The Impact of Abortion on Crime and Crime-Related Behavior[x]

Randi Hjalmarsson

Andreea Mitrut

Cristian Pop-Eleches

Abstract

The 1966 abolition and 1989 legalization of abortion in Romania immediately doubled and decreased by about a third the number of births per month, respectively. To isolate the link between abortion access and crime while abstracting from cohort and general equilibrium effects, we compare birth month cohorts on either side of the abortion regime. For both the abolition and legalization of abortion, we find large and significant effects on the level of crime and risky-behavior related hospitalization, but an insignificant effect on crime and hospitalization rates (i.e. when normalizing by the size of the birth month cohort). In other words, the Romanian abortion reforms did affect crime, but all of the effect appears to be driven by cohort size effects rather than selection or unwantedness effects.

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1. Introduction

Abortion policy is actively debated in both the United States and around the world today. With the election of President Trump and recent conservative shift in the Supreme Court, many state legislators are putting forward bills that make abortion policies more restrictive in the US.[1] This contrasts many other countries around the world: a 2018 Guttmacher report indicates that 27 countries liberalized their abortion laws since 2000.[2] Most of this debate focuses on the moral, religious, and constitutional legality of abortion, and pays little attention to the potential societal (external) consequences of abortion laws. This paper contributes to this debate by studying the impact of abortion laws in Romania on one such societal outcome: crime and crime-related behaviors.[3]

Romania, which abolished abortion in October 1966 and legalized it again in December 1989, provides a unique opportunity to study the effect of abortion on crime for a number of reasons. First, given that abortion is the main form of birth control in Romania during both reform periods, the magnitudes of the shocks are quite large. The number of births between 1966 and 1967 approximately *doubled* with the 1966 ban and decreased by about a third in the months after June 1990 as a result of the 1989 legalization. Thus, the Romanian shocks are substantially larger than those studied in the U.S.; Levine et al. (1999) estimate the impacts of abortion legalization on US fertility to be between 4% and 11%. Of course, this may also imply that the marginal user of abortion is different in Romania than in the context of the US studies. Second, we can study the effects of *both* the abolition and legalization of abortion, which increases the external validity of the analysis. Specifically, do we reach the same conclusions despite the fact that the reforms occurred in two very different time periods, with different socio-economic-political environments? Do we find the same results despite the fact that the effect on births of the abolition was three times as large as the legalization? Third, national administrative prison and hospital registers, which include an individual's month of birth, allow for an identification strategy that relies on the comparison of birth month cohorts on either side of the abortion regime. Since birth months on only one side of the cutoff are exposed to abortion legalization, but cohorts on both sides are exposed to similar crowding effects resulting from changes in cohort sizes from these policies, we can isolate the link

[1] See https://www.vox.com/2018/3/22/17143454/trump-ohio-heartbeat-bill-abortion-ban-mississippi, last accessed November 30, 2018, for a summary of recent US restrictions.
[2] https://www.guttmacher.org/report/abortion-worldwide-2017. Last accessed November 30, 2018.
[3] There is a larger literature looking at the effects of abortion policies on other socio-economic outcomes of children, such as poverty, education, health or fertility. For the US, see for example, Gruber et al. (1999), Charles and Stephens (2006), Joyce (1987) and Grossman and Joyce (1990). For Romania, see Pop-Eleches (2006), Mitrut and Wolff (2011) and Malamud et al. (2016).

between abortion access and crime abstracting from such general equilibrium effects or any other common shocks that affect children born within the same age cohort. The literature studying the effect of abortion policy on crime dates back to Donohue and Levitt's (2001) well known paper that puts forward the legalization of abortion as an explanation for up to 50% of the drop in crimes in the US in the early 1990s. They hypothesize that this is consistent with the timing of Roe v. Wade in 1973, which led to a substantial increase in abortions – especially among poor, unmarried mothers, whose children would have been at an increased risk of crime. Donohue and Levitt (2001) find that crime decreased 15-25 years later, as these more 'wanted' cohorts reached the peak crime ages. Moreover, Donohue and Levitt's (2019) recent evaluation of the abortion-crime relationship using almost twenty additional years of data (1998-2014) re-affirms the initial findings and predictions from their original work (Donohue and Levitt, 2001) – namely that there would be a further decline of about 20% in US crime.

There are a number of different channels consistent with the Donohue and Levitt (2001) hypothesis and finding that abortion legalization reduced crime. First, the most straight forward channel is that there were substantial reductions in cohort size. Even if there is no change in the compositional characteristics of cohorts, this would imply lower crime levels. But it would also imply an unchanging crime rate. Second, one would expect a decrease in the number of unwanted or unplanned children. This quantity reduction would be accompanied by an increase in child quality (Becker, 1981). Moreover, abortion legalization could make the timing of childbearing more optimal for mothers (especially in contexts where access to birth control is difficult). In turn, mother's education and labor market outcomes may improve, and have positive spill-overs onto children outcomes (Angrist and Evans, 1996). Involuntary parenthood could also impact less tangible mother outcomes, like her physical and mental well-being, which could influence the development of the child. One would expect that a decrease in unwanted children (and improved child quality and childhood environments) affects not only the number of crimes but also the crime rate, given the relationship between unwantedness and crime seen in the literature.[4] A third potential channel is compositional changes in the socio-economic characteristics of women who carry pregnancies to term. How this 'selection' affects crime is theoretically ambiguous, and depends on who the marginal users of abortion are (e.g. those of low or high SES background). Finally, crowding effects (an example of a general equilibrium effect) can occur if the fertility impact of abortion is particularly large: for instance, the same amount of criminal justice resources (e.g. policing and prison capacity) will be

[4] For instance, Doyle (2008) finds that foster care placement in Illinois increased the arrest rate of the marginal child by 200-300%.

dedicated to a much smaller population with legalized abortion. Abstracting from general equilibrium effects, there are thus three main channels through which abortion policy can impact crime – cohort size, unwantedness, and selection effects; though all three channels can affect the level of crime, both the unwantedness and selection effects should also translate into an effect on crime rates.

Donohue and Levitt's (2001) controversial findings have been actively questioned in the literature. Joyce (2004) suggests they are driven by not properly accounting for unmeasured time effects such as changes in crack cocaine – a concern that is avoided in our context. Foote and Goetz (2008) highlight sensitivity in the results to specification. Specifically, they argue that the identification of the true effect of abortion on crime is most convincing when using within-state variation. Though some of the Donohue and Levitt (2001) results were designed to do this, there was a coding error in the initial analysis. More importantly perhaps, Foote and Goetz (2008) point out that the Donohue and Levitt specification only looked at crime levels, while per capita crime data is needed to assess whether there is a selection effect. Foote and Goetz (2008) argue that when using such data, there is no evidence of a selection effect of abortion on crime, and one cannot even conclude that there is evidence of a cohort size effect. Foote and Goetz (2008) also highlight that one can even find a negative relationship between the abortion rate (where the denominator is the number of births) and the number of arrests when there is no selection of cohort size effects of abortion on crime; using an indicator of abortion policy rather than the abortion rate helps to avoid this. Donohue and Levitt's (2008) response highlights another challenge in this literature – identifying and measuring the extent to which a birth cohort (measured yearly) is exposed to an abortion policy.[5]

Rather than re-examining this same context, the current paper sheds light on this important and controversial question in a new context – the national reforms in Romania. We do, however, carefully inform our research design with this debate in mind: (i) the *national* nature of the Romanian reforms implies that we are using within-'state' variation, (ii) our use of individual register data, including month of birth, allows us to explicitly (and cleanly) measure abortion policy exposure, (iii) our main variable of interest is exposure to legalized abortion or not (allowing for the measurement of cohort size effects on crime), and (iv) we look at both crime levels and crime rates to disentangle cohort size effects from selection and unwantedness effects.

[5] Donohue and Levitt (2004 and 2008) also argue the robustness of their results to these alternative specifications. Other papers studying the effect of abortion on crime are Kahane, Patton and Simmons (2007) for the UK, Sen (2007) for Canada and Pop-Eleches (2006) for Romania. See also the review of this literature by Joyce (2010).

Our main measure of crime is convictions (broken down by crime category) that result in a prison sentence. Given that prison sentences represent relatively serious offenses, we complement our analysis with hospital admission data for mental health disorders and risky behavior (including schizophrenia, substance abuse (drug and alcohol) and accidents); this is consistent with a large criminology/sociology literature that documents a strong correlation between physical and mental health and crime. [6] These secondary outcome variables are also more equally distributed across the life-cycle and gender than crime.

Consistent with the large decrease (increase) in the number of births with the 1989 legalization (1966 ban) of abortion, we observe large and significant decreases (increases) in the level of each of our measures of crime and its risk factors: for total, property and violent crime as well as hospitalization for mental health disorders, and hospitalization for risky behavior, like drug abuse. But, all of these effects disappear when normalizing by the size of the birth month cohort. That is, the crime rate does not change. This pattern of results (significant large effects on levels but insignificant and precisely estimated zero effects on rates) is readily visible from both simple graphs and more formal specifications that control for month of birth dummies and a month time trend. Moreover, the same results are seen with both the abolition and legalization of abortion.

In addition, we demonstrate that the lack of an effect on crime or hospitalization rates is unlikely to be driven by a lack of precision that may arise when aggregating crime and hospital registers to the birth-month cohort level. That is, using the 2011 Romanian census, we conduct an individual level analysis of the impact of abortion policy on the propensity (i) to be observed in an institution or (ii) to report as not living in the household (for a reason other than education, work or family reasons) for the last 12-months. We find the same pattern of results. When aggregating the data, there is an effect of abortion policy on levels, but we find no effect on aggregate rates or individual propensities.

Our results can help reconcile the contradictory findings of the previous literature. As argued by Donohue and Levitt (2001), we find strong evidence that abortion policy affects crime. However, we also find that all of the effect is driven by cohort-size, and that there is no evidence of selection or unwantedness effects of abortion on crime in Romania. This supports Foote and Goetz's (2008) emphasis on the importance of using the crime rate to measure a selection effect.

[6] See Piquero et al. (2014) for a review.

The latter result – no selection and unwantedness effects – is particularly surprising given both the magnitude of the cohort size effect and the fact that previous research on the Romanian context has found abortion policy to have some effect on other socioeconomic outcomes, like education (Pop-Eleches (2006)). We conclude the paper with a discussion of potential explanations for why we find no effect on crime rates. First, we emphasize the possibility that the previously seen effects on outcomes like education are too small to translate into an effect on crime, given the estimates in the education-crime literature. Secondly, we show that given the large changes in fertility, our study should have been powered to detect the unwantedness effects mentioned in the literature (Donohue and Levitt (2001), Rasanen et al. (1999)), which implies as an alternative explanation that being unwanted at birth is less detrimental either in our specific Romanian setting or more generally.

2. Institutional Background

Romania experienced two large shifts in abortion availability. In October 1966, the communist government issued Decree 770 that abruptly moved from one of the most liberal policies in the world to a restrictive and conservative policy that made abortion and family planning, e.g. contraceptives, illegal.[7] The ban was applied starting with December 1st 1966 and it had an instant effect raising the fertility rates from 1.9 to 3.9 children per woman in one year (Figure 1). This policy was in place with some minor changes until December 1989 when Ceausescu was killed and his regime removed from power. The unexpected and immediate repeal of the abortion ban on the day after the Romanian dictator's execution resulted in an instant decline in the fertility rate: in 1990, Romania reached the highest rate of induced abortion – 200 per 1,000 women aged 15-44 – in the world (Serbanescu et al., 1995). Because this legalization coincided with the transition from a communist regime, the sudden fertility decrease in 1990 may just represent changes in behavior and/or preferences for children, and not free abortion access. However, for other countries from the former Communist Bloc, which also experienced a dissolution of the communist regime in 1989 (but no changes in abortion availability), an abrupt change in fertility in 1990 is not seen, but rather a gradual decrease (see Figure 1).[8] In East Germany, Chevalier and Marie (2017) find a decrease in fertility that started in August

[7] The 1966 decree stipulated that abortion was allowed only for: women who already had four children, women over age 45 whose lives were jeopardized by the pregnancy, and pregnancies that resulted from rape or incest.
[8] Pop-Eleches (2010) provides evidence that the drop in fertility is not explained by the repeal of other pronatalist policies introduced during the Ceausescu regime or by changes in the use of modern contraceptives. (Modern contraceptives were also banned during the Communist years and remained very uncommon in Romania several years after 1990.)

1990, nine months after the fall of the Berlin Wall. However, as discussed in Malamud et al. (2016), this decline was the result of selection into conceptions (as the time lag is nine months) rather than being due to post-conception selection through abortion (which should have a six month lag, as under the new policy abortion was legal only during the first trimester). In Romania, Panel A of Figure 2 shows a large decrease in the number of children born starting in July 1990, six months after December 1989. Similarly, a large *increase* in the monthly cohort size can be seen with a 6-month lag after the abortion ban on December 1, 1966, i.e. in June 1967 (Panel A of Figure 3). Overall, this evidence suggests that abortion availability explains Romania's sudden changes in fertility in 1967 and 1990.

In addition to affecting cohort size, abortion availability can also affect the socio-economic composition of birth cohorts if abortion is differentially utilized by mothers of different backgrounds. There is no theoretical consensus on the direction of these changes. We discuss the possible effects of these changes on our outcomes separately for the two reforms. First, for the 1989 reform, Malamud et al. (2016) show that abortion access had little impact on the characteristics of women giving birth before and after July 1990: if anything, abortion legalization had a large influence on households from disadvantaged backgrounds (low educated mothers from rural areas were less likely to give birth), but effects were small in magnitude and not significant.[9] Though the Malamud et al. (2016) findings suggest that compositional changes after the 1989 reform are unlikely to affect our results, we demonstrate the robustness of our main findings to controlling for parental characteristics.[10] Second, and in contrast, Pop-Eleches (2006) shows large compositional changes for the 1966 reform: children born after the unexpected abortion ban were more likely to be born to highly educated mothers living in urban areas, because these women were more likely to use abortion before the ban. Since our crime registers cannot be linked with family background data in the 1960s, we are limited in our ability to control for these potentially important effects.[11] However, to partially address this concern, we demonstrate the robustness of our results to adding controls from the 1977 Census.

[9] Because the administrative data in Romania contains little information about the mothers' socio-economic background, Malamud et al. (2016) use the 1992 Census when children were about two years old and still living with their parents. Note that other characteristics (divorced, number of children) are more problematic due to potentially high endogeneity concerns.

[10] Disadvantaged families were less likely to give birth after the abortion legalization so our results will be downward biased due to the composition effect channel (we would expect less criminals).

[11] Because better off families give birth after June 1967, not controlling for the composition effects may result in this case in estimating the opposite effects. Pop-Eleches (2006) finds that, before controlling for the compositional effects, the unwanted children born after June 1967 were better-off in terms of education and labor market outcomes. Controlling for the composition effects the pattern of his effects is reversed.

3. Data

The main data used in our analysis are the official crime registers from the Romanian National Penitentiary Administration, which include all criminal convictions that result in time served in prison from January 1997 to September 2017 and the stock of prisoners in January 1997 who were released after this date.[12] Our analysis samples consist of all individuals born between 1964-1970 and 1987-1993. For the cohorts born around the 1989 reform, we also observe all instances where individuals are held in preventative detention but not convicted.[13]

This data structure implies that crimes are observed at different ages for each cohort. For the cohorts born around the 1989 reform, we observe crimes committed before age 24 for the youngest cohort (1993) but before age 30 for the oldest (born in 1987). The unbalanced nature of the data is similar for the 1966 reform. The key difference is that we can only observe crimes for the 1964-1970 birth cohorts when they are relatively old: between approximate ages of 27 and 47 for those born in 1970 and 33 and 53 for the 1964 cohort. Figure 4 demonstrates this unbalanced nature of the data as well as the fact that the Romanian age-crime profile is similar to that of other countries, peaking in the early 20s and falling afterwards. We demonstrate that the results are robust to such censoring by defining the outcome variables conditional on ages observed for all cohorts in the analysis sample.[14]

Our crime measure is an indicator equal to one if a person born on either side of the reforms has any conviction resulting in a prison sentence between 1997 and 2017. Each prison sentence can have multiple charges associated with it. Descriptive statistics (see Tables 1 and 2) indicate that there are on average two convictions for each sentence. We also observe the crime category associated with each conviction, from which we create two further (not mutually exclusive) indicators for convictions of violent and property crimes, respectively.[15]

We will look at two sets of main dependent variables – levels and shares. The first is simply the aggregate number of individuals with a conviction. Because the crime registers

[12] Those already in prison in January 1997 account for 8.4% of the prisoners born 1964-1970. Dropping these individuals from the main regression does not affect the results. Note that this is only relevant for the 1966 reform sample.

[13] About 24% (or 9,512) of the individuals born around the 1989 reform and sentenced to prison were held in preventative detention and not convicted. The Romanian National Penitentiary Administration provided the data in two separate batches (for the 1966 and 1989 reforms); for the 1966 reform, we were unable to get both gender identifiers and the individuals in preventative detention.

[14] To the extent a linear trend in birth month captures the changing degree of censoring across birth cohorts, this is included in the baseline.

[15] One individual is usually convicted of more than one crime type: e.g., one conviction is violent and two property related. This individual will have *violent* =1 and *property* =1. Offense codes included in each category are listed in the Table notes.

include month of birth, we collapse our outcome variables according to month and year of birth, and compute the share of convicted individuals, which is our key outcome.[16] Note that these levels and shares are based on an analysis sample that includes both men and women (despite 96% of the prison sentences around the 1989 reform being for men). This is because (i) the denominator, or number of births, cannot be measured separately by gender and (ii) we do not have the gender of the offenders for the 1966 reform. [17]

The above-described crime data constrain our ability to say something about the effects of the Romanian abortion reforms on crime in two ways. First, as the majority of those convicted of offenses resulting in prison are male, these data do not tell us much about females. Second, we observe cohorts affected by the 1966 reform long after they pass the peak of the age-crime profile. Third, one may question the appropriateness of using incarceration numbers to measure changes in criminal behavior – e.g. if judges try to aim for specific capacity levels, or prison authorities adjust capacity levels to reflect population size.

We thus use the 2007-2017 National Inpatient Registers to complement our crime outcomes and address these concerns. These registers contain individual-level data for each stay in Romanian hospitals starting in January 1, 2007. This is an outcome that is more equally distributed across genders, as about 29% and 47% of hospitalizations for cohorts born around the 1989 and 1966 reforms, respectively, were male. Moreover, hospitalization is an outcome that does not have the same age profile as crime. Based on over 7 million hospital entries for our cohorts of interest, we calculate two indicators that take the value one if an individual spent at least one night in hospital care because of: i) mental and behavioral disorders and ii) risky behavior.[18] Similar to the crime registers, the hospitalization registers include month of birth, which allow us to consider the same sets of main dependent variables – levels and shares.[19]

[16] Because the prison register cannot be matched to an entire birth cohort register, we cannot look at an individual's propensity to be incarcerated with this data source; rather, we must aggregate the data. We can look at an incarcerated individual's propensity of having committed a specific offense type, but do not find any patterns of significance.

[17] Note that our denominator - the cohort size at birth, by month and year of birth –, which was retrieved from the Romanian Demographic Yearbook (NIS, 2005), cannot be observed separately by gender. Therefore, in both the numerator and denominator we keep both genders. Parent' preferences over sons or daughters and the corresponding sex-selective abortion was not a common practice in Romania. Moreover, the use of ultrasound technology was rarely available around the two reforms. Finally, there were no significant changes in the shares of males in the total number of births when comparing aggregate numbers around the reforms.

[18] Specific ICD-10 codes included in the *Mental and behavior disorder* and *Risky behavior* indicators are listed in the Table notes. The largest share (about 30% around each reform) for the former is F20-F29 (*Schizophrenia, schizotypal and delusional disorders*) while the largest sub-category of *Risky behavior* is primarily transport related accidents and injuries.

[19] We again look at males and females together. Results are similar, however, if we consider the share of female (or male) hospitalizations relative to the full cohort.

4. Methodology and Results

4.1. Graphical Evidence – The Impact of Legalizing and Abolishing Abortion on Crime

We begin our analyses of the impact of abortion on crime with simple plots of the raw data. Figures 2 and 3 present the results for the 1989 legalization and 1966 abolition, respectively. The vertical line in each figure corresponds to July 1990 and June 1967: as highlighted in the background section, individuals born in these months or later were exposed to the new abortion regimes. Panel B of each figure presents the *number* of individuals in each birth month cohort convicted of any charge (regardless of crime type) that resulted in a prison sentence. Panel C normalizes this by the number of live births in that month; specifically, the y-axis presents the *share* of individuals convicted (and incarcerated) per 1000 live births. Panels D and E, respectively, present number and share of individuals convicted for both violent (grey, dashed line) and property (solid, black line) crime offenses. Our main findings are, in fact, readily visible in these simple graphs: there is a large decrease in crime levels but not an apparent decrease around the cutoffs in crime rates when abortion is legalized in 1989. Likewise, there is a large increase in crime levels but not crime rates when abortion is abolished in 1966. These patterns are seen both overall and across crime categories.

4.2. Baseline Empirical Specification

The patterns that emerged in these raw data are striking. But, such an analysis also has its limitations. First, as highlighted previously, given that crimes are only observed from 1997 to 2017, crimes are measured at different ages for each birth month cohort. While one would not expect this to result in much of a bias when comparing cohorts on either side of the cutoff, it becomes an increasing concern as we get further from the cutoff. For instance, individuals born in 1987 are observed between the ages of 10 and 30 while those born between in 1993 are observed between 4 and 24; the younger the cohort, the fewer peak crime months that are observed. This explains the downward trend in the criminal behavior across birth month cohorts seen in the figures. Second, these figures do not control for potential compositional effects of the abortion reforms (highlighted in the background section).

Thus, equation (1) presents a baseline empirical specification that allows us to assess whether there is a significant effect of the abortion reforms on crime levels and crime rates, over and above trends in the data (that could arise, for instance, from censoring).

$$y_{mt} = \propto + \beta treat_{mt} + \gamma_m + month_{mt} + \varepsilon_{mt} \quad (1)$$

Specifically, we regress the outcome y (e.g. number of births, number convicted individuals, share convicted) in birth month m and year t on a dummy indicating whether the birth cohort is treated. This treatment variable turns on for individuals born in July 1990 and June 1967 for the respective reforms.[20] The baseline specification includes month of birth fixed effects (γ_m) to control for seasonality and a linear trend in birth month ($month_{mt}$) to allow for trends (like that which arises from the censoring of the data). We interpret β as the causal effect of the change in abortion regime on the outcome of interest. The baseline sample includes individuals born within 18 months of the reform on either side; the further we get from the reform, the more one should be concerned about potential differences across cohorts that could affect crime. After presenting the baseline results, we conduct sensitivity analyses to (i) alternative specifications, (ii) conditioning the outcome variable on age to deal with the potential censoring bias, (iii) extending the sample, and (iv) controlling for compositional changes.[21]

4.3. 1989 Legalization Results and Robustness

Table 3 presents the results of estimating the impact of the 1989 legalization of abortion on crime. Columns (1)-(3) present the estimated treatment effect (β) from the baseline specification for the following outcomes: number of births, number of individuals with a conviction resulting in incarceration, and share of convicted individuals. Panels A – C presents the results for all crime categories, violent crimes, and property crimes respectively. Standard errors are in parentheses and pre-treatment means of the dependent variable in italics. The legalization of abortion resulted in an immediate decrease in the number of births by approximately 7,700 (25% relative to the pre-treatment mean). Similarly, the number of convicted individuals decreased by 22% for any offense, 20% for violent crimes, and 25% for property crimes. Given the proportionate change in the number of births and number of convictions, it is not surprising that we do not find a significant change in the share of convicted individuals in column (3) – overall or by crime type. The point estimate itself is quite small, even relative to the mean (1.3%). However, standard errors are such that the 95% confidence

[20] We have also assessed the robustness of our results to allowing the treatment to occur in June for the 1989 reform (as there is some evidence that births changed already in June). This does not change the results. Similarly, we have chosen the cut-off to be July for the 1966 reform (as the policy came in effect in the beginning of December 1966), but the results do not change if we use June as a cut-off point.

[21] We have also assessed the sensitivity of our results to normalizing the crime count by the number of live births. Specifically, we have also taken into account selective mortality and external migration. The results are robust and available upon request. One potential bias we cannot address are deaths in orphanages. To the extent that the 'unwanted' children suffered early death in these institutions, we cannot observe these deaths in our mortality records (starting in the 1994) for the 1966 reform.

interval cannot rule out an effect of abortion legalization ranging from a 10% reduction to a 12% increase in the conviction rate for any offense.

Columns (4) – (7) demonstrate the robustness of the main finding that legalizing abortion did not have a significant effect on crime rates. Column (4) replaces the linear trend in birth month with birth year dummies. Column (5) restricts the outcome variable to be age-specific (convictions before age 26) to deal with the data censoring. Column (6) extends the sample to a 7-year window (and restricts convictions to age 24 accordingly). This increase in sample size comes with the tradeoff that the analysis cohorts are born up to seven years apart, and may have different childhood experiences (such as education). We thus include linear birth of month trends and year of birth fixed effects to flexibly control for these differences.[22] Column (7) includes controls for potential compositional effects of the abolition of abortion, including ethnicity, parents' education and parents' years of birth from the 1992 Census.[23]

One potential critique of the analysis so far is that we can only observe convictions that result in incarceration, which arguably are the most serious crimes. How can we rule out that there is no effect on more minor crimes? For the 1989 reform, we can actually expand the definition of conviction to include those who were observed in the data because they were held in preventative detention (and who were not sentenced to incarceration). Table 4 shows the same pattern of results. The share of individuals in preventative detention or incarceration does not change (though the level does). Moreover, in results available upon request, we do not find any effect on other crime outcomes that we can measure and which can potentially proxy for the severity of crime, including the average time served in days, the average age at arrest, and the share of individuals who have recidivated (i.e. repeat offenders).

4.4. 1966 Abolition Results and Robustness

Table 5 presents the results for the 1966 abolition of abortion and is identical in format to Table 3. Columns (1) and (2) show that abolishing abortion immediately increased the number of births by almost 32,355 (133% relative to the pre-treatment mean) and the number of individuals convicted of an offense resulting in incarceration by 129% overall, 124% for violent

[22] There is no significant change in the share convicted when including just year of birth dummies or year of birth dummies and a linear trend (as shown in the table). Small significant effects are seen, however, with just the linear trend; this is not too surprising, as the further away from the cutoff we get, the less likely an assumption of linearity is to hold.

[23] We include averages at the month and year of birth of the child for the following indicators: children's ethnicity: Romanian (vs. the baseline non-Romanian), parent's education: gymnasium (grade 1-8), secondary (9-12) and university (baseline is no education) and parents' year of birth. The results are also robust to including the county of birth of the child, which is available in the crime registers (there are 42 counties; each county contains several municipalities).

crimes, and 127% for property crimes. Yet, as seen for the legalization of abortion, column (3) shows that abolishing abortion did not significantly affect the share of individuals with a conviction; the associated point estimate represents an increase in the conviction rate of 1.5%. The associated 95% confidence interval includes effects ranging from an 11% decrease to an 8.4% increase. This non-effect is again robust to the specification, age at which the outcome variable is measured, sample window, and controlling for potential composition effects (see columns (4) – (7) of Table 2).[24] And we again find no effects for the additional crime outcomes of time served, age at arrest, and recidivism (available upon request). Of course, one limitation of this analysis that is particular to the 1966 reform is that we can only observe crime convictions for ages beyond the peak of the age crime profile (when the sample is in their 30s and 40s). While we have no way of measuring serious criminal offenses at early ages for these cohorts, the subsequent analysis of hospitalization records helps alleviate this concern.

5. Robustness Analysis: Additional Measures of Crime-Related Outcomes

5.1. Mental Health and Risky Behavior Hospitalizations

The analyses thus far highlight that the (de)legalization of abortion had significant effects on crime levels but not crime rates. Does this pattern extrapolate to offenses that do not result in incarceration or to criminal behavior at different points in the age-crime profile? In the absence of arrest data for offenses that do not result in detention, we complement our analysis with hospitalization data (detailed below) for mental and behavioral disorders and risky behavior. These variables are of interest because they are highly correlated with criminal behavior: they are both known-risk factors of crime and potential consequences of crime and incarceration. Piquero et al (2014) provides an overview of literature relating physical and mental health to crime. One example is Sailas et al (2005), who find a seven times higher mortality rate among young male offenders sentenced to prison than an age-matched population sample, as well as an association with hospitalization for psychiatric disorders or substance abuse.[25]

Specifically, we look at the effect of the reforms on the number of hospitalizations and rate of hospitalizations per birth cohort size. As stated above, we focus on two types of hospitalizations: (i) mental and behavioral disorders and (ii) risky behavior. For the cohorts around the 1966 reform, the first category captures hospitalizations due primarily to mood

[24] We account for composition effects using similar controls as for the 1989 reform but using the 1970 Census (when children born around the 1966 reform were still living with their parents).

[25] While many studies in this literature try to control for pre-crime health/mental health, they generally cannot disentangle causality due to the large selection into crime on these variables.

disorders such as depression or bipolar disorder (30%), schizophrenia related disorders (30%), and mental and behavioral disorders due the use of alcohol, drugs, or other substances (10%). For the 1989 reform cohorts, schizophrenia and substance related disorders are of similar size as the earlier cohorts, but mood disorders now represent only 14% of the hospitalizations and mental retardation 19%. The largest shares in the *Risky behavior* category include injuries (over 74%), transport related accidents (15.5%), and poisoning, burns and toxic effects of substances (5%).[26]

In addition, mental health and risky behavior hospitalizations occur with much greater frequency than incarceration, implying that we are potentially capturing a different marginal individual. Of course, some of these risky behaviors (e.g. drug use) are also crimes in and of themselves. We can only observe these registers from 2007 to 2017. While this again implies, for instance, that those born in 1967 are between the ages of 40 and 50, these outcomes are not subject to the same age profile as crime.

Table 6 presents the effect of the 1989 legalization in Panel A and the 1966 abolition in Panel B on these crime-related outcomes. Specifically, columns (1) and (2) look at the level and rate of hospitalizations for mental and behavioral disorders while (7) and (8) do the same for risky behavior hospitalizations. The bottom line is that the same general story is seen. There are large and significant effects on the number of hospitalizations for both mental disorders and risky behaviors of both the legalization and abolition. But these do not translate into significant effects on the rate of hospitalization. This non-effect is again robust to controlling for birth years, extending the sample, and compositional controls.

5.2. 2011 Romanian Census: Propensity to be 'At-Risk' Analysis

One limitation of the previous analyses is that they are constrained to studying those individuals *observed* in the prison system or admitted to the hospital. While we can normalize by the number of individuals born in a cohort, we cannot conduct an individual level analysis of how the abortion reforms affect the propensity to be incarcerated or hospitalized. That is, we do not observe those without these events. The 2011 Romanian Census data allow us to overcome this issue, though one cannot cleanly measure incarceration or hospitalization (especially by cause). Rather, we can use two mutually exclusive proxies for being an individual 'at risk' of being part of this criminal population. The first (risk 1) is whether the individual is institutionalized

[26]The results are not sensitive when excluding the S00-T98 codes from the latter indicator. Because some of the codes may not be related to risky behavior (e.g., *Complications of surgical and medical care, not elsewhere classified,* T80-T88 (2%)).

at the time of the census in an institution, including: prisons, pre-trial detention, child protection institutions, emergency centers, night shelters, hospitals, asylums, and hospital homes.[27] The second (risk 2) is an individual who is reported as not living in the household for at least the last 12-months, for a reason other than education, working or family reasons. One example reason is that the individual is detained. We combine both proxies to create an indicator for each individual being 'at risk', and also look at each measure separately. Another advantage of this analysis and the large sample size, therefore, is that it allows us to assess whether the previous non-results for incarceration and hospitalization rates were driven by a lack of precision.

Table 7 presents results separately for the 1989 and 1966 reforms in Panels A and B, respectively. For our main outcome (an individual being "at risk" of being part of the criminal population), we present two sets of results: (i) an individual level-analysis and (ii) aggregate analyses of levels and rates that parallel the specifications used with the aggregated prison and hospitalization registers.

The individual level-analysis shows that the abortion policies in Romania had no significant impact on the individual propensity to be at risk of being part of the criminal population. Column (1) presents the baseline specification, which includes month of birth fixed effects and a linear trend in birth month. Column (2) controls for compositional changes using individual level controls (ethnicity, gender, county of birth dummies and whether the place of birth was urban or rural); again, such individual level controls were not possible in the earlier data sets, and allow for cleaner controls for compositional changes. Column (3) shows that our results hold when restricting the sample to individuals born just one year on each side of the reform. Columns (4) and (5) show the same specification as column (2) but separately for each of the two proxies of being at risk (risk 1 and risk 2). We note that just like in Table 3, the point estimates for our preferred specification (column 1) are small and, given our 95% confidence intervals, we cannot rule out an effect of the lifting of the abortion ban ranging from a 14.6% reduction to a 4.5% increase in the probability of being at risk of being in the criminal population as previously defined.

[27] The largest category is "common spaces of living" (about 48% or 9200 individuals in our sample born three years on each side of the two reforms) and includes prison, jail, pre-trial detention, penitentiaries, and correction centers. The second and the third most important categories include asylums, sanatoriums, and hospital homes (22.3%) and child protection institutions (18% or 3400 individuals). Other categories are school homes (8% or 1520 individuals), hospitals (3%) and emergency centers and night shelters (1.25%). Our results shown later are not sensitive to excluding some categories.

The aggregate analyses show that the lack of an effect for the individual-level analysis above is not purely driven by the specific outcome being studied or a specific sample of the population. For simplicity, we present here the baseline specifications (i.e. month of birth fixed effects and birth month linear trend) in columns (6) and (7) for the level or number of at risk individuals in each birth month cohort and share of at risk individuals, respectively. Column (8) expands the share at risk specification to control for the composition effects in a similar manner as our previous specifications. These results show, as was the case in the prison and hospitalization register data, significant effects on the number of individuals "at risk" for both the legalization and abolition of abortion, but no significant effects on the rates. Moreover, these results taken together with the individual-level analysis suggests the lack of an effect on prison and hospitalization rates is not simply driven by an aggregation of the data.

6. Discussion

Our main finding is that abortion policy in Romania has had a large and significant impact on the number of crimes and hospitalizations for crime-related behaviors. But this impact is proportionate to the change in the size of the population, such that there is no significant effect on crime or hospitalization rates. Moreover, this pattern of significant level but insignificant rate effects is seen across multiple crime outcomes and opposing reforms, increasing the external validity of these results. Thus, we find evidence consistent with abortion policy having large cohort size effects on crime but little evidence consistent with either a large unwantedness or selection effect (though point estimates suggest changes in crime of about 1% due to the selection effects of abortion policy, we cannot rule out changes of up to 10%).

One must naturally ask how the Romanian context compares to that of other countries in Western Europe and the US. The Romanian criminal justice system is not an outlier (see Aebi et al., 2015); the number of inmates per 100,000 inhabitants in 2015 was about 145 in Romania compared to an average of 133 in other European countries and as seen earlier, the age-crime profile in Romania is also similar to other countries. In terms of offense types, drug offenses are relatively low in Romania (4% vs. 20% in other Western European countries and the U.S.), while other offenses are more comparable (e.g. the share of the homicides and other types of thefts). Finally, similar to the US, Romanian prisons are overcrowded.

Why do we not find evidence consistent with these changes in abortion legislation impacting the crime rates of individuals directly affected by these reforms? The lack of such an effect is arguably particularly puzzling because previous work studying the Romanian context (Pop-Eleches (2006) and Mitrut and Wolff (2011)) has shown that abortion restrictions led to

worse health at birth, education and labor market outcomes.[28] One explanation is that even though there are significant effects of abortion policy on outcomes like education, the secondary effect on crime (i.e. through the education channel) is not large enough to be detected. Going back to the data used by Pop-Eleches (2006) for the 1966 abortion ban, the estimated impact of the abortion ban on education is an increase of about 0.2 years of schooling, when not accounting for selection and a decrease of 0.07 years of schooling when accounting for the selection of parents who give births. When we scale these results using estimates from the literature on the causal effect of education on crime from Sweden (Hjalmarsson et al., 2015), accounting for parental selection changes education of children by about 0.27 years of schooling, and this should be associated with roughly a 2% change in convictions, a 4% change in incarceration and a 2.5% change in violent crimes.[29] The corresponding effects based on estimates from the US by Lochner and Moretti (2004) imply changes in arrests of 2-3%.[30] We interpret these back of the envelope calculations as providing suggestive evidence that the implied impact on crime coming from the education channel is small.[31]

Next, we discuss possible explanations as to why we do not find evidence of an unwantedness effect in crime outcomes in our Romanian context. Donohue and Levitt's (2001) back of the envelope calculations imply that, in the US, 6% of the reduction in crimes could be due to this unwantedness channel. These calculations are based on estimates by Rasanen et al. (1999) that suggest that unwantedness at birth doubles an individual's likelihood of committing a crime. If we use the same assumptions as Donohue and Levitt (2001), including that 75% of unwanted births are aborted, the number of convicted individuals for violent crimes should have decreased in Romania after 1990 by 86, rather than our estimates of 34.83 in Panel B of Table 3. Similarly, if we focus on crime rates, the implied decrease in crime should be 0.00125, rather than the effect of 0.000296 estimated in Column 3 of Panel B of Table 2. For both of these outcomes and given the size of our standard errors, we can reject that the expected and estimated effects are the same.

[28] Mitrut and Wolff (2011) also show that the 1989 reform decreased the number of children abandoned, defined as children institutionalized (in orphanages, home hospitals, boarding school for children with no family) in 1994 with no contact with their families. While this was an imperfect measure of unwantedness, the share of children in state institutions in 1994 (abandoned and those institutionalized due to health problems) in the total births was not significantly different from zero around the 1989 reform cut-offs.

[29] Hjalmarsson et al (2015) find that an additional year of schooling reduces the chance of conviction by 8%, incarceration by 16% and a violent crime conviction by 10%.

[30] Lochner and Morretti (2004) estimate that, on average, a one year increase in high school education reduces the incarceration rate by 10-15%.

[31] These results also help explain why controlling for observable compositional effects does not affect our crime results.

Since our study should have been powered to detect the unwantedness effects mentioned in the literature, an alternative explanation could be that being unwanted at birth is less detrimental in Romania. During the communist period, Romania was still a fairly traditional society with the vast majority of children being born into intact families. As a result, the potential negative consequences of unwantedness might be mitigated by these societal norms. While our analysis does not allow us to rule out this possibility, a number of facts suggest that unwanted births were extremely costly to both parents and children. We previously discussed earlier work of the abortion ban on socio-economic outcomes (Pop-Eleches (2006) and Mitrut and Wolff (2011)). In addition, Romania's maternal mortality rate was by far the highest in Europe in the 1980's and was reduced between 1989-1990 from 159 to 83 per 100,000 birth (Hord et al., 1991), which suggests that in the absence of access to abortion and modern contraceptives, many women exposed themselves to risky and costly illegal abortions. Finally, after the fall of communism, the conditions of many of the unwanted children growing up in Romania's orphanages shocked the world. For all these reasons, one might expect to find a relationship between abortion and crime rates. That we do not find any effect is striking evidence to the contrary.

References

Aebi, M., M. Tiago, and C. Burkhardt (2015). Survey on Prison Populations (SPACE I – Prison Populations Survey 2014) Survey 2014. Council of Europe Annual Penal Statistics.

Angrist, Joshua, and William N. Evans. 1999. "Schooling and Labor Market Consequences of the 1970 State Abortion Reforms." In Research in Labor Economics, ed. Ronald Ehrenberg, 75–111. Westport, Conn.: JAI Press.

Charles, Kerwin K., and Melvin J. Stephens. 2006. "Abortion Legalization and Adolescent Substance Use." J. Law and Econ. 49 (October).

Chevalier, A., & Marie, O. 2017. "Economic uncertainty, parental selection, and children's educational outcomes." *Journal of Political Economy*, 125(2), 393-430.

Donohue, John, and Steven Levitt. 2001. "The Impact of Legalized Abortion on Crime." Quarterly Journal of Economics 116(2):379-420.

Donohue, John, and Steven Levitt. 2004. "Further Evidence that Legalized Abortion Lowered Crime: A Reply to Joyce." Journal of Human Resources. 39(1):29-49.

Donohue, John, and Steven Levitt. 2008. "Measurement Error, Legalized Abortion, and the Decline in Crime: A Response to Foote and Goetz." Quarterly Journal of Economics. 123(1):425-440.

Donohue, John, and Steven Levitt. 2019. "The Impact of Legalized Abortion on Crime Over the Last Two Decades." NBER Working Paper 25863.

Doyle, J.J. (2008) "Child Protection and Adult Crime: Using Investigator Assignment to Estimate Causal Effects of Foster Care," *Journal of Political Economy*, 116(4): 746-770.

Foote, Christopher, and Christopher F. Goetz; The Impact of Legalized Abortion on Crime: Comment, The Quarterly Journal of Economics, Volume 123, Issue 1, 1 February 2008, Pages 407–423,

Grossman, Michael, and Theodore J. Joyce. 1990. "Unobservables, Pregnancy Resolutions, and Birth Weight Production Functions in New York City." J.P.E. 98, no. 5, pt. 1 (October): 983–1007.

Gruber, Jonathan, Phillip B. Levine, and Douglas Staiger. 1999. "Abortion Legalization and Child Living Circumstances: Who Is the 'Marginal Child'?" Q.J.E. 114 (February): 263–91.

Hjalmarsson, Randi, Helena Holmlund, and Matthew Lindquist (2015) "The Effect of Education on Criminal Convictions and Incarceration: Causal Evidence from Micro-data", *The Economic Journal*, 125: 1290-1326.

Hord, Charlotte, Henry P. David, France Donnay, and Merrill Wolf. 1991. "Reproductive Health in Romania: Reversing the Ceausescu Legacy." Studies in Family Planning 22(4): 231-40

Joyce, Theodore J. 1987. "The Impact of Induced Abortion on Black and White Birth Outcomes in the U.S.," Demography, 24(2): 229-244.

Joyce, Theodore. 2004. “Did Legalized Abortion Lower Crime?” Journal of Human Resources. 39(1):1-28.

Joyce, Theodore, 2009. "A Simple Test of Abortion and Crime," The Review of Economics and Statistics, MIT Press, vol. 91(1), pages 112-123, 08.

Joyce, Ted. 2010. “Abortion and Crime: A Review. In The Handbook of the Economics of Crime. Bruce Benson and Paul Zimmerman, eds. (New York: Edward Elgar) pp. 452-487.

Kahane, Leo, Paton, David, and Rob Simmons. 2008. “The Abortion-Crime Link: Evidence from England and Wales.” Economica 75(297):1-21.

Levine, Phillip, Douglas Staiger, Thomas Kane, and David Zimmerman (1999) “*Roe v Wade* and American Fertility,” *American Journal of Public Health*, 89: 199-203.

Lochner, Lance, and Enrico Moretti (2004) “The Effect of Education on Crime: Evidence from Prison Inmates, Arrests and Self-Reports”, *American Economic Review*, 94(1): 155-189.

Machin, Stephen, Olivier Marie, and Suncica Vujic (2011) “The Crime Reducing Effect of Education”, *The Economic Journal*, 121(552): 463-484.

Malamud, Ofer, Cristian Pop-Eleches and Miguel Urquiola (2016) "Interactions Between Family and School Environments: Evidence on Dynamic Complementarities?," NBER Working Paper 22112

Mitrut, Andreea and François-Charles Wolff (2011) “The Impact of Legalized Abortion on Child Health Outcomes and Abandonment. Evidence from Romania”, Journal of Health Economics, 30(6), 1219-1231.

National Institute of Statistics/NIS [Romania] (2005). Anuarul demografic al României [Romanian demographic yearbook]. Bucharest: NIS.

Piquero, Alex R., David P. Farrington, Jonathan P. Shepherd, and Katherine Auty. 2014. "Offending and Early Death in the Cambridge Study in Delinquent Development." Justice Quarterly 3 1(3):445-72.

Pop-Eleches, Cristian. 2006. “The Impact of an Abortion Ban on Socioeconomic Outcomes of Children: Evidence from Romania. Journal of Political Economy 114(4):744-773.

Pop-Eleches, Cristian. 2010. "The Supply of Birth Control Methods, Education and Fertility: Evidence from Romania", Journal of Human Resources 45(4): 971-997

Rasanen, Pijkko, Hakko H, Isohanni M, Hodgins S, Järvelin MR, Tiihonen J. 1999. “Maternal Smoking during Pregnancy and Risk of Criminal Behavior among Adult Male Offspring in the Northern Finland 1966 Birth Cohort,” American Journal of Psychiatry, CLVI, 857–862.

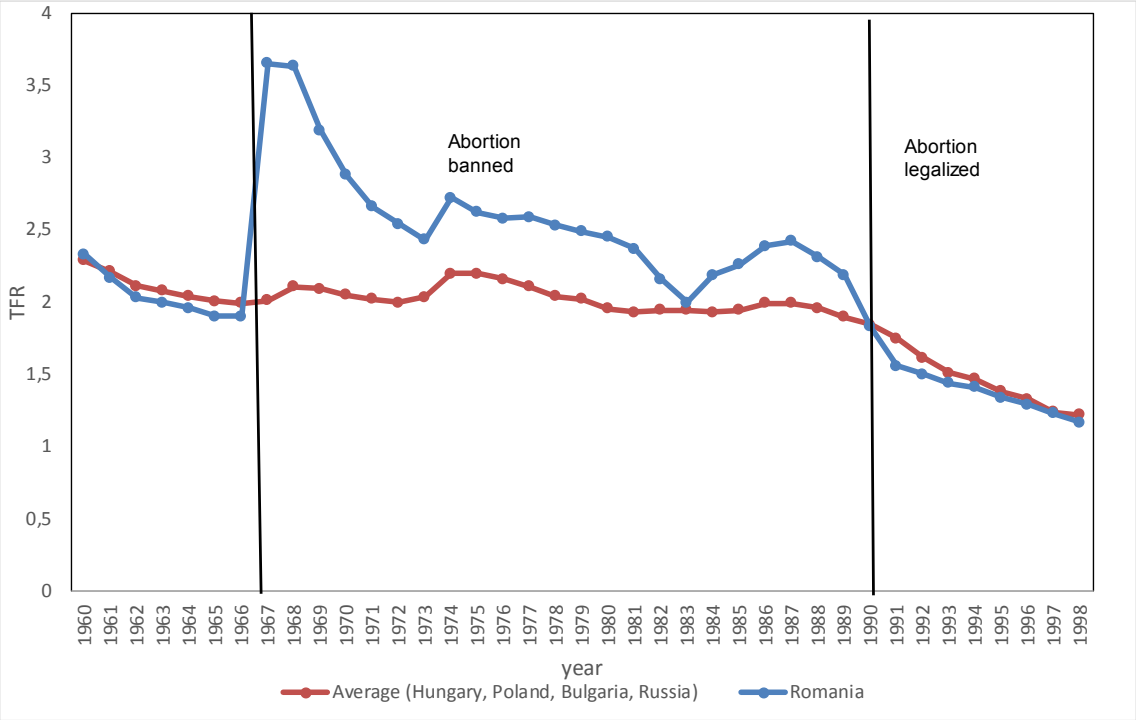
Sailas, Eila, Benjamin Feodoroff, Nina Lindberg, Matti Virkkunen, Reijo Sund, Kristian Wahlbeck (2005) ”The Mortality of young offenders sentenced to prison and its association

with psychiatric disorders: a register study" European Journal of Public Health, 16(2): 193-197.

Sen, Anindya. 2007. "Does Increased Abortion Lead to Lower Crime? Evaluating the Relationship between Crime, Abortion and Fertility." The B.E. Journal of Economic Analysis & Policy 7(1):1-36.

Serbanescu, F., Morris, L., Stupp, P., Stanescu, A., 1995. "The impact of recent policy changes on fertility, abortion and contraceptives in Romania." Studies in Family Planning 26 (2), 76-87.

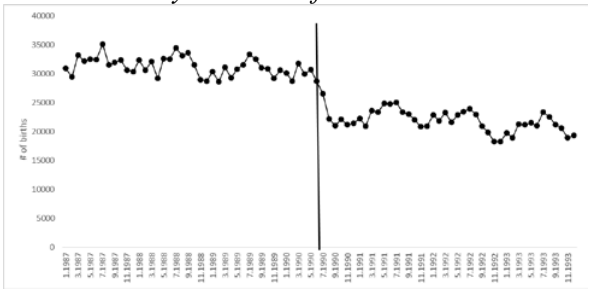
Figure 1. Total Fertility Rates: Romania vs. other ex-communist countries



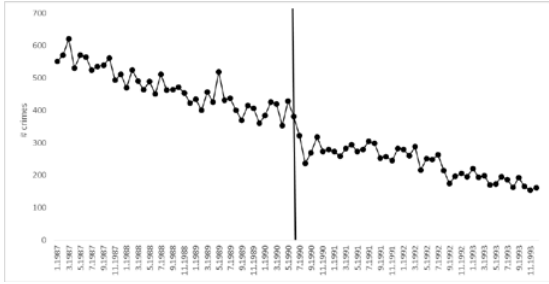
Note: Total Fertility Rates (TFR) for Romania and the average of some of the countries in the Communist Bloc: Hungary, Poland, Bulgaria and Russia. TFR is the average total number of children that would be born per woman in her lifetime, assuming no mortality in the childbearing ages, calculated from the age distribution and age-specific fertility rates of a specified group in a given reference period. *Source*: United Nations Statistics.

Figure 2. The 1989 Legalization of Abortion: Number of Births, Crime Levels and Crime Shares by Crime Type

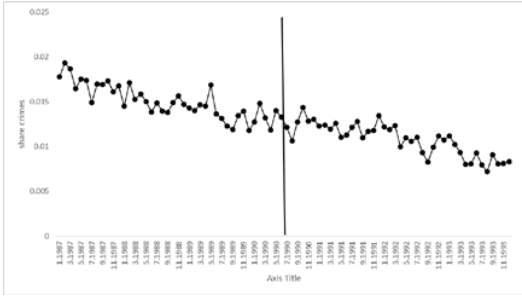
Panel A. Monthly Number of Births



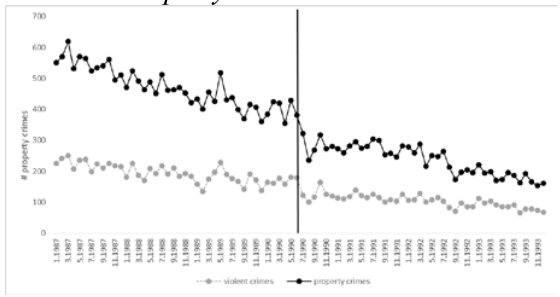
Panel B. Overall Crime Levels



Panel C. Overall Crime Shares



Panel D. Property and Violent Crime Levels

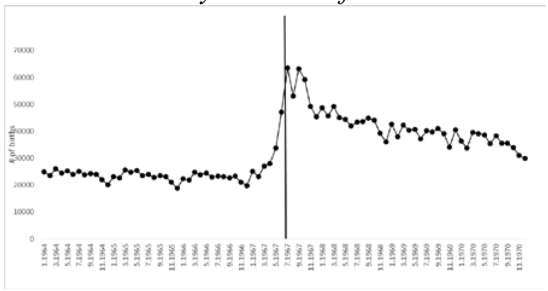


Panel E. Property and Violent Crime Shares

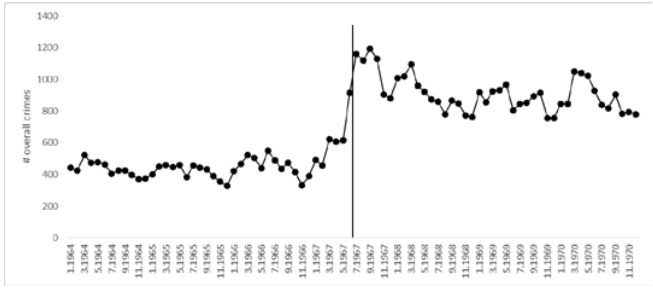
Note: This figure shows the effect of the 1989 legalization of abortion on the monthly # of births (Panel A), # of convictions - overall (Panel B), share of convicted individuals overall (Panel C), and # and share of convictions by crime type (Panels D and E). The solid black line is for property offenses and the dashed grey line for violent crimes. The Y-axis indicates the # or the share convicted, while the X-axis indicates the month and year of birth for the individuals born between January 1987 and December 1993 (i.e. 3 and a half years on either side of the reform July 1990) and observed in the crime registers from 1997 to September 2017. No age restrictions are imposed on the crime measures. Data sources: Statistics Romania (birth data) and the National Penitentiary Administration (crime registers).

Figure 3. The 1966 Abolition of Abortion: Number of Births, Crime Levels and Crime Shares by Crime Type

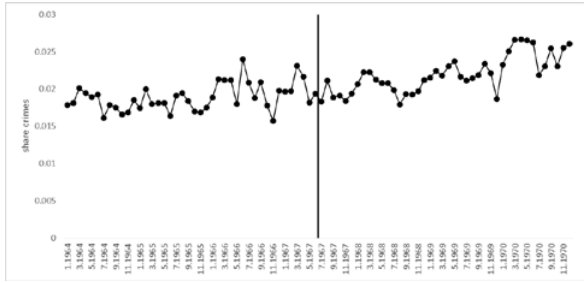
Panel A. Monthly Number of Births



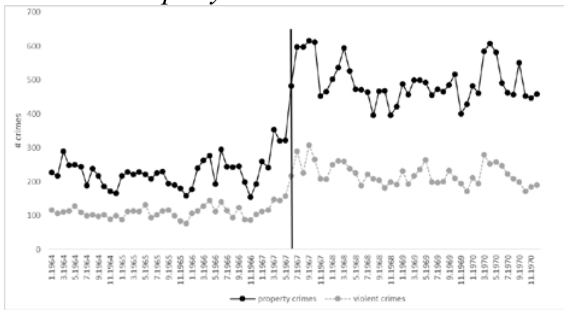
Panel B. Overall Crime Levels



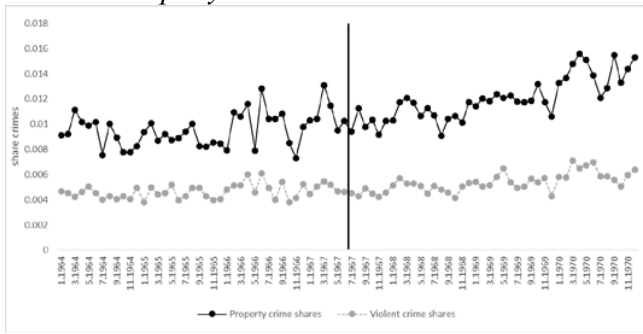
Panel C. Overall Crime Shares



Panel D. Property and Violent Crime Levels



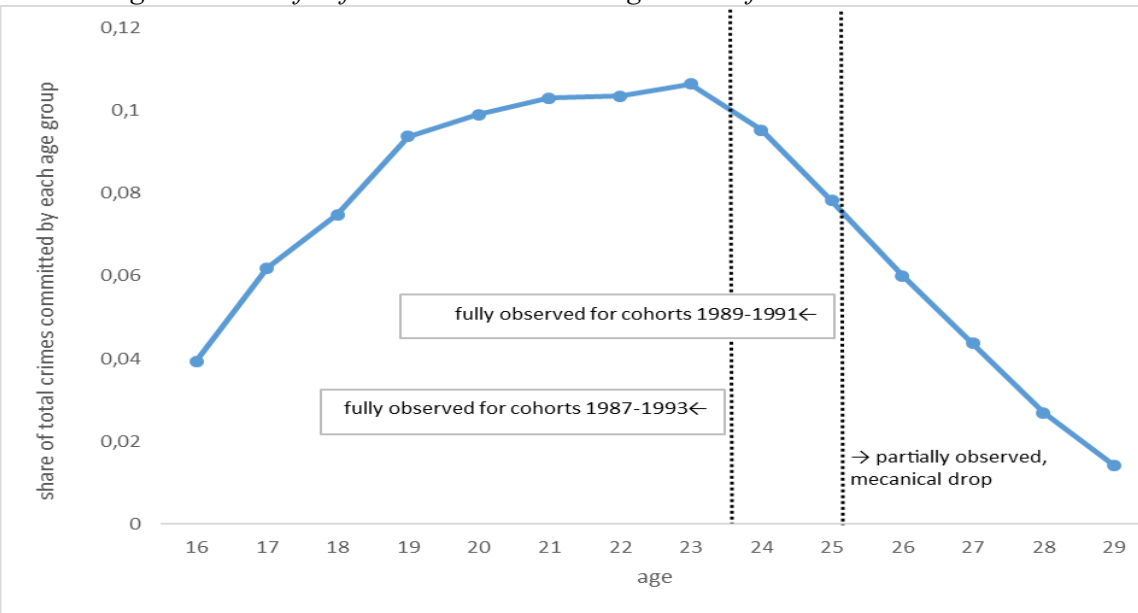
Panel E. Property and Violent Crime Shares



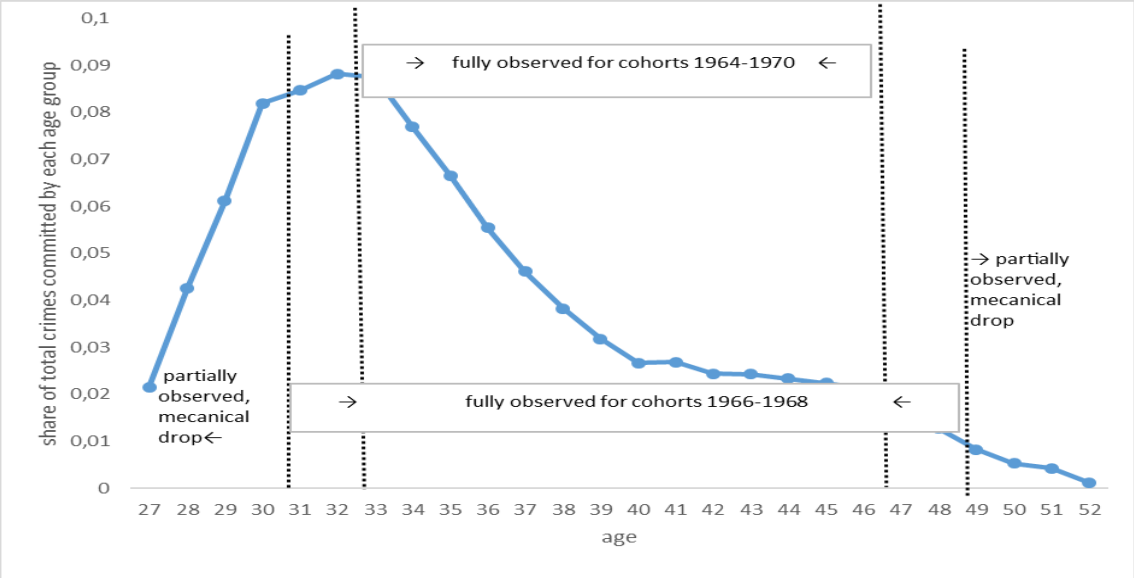
Note: This figure shows the effect of the 1966 abortion ban on the monthly # of births (Panel A), # of convictions - overall (Panel B), share of convicted individuals overall (Panel C), and # and share of convictions by crime type (Panels D and E). The Y-axis indicates the # or the share convicted, while the X-axis indicates the month and year of birth for the individuals born between January 1964 and December 1970 (i.e. 3 and a half years on either side of the reform June 1967) and observed in the crime registers from 1997 to September 2017. No age restrictions are imposed on the crime measures. Property and violent crimes are defined in the text. Data sources: The Romanian Demographic Year Book (2005) (birth data) and the National Penitentiary Administration (crime registers).

Figure 4. Age Crime Profiles

Panel A: Age-Crime Profile for Cohorts Surrounding 1989 Reform



Panel B: Age-Crime Profile for Cohorts Surrounding 1966 Reform



Note – Age-crime profile for the cohorts born 1987-1993 (Panel A) and 1964-1970 (Panel B). The crime registers include all individuals arrested and convicted between January 1997 and September 2017; this means that crimes are observed at different ages for each of our cohort in an unbalanced way. In *Panel A* we show the share of total crimes committed by each age; for these individuals we observe their criminal records before the age of 30 (more precise before 29 years and 9 months) for the oldest cohort but we do observe the full age crime profile before the ages of 23 and 9 months and 25 and 9 months, when we keep 3.5 and 1.5 years on either side of the reform, respectively. Thus, for our main working cohorts (1989-1991) we observe the full profile before age 26. In *Panel B* (for the 1966 reform) we observe the cohorts when they are older. For all individuals we observe convictions between approximate ages of 33 and 47, while for the main analysis sample (1966-1968) we observe convictions between approximate ages 31 and 49. *Source*: The National Penitentiary Administration (crime registers).

Table 1. Summary Statistics 1989 Reform

	Full sample: Individuals born 1987-1993		*Working sample: All individuals born 1989-1991*	
	Mean	S.D.	Mean	S.D.
I. Imprisonment registers (1997-2017)				
# of charges per case	1.815	1.583	1.835	1.636
Sentence length (in days)**	2461.156	3202.989	2488.091	3200.297
Age when convicted	21.976	3.461	21.878	3.143
Age when arrested	21.915	3.473	21.820	3.154
Juvenile arrested (<18)	0.150	0.357	0.136	0.343
Recidivist	0.471	0.499	0.453	0.497
Violent	0.421	0.493	0.420	0.493
Property	0.484	0.499	0.482	0.499
Other	0.196	0.397	0.201	0.400
Male	0.963	0.186	0.964	0.184
Total number of 'cases'**	29,670		12,456	
II. In-patient registers (2007-2017)				
Hospitalization length (in days)	5.693	12.683	5.640	10.387
Age when hopsitalized	21.867	3.799	21.662	3.354
Cause of hospitalization:				
Mental and Behavioural Disorders	0.043	0.203	0.041	0.197
Risky behaviour	0.096	0.295	0.104	0.305
Male	0.288	0.453	0.285	0.451
Total # of hospitalizations***	2,726,620		1,170,338	
III. 2011 Census				
'At Risk' for Crime	0.003397	0.05795	0.02241	0.05653
Risk measure 1	0.002868	0.05347	0.00274	0.05228
Risk measure 2	0.000502	0.02240	0.00047	0.02158
Total # of individuals	2,104,824		999,862	

Note – Panel I: The crime registers include all criminal convictions that result in time served in prison from January 1997 to September 2017. **The data is organized such each individual can have more than one case, and each case can include multiple charges. *Property* and *violent* crimes are defined as follows. Violent crimes cover categories: 174-192 from the penal code (CP) and the new penal code (NCP/L286), 193-200 (NCP) and codes 233, 234, 236 (NCP), 267 (CP), 287 (NCP), 335, 336 (CP), 401, 402 (NCP), and 438-445 (NCP). The most common violent crimes were: robbery, murder, rape, and premeditated murder. Property crimes include premeditated theft (CP209, 209CP) – with over 85% of all property crimes for individuals born around both reforms, followed by trespassing (192CP), theft (208CP), and stealing (229 NCP). *Other* refers to crimes that are not violent or property. Panel II: The inpatient registers include all hospitalizations in Romania from January 2007 to December 2017. Mental and Behavioural Disorder hospitalizations have the following ICD-10 codes: F30-F39 (*Mood [affective] disorders including depressive episodes and bipolar affective disorder*), F20-F29 (*Schizophrenia, schizotypal and delusional disorders*), F10-F19 (*Mental and behavioural disorders due to psychoactive substance use (alcohol, drugs, substances)*), F00-F09 (*Organic, including symptomatic, mental disorders*), and F70-F79 (*Mental retardation*). The *Risky behavior* indicator captures: ICD-10 code U50-Y98 "*External causes of morbidity and mortality*" – almost exclusively transport related accidents, "*Injury, poisoning and certain other consequences of external causes*" (ICD-10 codes S00-T98) which is primarily (85%) *Injuries* (Codes S), and *Poisoning and certain other consequences of external causes* (T15-T98).***Same individual can have multiple hospitalizations, but cannot be matched over time. Our main working sample consist of all individuals born between 1989-1991, while the full sample (used in some robustness) includes all individuals born 1987-1993. Panel III: Our *risk* measure =1 if the individual is: (i) institutionalized at the time of the census in one of the following types of institutions: prison, jail, juvenile detention centers, orphanages, asylum, sanatorium, hospital homes and hospitals, and emergency centers and night shelters (risk 1 measure) or (ii) reported as not living in the household for at least the last 12-months for a reason other than education, working or family reasons, e.g. being detained (risk 2 measure). *Data sources*: The Romanian National Penitentiary Administration (Panel I), the Romanian National Inpatient Registers (Panel II) and the 2011 Romanian Census (Panel III).

Table 2. Summary Statistics 1966 Reform

	Full sample: All individuals born 1964-1970		*Working sample: All individuals born 1966-1968*	
	Mean	S.D.	Mean	S.D.
I. Imprisonment registers				
# of charges per case	2.351	2.162	1.476	1.167
Sentence length (in days)**	2174.263	3506.166	2187.882	3444.293
Age when convicted	34.700	6.074	35.094	5.923
Age when arrested	34.623	6.051	35.021	5.847
Recidivist	0.687	0.462	0.684	0.464
Type of crimes:				
Violent	0.243	0.429	0.242	0.428
Property	0.531	0.499	0.523	0.499
Other	0.281	0.451	0.292	0.454
Total # of 'cases'**	57.616		26.313	
II. In-patient registers (2007-2017)				
Hospitalization length (in days)	8.467	35.772	8.449	33.589
Age when hopsitalized	44.774	3.810	44.670	3.345
Cause of hospitalization:				
Mental and Behavioural Disorders	0.111	0.313	0.111	0.313
Risky behaviour	0.069	0.254	0.069	0.255
Male	0.468	0.499	0.472	0.499
Total # of hospitalizations***	2,726,620		1,170,338	
III. 2011 Census				
'At Risk' for Crime	0.007559	0.08661	0.00757	0.08668
Risk measure 1	0.006812	0.08225	0.00681	0.08225
Risk measure 2	0.000774	0.02733	0.00076	0.02755
Total # of individuals****	1,920,102		840,180	

Note – Panel I: The crime registers include all criminal convictions that result in time served in prison from January 1997 to September 2017. **The data is organized such each individual can have more than one case, and each case can include multiple charges. Violent crimes cover categories: 174-192 from the penal code (CP) and the new penal code (NCP/L286), 193-200 (NCP) and codes 233, 234, 236 (NCP), 267 (CP), 287 (NCP), 335, 336 (CP), 401, 402 (NCP), and 438-445 (NCP). The most common violent crimes were: robbery, murder, rape, and premeditated murder. Property crimes include premeditated theft (CP209, 209CP) – with over 85% of all property crimes for individuals born around both reforms, followed by trespassing (192CP), theft (208CP), and stealing (229 NCP). *Other* refers to crimes that are not violent or property. Gender information is not available. Panel II: The inpatient registers include all hospitalizations in Romania from January 2007 to December 2017. Mental and Behavioural Disorder hospitalizations have the following ICD-10 codes: F30-F39 (*Mood [affective] disorders including depressive episodes and bipolar affective disorder*), F20-F29 (*Schizophrenia, schizotypal and delusional disorders*), F10-F19 (*Mental and behavioural disorders due to psychoactive substance use (alcohol, drugs, substances)*), F00-F09 (*Organic, including symptomatic, mental disorders*), and F70-F79 (*Mental retardation*). The *Risky behavior* indicator captures: ICD-10 code U50-Y98 "*External causes of morbidity and mortality*" – almost exclusively transport related accidents, "*Injury, poisoning and certain other consequences of external causes*" (ICD-10 codes S00-T98) which is primarily (85%) *Injuries* (Codes S), and *Poisoning and certain other consequences of external causes* (T15-T98).***Same individual can have multiple hospitalizations, but cannot be matched over time. Our main working sample consist of all individuals born between 1966-1968, while the full sample (used in some robustness) includes all individuals born1964-1970. Panel III: Our *risk* measure =1 if the individual is: (i) institutionalized at the time of the census in one of the following types of institutions: prison, jail, juvenile detention centers, orphanages, asylum, sanatorium, hospital homes and hospitals, and emergency centers and night shelters (the risk 1 measure) or (ii) reported as not living in the household for at least the last 12-months for a reason other than education, working or family reasons, e.g. being detained (the risk 2 measure). *Data sources*: The Romanian National Penitentiary Administration (Panel I), the Romanian National Inpatient Registers (Panel II) and the 2011 Romanian Census (Panel III).

Table 3. The Impact of the 1989 Legalization of Abortion on Crime.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variable:						
	# births	# Convicted Individuals	Share Convicted Individuals				
Panel A. Any Crime							
	-7,699	-91.33	0.000179	0.000179	0.000103	0.000135	0.000299
	(770.0)	(19.13)	(0.000746)	(0.000762)	(0.000675)	(0.000501)	(0.00133)
	30535.56	*414.0556*	*0.0135721*	*0.0135721*	*0.011402*	*0.0092236*	*0.0135721*
Panel B. Violent Crime							
	-7,699	-34.83	0.000296	0.000296	0.000425	0.000312	0.000607
	(770.0)	(11.19)	(0.000493)	(0.000480)	(0.000476)	(0.000359)	(0.000782)
	30535.56	*171.7778*	*0.0056295*	*0.0056295*	*0.0049472*	*0.0042213*	*0.0056295*
Panel C. Property Crime							
	-7,699	-50.42	-0.000217	-0.000217	-0.000355	0.000135	-0.000263
	(770.0)	(12.92)	(0.000471)	(0.000482)	(0.000435)	(0.000501)	(0.000834)
	30535.56	*199.0556*	*0.0065288*	*0.0065288*	*0.005844*	*0.0092236*	*0.0065288*
Month of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth Month Linear Trend	Yes	Yes	Yes	No	Yes	Yes	Yes
Birth Year Dummies	No	No	No	Yes	No	Yes	No
Composition Controls	No	No	No	No	No	No	Yes
Sample Birth Months	Jan '89 - Dec '91	Jan '89 - Dec '91	Jan '89 - Dec '91	Jan '89 - Dec '91	Jan '89 - Dec '91	Jan '87 - Dec '93	Jan '89 - Dec '91
Outcome restriction	No	No	No	No	conv. before age 26	conv. before age 24	No

Note -- This table estimates the effect of the 1989 legalization of abortion on the number of births, number of convictions (overall and by crime type) and share convicted. The baseline results with birth month fixed effects and a month of birth linear trend are in columns (1) - (3), while robustness and sensitivity checks are presented for the main variable of interest (the share convicted) in columns (4) - (7). Unless otherwise noted, the analysis sample is individuals born from January 1989 to December 1991, i.e. individuals 1.5 years on either side of the reform. This is extended on both sides in column (6). The dependent variable is the number of convictions observed in the crime register from 1997 to September 2017. Column (5) assesses the sensitivity of the results to censoring in this data, as the youngest cohorts are only observed until age 25. Column (7) includes controls for potential compositional effects: averages of ethnicity and the parents' education (gymnasium, secondary, university) and years of birth observed at the 1992 Census. Standard errors in parentheses. Property and violent crimes are defined in the text. Data sources: The Romanian Demographic Year Book (2005) (birth data) and the National Penitentiary Administration (crime registers). Pre-treatment means in italics.

Table 4. The Effect of the 1989 Reform on Preventative Detention

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variable:						
	# births	# preventative detention	Share in Preventative Detention				
	-7,699	-41.08	-0.000323	-0.000323	-0.000422	-0.000184	-0.0000725
	(770.0)	(8.273)	(0.000308)	(0.000312)	(0.000247)	(0.000230)	(0.000259)
	30535.56	*131.3333*	*0.0042991*	*0.0042991*	*0.0035896*	*0.0027723*	*0.0042991*
Month of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth Month Linear Trend	Yes	Yes	Yes	No	Yes	Yes	Yes
Birth Year Dummies	No	No	No	Yes	No	Yes	No
Composition Controls	No	No	No	No	No	No	Yes
Sample Birth Months	Jan '89 - Dec '91	Jan '89 - Dec '91	Jan '89 - Dec '91	Jan '89 - Dec '91	Jan '89 - Dec '91 conv. before age	Jan '87 - Dec '93 conv. before age	Jan '89 - Dec '91
Outcome restriction	No	No	No	No	26	24	No

Note -- This table estimates the effect of the 1989 legalization of abortion on the number of births, number in preventative detention and share in preventative detention. The baseline results with birth month fixed effects and a month of birth linear trend are in columns (1) - (3), while robustness and sensitivity checks are presented for the main variable of interest (the share convicted) in columns (4) - (7). Unless otherwise noted, the analysis sample is individuals born 1989-1991, i.e. individuals 1.5 years on either side of the reform. This is extended on both sides in column (6). The dependent variable is the number of individuals in preventative detention observed in the crime register from 1997 to September 2017. Column (5) assesses the sensitivity of the results to censoring in this data, as the youngest cohorts are only observed until age 26 (25 and 9 months). Column (7) includes controls for potential compositional effects: averages of ethnicity and the parents' education (gymnasium, secondary, university) and years of birth observed at the 1992 Census. Data sources: The Romanian Demographic Year Book (2005) (birth data) and the National Penitentiary Administration (crime registers). Standard errors in parentheses. Pre-treatment means in italics.

Table 5. The Impact of the 1966 Abortion Abolition on Crime

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variable:						
	# births	# Convicted Individuals	Share Convicted Individuals				
Panel A. Any Crime							
	32,355	628	-0.000292	-0.000161	-0.000496	0.000099	-0.00560
	(4,625)	(83.54)	(0.000989)	(0.000936)	(0.000852)	(0.000552)	(0.00323)
	24161.59	*484.58*	*0.0200384*	*0.0200384*	*0.0179155*	*0.012132*	*0.0200384*
Panel B. Violent Crime							
	32,355	148	-0.000111	-0.000219	-0.000120	-0.000151	-0.00151
	(4,625)	(20.60)	(0.000295)	(0.000252)	(0.000197)	(0.000166)	(0.000909)
	24161.59	*119.4706*	*0.0049452*	*0.0049452*	*0.0038628*	*0.0026682*	*0.0049452*
Panel C. Property Crime	32,355	315.3	-0.000600	-0.000633	-0.000659	0.0000734	-0.00362
	(4,625)	(47.54)	(0.000667)	(0.000667)	(0.000636)	(0.000326)	(0.00226)
	24161.59	*248.0588*	*0.0102284*	*0.0102284*	*0.009542*	*0.0061365*	*0.0102284*
Month of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth Month Linear Trend	Yes	Yes	Yes	No	Yes	Yes	Yes
Birth Year Dummies	No	No	No	Yes	No	Yes	No
Composition Controls	No	No	No	No	No	No	Yes
Sample Birth Months	Jan '66 - Dec '68	Jan '66 - Dec '68	Jan '66 - Dec '68	Jan '66 - Dec '68	Jan '66 - Dec '68	Jan '64 - Dec '70	Jan '66 - Dec '68
Outcome restriction	No	No	No	No	conv. from 31 to 49	conv. from 33 to 47	No

Note -- This table estimates the effect of the 1966 abolition of abortion on the number of births, number of convictions (overall and by crime type) and share convicted. The baseline results with birth month fixed effects and a month of birth linear trend are in columns (1) - (3), while robustness and sensitivity checks are presented for the main variable of interest (the share convicted) in columns (4) - (7). Unless otherwise noted, the analysis sample is individuals born from January 1966 to December 1968 i.e. individuals 1.5 years on either side of the reform. This is extended on both sides in column (6). The dependent variable is the number of convictions observed in the crime register from 1997 to September 2017. Column (5) assesses the sensitivity of the results to censoring in this data, as the youngest cohorts are only observed until age 48 Column (7) includes controls for potential compositional effects: averages of ethnicity and the parents' education (gymnasium, secondary, university) and years of birth observed at the 1977 Census. Standard errors in parentheses. Property and violent crimes are defined in the text. Data sources: The Romanian Demographic Year Book (2005) (birth data) and the National Penitentiary Administration (crime registers). Significance noted by *** 1%, ** 5%, and * 10%. Pre-treatment means in italics.

Table 6. The Impact of the 1989 Legalization and 1966 Abolition of Abortion on Mental Health and Risky Behavior Hospitalizations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Dependent Variable: # and Share of hospitalizations for Mental Disorder and Risky Behavior											
	# mental disorder	Share mental disorder					# risky behavior	Share risky behavior				
Panel A. 1989 Legalization (Baseline sample months January 1989- December 1991)												
	-454.4	-0.003557	-0.00146	-0.000932	0.000945	-0.00686	-847.3	-0.001684	-0.001684	0.00119	-0.0059	-0.00522
	(105.4)	(0.003880)	(0.00378)	(0.00296)	(0.00132)	(0.00647)	(427.0)	(0.01336)	(0.007076)	(0.0113)	(0.00220)	(0.0103)
	1495.222	*0.0490112*	*0.0490112*	*0.0333912*	*0.0165596*	*0.0490112*	*4453.056*	*0.1457351*	*0.1457351*	*0.1134897*	*0.054038*	*0.1457351*
Panel B. 1966 Abolition (Baseline sample months January 1966- December 1968												
	4,892	0.00476	0.00511	0.00545	0.00304	-0.00864	2,978	0.00166	0.00207	0.00148	0.000357	-0.00479
	(702.1)	(0.00585)	(0.00567)	(0.00430)	(0.00183)	(0.0141)	(413.0)	(0.00476)	(0.00511)	(0.00367)	(0.00160)	(0.0123)
	2628.966	*0.0962198*	*0.0962198*	*0.099211*	*0.061592*	*0.096219*	*2917.154*	*0.1054467*	*0.1054467*	*0.061046*	*0.0375453*	*0.105446*
Birth Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth Month Linear Trend	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Birth Year FE	No	No	Yes	No	Yes	No	No	No	Yes	No	Yes	No
Composition Controls	No	No	No	No	No	Yes	No	No	No	No	No	Yes
Extended Sample	No	No	No	No	Yes	No	No	No	No	No	Yes	No
Age restrictions for outcome variable:	No	No	No	Panel A: 18-26 Panel B: 41-49	Panel A: 20-24 Panel B: 43-47	No	No	No	No	Panel A: 18-26 Panel B: 41-49	Panel A: 20-24 Panel B: 43-47	No

Note -This table presents the effect of the 1989 legalization of abortion (Panel A) and the 1966 abolition of abortion (Panel B) on hospitalizations for mental disorders or risky behavior. Mental disorders are defined to include all hospitalization with the ICD-10 codes F "Mental and Behavioral Health" and risky behaviors include "External causes of morbidity and mortality" (ICD-10 codes U50-Y98) and "Injury, poisoning and certain other consequences of external causes" (ICD-10 codes S00-T98). The baseline results are in columns (1) - (2) and (7) - (8). Columns (3) and (9) replace the linear month of birth trend with year dummies, columns (4) and (10) we restrict the sample to individuals during the same age of hospitalization , while columns (5) and (11) extend the sample years from 1.5 around each reform in baseline to 3 years around each reform; finally, columns (6) and (12) assess robustness to controls for compositional effects: averages of ethnicity and the parents' education (gymnasium, secondary, university) and years of birth observed at the 1977 and 1992 Census (for the 1966 and 1989 reforms, respectively). Data sources: the National Inpatient Registers. Standard errors in parentheses. Pre-treatment means in italics.

Table 7. The Impact of the 1989 Legalization and 1966 Abolition on Individual's Probability of Being 'At Risk' for Crime

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable:							
	Propensity to be at risk of being part of the criminal population					# at risk individuals	Share population at risk (at October 2011 Census)	
Panel A. 1989 Legalization (Baseline sample months January 1989- December 1991)								
	-0.000382	-0.000396	0.00567	-0.000387	0.0000052	-59.25***	-0.000440	-0.000101
	(0.000362)	(0.000355)	(0.00669)	(0.000320)	(0.000121)	(9.253)	(0.000373)	(0.000430)
	0.0075533	*0.0075533*	*0.0074164*	*0.0067176*	*0. 0008357*	*195.8333*	*0.0064264*	*0.0064264*
	[840,180]	[840,180]	[562,684]	[840,180]	[840,180]			
Panel B. 1966 Abolition (Baseline sample months January 1966- December 1968								
	-0.000194	-0.000176	-0.000128	-0.000153	0.0000234	75.08***	-0.000114	-0.000075
	(0.000286)	(0.000253)	(0.000152)	(0.000229)	(0.000097)	(13.31)	(0.000241)	(0.000288)
	0.0033292	*0.0033292*	*0.0033457*	*0.0028701*	*0.0004591*	*61*	*0.0025154*	*0.0025154*
	[999,862]	[999,862]	[691,217]	[999,862]	[999,862]			
Type of Analysis	Individual	Individual	Individual	Individual	Individual	Aggregate	Aggregate	Aggregate
Risk Measure (1, 2, or both)	Both	Both	Both	1	2	Both	Both	Both
Month of Birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth Month Linear Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Composition Controls	No	Yes	Yes	Yes	Yes	No	No	Yes
Sample window	3 years	3 years	2 years	3 years	3 years	3 years	3 years	3 years

Note -This table presents the effect of the 1989 legalization of abortion (Panel A) and the 1966 abolition of abortion (Panel B) on the individual propensity to be 'at risk' of being part of this criminal population (columns 1-5). Our *risk* measure is an indicator of whether the individual is: (i) institutionalized at the time of the census in one of the following types of institutions: prison, jail, juvenile detention centers, orphanages, asylum, sanatorium, hospital homes and hospitals, and emergency centers and night shelters (the risk 1 measure) or (ii) reported as not living in the household for at least the last 12-months (but living in Romania) for a reason other than education, working or family reasons, e.g. being detained (the risk 2 measure). Composition controls in column (2) include exogenous variables such as gender, ethnicity, 42 county of birth indicators and whether the person was born in a rural or urban area. Finally, we show aggregate level analysis similar to our previous tables, for the number of individuals at risk in October 2011 (column 6) and share at risk, in the baseline specification with birth month fixed effects and a month of birth linear trend (column 7) and with controls for potential compositional effects (averages of ethnicity, gender, place of birth and counties of birth as observed at the October 2011 census). Standard errors in parentheses (clustered at the county of birth in columns 1-5). Significance noted by *** 1%, ** 5%, and * 10%. Pre-treatment means in italics. Sample sizes in brackets for the individual level analyses.