washington in the years preceding.

6.2 Stillbirths

The preceding sections provide evidence on the causal impact of a pregnancy assuming the onset of pregnancy does not coincide with other time-varying confounds. In this section we construct a sample of couples who experience a pregnancy that ends in a late-stage miscarriage. If the outcome of the pregnancy has a causal effect on arrests in line with the previous results, parents to stillborn infants should show higher rates of arrests post-pregnancy.

A stillbirth is the delivery, at some point after the 20th week of pregnancy, of a baby who has died. Hospitals are legally required to report stillbirths if the gestation period is 20 weeks or more. Importantly for our purposes, there is still comparable coverage of the fathers' name and date of birth, which are only missing from 9 percent of the stillbirths.

Existing work using miscarriages as an instrument (e.g. Hotz et al., 2005) includes all reported miscarriages, not just those occurring after 20 weeks of gestation. This could bias estimates if some of the early miscarriage sample would have gotten an abortion, and since among pregnant teens those who receive abortions are positively selected with respect to economic outcomes (see Hoffman, 2008). An advantage of our sample is that it does not have this censoring issue since over 90 percent of abortions occur before the 13th week of gestation (Jatlaoui et al., 2018).

On the other hand, stillbirths are less commonplace than miscarriages and often have distinct

causes affecting the health of the mother such as pre-eclampsia, bacterial and viral infections, other medical conditions, and possibly domestic violence (Lawn et al., 2016). Further, the experience of a stillbirth is often followed by a pronounced period of bereavement (Heazell et al., 2016). As a check on the influence of these physical or psychological consequences, we find similar effects looking at periods 6 months or more beyond birth, rather than immediately afterwards.

The last column in Table 1 shows descriptive statistics for the stillbirths in our sample, restricting to those having a clear match in the arrest data and that are the mother's first birth. Mothers to stillborn babies are 10 percentage points less likely to be married but are otherwise positively selected based on receipt of WIC and arrest probabilities. Also, mothers in our data who experience stillbirths exhibit greater variance in age than mothers to liveborn children, and the infants are likely to be male and twins, in line with medical studies on risk factors (Lawn et al., 2016).

Since arrests are rare and our stillbirths sample is relatively small, we shift to a simple difference-in-differences specification to reduce noise. The specification includes person fixed effects and an indicator for post-birth interacted with an indicator for live birth:

$$y_{it} = \alpha_i + \gamma * preg_{it} + \delta_1 * after_birth_{it} + \delta_2 * after_birth_{it} * live_i + x'_{it}\beta + \epsilon_{it} \tag{2}$$

where $preg_{it}$ is equal to one for $t \in \{-9, -1\}$ and $after_birth_{it}$ is an indicator for $t \geq 0$. The pregnancy indicator is included to remove the decline in arrests observed in the earlier results from the implicit pre-period estimates. We obtain similar results interacting the pregnancy and live indicators. The vector x'_{it} includes a 4th-order polynomial in age and dummies for being above age 18 and 21.

The results, shown in Table 7 for men and Table 8 for women echo the main results. Column (1) shows the results for the four main crime categories from the event study analysis, split out separately in columns (3)-(6); column (2) shows the effects on domestic violence. Fathers to liveborn children commit more domestic violence following the birth, but less of the four main offense categories. Columns (4) and (5) suggest that this is driven by drug and economic offenses, although the latter result is not significant. Mothers similarly show a reduced rate of drug arrests

following the birth, with significantly fewer drug and property destruction offenses.

7 Conclusion

How does someone change when they wed or become a parent? The previous sections uncover several novel patterns in criminal arrests around childbirth and marriage, leveraging a detailed administrative sample and providing clear evidence on the size and nature of "turning points." For mothers, childbirth is transformative, even with the large rebound in arrests that occurs after pregnancy. For fathers, a smaller but still significant decrease occurs in the same offenses. Marriage, in the words of Edin and Kefalas (2011), is reserved for couples who have made it. However, the increase in domestic violence around both births and marriage is a significant qualifier.

Parenthood is not a policy, although governments take a wide range of actions in order to prevent teen pregnancy, support marriage, and encourage father involvement. Our findings on teen mothers provide some of the strongest evidence to date against the conventional wisdom around its consequences. Further, the novel findings on the timing of desistance for fathers suggest that pregnancy could be a uniquely potent time for interventions promoting additional positive changes. Finally, the stark patterns in domestic violence arrests may argue for expanding the purview of home visitation programs in the postnatal period, typically directed at child welfare (Bilukha et al., 2005).

The findings on drug arrests in particular have two implications about incentive-based approaches to treatment: first, that drug use can respond to incentives; second, that incentives built around social bonds could be powerful. The first point challenges definitions of addiction which assert that drug use is the outcome of involuntary impulses.[9] And while the experience of childbearing cannot be synthesized in an intervention, addiction experts observe that some successful treatments, such as Alcoholics Anonymous, are based on promoting social cohesion and interdependence (Heyman, 2009).

[9]For example, the National Institute on Alcohol Abuse and Alcoholism (NIAAA), defines drug abuse as a disease: "Addiction is a chronic, often relapsing brain disease...[s]imilar to other chronic, relapsing diseases, such as diabetes, asthma, or heart disease"

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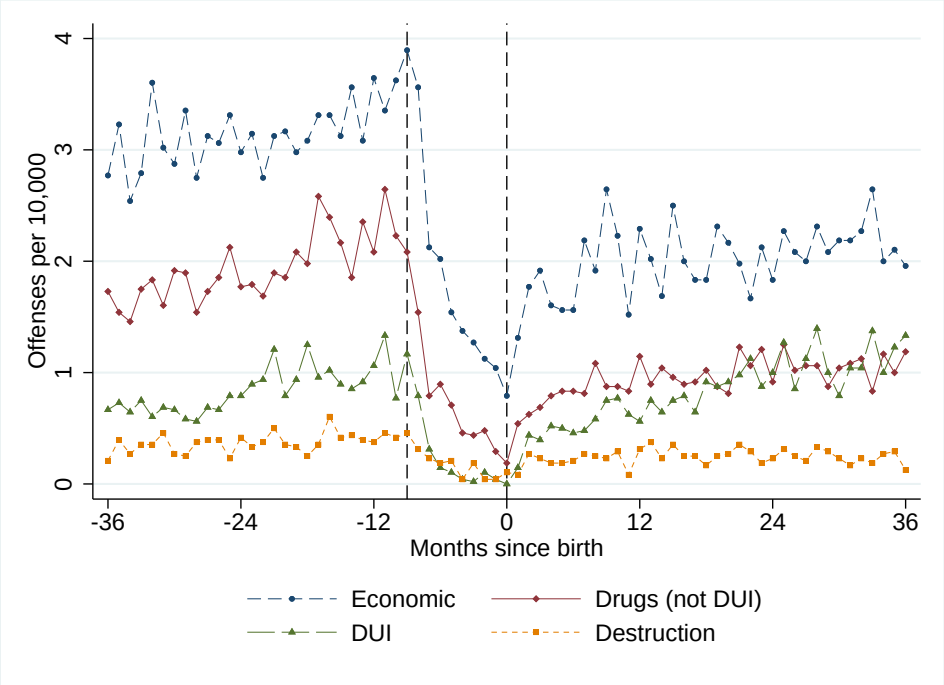
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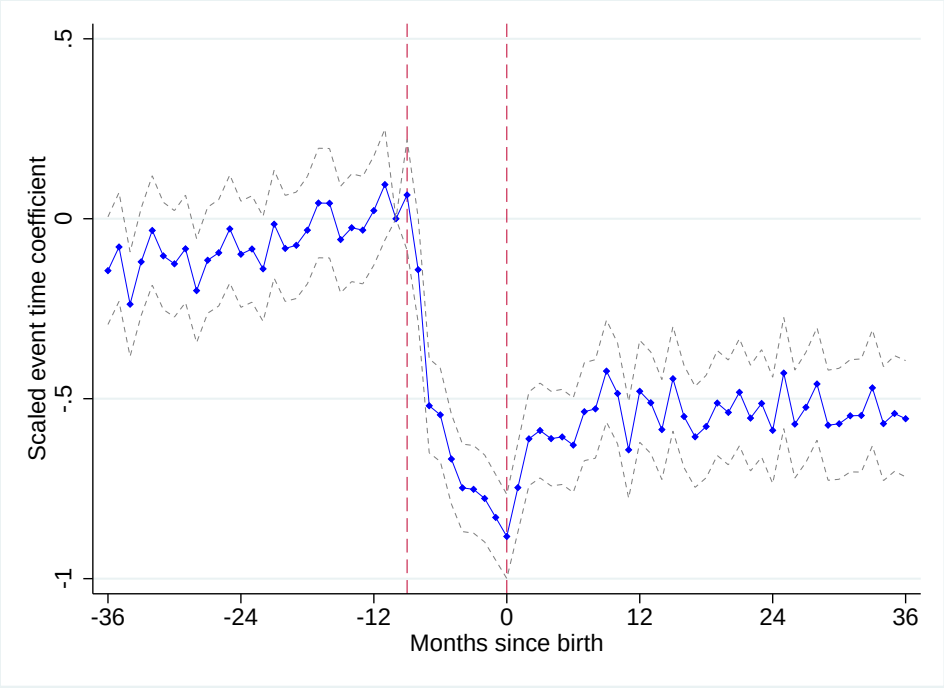
8 Figures

Figure 1: Monthly arrest rate around first birth, All first-time mothers

(a) Raw averages



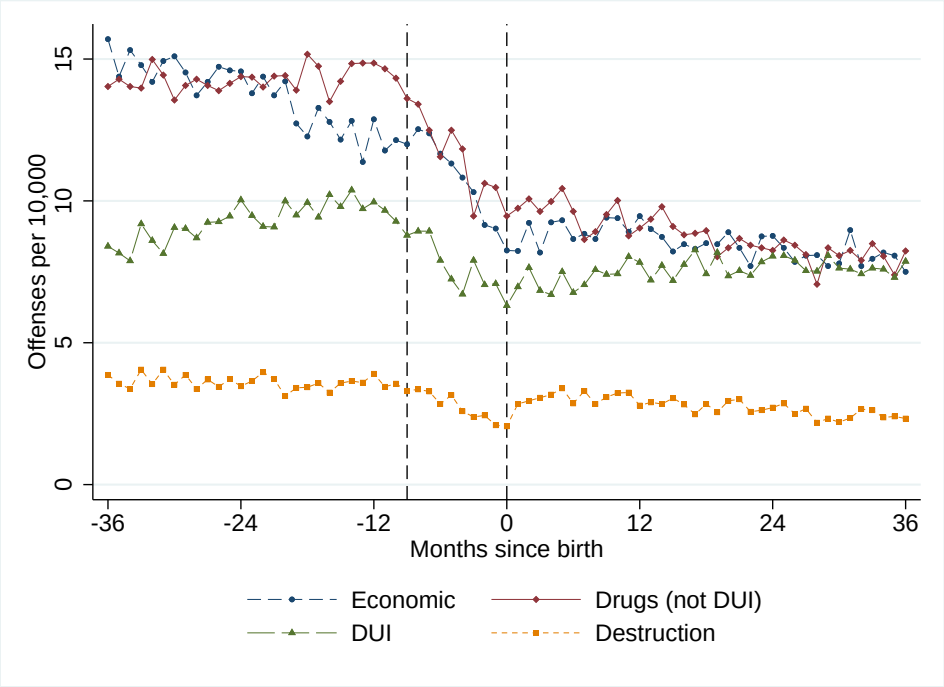
(b) Event study coefficients



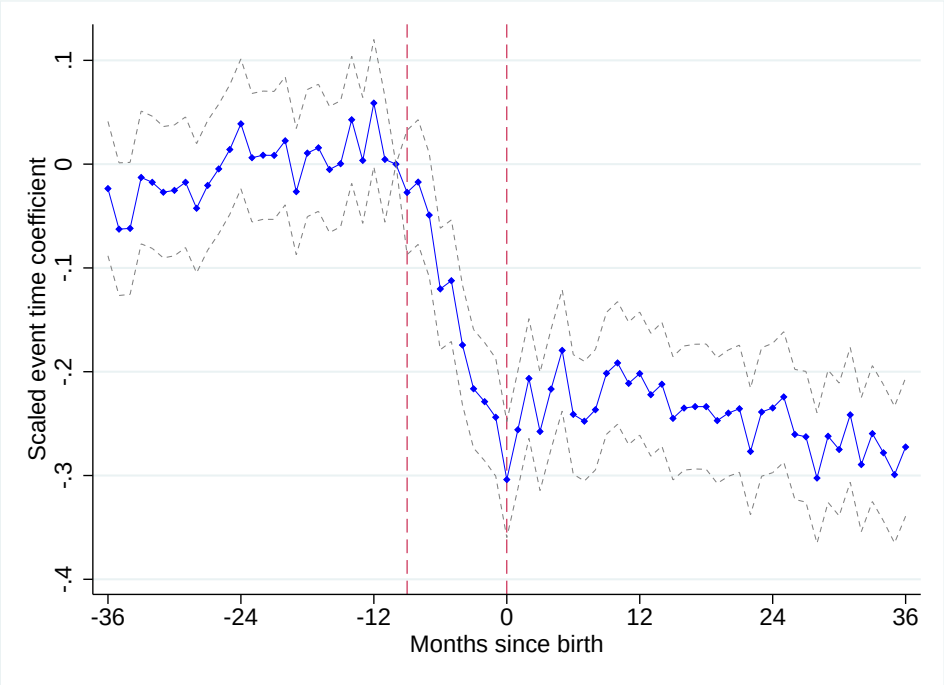
Includes fully-balanced arrest data for 480,111 first-time mothers. DUI stands for driving under the influence. In panel (b), the dots show point estimates and dashed lines show 95% confidence intervals of the coefficients δ_k from the event study specification shown in Equation 1, with an indicator for any arrest in the four crime categories from panel (a) as the dependent variable. The coefficients are divided by the average arrest rate in the omitted period, 10 months before birth. The vertical dashed lines mark 9 months before the birth and the month of birth.

Figure 2: Monthly arrest rate around childbirth, All first-time fathers

(a) Raw averages



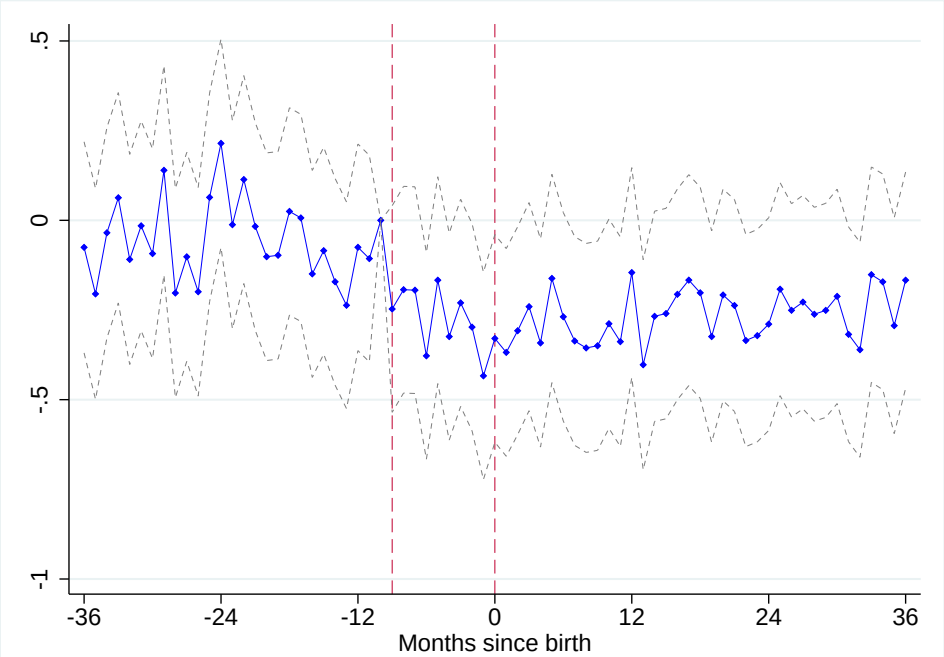
(b) Event study coefficients



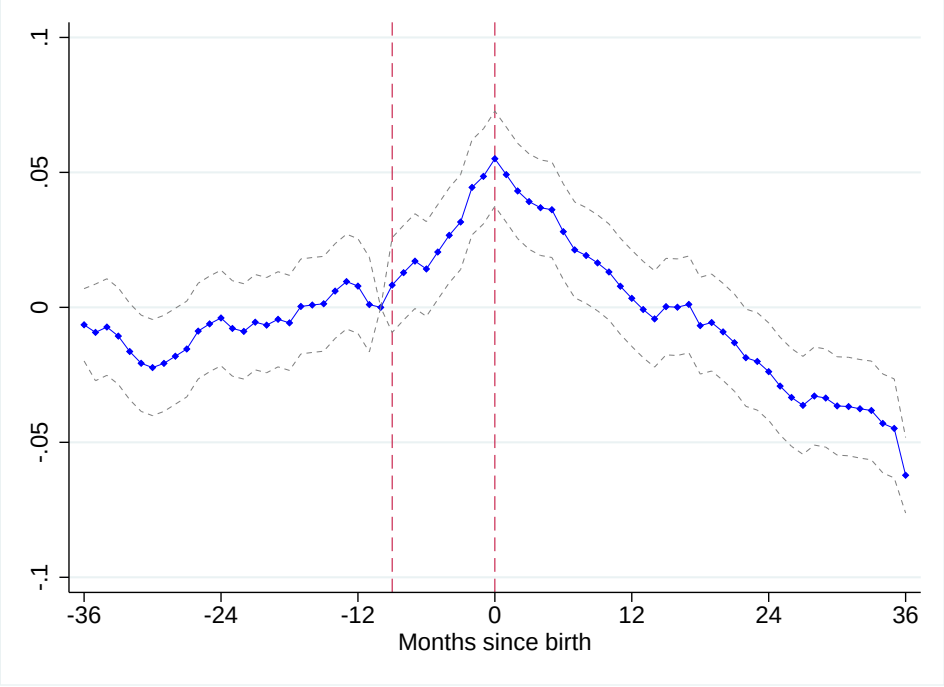
Includes fully-balanced arrest data for 545,166 first-time fathers. In panel (b), the dots show point estimates and dashed lines show 95% confidence intervals of the coefficients δ_k from the event study specification shown in Equation 1, with an indicator for any arrest in the four crime categories from panel (a) as the dependent variable. The coefficients are divided by the average arrest rate in the omitted period, 10 months before birth. The vertical dashed lines mark 9 months before the birth and the month of birth.

Figure 3: Event studies for wage sample, All first-time fathers

(a) Crime



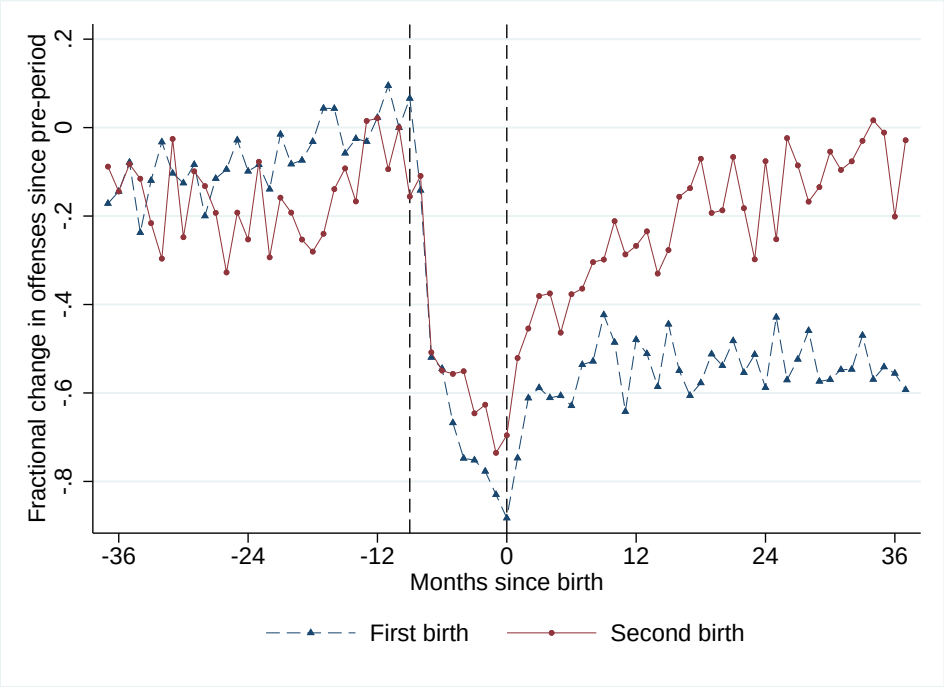
(b) Quarterly earnings > $ 1,000



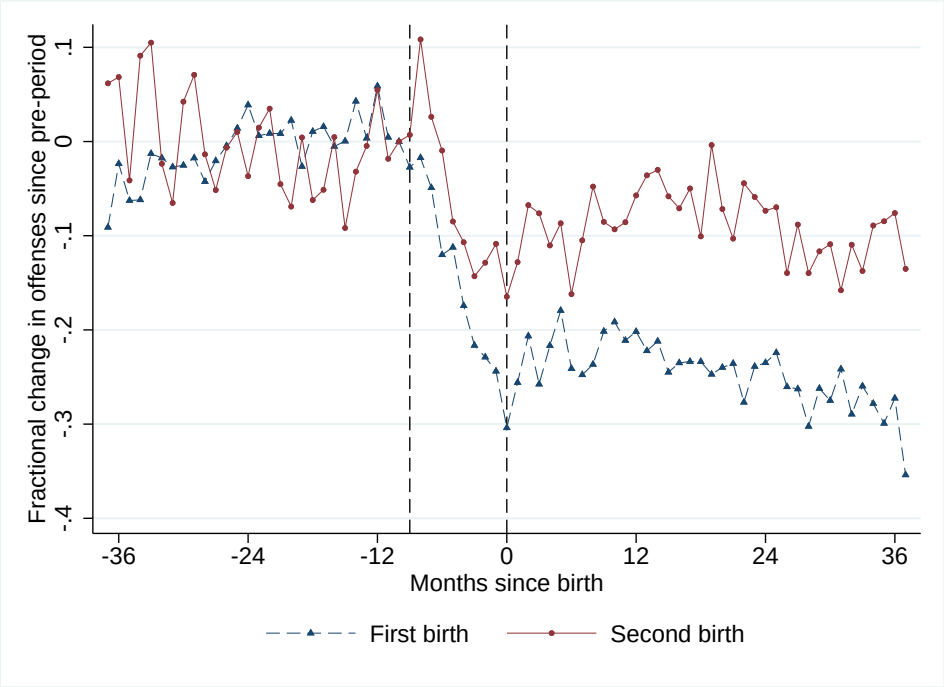
Includes fully-balanced arrest data for 5,773 first-time fathers who came under DOC supervision prior to the birth. In panel (a), the dots show point estimates and dashed lines show 95% confidence intervals of the coefficients δ_k from the event study specification shown in Equation 1, with an indicator for a drug, DUI, economic, or property destruction arrest as the dependent variable and divided by the average arrest rate in the omitted period, 10 months before birth. The vertical dashed lines mark 9 months before the birth and the month of birth. Panel (b) plots the same coefficients and confidence interval with quarterly earnings over $1,000 as the dependent variable.

Figure 4: Second births

(a) Event study coefficients, women



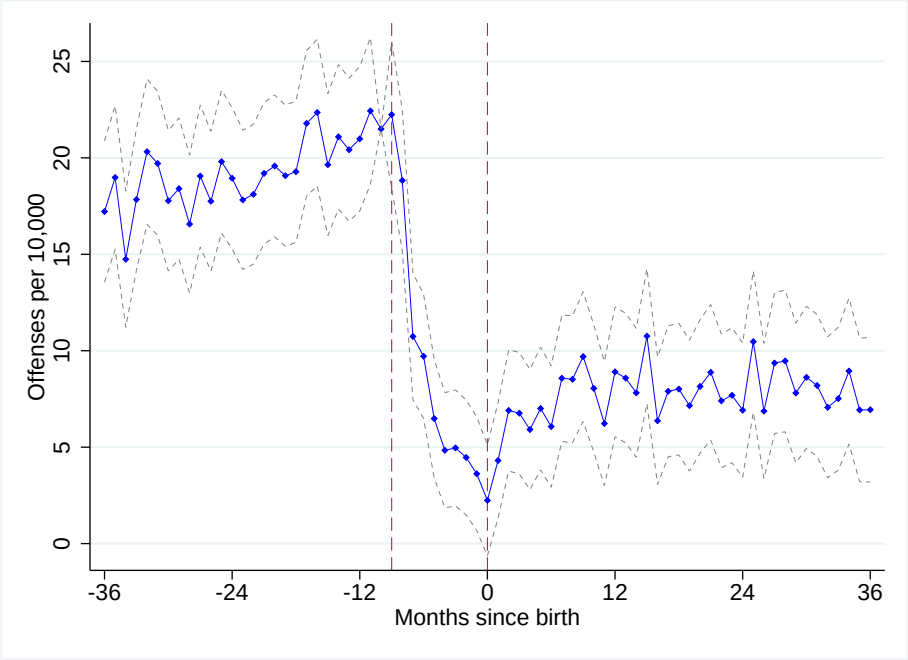
(b) Event study coefficients, men



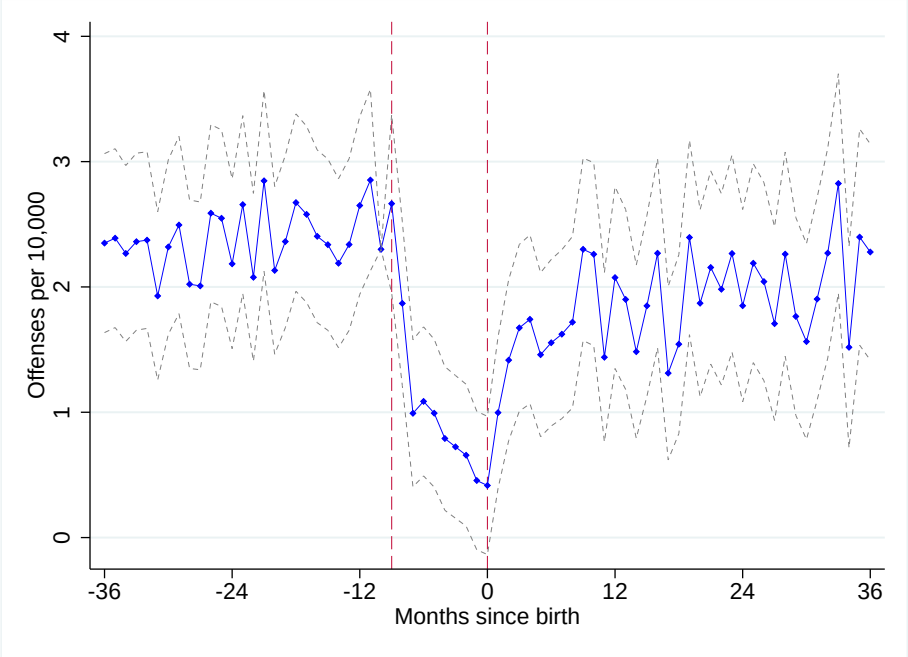
Plots show coefficients δ_k from the event study specification show in Equation 1 with an indicator for any drug, DUI, economic, or property destruction arrest as the dependent variable. Each line represents a separate regression run using fully-balanced arrest data on the women (panel (a), N=160,360) and men (panel (b), N=180,557) with two births in the sample window. The vertical dashed lines mark 9 months before the birth and the month of birth.

Figure 5: Mother heterogeneity by marital status, event study coefficients

(a) Unmarried mothers



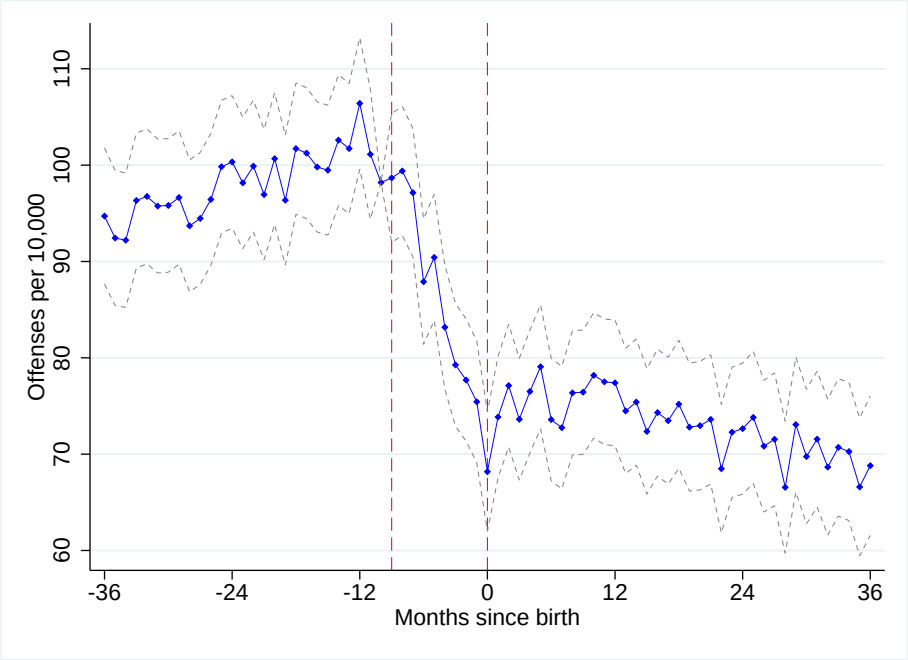
(b) Married mothers



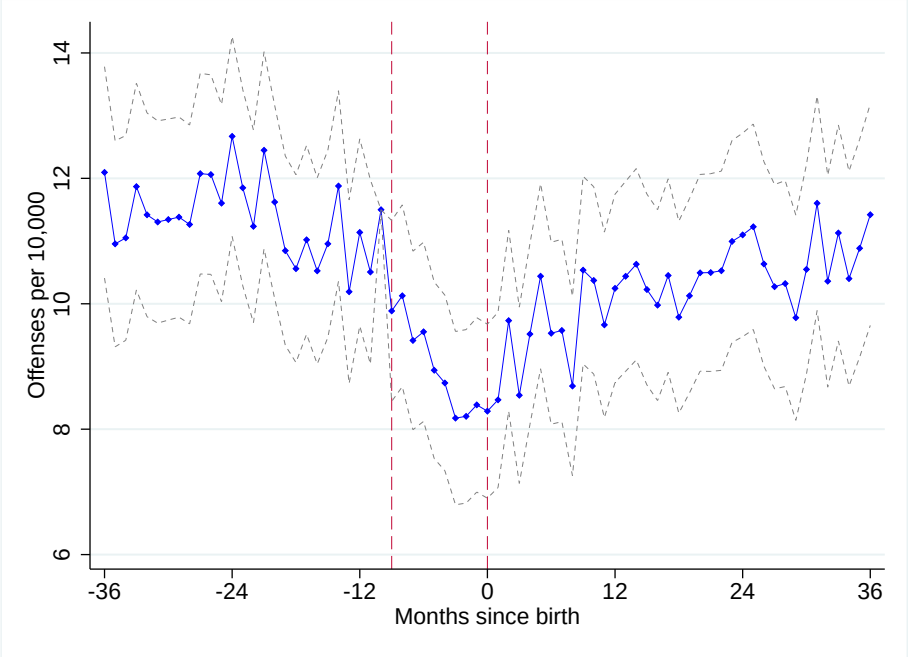
Includes fully-balanced arrest data on 112,016 unmarried and 368,095 married first-time mothers. Dots show point estimates and dashed lines show 95% confidence intervals of the coefficients δ_k from the event study specification shown in Equation 1, with an indicator for a drug, DUI, economic, or property destruction arrest as the dependent variable. The omitted period is 10 months before birth and the arrest rate in the omitted period is added to the coefficients to show average arrest rates. The vertical dashed lines mark 9 months before the birth and the month of birth.

Figure 6: Father heterogeneity by marital status, event study coefficients

(a) Unmarried fathers



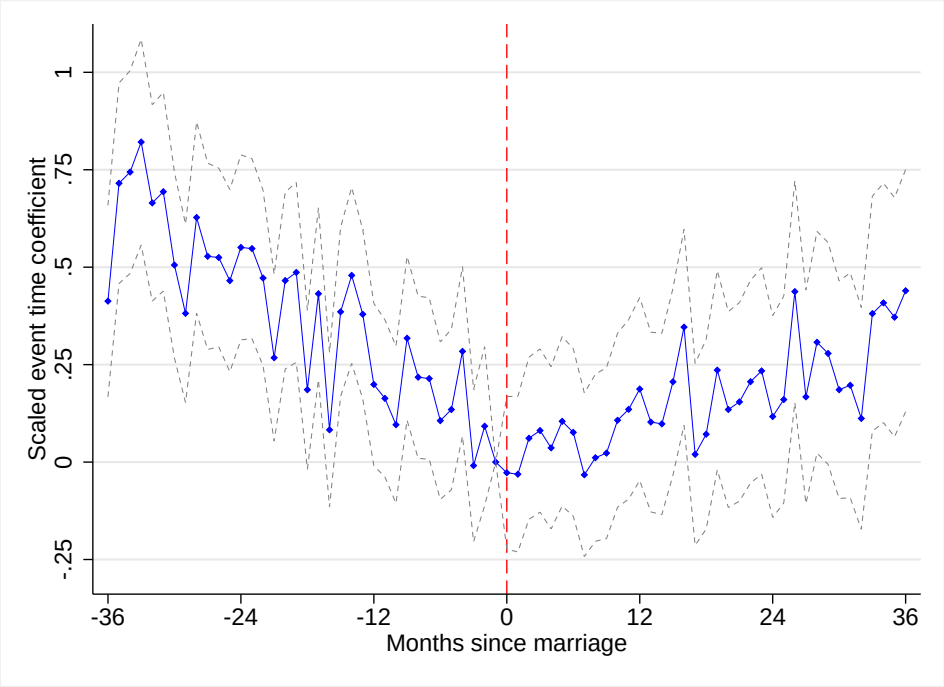
(b) Married fathers



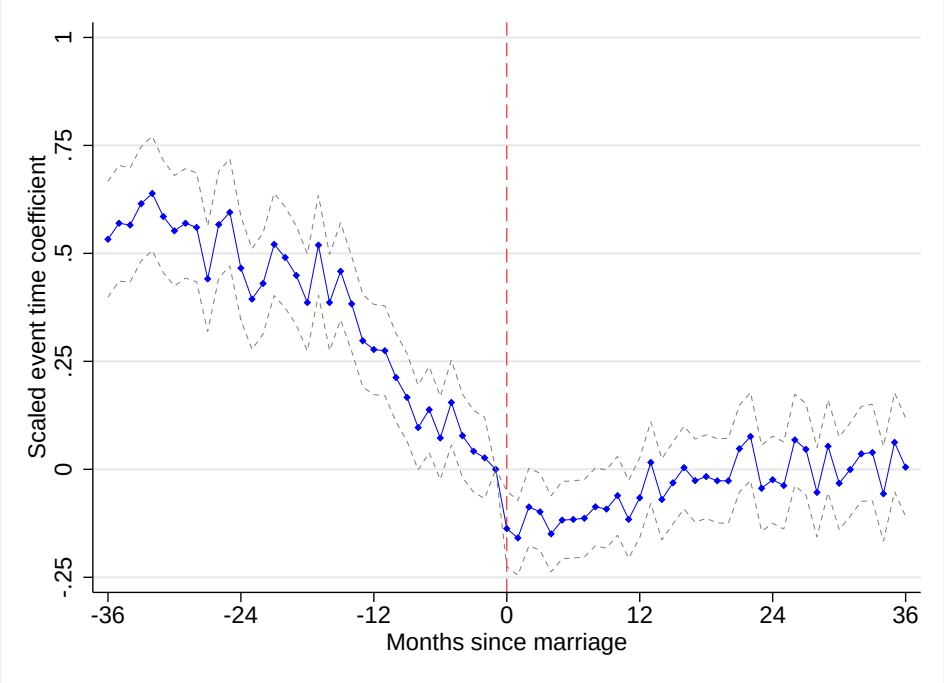
Includes fully-balanced arrest data on 160,052 unmarried and 385,114 married first-time fathers. Dots show point estimates and dashed lines show 95% confidence intervals of the coefficients δ_k from the event study specification shown in Equation 1, with an indicator for a drug, DUI, economic, or property destruction arrest as the dependent variable. The omitted period is 10 months before birth and the arrest rate in the omitted period is added to the coefficients to show average arrest rates net of age effects. The vertical dashed lines mark 9 months before the birth and the month of birth.

Figure 7: Plots of arrests around marriage

(a) Event study coefficients, women



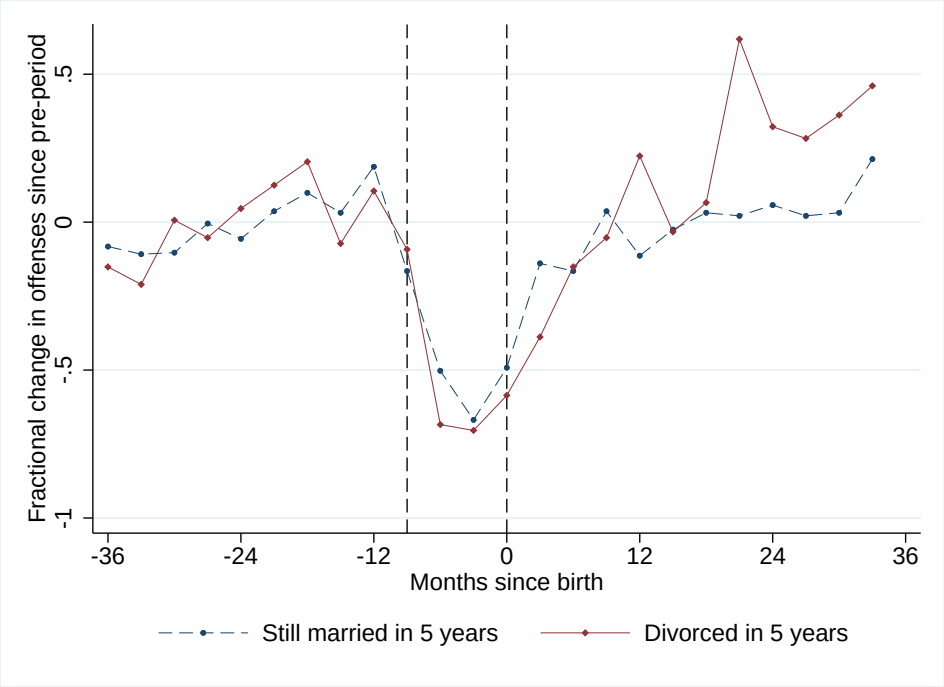
(b) Event study coefficients, men



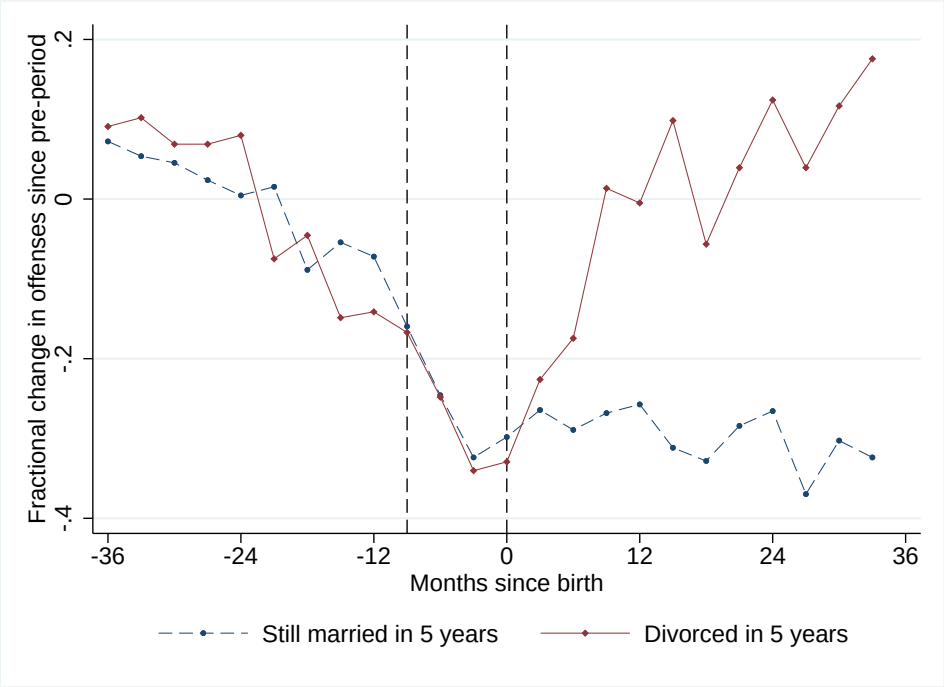
Includes all fathers (N=245,756) and mothers (N=222,392) from the birth data who are visible in the arrest data 3 years after and 3 years before their marriage. Dots show point estimates and dashed lines show 95% confidence intervals of the coefficients δ_k from the event study specification shown in Equation 1, with an indicator for a drug, DUI, economic, or property destruction arrest as the dependent variable. The omitted period is one month before birth. The vertical dashed line marks the month of marriage.

Figure 8: Heterogeneity in the effect of childbirth between good marriages and bad marriages

(a) Raw averages, women



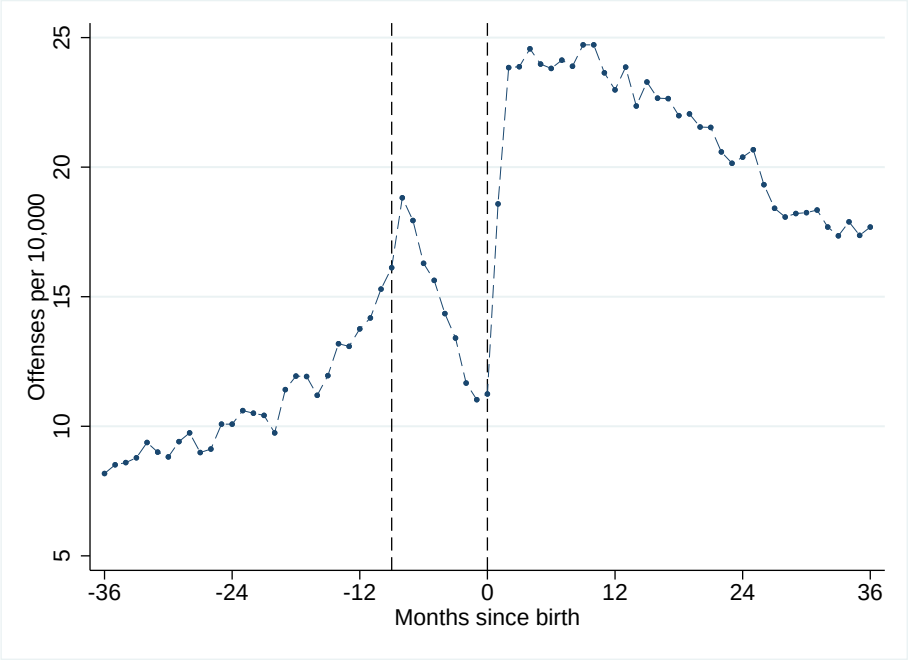
(b) Raw averages, men



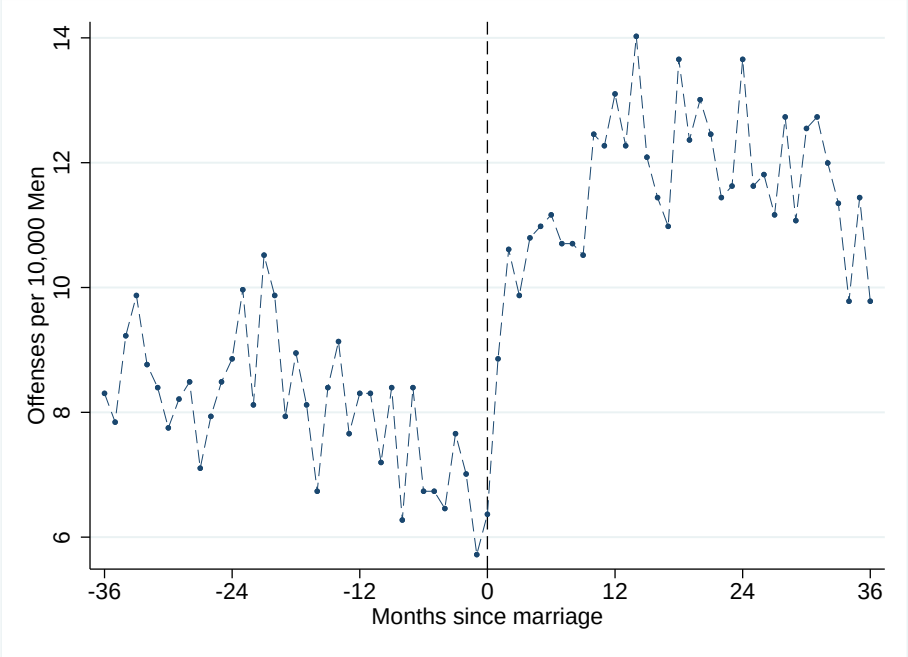
Panel (a) includes fully-balanced arrest data on 349,779 still-married women and 18,316 divorced women. Panel (b) includes fully-balanced arrest data on 364,076 still-married men and 21,038 divorced men. The outcome is any drug, DUI, economic, or property destruction arrest. Divorce classification is derived from a fuzzy match between the Washington state marriage and divorce indexes. The vertical dashed lines mark 9 months before the birth and the month of birth.

Figure 9: Domestic violence

(a) Arrests around birth



(b) Arrests around marriage



Panel (a) includes fully-balanced arrest data for 545,166 first-time fathers and the vertical dashed lines mark 9 months before the birth and the month of birth. Panel (b) includes fully-balanced arrest data for 245,756 married men and the vertical dashed line indicates the month of marriage.

9 Tables

Table 1: Descriptive statistics, Mother sample

Variable	(1) All births	(2) + Clear match	(3) +Mother's first	(4) Stillbirths
Mother age	27.91	28.50	27.55	28.04
	(6.01)	(5.91)	(6.05)	(6.66)
Father age	30.40	30.97	30.05	30.45
	(6.83)	(6.72)	(6.87)	(7.47)
Mother married at birth	0.73	0.81	0.77	0.67
	(0.44)	(0.39)	(0.42)	(0.47)
Mother on Medicaid	0.36	0.31	0.32	
	(0.48)	(0.46)	(0.47)	
WIC	0.34	0.30	0.31	0.23
	(0.47)	(0.46)	(0.46)	(0.42)
Twins+	0.02	0.02	0.02	0.05
	(0.12)	(0.13)	(0.13)	(0.22)
Male infant	0.51	0.51	0.51	0.52
	(0.50)	(0.50)	(0.50)	(0.50)
Mother White	0.71	0.71	0.69	
	(0.45)	(0.45)	(0.46)	
Mother Black	0.04	0.03	0.04	
	(0.20)	(0.18)	(0.19)	
Mother Hispanic	0.11	0.12	0.13	
	(0.32)	(0.32)	(0.33)	
Mother Asian	0.09	0.10	0.11	
	(0.29)	(0.30)	(0.32)	
Mother other or missing	0.04	0.04	0.04	
	(0.21)	(0.19)	(0.19)	
Low birth weight (<2500g)	0.05	0.05	0.06	0.60
	(0.22)	(0.21)	(0.23)	(0.49)
Any father arrest	0.41	0.35	0.34	0.31
	(0.49)	(0.48)	(0.47)	(0.46)
Any mother arrest	0.25	0.09	0.07	0.04
	(0.43)	(0.28)	(0.26)	(0.18)
Median zipcode income	59834.99	60739.80	60599.29	58650.58
	(18187.96)	(18542.80)	(18396.08)	(18073.86)
Midpregnancy marriage	0.03	0.03	0.04	0.05
	(0.18)	(0.18)	(0.21)	(0.21)
Divorce	0.22	0.21	0.21	0.36
	(0.42)	(0.41)	(0.41)	(0.48)
Father ever incarcerated	0.04	0.03	0.02	0.04
	(0.20)	(0.16)	(0.15)	(0.19)
Father ever on probation	0.09	0.06	0.05	0.07
	(0.28)	(0.23)	(0.22)	(0.25)
Observations	983,687	809,451	480,111	3,502

Standard deviations shown in parentheses. Insurance and ethnicity not recorded for stillbirths. Median zipcode income is for the years 2006-2010 from the American Community Survey via Michigan's Population Studies Center.

Table 2: Descriptives for married and unmarried parents

Variable	(1) Unmarried	(2) Married
Mother age	23.58	28.60
	(5.73)	(5.51)
Father age	25.93	30.78
	(6.57)	(6.10)
Mother on Medicaid	0.65	0.22
	(0.48)	(0.42)
WIC	0.61	0.23
	(0.49)	(0.42)
Twins+	0.01	0.02
	(0.11)	(0.13)
Male infant	0.51	0.51
	(0.50)	(0.50)
Father White	0.48	0.72
	(0.50)	(0.45)
Father Black	0.07	0.04
	(0.26)	(0.19)
Father Hispanic	0.19	0.10
	(0.39)	(0.30)
Father Asian	0.05	0.10
	(0.21)	(0.30)
Father other or missing	0.21	0.04
	(0.41)	(0.19)
Low birth weight (<2500g)	0.06	0.05
	(0.24)	(0.23)
Any father arrest	0.56	0.24
	(0.50)	(0.43)
Any mother arrest	0.46	0.14
	(0.50)	(0.35)
Median zipcode income	54753.86	62025.28
	(15006.51)	(18820.73)
Father ever incarcerated	0.07	0.01
	(0.26)	(0.10)
Father ever on probation	0.14	0.03
	(0.34)	(0.16)
Observations	160,052	385,114

Standard deviations shown in parentheses. The samples restrict to clean matches and father's first birth. Median zipcode income is for the years 2006-2010 from the American Community Survey via Michigan's Population Studies Center.

Table 3: Event study coefficients, All mothers

	Economic	Drugs	DUI	Destruction
36 months before birth	-0.133	-0.100	0.027	-0.409
	(0.089)	(0.128)	(0.224)	(0.271)
24 months before birth	-0.107	-0.148	0.095	0.031
	(0.087)	(0.125)	(0.220)	(0.297)
12 months before birth	0.021	-0.061	0.356	-0.041
	(0.090)	(0.128)	(0.233)	(0.290)
9 months before birth	0.060	-0.082	0.494	0.090
	(0.091)	(0.128)	(0.241)	(0.300)
6 months before birth	-0.384	-0.634	-0.760	-0.525
	(0.080)	(0.108)	(0.166)	(0.250)
3 months before birth	-0.575	-0.838	-0.918	-0.537
	(0.074)	(0.101)	(0.156)	(0.251)
Month of birth	-0.694	-0.945	-0.950	-0.736
	(0.071)	(0.097)	(0.156)	(0.235)
3 months after birth	-0.450	-0.739	-0.484	-0.471
	(0.080)	(0.107)	(0.192)	(0.262)
6 months after birth	-0.542	-0.699	-0.415	-0.533
	(0.078)	(0.110)	(0.199)	(0.261)
9 months after birth	-0.303	-0.650	-0.071	-0.502
	(0.086)	(0.113)	(0.222)	(0.267)
12 months after birth	-0.406	-0.575	-0.298	-0.332
	(0.085)	(0.118)	(0.213)	(0.286)
24 months after birth	-0.576	-0.720	0.221	-0.589
	(0.086)	(0.120)	(0.256)	(0.286)
36 months after birth	-0.611	-0.626	0.636	-0.900
	(0.094)	(0.133)	(0.294)	(0.289)

Selected point estimates shown for the event study specification given in Equation 1 controlling for a 4th-order polynomial in age and dummies for being over age 18 and 21, and using cluster-robust standard errors. The omitted period is ten months before birth. Coefficients are divided by the omitted period mean to give the proportional change since before the pregnancy.

Table 4: Event study coefficients, All fathers

	Economic	Drugs	DUI	Destruction
36 months before birth	0.084	-0.111	-0.037	-0.049
	(0.031)	(0.038)	(0.057)	(0.079)
24 months before birth	0.076	-0.049	0.085	-0.078
	(0.029)	(0.037)	(0.057)	(0.073)
12 months before birth	0.027	0.018	0.059	0.061
	(0.028)	(0.037)	(0.056)	(0.074)
9 months before birth	-0.007	-0.039	-0.056	-0.057
	(0.027)	(0.036)	(0.054)	(0.071)
6 months before birth	-0.015	-0.127	-0.139	-0.142
	(0.027)	(0.035)	(0.053)	(0.069)
3 months before birth	-0.070	-0.230	-0.139	-0.232
	(0.027)	(0.033)	(0.053)	(0.067)
Month of birth	-0.157	-0.229	-0.290	-0.287
	(0.026)	(0.033)	(0.051)	(0.066)
3 months after birth	-0.161	-0.194	-0.237	-0.088
	(0.026)	(0.034)	(0.052)	(0.071)
6 months after birth	-0.141	-0.176	-0.246	-0.115
	(0.026)	(0.034)	(0.053)	(0.071)
9 months after birth	-0.112	-0.186	-0.178	-0.080
	(0.027)	(0.034)	(0.054)	(0.073)
12 months after birth	-0.113	-0.206	-0.139	-0.131
	(0.027)	(0.034)	(0.055)	(0.072)
24 months after birth	-0.160	-0.208	-0.104	-0.152
	(0.029)	(0.036)	(0.059)	(0.076)
36 months after birth	-0.239	-0.192	-0.099	-0.243
	(0.031)	(0.039)	(0.063)	(0.080)

Selected point estimates shown for the event study specification given in Equation 1 controlling for a 4th-order polynomial in age and dummies for being over age 18 and 21, and using cluster-robust standard errors. The omitted period is ten months before birth. Coefficients are divided by the omitted period mean to give the proportional change since before the pregnancy.

Table 5: Descriptives of married and divorced couples

Variable	(1) Married	(2) Divorced	(3) Difference
Mother age	28.83	26.92	-1.91***
	(5.54)	(5.64)	(0.00)
Father age	31.22	29.48	-1.74***
	(6.43)	(6.66)	(0.00)
Mother married at birth	1.00	1.00	
	(0.00)	(0.00)	
Mother on Medicaid	0.24	0.26	0.02***
	(0.42)	(0.44)	(0.00)
WIC	0.24	0.29	0.05***
	(0.43)	(0.46)	(0.00)
Twins+	0.02	0.02	-0.00***
	(0.14)	(0.12)	(0.00)
Male infant	0.51	0.51	-0.00
	(0.50)	(0.50)	(0.91)
Father White	0.71	0.77	0.06***
	(0.45)	(0.42)	(0.00)
Father Black	0.04	0.05	0.01***
	(0.19)	(0.22)	(0.00)
Father Hispanic	0.11	0.06	-0.05***
	(0.32)	(0.24)	(0.00)
Father Asian	0.10	0.07	-0.03***
	(0.30)	(0.25)	(0.00)
Father other or missing	0.04	0.05	0.00***
	(0.20)	(0.21)	(0.00)
Low birth weight (<2500g)	0.06	0.05	-0.00***
	(0.23)	(0.23)	(0.00)
Any father arrest	0.27	0.53	0.26***
	(0.45)	(0.50)	(0.00)
Any mother arrest	0.13	0.32	0.19***
	(0.34)	(0.47)	(0.00)
Median Zipcode Income (2006-2010)	61839.96	59445.59	-2394.37***
	(18851.11)	(16933.97)	(0.00)
Midpregnancy marriage	0.06	0.15	0.09***
	(0.23)	(0.36)	(0.00)
Father ever incarcerated	0.01	0.04	0.03***
	(0.11)	(0.21)	(0.00)
Father ever on probation	0.03	0.10	0.07***
	(0.17)	(0.30)	(0.00)
Observations	405,387	43,115	448,502

Standard deviations shown in parentheses. *** indicates $p < .01$. The samples restrict to clean matches and father or mother's first birth. Median zipcode income is for the years 2006-2010 from the American Community Survey via Michigan's Population Studies Center.

Table 6: Regression discontinuity results

	Women		Men	
	(1)	(2)	(3)	(4)
	Alcohol	Non-Alcohol	Alcohol	Non-Alcohol
Over 21	5.630**	4.789	45.89***	-50.80
	(2.330)	(11.32)	(7.938)	(39.19)
Post-mean	17.84	263.19	187.76	2219.60
r-squared	0.070	0.019	0.107	0.455
N	422,910	422,910	347,324	347,324

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table reports the regression discontinuity estimate using daily arrest counts for all individuals in the DOH sample observable for three years before and after their 21st birthday. Birthday indicators are included as controls, as well as a quadratic in days since 21st birthday fully interacted with the indicator.

Table 7: Stillbirth results, men

	(1) Four main	(2) DV	(3) DUI	(4) Drug arrest	(5) Economic	(6) Destruction
After birth	0.589	8.366***	-2.046*	0.976	1.373	0.0805
	(2.833)	(1.709)	(1.092)	(1.480)	(1.854)	(0.953)
Live X After birth	-5.955**	2.948*	-0.888	-2.785*	-2.755	0.318
	(2.816)	(1.683)	(1.079)	(1.466)	(1.843)	(0.948)
Age poly	yes	yes	yes	yes	yes	yes
FEs	yes	yes	yes	yes	yes	yes
Group size	6	6	6	6	6	6
Outcome Mean	38.079	9.511	9.882	14.517	12.429	3.509
r^2	0.205	0.158	0.102	0.158	0.179	0.105
N livebirths	545,166	545,166	545,166	545,166	545,166	545,166
N stillbirths	3,831	3,831	3,831	3,831	3,831	3,831

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table reports estimates from the difference-in-differences specification reported in Equation 2 and including person fixed effects, an indicator for pregnancy, a 4th order polynomial in age, and an indicator for after birth interacted with the livebirth indicator. Outcome is scaled to give monthly arrests per 10,000. DV stands for domestic violence; DUI stands for driving under the influence.

Table 8: Stillbirth results, women

	(1) Four main	(2) DV	(3) DUI	(4) Drug arrest	(5) Economic	(6) Destruction
After birth	-1.456*	-0.0368	-0.810***	-0.106	-0.750	0.162
	(0.771)	(0.401)	(0.266)	(0.348)	(0.585)	(0.108)
Live X After birth	-1.823**	0.122	-0.173	-1.129***	-0.374	-0.273***
	(0.755)	(0.391)	(0.259)	(0.340)	(0.572)	(0.103)
Age poly	yes	yes	yes	yes	yes	yes
FEs	yes	yes	yes	yes	yes	yes
Group size	6	6	6	6	6	6
Outcome Mean	6.579	1.144	0.975	2.213	3.236	0.407
r^2	0.162	0.114	0.091	0.128	0.145	0.090
N livebirths	480,111	480,111	480,111	480,111	480,111	480,111
N stillbirths	3,502	3,502	3,502	3,502	3,502	3,502

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table reports estimates from the difference-in-differences specification reported in Equation 2 and including person fixed effects, an indicator for pregnancy, a 4th order polynomial in age, and an indicator for after birth interacted with the livebirth indicator. Outcome is scaled to give monthly arrests per 10,000. DV stands for domestic violence; DUI stands for driving under the influence.

Appendix A Habit formation model

The findings around birth show large effects on drug arrests. In this section, we ask how much of these responses are consistent with potentially addicted users rationally adjusting behavior in anticipation of a large change to their environment.

Economists have often employed habit-formation models in the style of Becker and Murphy (1988) in order to study addictive behavior, but most studies focus on one-time decisions or annual panels. Our context has the advantage of having a proxy for drug use at the monthly level, and is built around a clear and powerful utility shock to drug use. Building off of O'Donoghue and Rabin (1999) and Becker and Murphy (1988), we use this setting to study the implications of a dynamic discrete choice model of rational addiction. We focus on mothers because the distinct changes during pregnancy and after birth provide greater latitude for identification of the model parameters.

A.1 Setup

Following O'Donoghue and Rabin (1999), we consider a dynamic discrete choice model where addiction is based on use in the previous period. Finitely-lived agents maximize a discounted stream of utility stemming from their choices of whether to use each period $a_t \in \{0, 1\}$, and enter each period either clean or addicted $k_t \in \{0, 1\}$. Addiction is simply whether or not the agent used last period, $k_t = a_{t-1}$. When clean, the utility from using is f_t, and the utility from refraining is normalized to 0. When addicted, agents get $f_t - \rho$ from using and $-\rho - \sigma$ from refraining. These payoffs are illustrated below.

	$U_t(1, k_t)$	$U_t(0, k_t)$
Clean ($k_t = 0$)	f_t	0
Addicted ($k_t = 1$)	$f_t - \rho$	$-\rho - \sigma$

The following assumptions to capture two key features of drug addiction:

(1) **Internalities**: utility from any action is higher when clean ($\rho > 0$)

(2) **Habit formation**: the utility gain from using is higher when hooked ($\sigma > 0$)

The addiction parameters σ and ρ are static, but f_t is allowed to change after childbirth:

$$f_t = \begin{cases} f \text{ for } t < 0 \\ f - \Delta f \text{ for } t \geq 0 \end{cases}$$

Finally, agents maximize the discounted stream of utility payoffs:

$$U = \sum_{t \in S} \delta^{t+36} U_t \tag{3}$$

where t indexes months since childbirth and S includes all periods between -36 and 36 months around birth. We assume that the errors are distributed generalized extreme value, which allows for analytic solutions for the probability of using drugs in any given period. These are given by

$$P(t,k_t) = \frac{e^{U(1,k_t)+\delta V_{t+1}(1)}}{e^{U(1,k_t)+\delta V_{t+1}(1)} + e^{U(0,k_t)+\delta V_{t+1}(0)}} \tag{4}$$

where $V_t(k_t)$ is the value of entering into period t in state k_t and $P(t,k_t)$ is the probability of using in period t in state k_t. Under these assumptions, the optimal path of discrete choice probabilities can be solved using backward recursion.

A.2 Illustrative examples

Figure B.10 plots the choice probabilities around birth for a fully forward-looking agent with $\delta = 1$, a high degree of habit formation, and a large decrease in use utility starting at $t = 0$. At news of the shock at $t = -9$, the agent decreases her probability of use immediately, then spreads her adjustment to the new steady state levels into the first 12 months after birth.

In the data, mothers' arrests show a considerable rebound following the low levels reached during childbirth. In order to fit this pattern, we assume that mothers experience an additional shock to drug use utility during pregnancy,

$$f_t = \begin{cases} f \text{ for } t < p \\ f - \Delta_1 f \text{ for } t \in \{p, 0\} \\ f - \Delta_2 f \text{ for } t \geq 0 \end{cases}, \tag{5}$$

where $p \in \{-10, ..., -1\}$. In this parsimonious setup, the data are best fit with $p = -2$, since the presence of habit formation and some degree of patience creates an incentive for mothers to begin desisting in anticipation.

Figure B.11 illustrates the choice probabilities of the model with the added shock. Without habit formation, both adjustments are made instantaneously (Panel (a)). With large σ, myopic agents make sudden adjustments in the later part of pregnancy, but still ease into the new steady state (Panel (b)). Finally, as agents become more future-regarding, reaction to the news of pregnancy becomes sharper (Panels (c) and (d)).

Identification of the f and two Δf terms comes from the initial level and the two level changes during the pregnancy and after. As illustrated in Figure B.11, δ and σ are identified off of the two the transition paths during pregnancy and after: The transition from pregnancy to $t-2$ identifies δ, since this captures the immediacy of the response to a future shock. The slope into the new steady state following birth identifies σ, since non-myopic agents will only ease into a new steady state given some degree of habit formation.

A.3 Estimation

We fit the model to the data using a minimum distance estimator. The estimator minimizes the distance between the moments predicted by the model and the observed moments, where the

observed moments are the raw observed drug arrest rates in the data.[10] The predicted moments are direct outputs of the logit framework given above. Since σ and ρ are not separately identified, we fix $\rho = 1$ and estimate four parameters: σ, the degree of habit formation; f, the utility of using; Δf, the change in f; and δ, the discount rate.

The results of this exercise are shown for unmarried and married mothers in Table B.4, with the corresponding figure showing the raw data along with the simulated vector the probabilities of using in Figure B.12. The point estimates suggest that mothers in either group are not fully myopic. Although the standard errors cannot reject high levels of discounting, the steep slope leading up to birth is consistent with strongly forward-looking behavior.

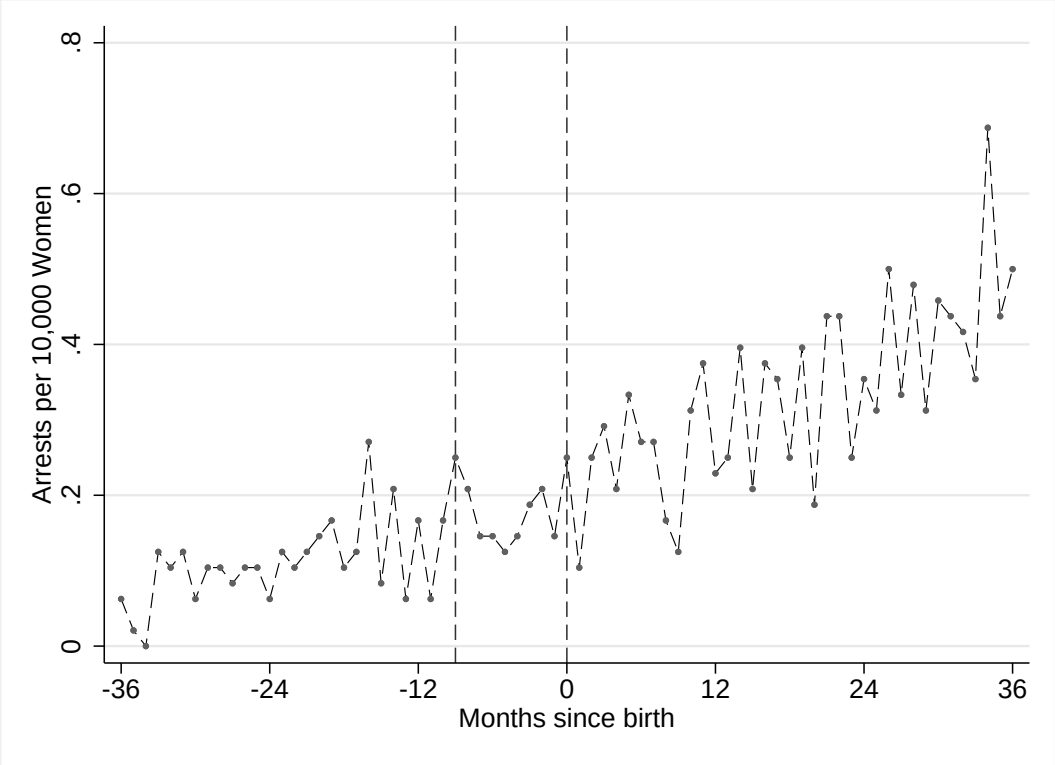
Both groups experience similar utility shocks during pregnancy, but the long-run change for married mothers, as foreshadowed in the empirical section, is almost zero. Most interestingly, the estimates suggest a higher level of habit formation for married mothers due to their slow adjustment into the new steady state. The higher levels of habit formation in turn imply that in their clean state, married mothers get a greater level of utility from using than unmarried mothers.

The results are thus broadly consistent with a habit formation framework in the style of Becker and Murphy (1988) allowing for utility shocks marking key moments in childbearing. In particular, the habit formation framework helps explain the slow transition into the steady state levels of arrests in the years following the birth. Interestingly, and as partial support for the habit formation approach, these patterns are unique to drug offenses: economic offenses for mothers show a much sharper rebound into the post-birth steady state, as shown in Figure 1.

[10] In order to better approximate actual crime rates, and following Lee and McCrary (2005), we scale the empirical moments by 10 in accordance with estimated clearance rates around 10 percent.

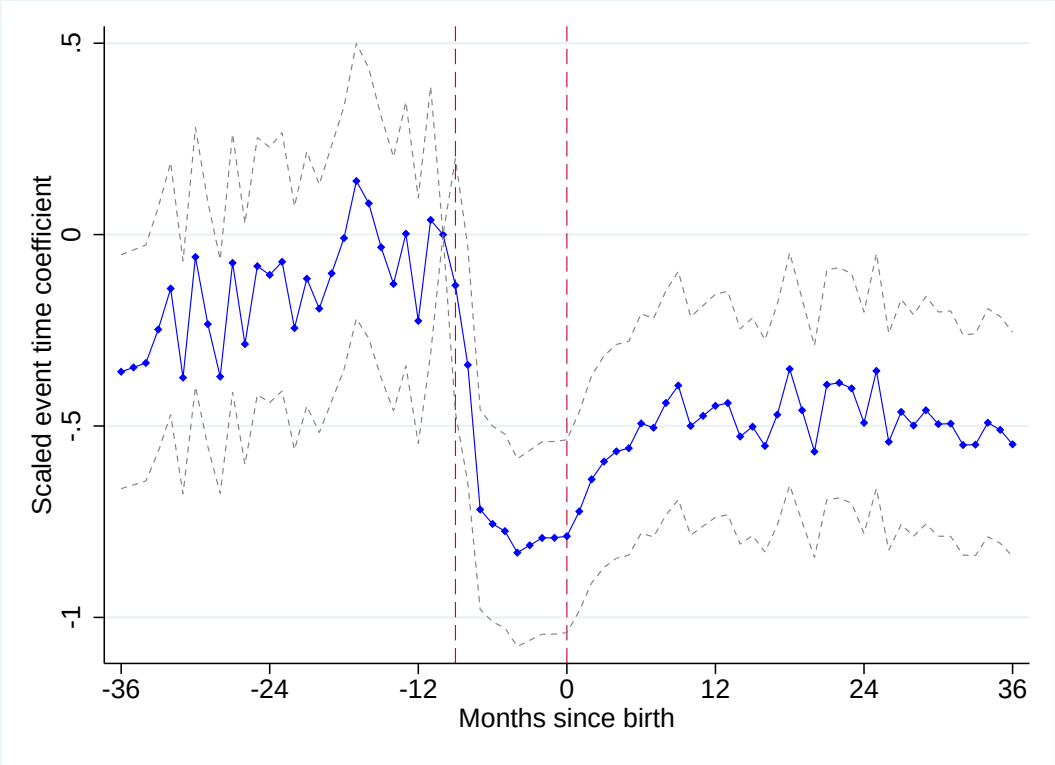
Appendix B Additional figures and tables

Figure B.1: Driving without a license, mothers



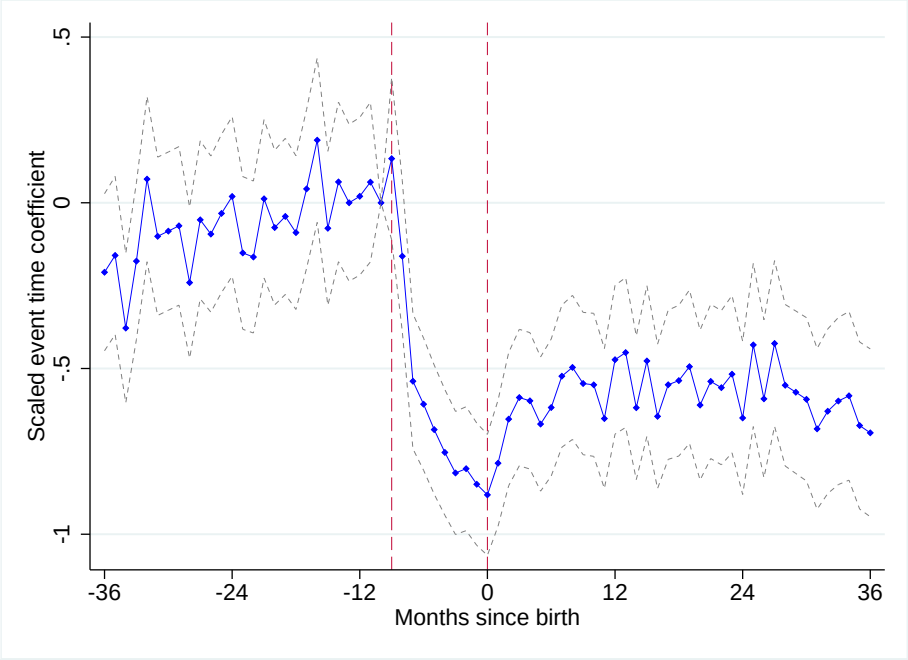
Includes fully-balanced arrest data for 480,111 first-time mothers. The vertical dashed lines mark 9 months before the birth and the month of birth.

Figure B.2: Event study coefficients for alcohol offenses, mothers under 21 years old



Includes 67,899 births. Dots show point estimates and dashed lines show 95% confidence intervals from an event study around birth shown in Equation 1. The coefficients are scaled by the average offense rate in the omitted period, 10 months before birth. The dashed lines marks 9 months before the birth and the month of the birth.

Figure B.3: Event study coefficients for teen mothers



Includes a fully balanced panel of 45,759 first-time mothers who gave birth at age 19 or younger. Dots show point estimates and dashed lines show 95% confidence intervals of the coefficients δ_k from the event study specification shown in Equation 1, with an indicator for any economic, drug, DUI, or property destruction offense as the dependent variable. The coefficients are divided by the average offense rate in the omitted period, 10 months before birth. The dashed lines mark 9 months before the birth and the month of birth.

Figure B.4: Event study coefficients for wage sample, Fathers who ever have 2nd child

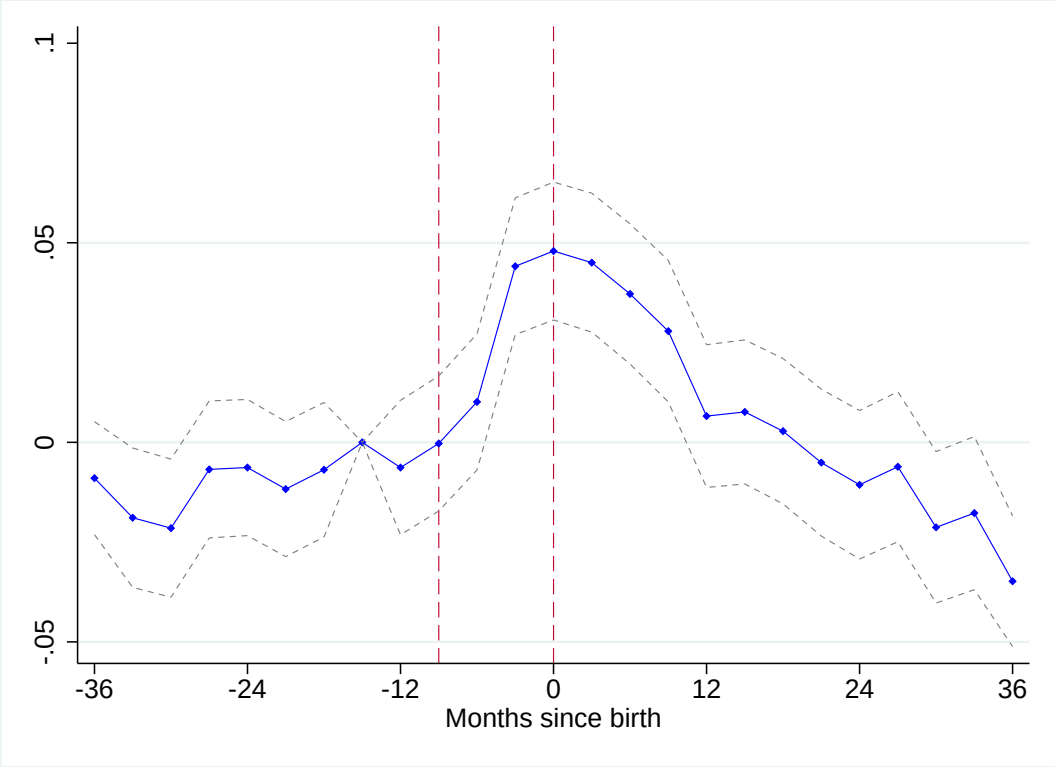
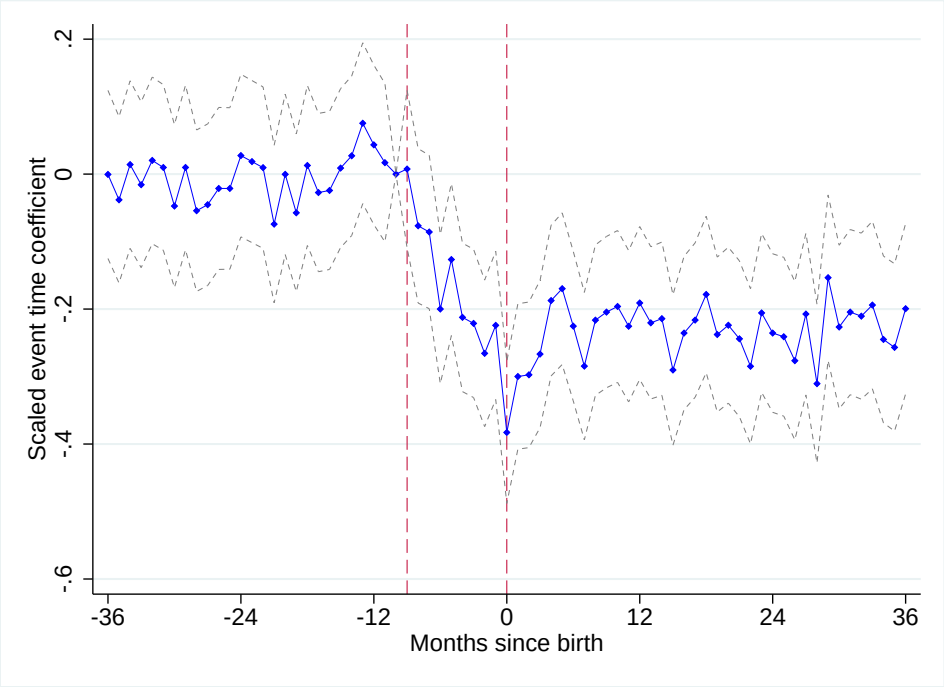
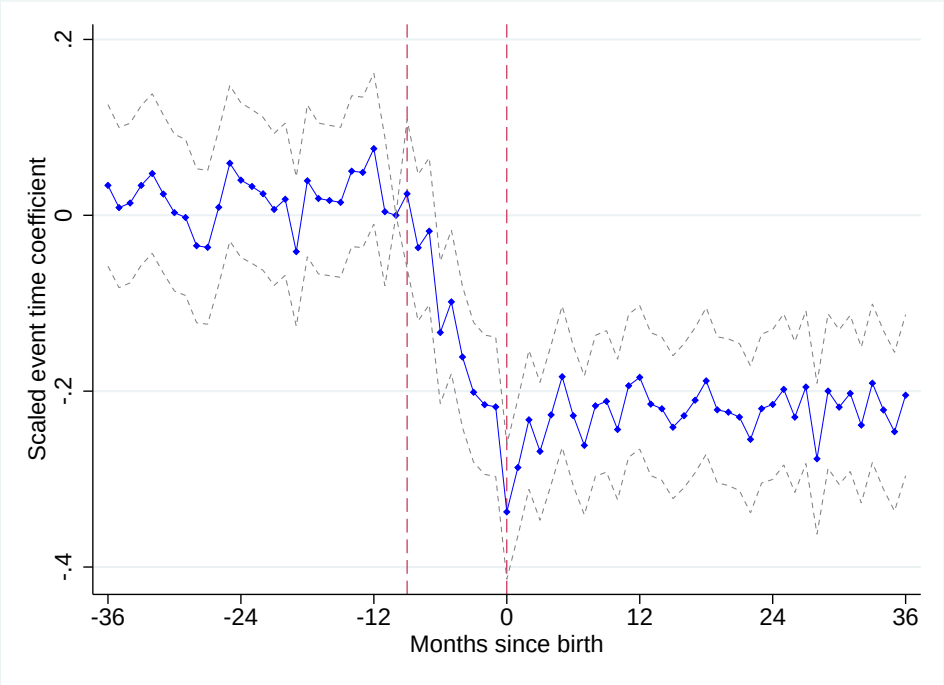


Figure B.5: Event studies around childbirth, unmarried fathers

(a) Unmarried fathers born in Washington



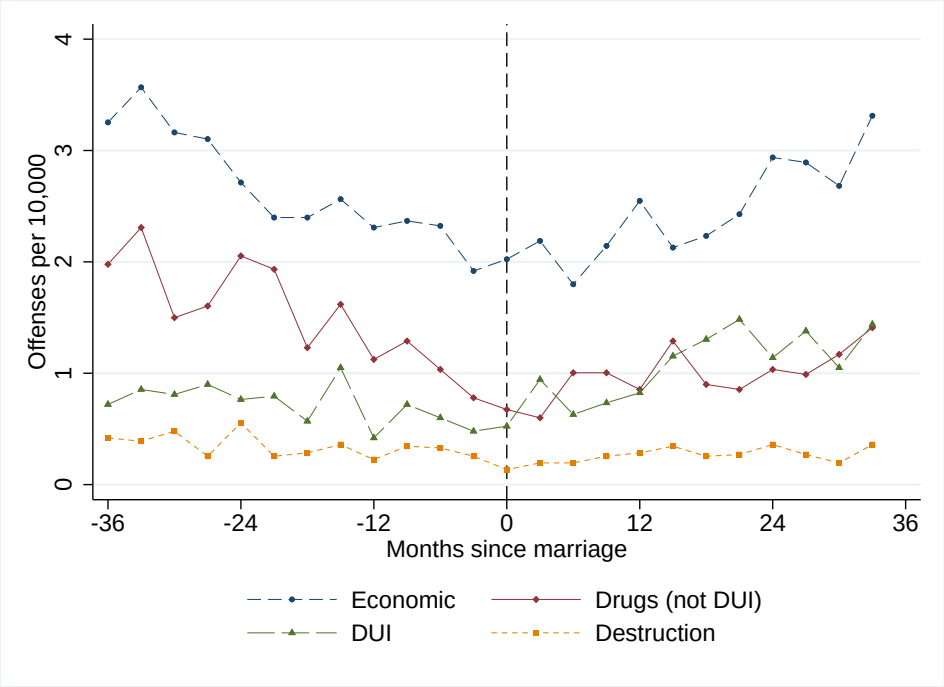
(b) Unmarried fathers with a juvenile offense



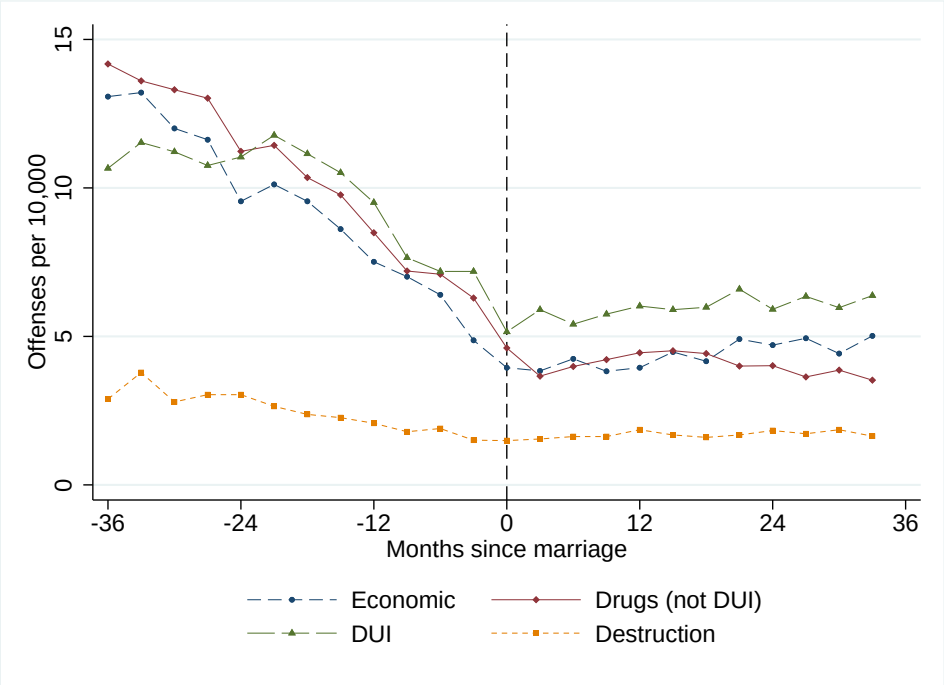
Panel (a) includes 15,600 fathers, panel (b) includes 37,014 fathers. Dots show point estimates and dashed lines show 95% confidence intervals of the coefficients δ_k from the event study specification shown in Equation 1, with an indicator for a drug, DUI, economic, or property destruction offense as the dependent variable. The coefficients are divided by the average offense rate in the omitted period, 10 months before birth. The vertical dashed lines mark 9 months before the birth and the month of birth.

Figure B.6: Raw averages around marriage

(a) Women



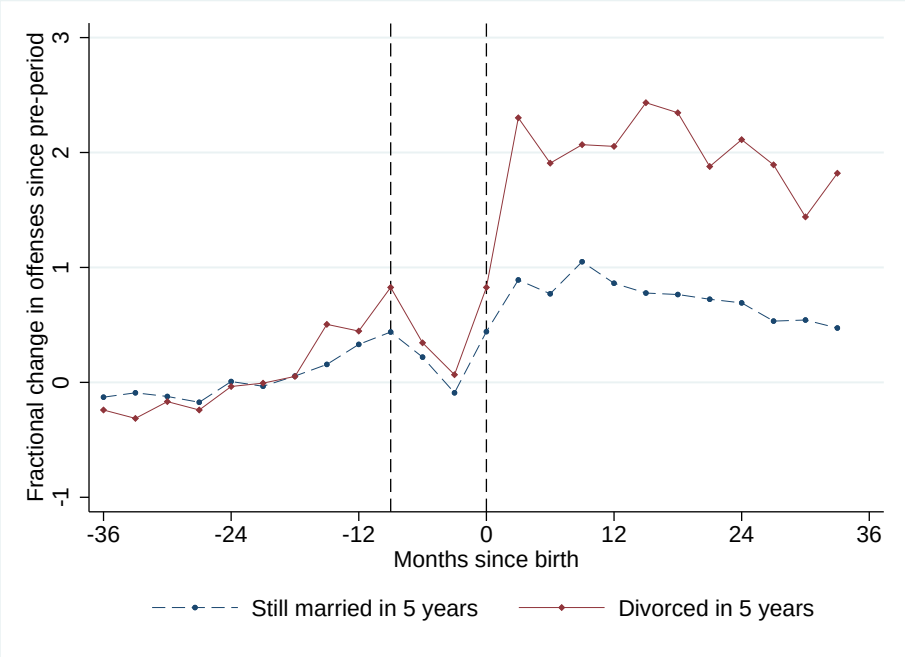
(b) Men



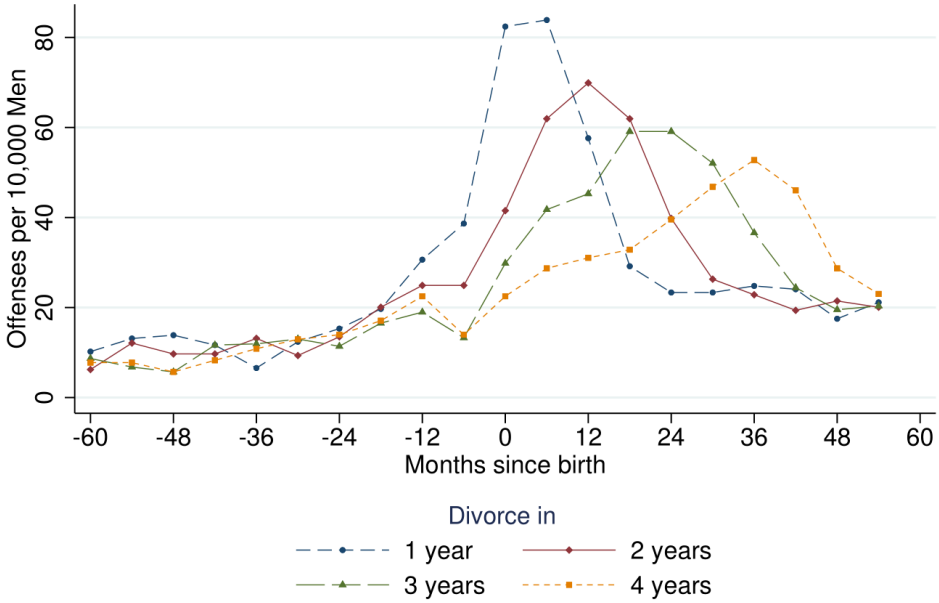
Includes all fathers (N=245,756) and mothers (N=222,392) from the birth data who are visible in the offense data 3 years after and 3 years before their marriage. The vertical dashed line marks the month of marriage.

Figure B.7: Domestic violence vs. divorce

(a) Domestic violence by marriage outcome



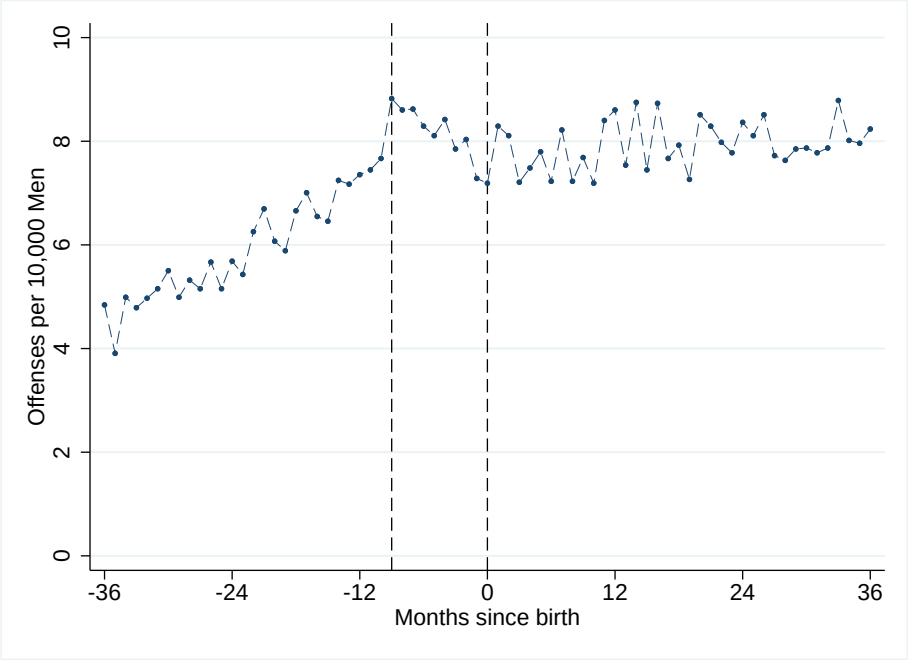
(b) Domestic violence by divorce timing



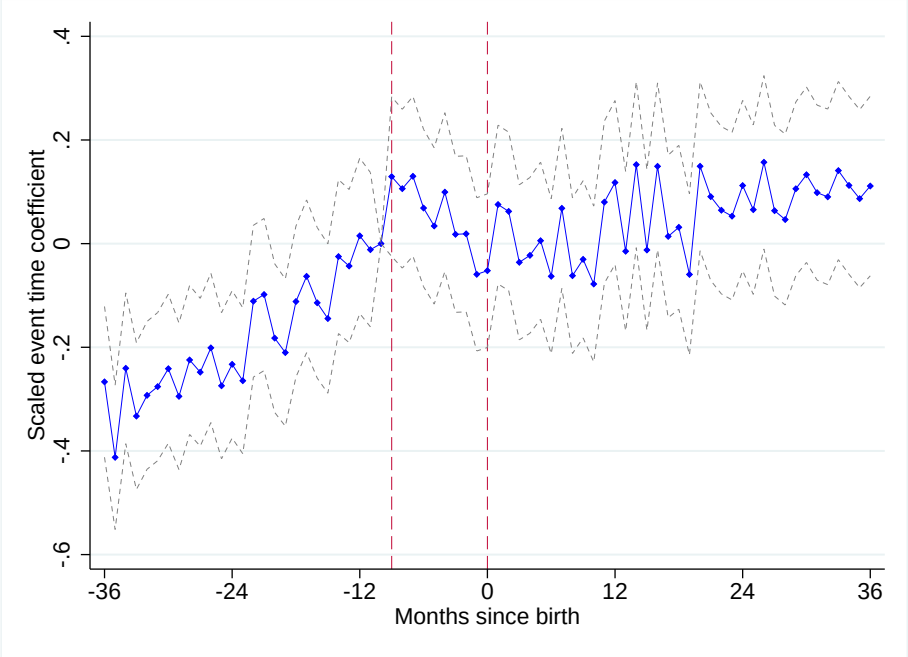
Panel (a) includes 364,076 still-married men and 21,038 divorced men. Panel (b) includes all men who were married for their first birth and then divorced 1-4 years after. Grouping is based on the rounded time in years between the child's birth date and date of the divorce decree (when the divorce is finalized). Sample sizes for the four groups are 2,285 (1 year), 4,816 (2 years), 6,147 (3 years), and 6,444 (4 years).

Figure B.8: Fathers traffic offenses

(a) Raw monthly average



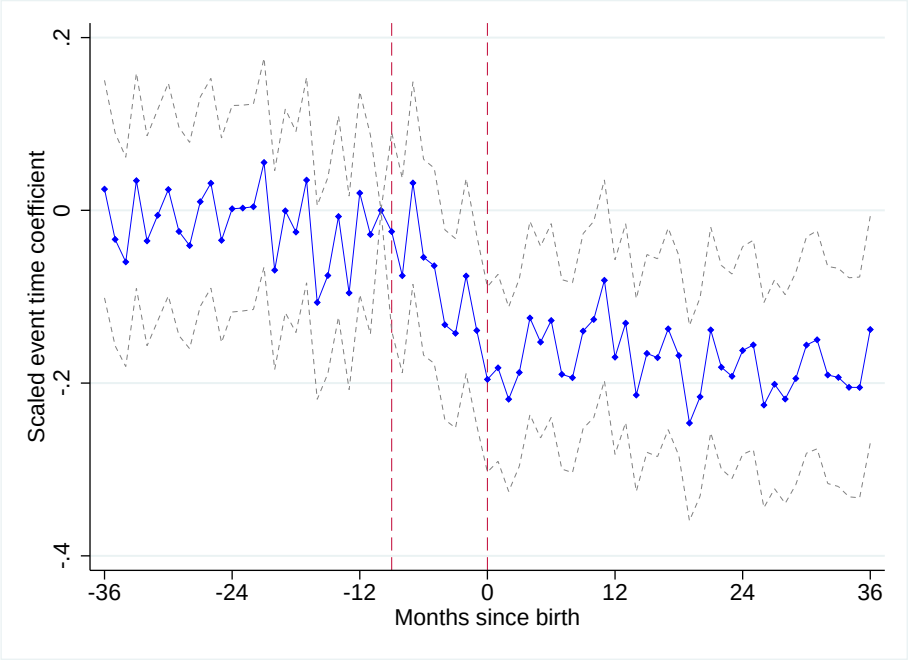
(b) Event study specification



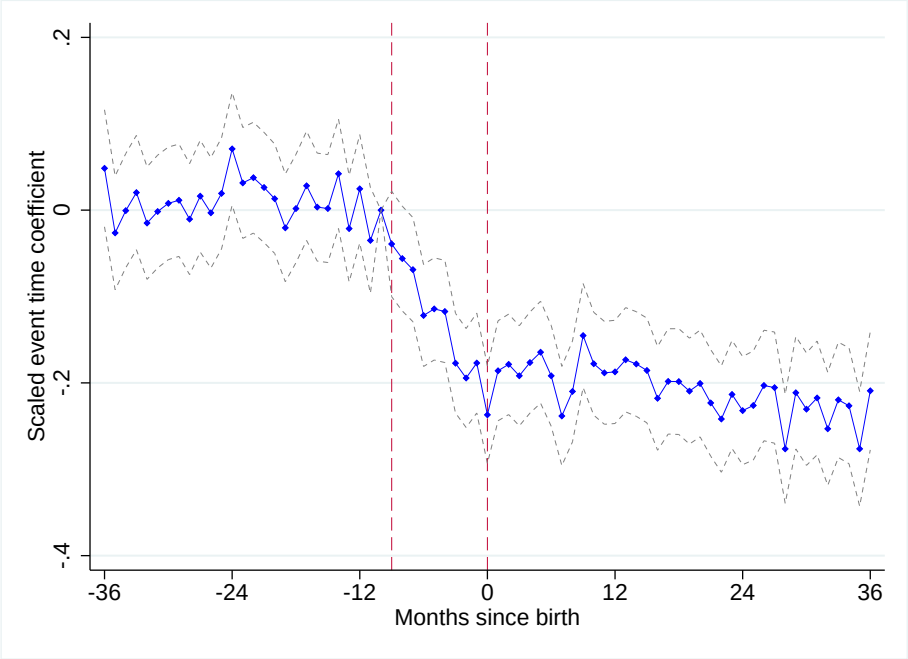
Panels show traffic offenses (mostly reckless driving and driving with an expired license) for 545,166 first-time fathers. In panel (b), dots show point estimates and dashed lines show 95% confidence intervals of the coefficients δ_k from the event study specification shown in Equation 1, with an indicator for a traffic offense as the dependent variable. The coefficients are divided by the average offense rate in the omitted period, 10 months before birth. The vertical dashed lines mark 9 months before the birth and the month of birth.

Figure B.9: Outmigration

(a) Event study estimates for men with future crime

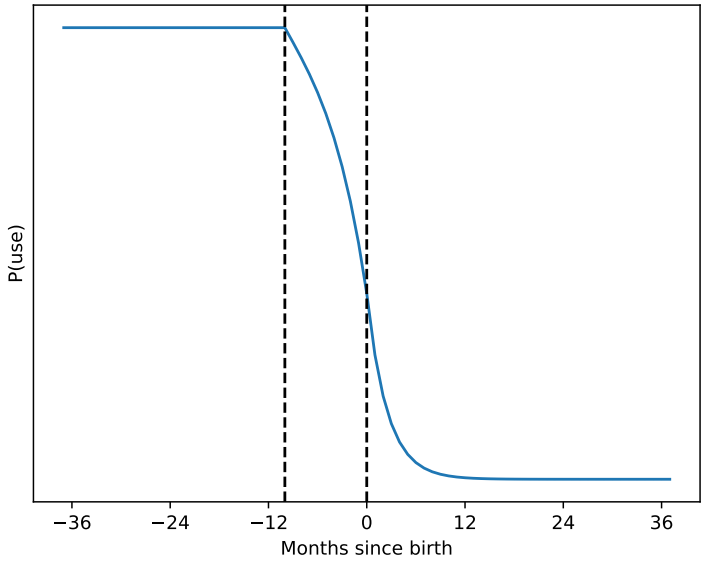


(a) Event study estimates for men with future children



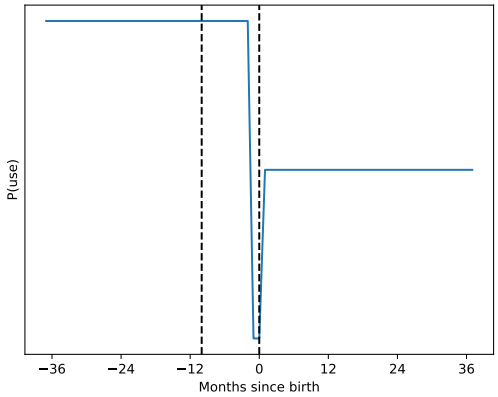
Both panels show point estimates and 95% confidence intervals from the event study specification given in Equation 1 for first-time fathers. Panel (a) restricts to men charged with a driving-related (including DUI) offense 4-5 years after the birth (N=14,980). The outcome for the specification underlying panel (a) is an indicator for any economic, drug, or destruction offense. Panel (b) restricts to fathers who at some point have a 2nd child in Washington (N=116,540), with an indicator for any economic, drug, DUI, or destruction offense as the outcome.

Figure B.10: Model calibration

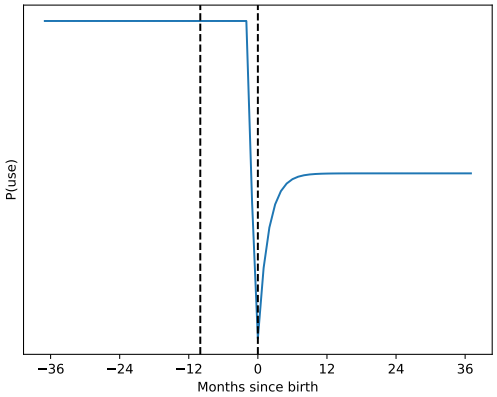


This plots the simulated choice probabilities with f changing from .8 to .2 at birth, and δ=1, $\sigma = 8$, $\rho = 1$

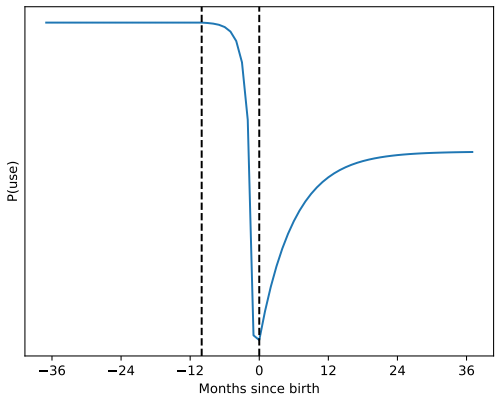
Figure B.11: Model calibration, two shocks



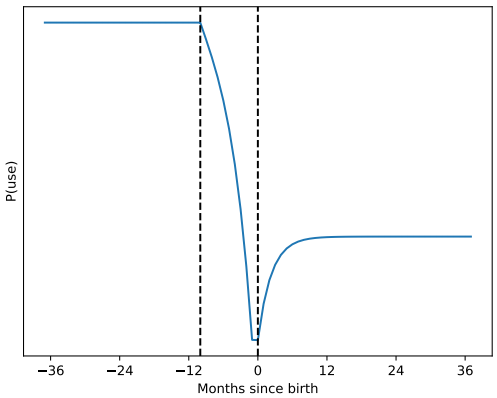
(a) Any δ, no habit formation



(b) Fully myopic, some habit formation



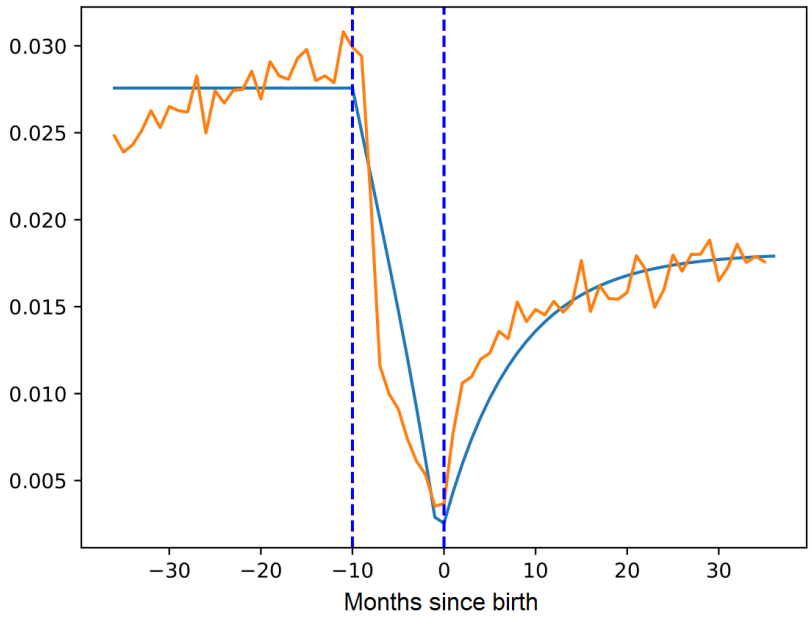
(c) $\delta = .75$, some habit formation



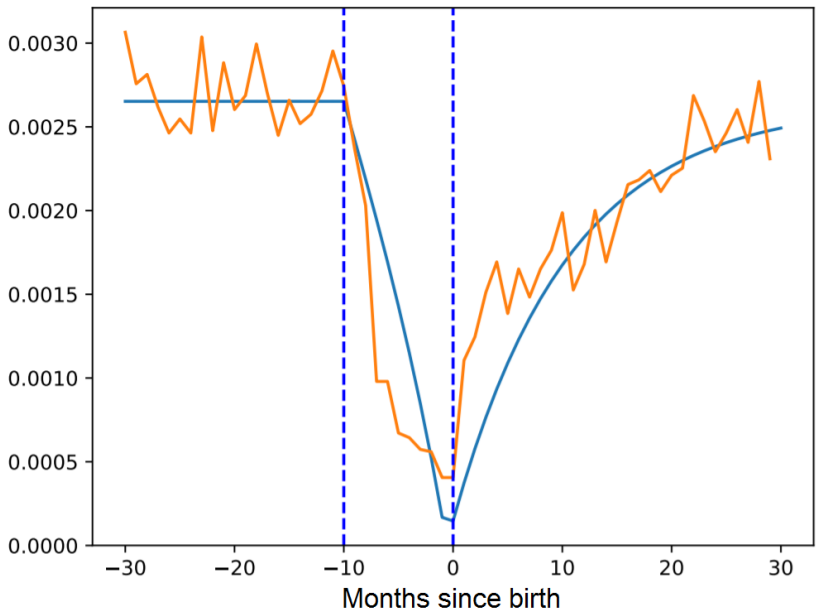
(d) $\delta = 1$, some habit formation

Figure B.12: Estimates from a dynamic model of addiction, mothers

(a) Unmarried mothers



(b) Married mothers



These plots show the parameter estimates from the model of habit formation described in Section A and estimated using minimum distance. The blue line gives the logit choice probabilities and the orange line gives the observed arrest rate.

Table B.1: Papers on Crime and Childbearing or Marriage

Authors and Year	Journal	Data and sample size	Main results
Gottlieb and Sugie (2019)	Justice Quarterly	NLSY97, N=8,496	Both cohabitation and marriage are associated with reductions in offending
Mitchell et al. (2018)	American Journal of Criminal Justice	NLSY97, N=2,787 non-fathers, 1,772 fathers	Fatherhood is associated with decreased substance use but not the likelihood of any arrest
Pyrooz et al. (2017)	Criminology	NLSY97, N=629	Mothers and residential fathers have decreased likelihoods of gang membership and offending
Tremblay et al. (2017)	Journal of Child and Family Studies	Pathways to Desistance Study, N=1,170	Fatherhood is associated with greater risk exposure among serious juvenile offenders
Na (2016)	Journal of Developmental and Life Course Criminology	Pathways to Desistance Study, N=864 adolescents and N=476 young adults	Teen fathers report increased offending following childbirth; older fathers experience a slight decrease
Zoutewelle-Terovan and Skardhamar (2016)	Journal of Quantitative Criminology	Statistics Norway, N=289 & Netherlands' Municipal Population Register and Judicial Documentation, N=279	For at-risk mothers and fathers, decrease leading up to birth; increase to higher levels afterwards
Landers et al. (2015)	Journal of Child and Family Studies	NLSY 1997, N=478	Young fathers have decreased drug use controlling for individual fixed effects
Craig (2015)	Journal of Crime and Justice	Add Health, N=3,327	Marriage decreases offending among whites and Hispanics but not blacks; Parenthood only decreases whites' offending

Table B.1 – *Continued from previous page*

Authors and Year	**Journal**	**Data and sample size**	**Main results**
Theobald et al. (2015)	Australian & New Zealand Journal of Criminology	Australian & New Zealand Journal of Criminology & Cambridge Study in Delinquent Development, N=411	The number of convictions decreases after childbirth for men; this effect is greater if the child is born before or within nine months of marriage
Barnes et al. (2014)	Justice Quarterly	Add Health, N=15,701	Marriage is correlated with but does not cause desistance
Zoutewelle-Terovan et al. (2014)	Crime & Delinquency	Netherlands Ministry of Justice, N=540	Marriage and parenthood both promote desistance of serious offending for men but not women
Skardhamar et al. (2014)	The British Journal of Criminology	Norwegian Register, N=80,064	Offending declines the year of before marriage followed by a slight increase after marriage; the rebound is due to those who split up
Craig and Foster (2013)	Deviant Behavior	Add Health, N=3,082	Marriage decreases delinquent behavior for both males and females
Monsbakken et al. (2012)	The British Journal of Criminology	Statistics Norway, N=208,296 persons (101,480 women and 106,816 men)	Offending declines permanently before childbirth despite slight rebound after
Bersani and Doherty (2013)	Criminology	NLSY97, N=2,838	Marriage decreases the likelihood of arrest; Offending is higher when one is divorced than when one is married
Doherty and Ensminger (2013)	Journal of Research in Crime and Delinquency	The Woodlawn Project, N=965	Marriage reduces offending for men only

Table B.1 – *Continued from previous page*

Authors and Year	Journal	Data and sample size	Main results
Jaffee et al. (2013)	Development and Psychopathology	Add Health, N=4,149	Marriage is associated with a lower rate of criminal activity
Mercer et al. (2013)	European Journal of Criminology	Netherlands Ministry of Justice & Population Registration, N=540	Married males have a higher likelihood of committing violent offenses compared with non-married males; reverse is true for women
Barnes and Beaver (2012)	Journal of Marriage and Family	Add Health, N=2,284 sibling pairs	Marriage is associated with desistance; this effect decreases after controlling for genetic influences
Beijers et al. (2012)	European Journal of Criminology	Netherlands, N=971	Marriage is associated with desistance among high-risk men married after 1970 in the Netherlands
Salvatore and Taniguchi (2012)	Deviant Behavior	Add Health, N=4,880	Both marriage and parenthood reduce offending
Van Schellen et al. (2012)	Journal of Quantitative Criminology	Netherlands CCLS, N=4,615	Marriage is associated with decreased conviction frequency for women; only marriage to a non-convicted spouse is beneficial for men
Kerr et al. (2011)	Journal of Marriage and Family	US - Capaldi and Patterson (1989) Study, N=206	Men desist from crime and use alcohol and tobacco less frequently following childbirth
Giordano et al. (2011)	Journal of Criminal Justice	Toledo Adolescent Relationships Study (TARS), N=1,066	Mothers are more likely to desist from crime than fathers; parents from disadvantaged backgrounds have less desistance than those from advantaged ones

Table B.1 – *Continued from previous page*

Authors and Year	Journal	Data and sample size	Main results
Forrest and Hay (2011)	Criminology & Criminal Justice	NLSY79, N=2,325	Unlike cohabitation, marriage is associated with reduced crime, but effects decrease once controlling for self-control measures
Herrera et al. (2011)	Journal of Research on Adolescence	Add Health, N=1,267 opposite sex romantic pairs	Relationship quality and length are associated with decreased crime
McGloin et al. (2011)	European Journal of Criminology	Netherlands CCLS, N=4,612	The year of marriage and year after have the greatest effect on decreasing offending
Kreager et al. (2010)	Criminology	Denver Youth Survey, N=567	Teen and young adult motherhood is associated with decreased delinquency for disadvantaged women; controlling for motherhood and age, marriage is not associated with desistance
Petras et al. (2010)	Criminology	Netherlands CCLS, N=4,615	The effects of marriage on probability and frequency of conviction are both negative
Ragan and Beaver (2010)	Youth & Society	Add Health, N=1,884	Marriage is associated with marijuana desistance
Skarhamar and Lyngstad (2009)	Statistics Norway Discussion Papers	Norwegian Register (Marriage N=121,207; First birth=175,118)	Men desist from crime leading up to marriage/childbirth; some rebound for serious offenses
Bersani et al. (2009)	Journal of Quantitative Criminology	Netherlands CCLS, N=4,615	Marriage is associated with a decrease in the odds of a conviction; the effect for women is less than that for men

Table B.1 – *Continued from previous page*

Authors and Year	**Journal**	**Data and sample size**	**Main results**
Savolainen (2009)	The British Journal of Criminology	Statistics Finland, N=1,325	Cohabitation has a stronger effect on desistance than marriage; parenthood is associated with decreased crime
Thompson and Petrovic (2009)	Journal of Research in Crime and Delinquency	NYS, N=1,496	First childbirth increases odds of drug usage for men and women, except single mothers; marriage decreases odds of drug usage for men but women's drug usage depends on strength of relationship
Beaver et al. (2008)	Social Science Research	Add Health, N=1,555	Being married increases the odds of desisting
King et al. (2007)	Criminology	NYS, N=1,725	After accounting for selection into marriage, marriage has a significant but small effect on crime; the decrease is much greater for males than females
Massoglia and Uggen (2007)	Journal of Contemporary Criminal Justice	Youth Development Study, N=1,000	Relationship quality is positively correlated with desistance
Sampson et al. (2006)	Criminology	Glueck and Glueck study (1950), N=500 male delinquents and 500 male nondelinquents	Marriage is associated with a 35 percent reduction in the odds of crime for men
Maume et al. (2005)	Journal of Quantitative Criminology	NYS waves 5-6, N=593	Marriage promotes marijuana desistance only for those with high marital attachment

Table B.1 – *Continued from previous page*

Authors and Year	**Journal**	**Data and sample size**	**Main results**
Hope et al. (2003)	The Sociological Quarterly	Add Health, N=6,877	Adolescent girls who keep their babies reduce delinquent behavior compared to those with other pregnancy resolutions
Piquero et al. (2002)	Social Science Quarterly	California Youth Authority, N=524	Controlling for individual differences, marriage is negatively associated with violent, but not nonviolent, arrests
Graham and Bowling (1995)	Home Office Research Study	UK household survey, N=2,529	Having children is a strong predictor of desistance for females but not for males

Table B.2: Descriptive statistics, Father sample

Variable	(1) All births	(2) + Clear match	(3) +Father's first	(4) Stillbirths
Mother age	27.84	28.04	27.12	27.50
	(5.98)	(5.95)	(6.02)	(6.67)
Father age	30.21	30.40	29.36	29.61
	(6.54)	(6.50)	(6.62)	(7.19)
Mother married at birth	0.73	0.75	0.71	0.61
	(0.44)	(0.43)	(0.46)	(0.49)
Mother on Medicaid	0.36	0.34	0.36	
	(0.48)	(0.47)	(0.48)	
WIC	0.34	0.33	0.34	0.26
	(0.47)	(0.47)	(0.47)	(0.44)
Twins+	0.02	0.02	0.02	0.06
	(0.12)	(0.13)	(0.13)	(0.23)
Male infant	0.51	0.51	0.51	0.53
	(0.50)	(0.50)	(0.50)	(0.50)
Father White	0.66	0.67	0.65	
	(0.47)	(0.47)	(0.48)	
Father Black	0.05	0.05	0.05	
	(0.22)	(0.21)	(0.21)	
Father Hispanic	0.12	0.11	0.13	
	(0.33)	(0.32)	(0.33)	
Father Asian	0.08	0.08	0.08	
	(0.26)	(0.27)	(0.28)	
Father other or missing	0.09	0.09	0.09	
	(0.29)	(0.28)	(0.29)	
Low birth weight (<2500g)	0.05	0.05	0.06	0.60
	(0.22)	(0.22)	(0.23)	(0.49)
Any father arrest	0.41	0.36	0.34	0.26
	(0.49)	(0.48)	(0.47)	(0.44)
Any mother arrest	0.25	0.23	0.23	0.21
	(0.43)	(0.42)	(0.42)	(0.41)
Median zipcode income	59820.84	60202.36	59893.14	58077.98
	(18182.44)	(18313.21)	(18092.66)	(17786.50)
Midpregnancy marriage	0.03	0.03	0.05	0.05
	(0.18)	(0.18)	(0.21)	(0.21)
Divorce	0.22	0.22	0.22	0.36
	(0.42)	(0.41)	(0.41)	(0.48)
Father ever incarcerated	0.04	0.03	0.03	0.03
	(0.20)	(0.17)	(0.16)	(0.18)
Father ever on probation	0.09	0.07	0.06	0.06
	(0.28)	(0.25)	(0.24)	(0.24)
Observations	976,581	896,459	545,166	3,831

Standard deviations shown in parentheses. Insurance and ethnicity not recorded for stillbirths. Median zipcode income is for the years 2006-2010 from the American Community Survey via Michigan's Population Studies Center.

Table B.3: Descriptive statistics for mothers

Variable	(1) Unmarried Mothers	(2) Married Mothers
Mother age	23.57	28.77
	(5.85)	(5.57)
Father age	26.30	31.19
	(6.91)	(6.44)
Mother on Medicaid	0.65	0.22
	(0.48)	(0.41)
WIC	0.60	0.22
	(0.49)	(0.42)
Twins+	0.01	0.02
	(0.10)	(0.13)
Male infant	0.51	0.52
	(0.50)	(0.50)
Father White	0.45	0.72
	(0.50)	(0.45)
Father Black	0.07	0.04
	(0.25)	(0.19)
Father Hispanic	0.22	0.10
	(0.41)	(0.30)
Father Asian	0.05	0.11
	(0.22)	(0.31)
Father other or missing	0.22	0.04
	(0.41)	(0.19)
Low birth weight (<2500g)	0.06	0.05
	(0.24)	(0.23)
Any father arrest	0.57	0.27
	(0.50)	(0.44)
Any mother arrest	0.14	0.05
	(0.35)	(0.22)
Median zipcode income	55061.28	62281.37
	(15203.25)	(18943.48)
Father ever incarcerated	0.07	0.01
	(0.26)	(0.10)
Father ever on probation	0.13	0.03
	(0.34)	(0.17)
Observations	112,016	368,095

Standard deviations shown in parentheses. Insurance information not recorded for stillbirths.

Table B.4: Habit formation model, mothers

Parameter	Unmarried mothers	Married mothers
Change in utility of using during pregnancy ($\Delta_1 f$)	1.310	1.777
	(0.480)	(2.041)
Permanent change in utility of using after pregnancy ($\Delta_2 f$)	0.026	0.0004
	(0.006)	(0.0007)
Habit formation (σ)	8.202	10.643
	(0.344)	(0.156)
Utility of using (f)	4.832	8.460
	(0.652)	(2.319)
Monthly discount factor (δ)	0.993	0.974
	(0.062)	(0.134)

Standard errors shown in parentheses. This table reports the parameter estimates from a model of habit formation matched to the observed arrest rates in the data using a minimum distance estimator.