Do age of consent laws decrease teen births?

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Abstract. This paper studies two legislative changes that extended legal penalties for sex with minors ages 14 to 16 in Canada and the US. Using differences-in-differences and triple-differences strategies, it presents new evidence that age of consent laws affect teen fertility, especially the rate that teenage girls aged 14 to 15 become pregnant and have children from adult men of ages targeted by the law changes. I find that the 2008 increase in Canada and the 1995 increase in the American state of Georgia led to substantial decreases in the fraction of births arising from partnerships made illegal. These impacts reflect net decreases in births and falling abortions rather than changes in reporting, implying decreased pregnancy rates. Further evidence suggests that the laws deterred relationships between teens and targeted partners altogether and I also uncover a strong response to the law through marriage of teens aged 14 to 15 in Georgia, which then provided a loophole because age of consent laws did not apply to married couples.

Résumé. Les lois sur l'âge de consentement font-elles diminuer le taux de grossesse des adolescentes? Cet article se penche sur deux modifications législatives, une au Canada et une aux États-Unis, qui ont allongé les sanctions pénales imposées aux personnes qui ont une relation sexuelle avec un mineur de 14 à 16 ans. À l'aide des méthodes des doubles différences et des triples différences, il présente de nouvelles preuves que les lois sur l'âge de consentement ont un effet sur la fertilité adolescente, plus particulièrement sur le taux auquel les adolescentes de 14 ou 15 ans tombent enceintes et donnent naissance à des enfants conçus avec des hommes adultes se situant dans les plages d'âge ciblées par les modifications apportées aux lois. Je constate que les augmentations mises en place en 2008 au Canada et en 1995 en Géorgie ont entraîné une diminution importante du taux de naissances découlant d'unions devenues illégales. Ces répercussions reflètent une diminution nette des naissances et une chute du taux d'avortement plutôt que des changements dans les signalements, ce qui suppose une diminution du taux de grossesse. D'autres données laissent entendre que les lois ont complètement découragé les relations entre les adolescentes et les partenaires ciblés. Je mets également en lumière une forte

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réaction à la loi qui s'est manifestée dans le taux de mariage des adolescentes de 14 ou 15 ans en Géorgie, ce qui a par la suite ouvert une faille, puisque les lois sur l'âge de consentement ne s'appliquaient pas aux couples mariés.

JEL classification: J12, J13, K42

1. Introduction

Prior evidence from US birth records suggests that a large, disproportionate fraction of up to two thirds of teen births could be from adult partners several years older (Landry and Forrest 1995, Males and Chew 1996). Awareness of this has led to an ongoing policy debate and several legislative changes to strengthen statutory rape and age of consent laws.[1] In theory, these laws could help protect youth as well as decrease teen childbearing, but relatively little is known about the determinants of these relationships or how to effectively reduce them through interventions.[2] More generally, the protection of youth is an important social issue of interest to policy makers about which little is known due to scarcity of data.

In Canada, the protection of minors has been a topic of political importance with the 2008 increase in the age of consent, the minimum age at which an individual is deemed able of giving informed consent to engage in sexual activity, from 14 to 16 years. The law was aimed at protecting teens and to "crackdown on adults who prey on youth" (Shearon 2008), which could naturally have affected the prevalence of relationships and births of these teens with partners of ages targeted by the law. In the continental US, one of the latest such change was the 1995 age of consent increase from 14 to 16 in the state of Georgia.

By extending coverage of penalties for sex with minors, these two legislative changes offer a rare opportunity to understand some of the dynamics surrounding teen births and partnerships between teens and older partners. While age of consent laws provide clear incentives against these partnerships, they may drive this behaviour underground through under-reporting of fathers' identities on birth certificates, misreporting of ages and deterring access to reproductive health services. For example, Blank et al. (2009) present evidence of substantial avoidance and age misreporting in the case of age of marriage laws in the US. Further, enforcement of age of consent laws is generally weak in both countries (Donovan 1997, Wong 2006), and some US states have historically had exemptions relating to marriage that can absolve partners. On the other hand, age of consent legislation is also

1 There is an active policy debate around these issues with plans to modify legislation in several US states as well as controversy regarding the low age of consent for marriage (Kristof 2017, Economist 2017).

2 This applies to sexual crimes more broadly as argued in Levenson and D'amora (2007) for the case of sex offender notification and registration.

interesting when interpreted in the context of recent evidence from Wolfe et al. (2007), Kearney and Levine (2012b) and Kearney and Levine (2014) that teen fertility seems mostly driven by conscious reactions to economic opportunities. Beyond increasing the cost of engaging in relationships that are legally deemed inherently nonconsensual,[3] age of consent legislation can be seen as changing the underlying incentives of teen childbearing for a targeted subgroup by explicitly increasing the cost of partnerships with men most likely to be financially stable. As such, the effect of these laws is a priori uncertain, but they could potentially improve outcomes of teens both by preventing harmful relationships and delaying childbearing.

This paper examines the effect of these policies using event-study (ES), difference-in-differences (DID) and triple-differences (DDD) strategies comparing birth outcomes of newly covered mothers to older teen mothers and teen mothers from other states for the US.[4] The increases were passed in countries with different laws, during different time periods and under different motivations. Similarly, the data from the two countries have different strengths. Together, they allow for a better evaluation of these policies than would be possible using a single country.

The results as a whole highlight that such criminal legislation leads to clear responses consistent with reducing teen fertility and deterring relationships made illegal.[5] Raising the age of consent led to decreases of approximately 14% in the fraction of births to illegal fathers for Canada and 7% to 14% for Georgia. These decreases do not appear driven by changes in reporting because I can rule out decreases in reporting of the age of fathers of more than 1% to 2%. Looking at all births by mothers of ages targeted by the laws, I find evidence of 3% to 5% decreases in the overall number of births. Scaling the decrease in the subgroup of births with fathers of known illegal ages to this larger group yields an expected decrease of 1.5% to 2.5%, indicating that the laws also decreased births from mothers with fathers who remain unknown on birth certificates, which is common for young teen mothers. In addition, graphical evidence suggests that abortion levels did not increase for newly covered teens, implying a negative impact on pregnancy rates. One consideration is whether these laws may have lead to increased use of contraception, decreasing pregnancy rates without decreasing the prevalence of relationships between teens and illegal partners. I present evidence of dynamic treatment effects of the Canadian law on older teens consistent with it breaking

3 Age of consent legislation establishes that teens below a certain age are fundamentally incapable of giving informed consent and that the resulting relationships are harmful and exploitative.

4 There is no geographical variation for Canada because the law was implemented across the entire country simultaneously.

5 Given the focus on birth outcomes, this policy evaluation cannot speak to the ability of these laws to protect male youth.

relationships between teens aged 14 to 15 and partners of ages targeted by the law at passing, translating into decreased birth rates also as these teens became older. Lastly, married couples were exempt from age of consent laws in Georgia during this period. Consistent with a conscious response to the legislation, I find that the age of consent increase led to a 10% to 26% increase in the probability that teen mothers aged 14 to 15 be married at the time of giving birth, driven by a net increase in the number of teen marriages.

This paper contributes to the economics literature on teen fertility and marriage as well as on crime. First, teen pregnancy is regarded as an important social issue[6] and determinant of adolescent health, education and socioeconomic status (Ribar 1994, Card 1999, Kirby 2001, Kearney 2010, Levine and Zimmerman 2010). The paper relates to the evaluation of criminal legislation for sexual crimes, for which there is relatively little evidence overall.[7] Directly related to age of consent and statutory rape legislation, Jepsen and Jepsen (2006) and Henry and Cunningham (2009) provide US evidence of a negative correlation between statutory rape laws and teen births and age of consent laws and age of first sexual activity, respectively. More closely related to this paper, Frakes and Harding (2015) pool and analyze over 20 changes in age of consent and statutory rape laws across US states over several decades, including the 1995 Georgia age of consent increase, and present aggregate evidence that these laws decrease teen fertility, although little evidence of an effect for increasing punishment severity. I contribute to this literature first by providing the first formal evidence for Canada, for which we may expect such legislation to potentially have very different effects considering its much lower rates of teen birth and marriage as well as differences in context and legislation (McKay 2006, Kearney and Levine 2012b). Second, rather than primarily focusing on overall birth rates, I provide detailed evidence on the impact of those laws on the fraction of births with illegal partners specifically, the propensity of fathers to not report their identity on birth certificates, the ability of these laws to decrease not only pregnancies but also relationships of teens with targeted partners and potential counterproductive impacts through increases in teen marriage. The results also inform the study of legislative changes more broadly because age of consent laws provide opportunities for misreporting, avoidance and substitution that could arise in other contexts, yet the laws successfully led to substantial behavioural changes beyond these channels. Prescott and Rockoff (2011) find that sex offender registration and notification policies reduce crime by deterring non-registered

6 A literature in economics surveyed in Levine (2014) suggests that lower socioeconomic outcomes for mothers may primarily reflect negative selection in who becomes a teen mother rather than a causal effect, but these findings reflect only one component of the costs of teen pregnancy.

7 See Chalfin and McCrary (2017) for a review of the deterrence literature and Bachman et al. (1992) for deterrence of sexual assault.

offenders, providing another example of a policy targeting sex crimes that can affect behaviour even with relatively weak enforcement. A body of research reviewed in Licari (2003) discusses the power of laws to change behaviour through signalling or changes in attitude even in cases where the threat of official punishment is low. This may be particularly true in this setting because social norms are likely to be strong for this type of crime and potential penalties (both legal and non-legal) can be high.

All appendix tables and figures mentioned in the text can be found in the online appendix.

2. Literature, age of consent legislation and data

Even with considerable political attention regarding protection of youth and teen births, research in the area has remained mostly descriptive and predominantly from the US. Males (2004) provides a summary of existing work relating to teen mothers and older fathers. He reports that around six times more children of mothers below 15 are fathered by men over 20 rather than similarly aged boys, nearly 7% of women aged between 15 and 17 have partners that are at least six years older than them and 60% of births from mothers of this age group are from fathers at least three years older. Darroch et al. (1999) and Manlove et al. (2006) compare survey responses from the National Survey of Family Growth and report that teen girls who have sexual relations with older males are less likely to use contraception, more likely to become pregnant and less likely to get an abortion if they do. Elo et al. (1999) document that age differences between teens and older partners have been stable over several decades, but there has been an increase in out-of-wedlock births for teen mothers. More closely related to abuse, Lindo and Schaller (2014) review research on the economic determinants of child maltreatment, while Boyer and Fine (1992) and Larkin et al. (2012) report a strong association between teen pregnancy and adverse childhood experiences. There is little evidence for Canada, although a survey from Miller et al. (2010) suggests that most teen births may be from older teens not covered by the 2008 age of consent legislation, while most cases of exploitation may relate to children rather than teenagers, suggesting that the law may have had limited scope to reduce the targeted behaviour. This descriptive evidence highlights the value of providing causal evidence from a formal policy evaluation using different sources of data and contexts.

2.1. Legislation in Canada

The bill to raise Canada's age of consent from 14 to 16 was designed primarily to fight internet predators and protect youth rather than targeting births.[8]

8 Detailed information on the background and discussion surrounding the bill is presented in Wong (2006). Former federal justice minister Vic Toews said

It was first proposed in June 2006, passed in November 2007 and officially came into effect on May 1, 2008. It introduced a five-year close-in-age exemption for teens aged 14 to 15, meaning that sexual relations between those teens and partners no more than five years older remained legal. Table A1 of the online appendix summarizes the law with the close-in-age exemption. The bill extended existing penalties attached to these crimes to offences involving victims aged 14 and 15.[9] It had broad political approval and was welcomed by law enforcement agencies, although it was denounced by some advocacy groups that claimed that the main problem was with the enforcement of already existing laws and that it would confuse teens and lead them to be more secretive about their sexual practices. Some of these arguments echo previous claims from the US opposing the use of statutory rape and age of consent laws to curb teen pregnancy, as outlined in Donovan (1997).

Although little information is available on the frequency and intensity of these laws' enforcement, it suggests a limited number of prosecutions and convictions. In an effort to assess the intensity of enforcement of the law, I searched for every related case using the Canadian Legal Information Institute (CanLII) database[10] between May 1, 2008, and the end of the sample in 2011. I focused on offences that would have been completely legal before the age of consent increase[11] but were made illegal when it passed. I found information on 22 such cases out of several hundreds across Canada. The exercise suggests that the law is unlikely to have led to a large number of convictions in the years studied in the analysis.

2.2. Legislation in Georgia, US

The State of Georgia passed their reform in 1995, aiming to decrease teen pregnancy and discourage partnerships between teens and older partners. The law was approved on April 19, 1995, and became effective on July 1 of the same year. Sexual relations of teens aged 14 and 15 with any older partners were technically made illegal, although relations between similarly

during the introduction of the bill that it did not target teens having sex with their peers but was meant to crack down on adults who prey on youth (Shearon 2008).

9 According to sections 150 to 153 of Canada's *Criminal Code*, perpetrators guilty of an offence punishable on summary conviction are liable to be imprisoned for a length of between 90 days and two years, while those guilty of an indictable offence are liable to be imprisoned for at least one year and no more than 14 years.

10 Available at www.canlii.org/en/.

11 For example, I exclude cases related to child pornography, prostitution, assault or force, incest and a relationship of trust and authority between the victim and the offender.

aged teens are considered much less severe and penalties increase substantially when the partner is above 18 (Code of Georgia Annotated, §16-6-3). Given the law's emphasis on adult partners, I focus on relationships of teens aged 15 with partners more than three years older (above 18) in the main analysis. Penalties attached to these crimes range between 1 and 20 years.[12]

An important legal consideration is that married couples are exempt from age of consent laws (Code of Georgia Annotated, §16-6-3). While the minimum age of marriage was 16 at the time of the age of consent increase and any marriage involving a minor requires parental consent, an exemption existed until 2006 that allowed teens under 16 to get married without parental consent "when the female applicant is pregnant or both applicants are the parents of a living child born out of wedlock" (1976 Ga. Laws, p. 1719, §3; 2006 Ga. Laws, p. 141, §6C/HB 847). Thus, the age of consent increase provided a clear incentive for teens with older partners to marry if they became pregnant or had children in order for their partners to avoid prosecution.

2.3. Data

The analysis uses data from Statistics Canada's Canadian Vital Statistics Births Database (CVSBD) for the years 2000 to 2011 and the public use Natality Detail Files (NDF)[13] from the United States Department of Health and Human Services for the years 1985 to 2001. The CVSBD and NDF contain detailed information on every nationally registered birth, which I restrict to births of citizens of their respective countries and to each state's residents in the case of the US. Using birth records has clear advantages because they provide access to the universe of births rather than a sample, are likely to be less easily manipulable than survey answers and represent a fairly objective easily measurable outcome. Nevertheless, because births are presumably a fairly rare outcome of statutory rape, they allow only a partial analysis of the impact of these laws on the outcomes of teens. I complement the analysis using abortions data from both countries to investigate net effects on pregnancy rates and test additional hypotheses relating to dynamic treatment effects of the laws to investigate whether they appeared to break relationships between teens and partners of targeted ages altogether.[14]

In both birth datasets, I observe the date and location of each birth as well as the age of the mother, her birthplace, current place of residence and

12 I was unable to find exhaustive information on the number of statutory rape cases pertaining specifically to the age of consent increase in Georgia.

13 Available at www.nber.org/research/data/vital-statistics-natality-birth-data.

14 Data on contraception use from national surveys like the Canadian Health Measures and the US National Survey of Family Growth are not available for most years surrounding the legislative changes and provide few observations for teens of ages targeted by the age of consent increases.

her marital status. When reported, I also observe the age of the father as well as his birthplace and current place of residence. The type of location where the birth took place (hospital, clinic or private residence) as well as who delivered the newborn (doctor, nurse, midwife or other) are also available.

The CVSBD contains the full date of birth of the mother along with the duration of the pregnancy in weeks, allowing me to calculate the age at which the mother became pregnant. This is particularly useful for determining whether the birth arose from an illegal relationship. It allows for a more precise definition of the treatment and comparison groups, but requires the exclusion of births from Ontario because the province does not report detailed age information on the mother.[15] Lastly, the CVSBD contains the zip code of residence of the mother and a classification of zip codes in income quintiles, which I use to construct an indicator variable for births by mothers living in a zip code with the lowest income quintile. Because a strong relationship is often posited between poverty and teen motherhood, this allows to investigate whether the effect of the law differed in the poorest areas. Following usage guidelines of the CVSBD, the sample size for each regression is randomly rounded to a multiple of five along with every descriptive statistic and count used in the analysis, including all figures. Per the same guidelines, in the handful of cases where cells had fewer than five observations, they were dropped from the analyses and visualizations. These changes have very little impact on the data and do not alter the results either qualitatively or quantitatively.

The NDF contains the age of the mother only in years rather than the exact date of birth, which precludes defining the treatment and comparison groups from conception. As such, the US analysis excludes mothers aged 14 and 16 because most of them may not have been covered by the age of consent increase. Teens aged 14 at birth were likely to be 13 when they became pregnant and already covered by previous age of consent legislation, while those aged 16 were likely 15 and thus covered by the age of consent increase. The NDF contains additional demographic information on the parents, namely race, ethnicity and years of schooling of the mother as well as the father's race and ethnicity when reported.

An important consideration is the reliability of information concerning the ages of the parents. There are clear incentives to misreport the true ages of either or both parents to avoid prosecution in cases where the partnership was

15 One measurement issue is that an age gap of more than five years between both parents at the time of the birth does not imply such an age gap at the time of pregnancy. Performing the analysis using the age of the mother at birth rather than at pregnancy confirms that this consideration has little impact on the results, as shown in table A4-1 of the online appendix. It also allows for the inclusion of births from Ontario, which leads to similar conclusions.

unlawful.[16] Fortunately, given regulation surrounding the registry of births in both countries, the issue of mothers misreporting their age is unlikely to arise in practice.[17] Nevertheless, reporting issues potentially remain for fathers. In cases where they wish to be legally recognized, then a proof of identification is required. The mother in particular may have an incentive for the father to be legally recognized, for example regarding child support payments, but this may be less likely to arise in situations where the relations leading to the pregnancy incriminate them. It is possible for the mother throughout the process to claim that the father of the newborn(s) is unknown and fill out forms accordingly. Evidence presented below suggests that this is common in both countries, but I discuss a strategy to test whether such reporting may create false evidence of the law's impact in the next section, which shows that it is not driving the results. Lastly, giving birth in other US states was not an option because Georgia was the last state in the continental US to raise the age of consent to at least 16. As such, avoidance mechanisms documented in Blank et al. (2009) for the minimum age of marriage relating to misreporting of age and interstate travelling are unlikely to be important factors in this setting.

Summary statistics are presented in table 1. While a negligible fraction of mothers aged 14 to 15 were married in Canada, this proportion was higher in Georgia during the period of interest at around 11% for mothers aged 15 and nearly 30% for older teen mothers. Nearly 40% of Canadian teen mothers resided in a zip code with income in the bottom 20% of the country and this is accentuated for younger mothers. Over half of the youngest teen mothers in Georgia were Black between 1985 and 2001. Over 16% of Canadian births from mothers aged 14 to 15 involved a father more than five years older (outside of the close-in-age exemption), while 50% of births from mothers aged 15 in Georgia involved a father more than three years older than the mother (subject to stricter statutory rape penalties). Because the age of the father is missing for a large share of births from the youngest mothers in both countries (roughly 35% missing for Canada and 60% for Georgia), the reported fraction of births with older fathers could be a lower bound if older fathers are more likely to not be identified. Note

16 There is also the possibility that women near the age cut-off could misreport the date of their pregnancy. I employ a donut hole estimation strategy shown in table A4-1 of the online appendix to rule out that the results are affected by such misreporting.

17 For hospital births, access to services requires an official piece of identification. After the birth, the medical professional in charge must fill out a form including information on the mother and the birth. The parents must then file a civil registration form with formal proof of identity. The signature of the father is not required to register the birth. These forms are then reviewed by governmental agencies to insure the consistency and quality of the information.

TABLE 1
Summary statistics for teen births

	Canada		Georgia	
	Mothers under 20	Mothers 14–15	Mothers under 20	Mothers 15
Mother				
Age of mother at birth	18.51	15.58	17.60	15
	(1.37)	(0.56)	(1.38)	(0.00)
Age of mother at pregnancy	17.72	14.74		
	(1.32)	(0.44)		
Pregnancy duration (weeks)	38.99	38.99		
	(2.11)	(2.17)		
Married	0.11	0.01	0.28	0.12
	(0.31)	(0.10)	(0.45)	(0.32)
Black			0.50	0.65
			(0.50)	(0.48)
Hispanic			0.04	0.03
			(0.20)	(0.18)
Years of education			10.37	8.61
			(1.64)	(0.99)
Low income	0.39	0.44		
	(0.49)	(0.50)		
Father				
Age of father	22.56	19.01	21.38	19.22
	(4.44)	(3.43)	(3.71)	(3.18)
Father over 3 years older			0.40	0.51
			(0.49)	(0.50)
Father over 5 years older	0.25	0.16		
	(0.43)	(0.37)		
Age of father available	0.78	0.64	0.60	0.41
	(0.42)	(0.48)	(0.49)	(0.49)
Black			0.38	0.50
			(0.49)	(0.50)
Hispanic			0.07	0.07
			(0.25)	(0.26)
Birth				
Hospital	0.99	0.99	1.00	0.99
	(0.07)	(0.08)	(0.07)	(0.08)
Medical professional	0.98	0.97	0.99	0.99
	(0.14)	(0.17)	(0.07)	(0.08)
Observations	174,800	12,080	301,479	17,884

NOTES: Standard deviations are presented in parentheses. Low income refers to the zip code of residence being in the lowest income quintile. The age of the mother is determined at the time of the pregnancy (birth) for Canada (the US). The sample is restricted to births of citizens excluding Ontario for Canada and to each state's residents for the US. For Canada, the fraction is calculated using numerators and denominators randomly rounded to a multiple of 5. Source: Canadian Vital Statistics Births Database 2000–2011 and the National Center for Health Statistics 1985–2001.

that virtually all births in both countries were delivered in hospitals by medical professionals, leaving little scope for identity or age misreporting of mothers.

Panel A of figure 1 presents yearly time series of the fraction of births with fathers more than five years older than the mother for mothers aged 14 to 15 and 16 to 18 at pregnancy. As mentioned above, the exact age of the mother along with the pregnancy length are available for Canada, which allows me to perform the analysis using age of the mother at pregnancy. Because the legislation was passed in late 2007 but became effective only in May 2008, there was time to anticipate such that births should be expected to have started falling in the second half of 2008, around nine months after it was passed and shortly after it became effective. The decrease could have begun earlier due to abortions, but this appears unlikely to be an important mechanism given graphical evidence presented in the results section indicating declining abortion rates for teens aged 14 to 15. The decrease in the fraction of births with fathers more than five years older corresponds to a 0.04 percentage points, or 22%, decrease in the fraction of births arising from relationships that were made illegal in 2008. This fraction also appears to have kept decreasing in the years after the law, consistent with a growing effect over time and an average effect of around 0.055 percentage points, or 30%, between 2008 and 2011. Note that there is no such level change for older teen mothers and that there is little evidence of a pattern of substitution to older teens. That is, men for whom it became illegal to have relations with teens aged 14 or 15 did not appear to increase their relations with teens aged 16 to 18 in response, as corroborated by evidence presented in the results section that the fraction of births with fathers more than five years older did not increase for these teens.

Panel A of figure 2 provides evidence suggesting that the law did not lead to a substantial decrease in the fraction of births for which information on the father was reported, inconsistent with the idea that changes in reporting drive the previous evidence. Changes in reporting, unlike births, require no anticipation and may thus be expected to arise as soon as the law became effective. The law having seemingly little effect on reporting is consistent with it leading to a true change in behaviour and could be explained by the fact that there was substantial time to anticipate and adjust to the law after it passed. Moreover, remaining unknown on birth certificates is not risk free because investigations sometimes follow births of very young mothers and various parties can still report the father to law enforcement.

If the law broke relationships between teens aged 14 to 15 and partners more than five years older, then it may also have had a delayed impact on older teens. The intuition for this can be understood from a simple matching model. If the law broke matches between teens aged 14 to 15 and partners more than five years older, then it may have led to an immediate decrease in births for teens 14 to 15, but also a delayed decrease as these teens age and

some get matched with younger partners while some remain without match.[18] This is corroborated by an analysis of this auxiliary hypothesis presented in online appendix A3, which also has potential implications for the selection of a comparison group/period in the DID analysis.

For Georgia, panel B of figure 1 presents yearly time series of the fraction of births with fathers more than three years older than the mother for mothers aged 15 and 17 to 18 at the time of the birth. As mentioned above, the age of the mother is available only in years for the US, so I exclude mothers aged 14

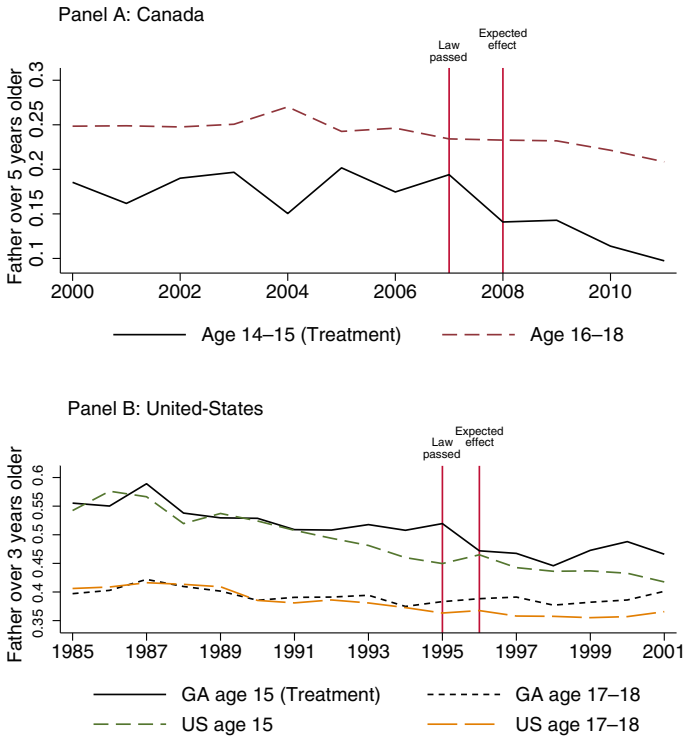

FIGURE 1 Fraction of births with older fathers, by year and age group
NOTES: The sample is restricted to births for which the father's age is available. "Expected effect" corresponds to nine months after each law was passed, leading into the next year in both cases. The age of the mother is determined at the time of the pregnancy (birth) for Canada (the US). The sample is restricted to births of citizens excluding Ontario for Canada and to each state's residents for the US. For Canada, the fraction is calculated using numerators and denominators randomly rounded to a multiple of 5. Source: Canadian Vital Statistics Births Database 2000–2011 and the National Center for Health Statistics 1985–2001. [Colour figure can be viewed at `wileyonlinelibrary.com`.]

18 This hypothesis cannot be tested for Georgia given that the US data includes only the mother's age at the time of birth.

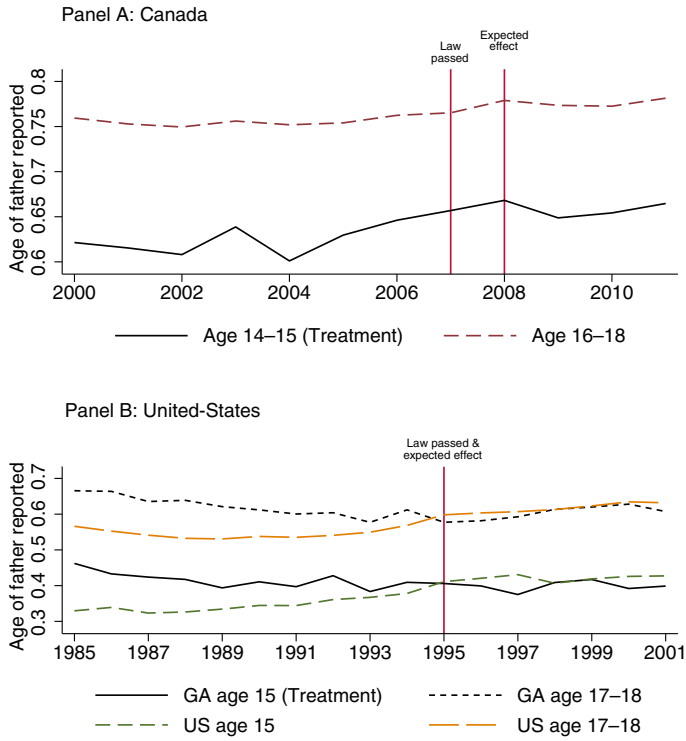

FIGURE 2 Fraction of births with father's identity, by year and age group
NOTES: Age of father reported is the fraction of births from teen mothers for which information on the father's identity is available. "Expected effect" corresponds to the year in which each law became effective. This corresponds to the same year in which it was passed for Georgia and one year after for Canada. See figure 1 for information on definitions, samples and sources. [Colour figure can be viewed at `wileyonlinelibrary.com`.]

(as they may have become pregnant at 13 and already have been covered by age of consent laws) and 16 (as they may have become pregnant at 15 and be newly covered by age of consent laws). Because the law became effective only two months after it was passed, there was little time to adjust or anticipate contrary to Canada, such that the law was expected to affect births starting in early 1996, around nine months after it was passed. Abortions could again have led to earlier decreases, but graphical evidence presented in the results section suggests that this was also a mechanism of limited importance for the US. The figure shows a decrease of around 0.05 percentage points, or 10%, in the fraction of births from outlawed relationships starting in 1996 for mothers aged 15 in Georgia with no apparent impact in other states or for older teens. Mothers aged 15 in Georgia and the rest of the US appear to differ in their pre-intervention trends, but geographical variation is used only in the DDD approach, which does not rely on a common trends assumption for validity. Panel B of figure 2 again shows no apparent change in the reporting

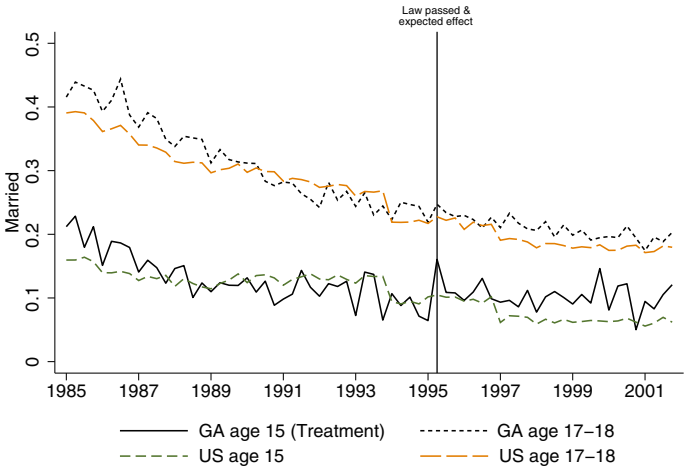

FIGURE 3 Fraction of births to married mothers, United States, by quarter and age group **NOTES:** "Expected effect" corresponds to the same date as when the law was passed. See figure 1 for information on definitions, samples and sources. [Colour figure can be viewed at `wileyonlinelibrary.com`.]

of fathers' ages after the law became effective, inconsistent with changes in reporting driving the apparent decrease in births with older fathers.

Figure 3 shows the quarterly fraction of teen mothers who were married at the time of birth in the US and provides suggestive evidence of a large increase of approximately 0.03 percentage points, or 25%, in the fraction married for teens aged 15 in Georgia at the time of the legislation although no apparent change for older mothers or other states. The figure shows that the increase appears particularly large in the quarter when the law was passed, suggesting a strong reaction from already-pregnant teens. Overall, these figures also show the plausibility of the common trends assumption between teens of covered ages and older teens, supporting the validity of the DID analysis using older teens as a comparison group.

3. Empirical strategy

I begin with an event study specification to provide yearly evidence on the impact of the age of consent increases comparing with older teens to account for potential confounders common across age groups. Specifically, I estimate the following model:

$$\begin{aligned} Y_{igtc} = \beta_0 &+ \Sigma_{k=y}^{T-1} \beta_k COVERED_g * \mathbb{1}(YEAR_t = k) \\ &+ \Sigma_{k=T+1}^{Y} \beta_k COVERED_g * \mathbb{1}(YEAR_t = k) \\ &+ \beta_1 X_i + \gamma_t + \delta_c + \varepsilon_{igtc}, \end{aligned} \tag{1}$$

where Y_{igtc} is the outcome of interest for birth i from a mother in age group g at time t in region (census division for Canada, county for Georgia) c. $COVERED_g$ is an indicator variable for whether the mother is of an age covered by the age of consent increases (aged 14 to 15 compared with 16 to 18 at the time of pregnancy for Canada, 15 compared with 17 to 18 at birth for Georgia), which is interacted with dummy variables for each year in the samples ($y = 2000$ for Canada, 1985 for Georgia, $Y = 2011$ for Canada and 2001 for Georgia). $YEAR_t$ denotes the calendar year of a birth and $\mathbb{1}(YEAR_t = k)$ accordingly takes the value 1 if the birth was registered in year k. Year T is omitted from the analysis, which corresponds to the years in which the age of consent increases were passed (2007 and 1995) when investigating the fraction of births with fathers more than five years older (three for Georgia) and the year before when investigating the fraction of births from married mothers in Georgia.[19] Also included in the regressions are X_i, a vector of birth and parent characteristics,[20] γ_t, year and month-of-the-year fixed effects, and δ_c, county or census division fixed effects. The coefficients of interest are the interacted coefficients that represent the effect of the age of consent legislation on teen birth outcomes of interest.

Next, as a way to summarize the event study evidence into a single parameter and test for joint statistical significance of the estimates, I estimate the following DID equation:

$$Y_{igtc} = \beta_0 + \beta_1 COVERED_g + \beta_2 POST_t + \beta_3 COVERED_g * POST_t + \beta_4 X_i + \gamma_t + \delta_c + \varepsilon_{itc}, \quad (2)$$

where $POST_t$ is an indicator for the period after the age of consent increase (starting nine months after the passing of the laws for outcomes relating to births and at enactment for outcomes relating to reporting or marriage) and $COVERED_g * POST_t$ is an interaction term. The regressions include the same additional controls and fixed effects as the event study approach. The coefficient of interest, β_3, represents the differential impact of the law for teens of covered ages. Using this approach to identify the law's impact on births with fathers of targeted ages does not require that fathers' ages always be available on birth certificates, but that reporting behaviour does not change because of the laws. I investigate this using equation (2) with the likelihood that a father is classified as unknown on birth certificates as the outcome

19 This is again because the age of consent increases are expected to affect births with a delay of several months after passing (which leads into the next year in both cases), but marriages as soon as the law becomes effective.

20 Throughout the US analysis, demographic information from both parents is included for outcomes that condition on births for which the father's age is available, but the father's information is omitted from others given that it is missing for a large share of observations.

variable. In that case, β_3, represents the impact of the law on the fraction of births with information on the father, which allows me to test for changes in reporting. To conduct inference, I present both heteroskedasticity robust standard errors as well as p-values from wild cluster bootstrapping based on two approaches (Abadie et al. 2017, MacKinnon and Webb 2019). The first clusters based on geographical location (province for Canada and county for Georgia) and the other based on the level of treatment assignment (age of the mother).

While no Canadian policy should reasonably threaten identification, the US analysis is complicated by the major welfare reform of 1996, the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA), which, among other measures, replaced the AFDC (Aid to Families with Dependent Children) with the TANF (Temporary Assistance for Needy Families). Several provisions of the reform were designed to disincentivize teen pregnancy and motherhood including cuts in benefits, additional work requirements and abstinence programs (Sawhill 2000, Pandey et al. 2005). While Kearney (2004) reports that such welfare reforms had limited impacts on teen fertility, insofar as these measures were particularly salient for the youngest, most disadvantaged mothers and those with older partners, comparing outcomes to older teens alone could conflate the impact of the age of consent increase and the welfare reform. Therefore, even if it appears unlikely that the reform would have had a large disproportionate impact on mothers aged 15 with little to no observed impact on older teens, this motivates the use of cross-state variation in the DDD approach to compare with other states and isolate the effect of the age of consent increase.

This naturally leads to a triple-difference design of the form

$$\begin{aligned} Y_{igts} = {} & \beta_0 + \beta_1 POST_t + \beta_2 POST_t * COVERED_g + \beta_3 POST_t * GA_s \\ & + \beta_4 POST_t * COVERED_g * GA_s + \beta_2 X_i + \gamma_t + \theta_{gt} \\ & + \eta_{gs} + \alpha_{st} + \varepsilon_{igts}, \end{aligned} \tag{3}$$

where Y_{igts} is the outcome of interest for birth i from a mother in age group g at time t in state s. GA_s is an indicator variable for whether the birth occurred in Georgia and $POST_t * COVERED_g$, $POST_t * GA_s$ and $POST_t * COVERED_g * GA_s$ are interaction terms. The DDD specification includes similar controls and fixed effects, as well as age group-by-year (θ_{gt}), age group-by-state (η_{gs}) and state-by-year (α_{st}) fixed effects. Another advantage of the DDD is that it relaxes the common trends assumption of the DID from equation (2). The coefficient of interest is now β_4, which represents the impact of the law on covered teens in Georgia compared with both older teens and other states. Again, equation (3) can be used to test whether the law led to changes in reporting behaviour using the likelihood that a father is classified as unknown on birth certificates as the outcome variable. Throughout the DDD analysis, standard errors are clustered at the state level to allow for arbitrary correlation of errors within states. Lastly, to complement the

DDD analysis, I present results using the synthetic control methods proposed in Abadie and Gardeazabal (2003) and Abadie et al. (2010) in online appendix A6, which support the main results. This alternative method constructs a synthetic state to be compared with Georgia from a re-weighted combination of US states based on their similarity to Georgia in terms of relevant teen birth outcomes in the period before the age of consent increase.

4. Results

Figure 4 presents event-study estimates of the impact of age of consent legislation on the fraction of births with fathers more than five (three for Georgia) years older from equation (1). The solid lines represent the year effects coefficients while the dashed lines represent pointwise 95% confidence intervals. Panel A for Canada shows a sustained decrease of approximately 0.04 to 0.05 percentage points, or 20% to 25%, for teen mothers aged 14 to 15 relative to older teens after the 2008 increase. The estimates for 2008 and 2009 are not statistically significant at the 95% level but those for 2010 and 2011 are. Panel B for Georgia shows a marked decrease of around 0.05, or 13%, after the 1995 increase, although coefficients are generally not individually statistically significant from zero.

Figure 5 presents similar estimates from equation (1) for the quarterly fraction of married teen mothers in Georgia. It reveals a very different effect of the law on Black and non-Black teens. The marriage rate for non-Black teens in the period was around one third and the estimates suggest an increase of around 0.075 percentage points, or 25%, starting in the second quarter of 1995, when the law was passed. Contrastingly, only 5% of Black teen mothers were married during this period and there is very little apparent change around the time of the law's passing, most of the pre–post difference seemingly driven by lower rates in the early years of the sample. The event study results shown in figures 4 and 5 also provide a way to test formally for pre-trend differences between the treatment and comparison groups, generally showing similar outcome trends across groups in both countries.

Table 2 presents the DID results for both countries. The first two columns of panel A show the estimated impact of the law on the fraction of births with fathers more than five years older in Canada. All specifications include month-of-the-year (quarter for the log births outcome), year and census division fixed effects. The second column adds an indicator variable for whether the mother resides in a zip code area with the lowest income quintile. The interaction term of interest is large, negative and statistically significant in both specifications. The estimates correspond to a decrease of approximately 14%. Clustered standard errors at the province and the age of the mother levels, which allow for arbitrary within-cluster correlation in the model errors are also presented in squared brackets for the coefficient of interest and largely do not affect statistical significance. The first two columns of panel B show the estimated impact of the law on the fraction of births with fathers more

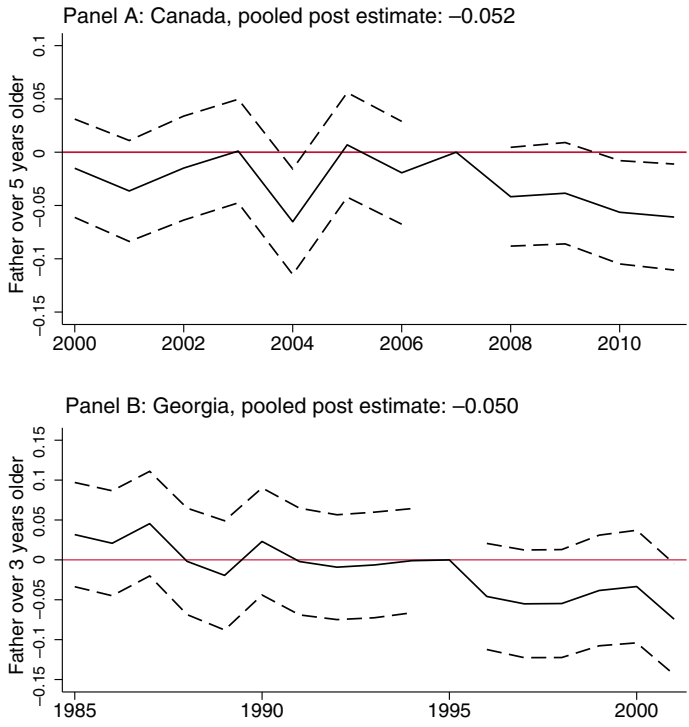

FIGURE 4 Event-study evidence of the age of consent increases on the fraction of births with older fathers

NOTES: Dashed lines represent 95% confidence intervals. For Canada, demographic controls include whether the mother resides in a zip code with income in the lowest quintile. For Georgia, they include whether the mother is Black or Hispanic, the mother's years of education and whether the father is Black or Hispanic. Regressions also include month of the year, year and census division (county for Georgia) fixed effects. See figure 1 for information on definitions, samples and sources. [Colour figure can be viewed at `wileyonlinelibrary.com` .]

than three years older in Georgia. All specifications include month-of-the-year (quarter for the log births outcome), year and county fixed effects. The second column adds demographic controls. Both columns provide evidence that the law led to a substantial disproportionate decrease in the fraction of births with fathers of targeted ages from teens aged 15 compared with teens aged 17 and 18. The interaction terms are statistically significant at the 5% level and correspond to a reduction of around 14%. Note that the coefficients on the "post" indicator are generally small and negative, indicating that births with fathers more than five (three for Georgia) years older did not increase for older teens in the comparison group. I can rule out increases of more than 2% to 5% and along with graphical evidence presented in figure 1, this suggests that there was little substitution effect from teens covered by the age of consent increases to older teens. Lastly, see figures A2 and A4 in the online

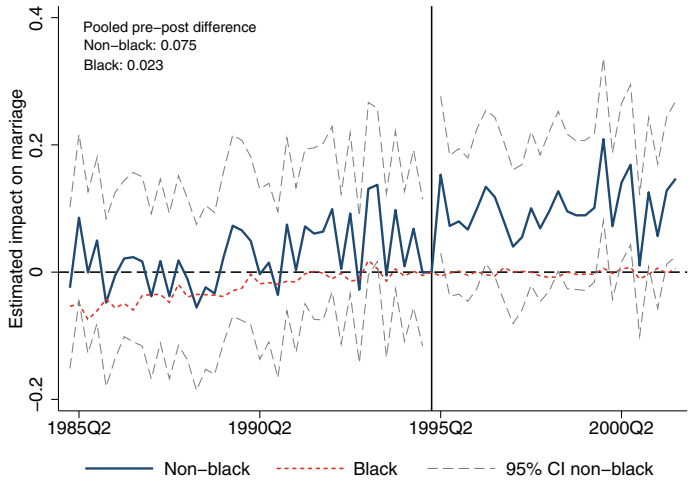

FIGURE 5 Event-study evidence of the Georgia age of consent increase on the fraction of births by married mothers

NOTES: Regressions include quarter-of-the-year, year and county fixed effects as well as controls for whether the mother is Black or Hispanic and the mother's years of education. See figure 1 for information on definitions, samples and sources. [Colour figure can be viewed at `wileyonlinelibrary.com`.]

appendix for histograms showing the age distribution of fathers before and after the age of consent increases and bar charts showing differential changes in the likelihood of births with fathers of different ages for covered mothers following the age of consent increases. This evidence also supports relative decreases in births with older fathers consistent with the laws' implementations and close-in-age exemptions. Births with fathers less than 18 to 19 years old increased relatively to older fathers, while those with older fathers decreased, especially for ages 20 and 25.

Columns 3 and 4 show that these estimated decreases are not due to decreases in reporting of fathers' identities because there is little evidence of changes in the likelihood that information on the father was available on birth records for both countries. I can rule out decreases of more than 2% in the probability that the father's identity be reported.

Columns 5 and 6 present estimates with the quarterly log number of births per census division (county for Georgia) as the outcome variable. The law had a smaller impact on overall fertility given that births with *known* fathers more than five (three for Georgia) years older make up for a minority of all births, roughly 10% for Canada and 20% for Georgia.[21] The estimates are suggestive of decreases in the number of births from mothers covered by the laws of

21 The fraction is approximately 50% (16%) of births for which the father's age is available, which is around 40% (65%) for Georgia (Canada).

TABLE 2

Differences-in-differences estimates of the age of consent increases on teen birth outcomes using older teens as comparison

Panel A: Canada						
Outcome	Father over 5 years older		Father reported		Log births	
Post*Mother 14–15	−0.032***	−0.033***	0.018*	0.018*	−0.031	−0.031
	(0.009)	0.009	(0.010)	(0.010)	(0.021)	(0.021)
Boot. p-value: province	[0.020]	[0.002]	[0.240]	[0.220]	[0.270]	[0.320]
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Boot. p-value: mother's age	[0.020]	[0.070]	[0.000]	[0.000]	[0.670]	[0.760]
Mother 14–15	−0.056***	−0.056***	−0.118***	−0.118***	−1.419***	−1.419***
	(0.006)	0.006	(0.005)	(0.005)	(0.012)	(0.012)
Post	−0.008	−0.008	0.013	0.013	0.064	0.064
	(0.011)	(0.011)	(0.009)	(0.009)	(0.039)	(0.039)
Outcome mean	0.233	0.233	0.750	0.750	1.227	1.227
Observations	82,230	82,230	109,585	109,585	15,570	15,570

Panel B: Georgia								
Outcome	Father over 3 years older		Father reported		Log births		Married	
Post*Mother 15	−0.057***	−0.058***	0.002	−0.010	−0.136***	−0.131***	0.074***	0.060***
	(0.013)	(0.013)	(0.008)	(0.008)	(0.038)	(0.038)	(0.005)	(0.005)
Boot. p-value: province	[0.002]	[0.002]	[0.687]	[0.020]	[0.028]	[0.042]	[0.000]	[0.000]

Continued

TABLE 2

Continued

Boot. p-value: mother's age	[0.002]	[0.002]	[0.487]	[0.002]	[0.507]	[0.042]	[0.000]	[0.000]
Mother 15	0.139***	0.066***	−0.199***	−0.117***	−1.364***	−1.187***	−0.177***	−0.098***
	(0.007)	(0.008)	(0.005)	(0.005)	(0.027)	(0.066)	(0.003)	(0.003)
Post	0.004	−0.004	0.001	−0.003	0.220***	0.166***	0.002	−0.002
	(0.010)	(0.010)	(0.010)	(0.010)	(0.055)	(0.061)	(0.010)	(0.009)
Outcome mean	0.401	0.400	0.594	0.595	3.428	3.431	0.259	0.258
Observations	92,985	89,737	156,571	154,076	2,144	2,142	156,551	154,066
Time and area fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Covariates	N	Y	N	Y	N	Y	N	Y

NOTES: Robust standard errors are presented in parentheses and bootstrapped clustered standard errors at the province or mother's age level in square brackets. "Log births" corresponds to the log of the average number of quarterly births by age group per census division (county for Georgia). All regressions include month-of-the-year (quarter for the log births outcome), year and census division (county for Georgia) fixed effects. When indicated, regressions for Canada also include a control for whether the mother resides in a zip code with income in the lowest quintile and regressions for Georgia also include covariates for whether the mother is Black or Hispanic and the mother's years of education and for the outcome "father over 3 years older," whether the father is Black or Hispanic. The sample size for the log of quarterly births outcome corresponds to the number of quarter X county or census division X age categories. The sample is restricted to teens aged 14 to 18 at the time of pregnancy for Canada and 15 or 16 to 18 at the time of the birth for Georgia. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. See table 1 for information on definitions, samples and sources.

about 3% for Canada and 13% for Georgia. A back of the envelope calculation indicates that these estimates are larger than scaling the previously identified impacts on the subgroup of births with fathers of targeted ages, which would correspond to 1.5% to 2.5% decreases in the number of births.[22] This suggests that the laws may also have led to fewer births from unknown fathers, consistent with deterring partners who would have remained unknown on birth certificates. From the DDD estimates discussed below, it also appears that most of the decrease for Georgia represents a national change not idiosyncratic to that state. As such, the smaller estimates from that specification likely better represent the effect of the age of consent increase on overall fertility.

Columns 7 and 8 of panel B provide evidence of a large statistically significant 23% to 28% disproportionate increase in the fraction of births from married mothers for teens aged 15 after the 1995 Georgia increase. One consideration is whether this constitutes a net increase in births from married mothers or simply decreased fertility from unmarried teens. Complementary evidence presented in online appendix A4 supports the former by showing that the net number of reported births from married mothers increased by approximately 17% after the age of consent increase. This is consistent with the law leading to an increase in teen marriage, likely as a way to avoid statutory rape legislation.

Table A4-1 in the online appendix presents a variety of treatment heterogeneity analyses and robustness checks to the DID results. For Canada, it provides little evidence of a differential impact in lower-income areas, although precision is low. It also shows that excluding teens who were less than three months away from 16 and may have been able to misreport their age at pregnancy has little impact on the results and that the estimated decrease in the fraction of births with fathers more than five years older is smaller when considering the likely noisier measure of age at birth, but remains substantial and statistically significant. For Georgia, it provides evidence that the decrease in the fraction of births with fathers more than three years older appears to have been largest for Black mothers although differed little between Hispanic teen mothers and non-Black non-Hispanic teen mothers. It also suggests that the decrease was concentrated to fathers above 18 with little apparent decrease for fathers aged 16 to 17. Regarding marriage, the law is estimated to have led to increases of around 13% for non-Black non-Hispanic teens, 24% for Hispanic teens and close to zero for Black teens. These racial and ethnic differences are consistent with lower (higher) rates of marriage for Black (Hispanic) teens, which may in turn have made it less (more) feasible as an option to avoid legislation. For both countries, normalizing the regressions of the log number

22 These numbers are obtained by scaling the effect of the law on the 20% (10%) sample of births with fathers more than three (five) years older to the entire population of covered mothers for Georgia (Canada).

of births by the province or county population has a negligible impact on the estimates. Table A3 in the online appendix also provides additional results for different age comparison groups and periods, which do not alter results substantively.

Table 3 presents the DDD results for the four outcomes of interest in Georgia, again using mothers aged 17 to 18 as comparison and now also comparing across states. For each outcome, the first column includes month-of-the-year (quarter for the log births outcome), year and state fixed effects, while the second column adds demographic controls and the full set of fixed effects. The first two columns show that the age of consent change is estimated to have led to a decrease in the fraction of births with fathers more than three years older for mothers covered by the law. The coefficients on the triple interaction terms are negative and statistically significant, corresponding to a decrease of 6% to 7%. Columns 5 and 6 again show little evidence of changes in the fraction of births for which the father's age was available. Columns 3 and 4 show the impact of the law on marriage and provide evidence of a statistically significant increase of 10% for teens aged 15 in Georgia. As shown in table A4-2 of the online appendix, the estimated impact is again close to zero for Black teens. Columns 7 and 8 show estimates of the law's impact on the quarterly log number of births per state, which constitute evidence of a 4% to 5% differential decrease for teens aged 15 in Georgia after the age of consent increase. This provides evidence that the law led to a net decrease in births, including some from fathers whose identity is not reported on birth certificates. Indeed, scaling up the estimates obtained in the subsample of births with known fathers more than three years older would correspond to a decrease of 1.5% in teen births.[23]

Data on abortions were gathered for Canada between 2007 and 2011 and Georgia between 1990 and 2001.[24] The Canadian data suffer from several shortcomings,[25] and the CDC makes no guarantee as to the accuracy of the data that they house, but these data represent the best available in both

23 A decrease of 7% in the subset of births with fathers more than three years older (23%), which corresponds to 39% of births with known fathers (60%).

24 The data were obtained from the Centres for Disease Control and Prevention (CDC), at www.cdc.gov/reproductivehealth/data_stats/index.htm, and the Canadian Institute for Health Information (CIHI) through a data request at www.cihi.ca/en/access-data-and-reports/data-holdings/make-a-data-request.

25 The data exclude all abortions from Quebec and include only abortions obtained in hospitals, excluding private clinics. In 2007, responsibility for collecting and maintaining abortion data was transferred from Statistics Canada to the Canadian Institute for Health Information. This led to changes in reporting that make the two periods hard to compare. See McKay (2012) for more details.

TABLE 3

Triple-differences estimates of the Georgia age of consent increase on teen birth outcomes using older teens and other states as comparison

	Father over 3 years older		Married		Age reported		Log births	
Post*Georgia*Mother 15	−0.028***	−0.021**	0.025***	0.023***	0.011	0.009	−0.076***	−0.039**
	(0.007)	(0.009)	(0.006)	(0.006)	(0.011)	(0.009)	(0.017)	(0.016)
Mother 15	0.103***		−0.178***		−0.177***		−1.452***	
	(0.008)		(0.008)		(0.017)		(0.019)	
Post	−0.032***	−0.124***	−0.003	0.002	−0.004	−0.008***	−0.033	−0.354***
	(0.008)	(0.001)	(0.003)	(0.002)	(0.004)	(0.003)	(0.036)	(0.021)
Post*Mother 15	−0.03***	0.029***	0.052***	−0.007**	−0.007	0.002	−0.065***	−0.084**
	(0.007)	(0.008)	(0.006)	(0.003)	(0.011)	(0.004)	(0.017)	(0.039)
Post*Georgia	0.02***	0.173***	0.012	0.011***	−0.072***	0.005	0.181***	0.431***
	(0.004)	(0.007)	(0.016)	(0.002)	(0.018)	(0.004)	(0.022)	(0.012)
Georgia*Mother 15	0.036***		−0.011		−0.034**		0.094***	
	(0.008)		(0.008)		(0.016)		(0.019)	
Outcome mean	0.390	0.385	0.249	0.233	0.596	0.602	2.981	3.011
Observations	2,554,079	2,086,076	4,281,668	3,583,015	4,281,910	3,583,116	89,383	75,173
Covariates	N	Y	N	Y	N	Y	N	Y
State FEs	Y	Y	Y	Y	Y	Y	Y	Y
Time FEs	Y	Y	Y	Y	Y	Y	Y	Y
Age group FEs	N	Y	N	Y	N	Y	N	Y
State X Year FEs	N	Y	N	Y	N	Y	N	Y
Age group X Year FEs	N	Y	N	Y	N	Y	N	Y
State X Age group FEs	N	Y	N	Y	N	Y	N	Y

NOTES: Clustered standard errors at the state level are presented in parentheses. All regressions include month-of-the-year (quarter for the log births outcome) fixed effects (FEs). When indicated, regressions also include covariates for whether the mother is Black or Hispanic as well as the mother's years of education and for the outcome "father over 3 years older," whether the father is Black or Hispanic. The sample size for the log of quarterly births outcome corresponds to the number of quarter X state X age categories. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. See table 2 for information on definitions, samples and sources.

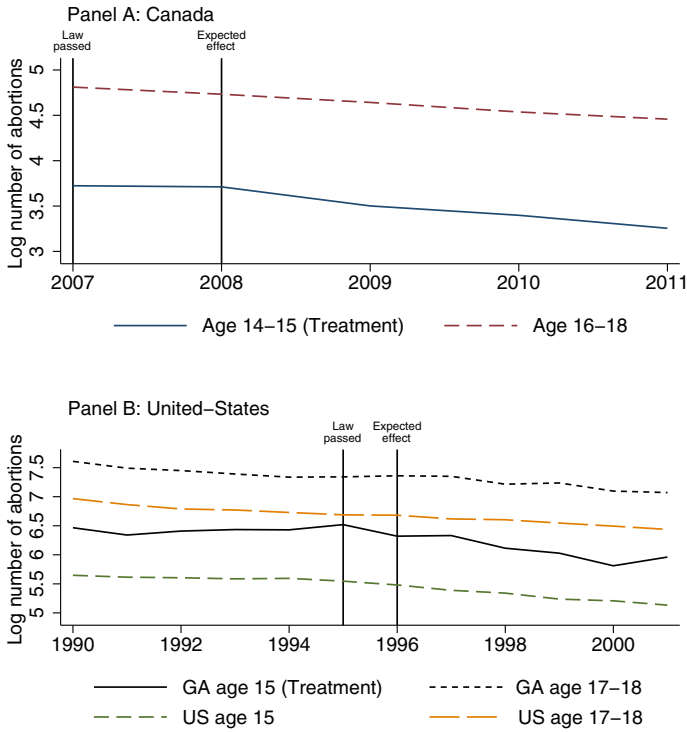

FIGURE 6 Log number of abortions, by year and age group
NOTES: Log number of abortions is the log of the average yearly number of abortions by age group determined at the time of the birth. The Canadian data excludes all abortions from Quebec or private clinics. State coverage in the US is not complete (around 42 states on average) and can vary by year.
SOURCES: Canadian Institute for Health Information 2007–2011 and Centers for Disease Control and Prevention 1990–2001 [Colour figure can be viewed at `wileyonlinelibrary.com`.]

cases.[26] Figure 6 presents the log of the yearly number of abortions for age groups of interest. The general trends between teens aged 14 to 15 (15 for Georgia) and older teens appear relatively similar, showing a steady decrease for all ages with perhaps a faster decrease for covered mothers following the legislative changes. As such, the laws do not appear to have increased abortions and the results taken together are suggestive of a decrease in pregnancy rates.

26 To the extent that measurement and reporting issues are constant before and after age of consent changes, then they are of reduced concern for the specific purposes of this paper. Further, there is little evidence of the laws themselves impacting reporting because there is no large change in either country or in Georgia compared with the rest of the US after the age of consent increases.

Another consideration is whether these laws may have led to decreased pregnancy rates without affecting the prevalence of relationships with targeted partners, for example through increased use of contraception. Delayed childbearing may hold some benefits to would-be teen mothers and achieve the stated goals of US legislation to reduce teen births, but would presumably fall short of legislation aimed at protecting youth from relationships inherently deemed nonconsensual. As discussed in online appendix A3, I find that the law also had a delayed decrease on the fraction of births with fathers of targeted ages for older teens, consistent with the law protecting youth by breaking relationships between teens aged 14 to 15 and partners more than five years older at the time of passing, which translated to decreased childbirth even as these teens became older.

5. Conclusion

This paper contributes new empirical evidence on the impact of age of consent legislation on teen birth outcomes and statutory rape in Canada and the US. The two legislative changes considered in the analysis provide a rare opportunity to evaluate these policies and study underlying aspects of teen child-bearing.

The laws outlawed relations between teens aged 14 to 15 and older partners outside of close-in-age exemptions. Accordingly, I focus on births by mothers of targeted ages specifically from partnerships made illegal by the age of consent increase. In both countries, the legislation led to a large reduction in the reported fraction of births arising from partnerships made illegal. These impacts could reflect a net decrease in childbearing for a subset of teen mothers, changes in age reporting, or compositional changes in the ages of mothers and fathers. Additional results show little evidence of changes in age reporting, substitution of teen mothers to younger fathers, or substitution of older fathers to older teen mothers, but evidence of decreases in the number of births by mothers of covered ages. The laws also plausibly decreased pregnancies because abortions did not increase following the changes. Further, evidence from Canada is consistent with the law deterring relationships between teens and older partners altogether. Lastly, in Georgia, the law also led to an increase in the fraction of teens who were married at the time of giving birth, pointing towards a conscious effort to exploit an exemption that then existed in the statutory rape laws.

The estimated impacts are consistent with previous evidence on the effect of such legislation in the US (Frakes and Harding 2015) and perhaps surprisingly, fairly consistent across countries. Evidence from Wolfe et al. (2007), Kearney and Levine (2012b) and Kearney and Levine (2014) also suggests that much variation in teen fertility seems driven by conscious reactions, often to economic opportunities. The estimated effect on teen births is roughly consistent with reported impacts of other policies and factors that affect the economic incentives of teen childbearing. Across papers looking at

determinants other than criminal legislation in the US literature (Kearney and Levine 2009, Kearney and Levine 2012a, Kearney and Levine 2012b, Kearney and Levine 2014), the best estimates of the contribution of certain factors in explaining decreases in teen births consist of around 3.3% for reductions in welfare benefits, 4.4% for family planning services expansion, 5.5% for unemployment, 1.6% for reduced sexual activity and 2.8% for increased use of contraception. As such, while the estimated impacts of age of consent increases on the subgroups of interest (births with fathers of targeted ages) are larger, estimates for total childbearing of around 3% to 4% are in line with findings relating to other aspects of teen fertility.

The analysis highlights that individuals react to these laws and that they have the potential to protect youth, but can also have perhaps counterproductive consequences depending on the legislative context and exemptions in place. Evidence that teen fertility can be affected through criminal legislation represents only a first step in understanding broader issues of statutory rape and their dynamics. Most importantly, further research remains to be done on the impact of these laws on the behaviour of teens themselves and their longer-term outcomes.

Supporting information

Supplementary material accompanies the online version of this article. The data and code that support the findings of this study are available in the Canadian Journal of Economics Dataverse at `https://doi.org/10.5683/SP3/BAQM4V`.

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