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The Impact of Legalized Abortion on Child Health Outcomes and Abandonment. Evidence from Romania[#]

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Abstract: We use household survey data and a unique census of institutionalized children to analyze the impact of abortion legalization in Romania. More exactly, we exploit the lift of the abortion ban in December 1989, when communist dictator Ceausescu and his regime were removed from power, to understand its impact on children's health at birth and during early childhood. Also, we try to understand whether the lift of the ban had an immediate impact on child abandonment. Our study suggests a positive, albeit modest, effect of abortion legalization on children's health at birth, while we do not find any significant effect on their health outcomes when measured by standard anthropometric z-scores at age 4 and 5. With respect to the permanently institutionalized (i.e., abandoned children), our findings suggest that abortion legalization had no immediate effect on child abandonment.

Keywords: abortion; health; anthropometric outcomes; child abandonment; Romania

JEL classification: I12, J13

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1. Introduction

Abortion legalization is, by far, one of the most controversial public policies around the world. Using the 1973 Roe v. Wade Supreme Court decision to legalize abortion in the US, an increasing number of studies have examined the characteristics of cohorts born before and after this policy came into effect. The main conclusion is that abortion availability has, on average, improved the socio-economic outcomes of the cohorts of children born after the change.[1]

Apart from the studies on the US, there is very limited evidence on a causal link between access to abortion and socio-economic outcomes of children. One exception is Pop-Eleches (2006), who finds that children born immediately after abortion became illegal in Romania display worse educational and labor market outcomes later on in life than do children born prior to this policy change.[2] Starting in 1966, Romanian communist authorities drastically restricted abortion and made family planning illegal. This was one of the most restrictive anti-abortion laws and one of the toughest in the world.[3] Abortion and family planning remained illegal until December 1989 when the communist dictator Nicolae Ceasusescu was killed and his regime was removed from power.

In this paper, we use the lift of the abortion ban in Romania in December 1989 to study the causal impact of abortion legalization on children's health status. Our main outcome of interest is health at birth measured by children's birth weights. Additionally, we examine the impact of the abortion legalization on early childhood malnutrition and stunting measured by height-for-age and weight-for-height z-scores. Understanding health outcomes early in life is crucial since poor health at birth (typically observed as low birth weight) and/or during early childhood (typically measured by anthropometric z-scores) has, on average, adverse long-term consequences such as poor school performance and lower labor market achievements in adults life (Case et al., 2002, 2005; Smith, 1998, 2009).

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[1] In particular, they are less likely to be living with a single parent or in poverty (Gruber et al., 1999), less likely to commit crimes (Donohue and Levitt, 2001, 2004), less likely to use controlled substances as teens (Charles and Stephens, 2006) and they have lower teen childbirth and out-of-wedlock childbearing rates (Angrist and Evans, 1999). Some of these findings remain somewhat controversial. For instance, Foote and Goetz (2008) recently casted doubt on the relevance of the causal link suggested by Donohue and Levitt (2001) between legalization of abortion and the decline in crime during the 1990s in the US.

[2] Additionally, Pop-Eleches (2006) provides evidence that the abortion ban influenced early infant outcomes, i.e., increased infant mortality and the percentage of low birth weight, from 1966 to 1968.

[3] Romanian women without children paid a "celibacy tax" of up to 10 percent from their monthly salaries, while women of childbearing were forced to undergo monthly gynecological exams at workplaces and schools (Greenwall, 2003).

Finally, to complement our understanding of the effect of a changed abortion policy, we investigate the issue of child abandonment, one of the most dreadful outcomes of the abortion ban in communist Romania. While the magnitude of this phenomenon before 1989 remains unknown, it is believed that more about 2-4% of the total Romanian population aged 0-18 were institutionalized in early 1990s (UNICEF, 2007). Our prior is that, if abortion availability reduces the number of unwanted children, one may expect a lower rate of child abandonment immediately after the abortion is legalized.[4]

To understand whether health outcomes are improved among children born after the lift of the ban, we carry out an empirical analysis using the first two waves (1994-95 and 1995-96) of the Romanian Integrated Household Survey. These are the first representative Romanian data sets that, in addition to the standard socio-economic information, include anthropometric measures such as birth weight, current weight, and height/length for children 0-60 months of age at the time of the survey. Furthermore, to assess the relationship between abortion ban and child abandonment, we use a unique census data covering all state institutionalized children in Romania in 1997.[5]

We first notice that the legalization of abortion in December 1989 led to an immediate reduction in the number of births about six months later, in July 1990. This pattern was expected since women who were in their second or third trimester could not make use of the abortion legalization since, under the new liberal law, abortion is only allowed during the first trimester of pregnancy. We use this unexpected policy change as a natural experiment and turn to before-after and difference-in-difference estimates to assess the impact of abortion legalization on several children-related outcomes.

We find a positive, albeit insignificant, estimate of the birth weight outcome. At the same time, we do find that children born after the abortion became legal have 3.3% likelihood of having a low birth weight than children born prior to the policy change. This effect is significant at the 10% level. Although the pattern of our estimates for weight-for-height and height-for-age z-scores is positive, as expected, these estimates are not statistically significant. With respect to child abandonment, we find evidence of a sudden drop starting in July 1990, similar to the non-institutionalized children, but the evidence becomes less clear when

[4] Bitler and Zavodny (2002) find that abortion legalization in the US lowered the rates on child abuse and neglect.
[5] Institutionalized children are not part of the Romanian census or any other official surveys in Romania.

considering a relative measure defined by the number of permanently institutionalized children relative to the total cohort size at birth.

The remainder of our paper is organized as follows. Section 2 discusses the theoretical mechanisms through which the abortion ban is expected to have influenced children's outcomes. Section 3 explains the Romanian context and describes our data. The estimation strategy is presented in Section 4, where we also comment on the results of both our before-after and difference-in-difference estimates. Section 5 considers two additional outcomes, namely anthropometric z-scores and child abandonment. Finally, Section 6 concludes.

2. The mechanisms through which an abortion ban may affect children's outcomes

There are three main possible mechanisms through which an abortion ban may affect children's outcomes (see also Pop-Eleches, 2006, 2009). *First*, changes in access to abortion may influence the number of unplanned or unwanted children (the so-called *unwantedness* effect), which, in turn, should affect children outcomes: (1) the standard model of child quality-quantity trade-off predicts that an increase in the number of children as a result of an unwanted pregnancy may lead to a decrease in child quality (Becker, 1981; Becker and Lewis, 1973); (2) when access to birth control methods is limited, women are less able to postpone their childbearing to an optimal time, which may be inconsistent with their long-term educational and labor market plans, which in turn may have negative effects on children's outcomes (Angrist and Evans, 1996);[6] (3) lack of access to abortion may have a negative influence on fetal health through at least two important channels: *a)* it may not allow parents to end a pregnancy based on fetal health and *b)* it may lead to delayed and/or unhealthy prenatal care due to unwantedness (Grossman and Jacobowitz, 1981; Rosenzweig and Schultz, 1983; Grossman and Joyce, 1990).[7]

Second, a further key process that may affect the average socio-economic outcomes of children is the composition of women who are more likely to carry pregnancies to term. There is no theoretical consensus on the direction of this effect and the empirical evidence is also

[6] In addition, involuntary parenthood may influence the mother's and/or the father's physical well being, which may affect the development of the child in utero and within the family.

[7] Additionally, young teenagers (13 to 17 years) have a higher risk of low birthweight babies and premature and small for gestational age births (Fraser et al., 1995). Advanced maternal age (>35 years) is also considered as a risk factor for low birth weight and stillbirths (Jolly et al., 2000).

quite mixed. In the US, the marginal users of abortion were women from more disadvantaged socio-economic backgrounds and therefore they were more likely to be affected by the policy change, further suggesting an increase in the average outcome of the children born following legalization of abortion (Gruber et al., 1999). Exploring the Romanian cohorts born before and after the 1966 abortion ban, Pop-Eleches (2006) finds that children born after the abortion ban are actually better-off in terms of education and labor market outcomes. This surprising effect is due to the composition of women more likely to have an abortion prior to the ban. On average, women living in urban areas and highly educated women were more likely to have an abortion in Romania prior to the 1966 policy change. Once controlling for this composition effect using observable background characteristics, the pattern is reversed and the abortion ban indeed decreases the long-term outcomes of Romanian children (as expected). Conversely, when turning to the effect of the 1989 legalization of abortion and access to birth control methods on children's educational outcomes, Pop-Eleches (2009) finds that the composition effect of women is similar to the pattern seen in the US during the 1970s: women from more disadvantaged socio-economic backgrounds are more likely to experience reduced fertility.

In addition to the unwantedness and the composition effects, changes in cohort size may also affect educational and/or health outcomes because of changes in the crowding of a country's educational and/or health resources: Romanian children born in 1967 went to school with a cohort that was more than twice as large as the 1966 cohort, hence the mean amount of public expenditures per child was most likely reduced. This kind of reduction can be expected to influence the number of children per class, which is negatively correlated with test scores (Angrist and Lavy, 1999).[8] Also, with respect to anthropometric outcomes, a cohort of smaller size could benefit from more frequent/better access to doctors and hospitals.

Overall, the different channels reviewed in this section foretell that abortion legalization positively affected the outcomes of children born immediately after the lift of the ban compared to children born before the lift.[9] Next, we turn to household and census data in an attempt to assess the magnitude of the causal link between abortion legalization and children's outcomes in Romania.

[8] In Israel, the gains from small classes are largest for students from disadvantaged backgrounds (Angrist and Lavy, 1999).

[9] In our empirical analysis, we will not be able to clearly disentangle among these channels.

3. Data and descriptive statistics

3.1 The Romanian context

In 1966, Romania abruptly shifted from one of the most liberal abortion policies in the world to a restrictive and conservative policy that made abortion and family planning illegal.[10] More exactly, the 1966 decree stipulated that abortion was allowed only for women who already had four or more children, for women over the age of 45 whose lives were jeopardized by the pregnancy, and for women whose pregnancy resulted from rape or incest. The policy had an immediate success in raising the fertility rate from 1.9 to 3.7 children per woman in one year (Figure 1). The sharp increase was followed by a steady decrease until 1985.[11] This decline was mainly due to a massive increase in illegal abortions (Kligman, 1998). Abortion stayed illegal until December 1989 when Ceausescu and his regime were removed from power.

As shown in Figure 1, the repeal of the ban on abortion and family planning was followed by an instant decline in the fertility rate, and also an increase in abortions. In 1990, Romania reached the highest rate of induced abortion in the world: 200 per 1,000 women aged 15-44, a number seven times higher than in the US (Serbanescu et al., 1995).[12]

Figure 2 shows the number of monthly births in 1989-1991 based on the Romanian natality files. We observe a huge drop in fertility starting roughly six months after abortion was legalized. This six-month lag was expected. Since abortion was legalized in late December 1989 and since under the new abortion policy an abortion is allowed only during the first trimester, we expect lower monthly births rates after June 1990.

However, one possible threat to our identification strategy could be that the drop in fertility starting in 1990 is due to a decline in demand for children caused by the transition period and not by the abortion legalization. To investigate this issue, we compare the demographic situation in Romania with that in Bulgaria and Hungary. In these two transition countries, we do not observe the same downward trend immediately starting in 1990. The decreasing slope is more gradual, and the two curves are very similar only after 1992, as shown in Figure 1.[13]

[10] According to Berelson (1979), in 1965 there were 408 abortions per 100 live births.
[11] In 1985, Ceausescu reinforced the decree by raising the number of required children per woman to five conception (Greenwall, 2003).
[12] Note also the huge number of over 1 million induced abortions in 1990 (in a country of 23 million people).
[13] Additional evidence is provided by Pop-Eleches (2005) who compares Romanian to its neighboring Moldova, and does not find similar patterns in fertility rates. Moldova is an appropriate comparison since the majority of the population is ethnically Romanian. Also, in Moldova abortion was not banned before 1989, so any changes after 1989 are basically induced by the transition process. The pattern observed in Moldova is pretty similar to that of other transition countries.

Another possible threat is that the drop in fertility might be explained by the repeal of different pronatalist policies introduced during the communist era. However, no major changes in the monthly child allowances or maternity leave policies took place immediately after the fall of communism (see World Bank Report, 1992 and Pop-Eleches, 2005, for a more exhaustive discussion).

3.2 Data

In our main analysis, we use the first two waves (1994-95 and 1995-96) of the Romanian Integrated Household Survey (RIHS), which is a Living Standards Measurement Study (LSMS) survey administrated by the Romanian National Commission for Statistics (INSSE) in cooperation with the Ministry of Labor and Social Protection and with the technical assistance of the World Bank. These are the first Romanian household representative surveys that, in addition to standard socio-economic characteristics, include information on fertility history as well as *anthropometric* information for children.

It is from these two waves of the survey that we can uncover the information on the cohorts born in July of 1989 and onward, since the questions about anthropometric outcomes were collected for all children 0-60 months of age at the time of the survey. All in all, we have information on almost 5,000 children 0-60 months of age. However, our main cohorts of interest comprise children born in 1989, 1990, and 1991, respectively. More specifically, in the empirical analysis, we consider two different subsamples: July 1989-June 1991 (1,875 observations) and January 1990-December 1991 (1,994 observations). Our two main outcomes of interest are birth weight and low birth weight. While low birth weight is usually referred to as birth weight less than 2.5 kg, we use a slightly higher value (< 3 kg) as only 4% of our sample was below the 2.5 kg limit (for a similar approach see Lindeboom et al., 2009). According to the RIHS, the mean birth weight of the children born July 1989-June 1991 is 3.23 kg, with a standard deviation of 0.44, and the proportion of all births with low birth weight (as defined above) amounts to 22.6%. Descriptive statistics of the sample are reported in Table 1.

The mean age of the children under consideration is around 50 months and 47% of the children are girls. Concerning the mother's characteristics, the average age at birth is 24.4 years. About 34% have finished primary education, 61% have attended secondary school, and only 5% have a tertiary education. Ninety percent are ethnically Romanian, 3% are Roma, and 7% are classified as "other" (Hungarian, Germans, etc.). One important issue at this point is to understand how the lift of the ban has changed the composition of families that carried pregnancies to term.

As already explained, we expect the lift of the ban to influence children born in July 1990 or later. We therefore start by checking whether the repeal of the abortion ban had any effect on the composition of families having children one year after (July 1990-June 1991) this cutoff compared to one year before (July 1989-June1990). From Table 1, we first observe that mothers' age at birth decreased by more than half of year after July 1990, i.e., older women were more likely to benefit from the lift of the ban. Also, we notice that the abortion legalization mainly influenced households from more disadvantaged backgrounds since women with only primary education were less likely to give birth once the abortion and other contraceptive methods were legalized.[14] These results are in line with Pop-Eleches (2009), who finds a similar composition effect using the 2002 census.

4. The effects on health at birth

4.1 Empirical strategy

In what follows, we present our methodology and empirical specifications. Let us start by considering a simple *before-after* strategy. More exactly, we consider children born July 1989-June 1991, i.e., children within a reasonably short time span before and after July 1990 (when the policy came into effect). We define a treatment dummy T, which equals 1 if the child i is born July 1989-June 1990 and 0 if the child i is born July 1990-June 1991. The impact of the policy change is captured by the coefficient α_1 from the following model:

$$y_i = \alpha_0 + \alpha_1 \times T_i + \varepsilon_i \quad , \qquad (1)$$

where y_i represents an outcome of interest for a child i (either birth weight or low birth weight). This estimation strategy is equivalent to the calculation of a simple difference between the outcomes when $T=1$ and $T=0$. At this stage, it should be noted that our coefficient of interest α_1 is expected to pick up the overall impact of the abortion legalization on children's health outcomes at birth: both the composition effect and the unwantedness effect (and a possible positive crowding effect resulting from a smaller cohort competing for fewer health resources).

[14] We also find that out-of-wedlock/divorced mothers (at the time of the survey) are less likely to give birth once the abortion ban is lifted. However, we do not include this covariate in our analysis due to potentially high endogeneity concerns.

In an attempt to control for the composition effect, we further add a set of observable controls into (1):

$$y_i = \beta_0 + \beta_1 \times T_i + \beta_2 \times X_i + \varepsilon_i \,, \quad (2)$$

where y_i and T_i are defined as above, and X_i is a set of child and family background variables. More exactly, we control for the mother's education (three dummies), mother's ethnicity (three dummies), mother's age at birth, an urban dummy for the child's place of birth, a dummy for the sex of the child, 46 county of birth dummies, and a survey wave indicator.[15] We also include two household specific controls, measured at the time of the survey: the number of durables goods in the household (such as TV, radio, car, computer, etc.) and the log of household consumption, which is presumably a better measure of long-term resource availability than income.[16] After we control for the composition effect in (2), β_1 captures the unwantedness effect (or a positive crowding effect of health, or both).

To assess the impact of the lift on the abortion ban, we further rely on a *difference-in-difference* strategy. The intuition is as follows. Suppose that the lift of the ban indeed has a positive effect on children's health at birth. Then, in 1990, one should observe an increase in health among children born during the 2nd semester (July-December) if compared to those born during the 1st semester (January-June). However a large number of empirical studies have highlighted that health outcomes are not orthogonal to calendar effects.[17]This finding holds both in developed countries like the US (van Hanswijck de Jonge et al., 2003) and Japan (Tanaka et al., 2007) and in transition and developing countries like Poland (Koscinski et al., 2004) and India (Lokshin and Radyakin, 2009). Yet, if such correlations between a child's health outcomes and semester of birth do exist, then we should observe a similar tendency for those born during the 2nd semester (if compared to those born during the 1st

[15] One potential concern is related to the possible endogeneity of mother's education, since this variable is measured at the time of the survey and not at the time of birth. Alternatively, we include a dummy for the mother's education that equals 1 if she has more than primary education. That is because most Romanian women finish primary education before age 15 and do not have children by that time, and, therefore, the endogeneity issue is reduced to minimum (see also Pop-Eleches, 2005). The results (available upon request) are very similar.

[16] Since these household controls are potentially more endogenous as they are measured at the time of the survey, we have also used different specifications in our estimation: 1) we try to take into account only the durables available during the year the child was born (since we know the year the household acquired each of these durables), 2) we control for other household specific variables such as number of rooms per occupant, square feet per occupant, homeownership, type of heating, type of lighting in the house (electric or not), conditional on that they have not moved during the last 3-4 years. Our results are robust to these specifications. .

[17] One way to correct for this is to include a set of month of birth dummies (or a polynomial of the month of birth) of the child. The difficulty with this strategy is that this would also bias the estimation of the treatment effect, given the correlation between these controls and the treatment dummy, thereby leading to an overstatement of the true treatment effect.

semester) in 1990 and in 1991. Or, put differently, if the abortion legalization had a significant effect, the difference between 1991 and 1990 in health outcomes for children born January-June should be positive and significant, while we do not expect any significant difference in health between children born July-December 1991 and those born July-December 1990.

Our main identification assumption is that 1990 and 1991 are very similar years, and they are indeed. No major reforms took place in the provision of maternity and child benefits in the first three years following the fall of communism (see World Bank, 2002), and the significant decline in the employment rate that followed the restructuring process did not start until late 1992.

Our difference-in-difference is obtained from the following model:

$$y_i = \gamma_0 + \gamma_1 \times T_i + \gamma_2 \times D_{90,i} + \gamma_3 \times T_i \times D_{90,i} + \varepsilon_i \quad , \tag{3}$$

where y is defined as before, T is equal to one when the child was born during the 2nd semester (and 0 otherwise), and D_{90} is a dummy that takes the value 1 if the child was born in 1990 and 0 if born in 1991. Our coefficient of interest is now γ_3 : if there are indeed positive consequences of the lift of the abortion ban, then we expect to find a positive value. In other words, the difference in y between children born during the 2nd semester and children born during the 1st semester should be significantly higher in 1990 than in 1991. Conversely, in the absence of the abortion effect, the difference in outcomes between children born during the 2nd and the 1st semester should be similar in 1990 and 1991.

As with the before-after estimates, we also incorporate some control variables to pick up the composition effect of women giving birth:

$$y_i = \delta_0 + \delta_1 \times T_i + \delta_2 \times D_{90,i} + \delta_3 \times T_i \times D_{90,i} + \delta_4 \times X_i + \varepsilon_i \ . \tag{4}$$

When estimating (4), we have also investigated the possibility of different returns to the exogenous covariates in 1990 and 1991, respectively, by adding interaction terms of the form $X_i \times D_{90,i}$. The results (available upon request) are very similar.

4.2 The impact of abortion legalization on children's birth weight and low birth weight

Table 2 reports our results from estimating equations (1) and (2) on birth weight (in panel A) and low birth weight (in panel B). More exactly, we start by showing the estimates of α_1 without controls (in Column *a*) and β_1 with family background variables (in Column *b*).

In panel A, we start by considering the birth weight outcome. Although the pattern of our estimates is positive, as expected, the estimates reveal no significant effects in the baseline specification in Column (1a) or after we control for the composition effect in Column (1b). We consider separately girls (Columns 2a, 2b) and boys (Columns 3a, 3b) and also urban (Columns 4a, 4b) and rural (Columns 5a, 5b).[18] The pattern is still positive, but our estimates do not turn out significant.[19]

Next, in panel B, we consider the low birth weight outcome. The overall impact of the abortion legalization appears to be positive. Both is Columns (1a) and (1b), the estimates are negative and significant at the 10% level, suggesting that children born after the abortion ban was lifted had a 3.3% lower likelihood of having a low birth weight. The results have a similar pattern when we consider girls and boys separately, but it is only for the urban area subsample that we find that our coefficient of interest is significant at the 10 % level.

Table 3 presents our main results for the health at birth outcomes using equations (3) and (4). More exactly, we start by showing the following coefficients: the coefficient on the treatment dummy variable γ_1, i.e., whether the child is born during the 2nd semester; γ_2, the year 1990 indicator; and our main coefficient of interest γ_3, i.e., the crossed term between the treatment and year indicator dummy. The crossed term is expected to capture the overall impact of the change in the abortion legislation on the newborns' health outcomes. For each outcome, we report estimates from our specification (3) in Column *a* and (4) in Column *b.*

In panel A, we consider again the birth weight outcome. Although the pattern of our main coefficient of interest (i.e., the interaction term) is again as expected, it is not significant. When we consider different subsamples, we find some significant results at the 10% level for boys (Column 3b) and for children born in an urban area (Column 4b) after we take into account the composition effect. Especially interesting is the finding that boys are more likely to have a higher birth weight if born after the abortion ban was lifted, which could be in line with the idea that boys are favored.

In panel B, we present the low birth weight outcome. The overall impact of the abortion legalization seems to be positive and large. In Columns (1a) and (1b), the estimate for γ_3 is negative and significant at the 5% level, suggesting that children born after the abortion ban

[18] There is abundant evidence that, especially in some developing countries, households generally favor boys. At the same time, that there are significant differences between urban and rural areas (see Haddad et al., 1997, for a survey).
[19] At this point, we should recognize as a possible threat the relatively small sample size. Unfortunately, there is no alternative micro datasets for that period in Romania.

was lifted had a lower likelihood of suffering from low birth weight. The results have a similar pattern when we consider only the urban area, with our coefficient of interest still significant at the 5% level but of even larger magnitude. Also, in Columns (2b) and (3b), we observe that both girls and boys had a lower likelihood of low birth weight if born after the abortion legalization. However, these coefficients become significant only once we control for the compositional effect.

Before moving on, it is important to note that in our empirical analysis, we are likely to underestimate the impact of the abortion legalization on birth outcomes. Indeed, the abortion legalization had also decreased infant mortality from 26.9 per 1,000 live births in 1989 and 1990 to 22.7 and 23.3 per 1,000 live births in 1991 and 1992, respectively (UNICEF TransMonee, 2008).[20] These children were probably the weakest in terms of birth weight. Consequently, we should interpret our results as children's outcomes given that the child survived (i.e., survived birth or the first year of life) and get a lower bound for the positive effect of the lift of the abortion ban. Unfortunatelly, there is no information in the data that could allow us to correct for this possible underlying selection bias.[21]

4.3 Falsification exercise

In Section 3.1, we provided evidence that any (possible) effects on the health at birth outcomes for children born soon after July 1990 are caused by access to abortion and not by some potential improvement in the socio-economic conditions within the country immediately after the fall of communism.

In this section, we perform a simple falsification exercise to further confirm that this is indeed the case. More specifically, we replicate our empirical strategy on health at birth outcomes using children born in 1991 and 1992 (1,854 observations), the 2nd semester being our treatment group.[22] Of course, since there is no change in abortion availability during these years, we expect the cross product between the 1991 year dummy and the 2nd semester dummy to be insignificant, unless we pick up something else (for instance some other socio-economic transformations).

[20] Besides infant mortality, abortion availability decreased fetal death and maternal mortality.
[21] Moreover, our estimates may be contaminated by omitted characteristics of the mothers' prenatal behavior, e.g. smoking. However, we expect this to affect similarly mother's characteristics immediately before and after 1990.
[22] While we only present the difference-in-difference strategy, the results (available upon request) attained using a before and after strategy are very similar.

When we apply our difference-in-difference estimation strategy, the crossed term is equal to -0.063 (t=-1.55) for birth weight with no controls and -0.033 (t=-0.82) with controls, and 0.056 (t=1.33) for low birth weight with no controls and 0.036 (t=-0.87) with controls. The fact that these crossed terms are never significant (the same pattern is observed when considering specific gender and rural-urban subsamples) further validates our assumption that the drop in fertility that we observe starting July 1990 is mainly due to changes in access to abortion.

5. Additional results on anthropometric z-scores and child abandonment

5.1 Weight-for-height and height-for-age z-scores

We now present additional evidence on the two most commonly used nutritional outcomes measured at the time of the survey: 1*) weight-for-height* which is an indicator of wasting and reflects the current malnutrition status relative to height, and 2) *height- for-age***,** which is an indicator of stunting due to chronic malnutrition attributed to long-term protein deficiency and/or low food intake for long periods of time, reflects not only current status but also past health and nutritional investment.[23]

When turning to the data, we standardize our anthropometric measures using a reference of well-nourished children (see WHO, 2006). The reference population is used to calculate the anthropometric indices that can be expressed in terms of z-scores.[24] Before presenting our main results, let us briefly discuss some descriptive statistics.[25] First, the average weight-for-height is 0.655 standard deviations above the median of the reference population; second, the height-for-age indicator is more than one standard deviation below the median of the reference population, indicating that chronic malnutrition is important among Romanian children.

We use a similar estimation strategy as for the birth weight outcome. Table 4 presents the regression results for equations (1) and (2) using the before-after strategy, while Table 5 reports results from estimating equations (3) and (4) using the difference-in-difference

[23] The weight-for-height and height-for-age indicators may or may not move together; e.g., a child with chronic malnutrition may not necessarily suffer from acute malnutrition (Victoria, 1991).
[24] More exactly, the z-scores are calculated for a child's weight (or height), given age and gender, by subtracting the median weight (or height) in the reference population and dividing by the standard deviation of the reference population. The main idea is that children under normal conditions grow in similar patterns, and therefore any deficiency in growth could be attributed to an unfavorable situation.
[25] We have already excluded 78 observations with extreme z-scores. "Extreme" usually means a z-score above 6 (in absolute value) for height-for-age and above 5 (in absolute value) for weight-for-height (WHO, 2006).

strategy. Additionally, in all of our regressions, we control for the child's age in months.[26] In panel A, we consider the weight-for-height z-scores and in panel B the height-for-age z-scores. The estimates in Tables 4 and 5 reveal no significant effects for the two considered nutritional outcomes.[27]

We need to be cautious about inferring strong conclusions since there are several potential threats to our identification strategy when we turn to the anthropometric z-scores. One potential concern is related to the issue of measurement error. It is generally argued that children's anthropometric status such as current weight and height/length are difficult to measure. According to the RIHS survey manual provided by the World Bank, the current weight and height information was collected during the 2nd compulsory visit at the household, while during the 1st visit mothers were asked to bring their children to the territorial dispensaries, where current height and weight were documented.

We cannot assess the magnitude of the possible under/over measurement reporting. If parents would over-report the weight and/or height of their weakest children (and if the weakest children are those born under the restrictive abortion regime) and correctly report the measures of their other children, we would probably find, on average, no significant differences between the two groups. It is important to stress that for birth weight, the possible measurement error issue is reduced to a minimum since birth weight is usually based on the child's medical certificate.[28]

Another potential concern with the z-score outcomes is that the nutritional status of very young children may change rapidly with age regardless of the existence of an external shock. Of a special concern, it is the height-for-age z-score which is a stock or long-term indicator, resulting from low growth due to protein deficiency for longer periods of time, and reflects not only current but also past health and nutritional investment. Thus, older children may accumulate a larger deficit resulting in lower height for age if compared to younger children (see Bundervoet et. al, 2009; Martorell and Habicht, 1986).

[26] The results, however, are very similar when we do not.

[27] In addition, we considered low (below -2 SD) weight-for-height (or wasting) and height-for-age (or stunting), but the results do not turn out significant.

[28] In Romania, when mothers leave the hospital/clinic after giving birth, they are automatically issued a medical certificate for the child ("*Certificat medical constatator al nascutului viu*") stating, among other information, birth weight. This certificate must be presented when registering the child in the national registry. One additional concern may be related to the number of children born at home. However, less than 1% of the children in our sample were born at home.

The nutritional literature recommends comparing children within certain age intervals in order to avoid capturing the pattern of malnutrition which changes with age. Waterlow et al., 1977 suggests the following age intervals: 1) *highly recommended*: 0-2.99 months, 3-5.99 months, 6-8.99 months, 9-11.99 months, 1-1.99 years, 2-2.99 years, 3-3.99 years, 4-4.99 years; 2) *recommended*: 0-5.99 months, 6-11.99 months, 1-1.99 years, 2-3.99 years, 4-5.99 years; 3) *permissible*: 0-11.99 months, 1-1.99 years, and 2-5.99 years. We compare children about 49 months old (in the before-after estimation strategy) and children about 45 months old (in the difference-in-difference strategy), while the average age difference between the treated and the control group is less than 12 months. So, we compare children in the *highly recommended* interval, so any possible bias due to aging is reduced to minimum. This provides some evidence that any relation that we may find is not due to a differential age pattern.[29]

5.2. Abandoned children

So far, we have only considered the outcomes of non-institutionalized children (i.e., children living with their parents). However, this leads to an incomplete picture of the situation since in Romania, starting in 1970's parents could temporarily or permanently place their children in state-run institutions.[30] This point is crucial since one of the most shocking outcomes of the abortion ban and lack of family planning was the high number of abandoned and institutionalized children. Many healthy children, but also children with deficiencies (such as mental problems, dystrophies, or deafness) were abandoned in state institutions, both before and after December 1989 (see Mitrut, 2008).[31]

Thus, we will now attempt to complement our findings on "at-home" children by focusing on the undocumented category of abandoned and institutionalized children. For this purpose, we make use of a unique census data set that covers all Romanian institutionalized children in 1997. This is basically the only data available since abandoned children were not included in any official statistics.

The backgrounds of these children are poorly documented, in particular due to very limited information about their biological families. Our census provides some useful information: birth year and month, gender, whether the child has any family contact, and whether the child

[29] However, in our analysis we have also controlled for potential age effects by controlling for the child's age in months. Additionally, another potential concern may be that children are measured in two different survey years. The results based on only one survey wave (1994-1995, to capture children born in 1989) do not vary.
[30] Child institutionalization was regulated by Law No. 3/1970,"The protection of certain groups of minors." This law was abolished only in June, 1997.
[31] "*The State wanted them, the State should raise them*" became an accepted norm under the Ceausescu regime, claimed by families when leaving their children in maternity wards, hospitals, or institutions.

entered the current institution from his/her family or from another institution.[32] Next, we distinguish between two main categories of children following Mitrut (2008): 1) *children in permanent institutional care*, i.e., orphans and social orphans and 2) *institutionalized children who stayed in contact with their families*, i.e., children who needed special care, like children with disabilities, but also healthy children temporarily institutionalized by their families due to poor economic conditions or some other social motive.

That institutionalization may be seen as a way for very poor families to "invest" in their children's human and/or health capital by temporarily institutionalizing their children (while staying in contact) clearly sets up a selection problem that prevents us from identifying a clear-cut link with the issue of unwantedness. To minimize this issue, in what follows, we concentrate on children in permanent institutional care, i.e., both orphans and social orphans. The latter group consists of children who have living parents, but who have no contact with them and are declared legally abandoned. The proportion of children in permanent institutional care accounted for 30% (more than 30,000 children) of all institutionalized children according to the 1997 census (among them, more than 92% were social orphans).

Since the underlying idea is to capture the effect of the abortion legalization on child abandonment (i.e., the unwantedness effect) at the time of birth and we only have information on whether the children came to the current institution from their families or from another type of institution, we consider only children who have been previously institutionalized in *leagane* (or nurseries for children 0-3 years old).[33]

Figure 3 presents the number of children born in 1989-1991 in permanent institutional care by month of birth.[34] We observe an abrupt drop in the number of abandoned children starting roughly six months after the lift of the ban, similar to in Figure 2. The reduction from July 1990 to September 1990 is about 44%. However, the relevant outcome is the number of abandoned children (i.e., children in permanent institutional care) relative to the cohort size at birth. Indeed, the reduction in abandonments could simply be due to the fall in births following the lift of the abortion ban. Figure 4 plots the number of abandoned children

[32] For a more detailed description of the data and the institutional setting, see Mitrut (2008).

[33] Most of the social orphans were usually abandoned immediately after birth in hospitals or maternity wards (Greenwell, 2003). From there they were transferred to *legane* and, after they turned 3 to other type of institutions (e.g., *case de copii* or children's home)

[34] Of course, since we observe children in 1997, we are not able to infer anything about issues like adoption, infant mortality, and fetal death. Moreover, one interesting outcome in itself is the health status of the institutionalized children. According to the INSEE Romania, the information on children's health refers to the current health condition, which in many cases coincides with the institutionalization motive. However, since most abandonments occurred in maternity wards and pediatric hospitals, it is expected that children's health also deteriorated while in the system.

relative to the total monthly cohort size at birth July 1989-June 1991. The evidence is less clear, with no obvious downward trend, although we still evidence a reduction for children born in July and August 1990.

This is maybe not totally unexpected. Child abandonment is a legacy of the communist regime. While it initially started as a consequence of the lack of abortion and family planning, child abandonment became a cynical but accepted norm in Romania. The deterioration of the socio-economic conditions starting late 1992 resulted in an increase in child abandonment (Greenwell, 2003). In 1997, more than 90% of the social orphans (age 0-3, i.e., children born 1994-1997) were admitted due to socio-economic motives.

6. Conclusion

In this paper, we explore how the lift of the Romanian abortion ban in December 1989, when dictator Ceausescu and his regime were removed from power, affected Romanian children's health at birth and during early childhood (at age 4 and 5) and the impact of the lift of the ban on child abandonment. We conduct our empirical analysis using the first representative Romanian survey data set that includes information on anthropometric measures. Using a before-after and a difference-in-difference estimation strategy, we find that children born after abortion became legal have a 3.3% lower likelihood of having a low birth weight than children born prior to the policy change. Although the pattern of our estimates for weight-for-height and height-for-age z-scores is positive, as expected, these estimates are not statistically significant.

This is the first study that attempts to assess the relationship between abortion and child abandonment by using a unique data set covering all institutionalized children in Romania in 1997. Although we notice that the lift of the abortion ban in December 1989 led to an immediate reduction in the number of abandoned children, this evidence is less clear when considering a relative measure defined by the number of permanently institutionalized children relative to the total cohort size at birth.

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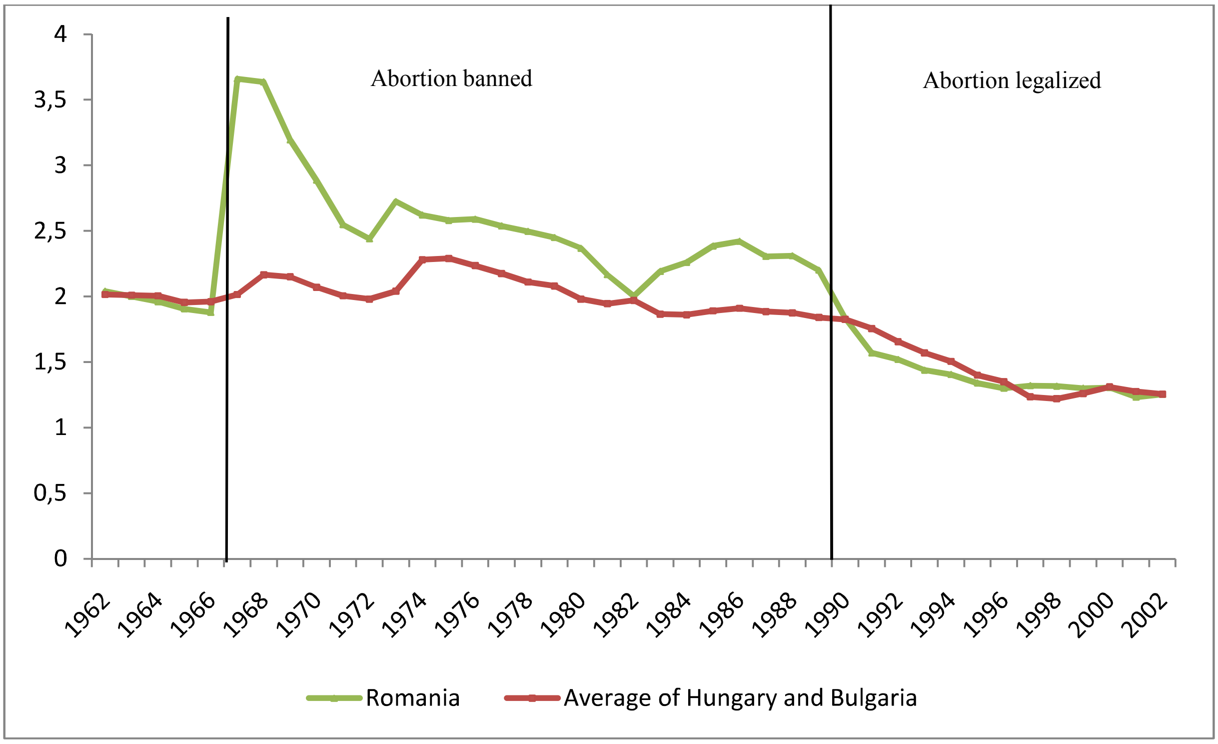
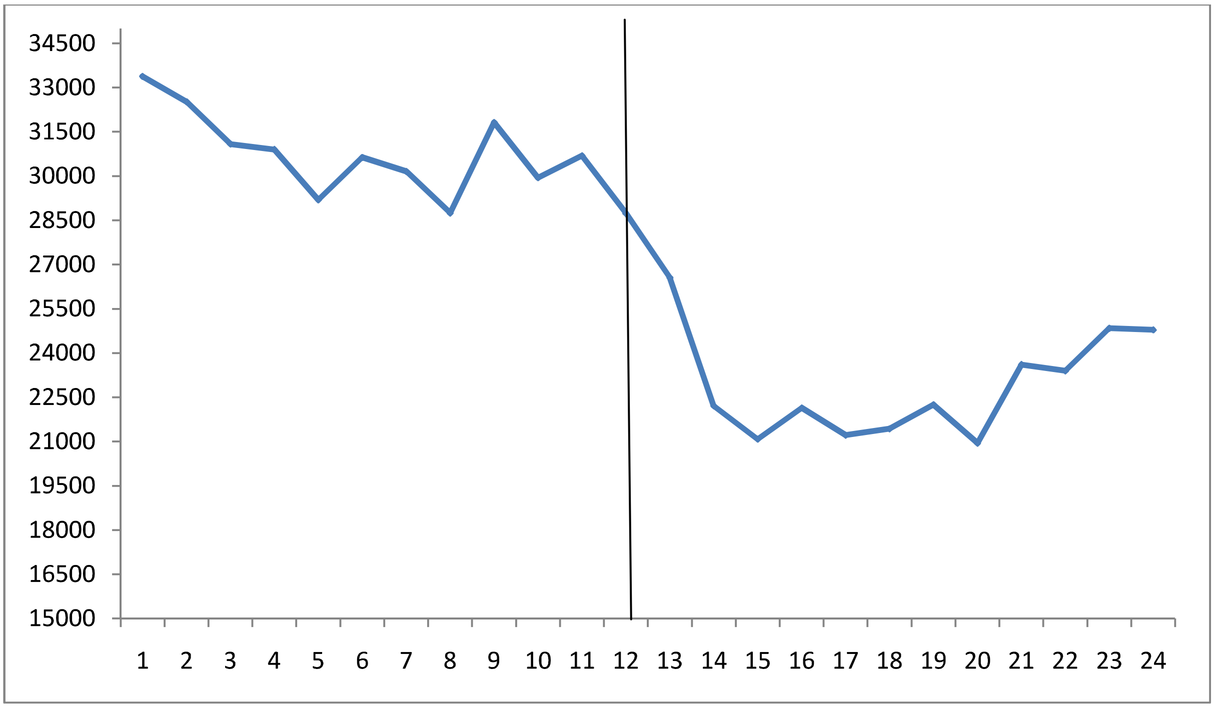
Fig. 1 – Total Fertility Rate in Romania vs. other transition countries, 1962-2002



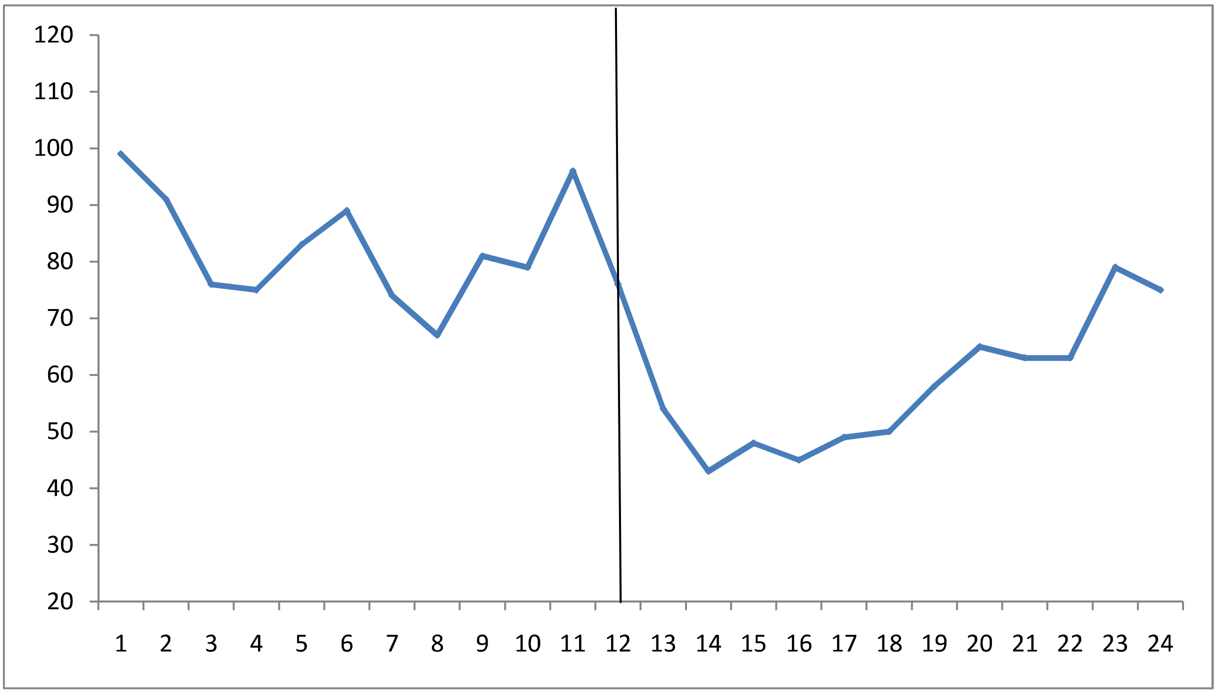
Source: UN (2002)

Fig. 2 – Cohort Size at Birth, by Month of Birth, July 1989- June 1991



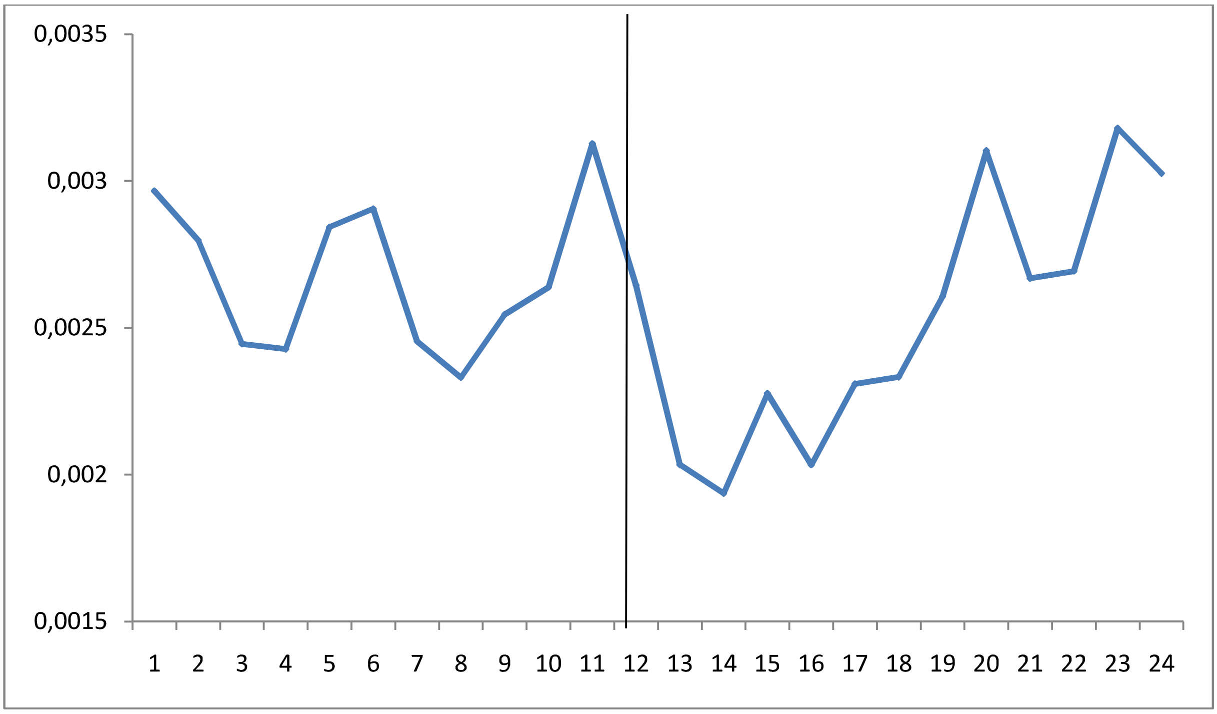
Notes: July 1989 = Month 1. The monthly size of cohorts of births, period July 1989 – June 1991, based on the natality files at INSEE, Romania. Source: INSSE, Romanian Demographic Yearbook, 2005.

Fig. 3 – Abandoned Children: Cohort Size at Birth, by Month of Birth, July 1989- June 1991



Notes: July 1989 = Month 1. The monthly size of cohorts of births of the abandoned Romanian children, period July 1989 – June 1991 based on the 1997 Romanian Census of the Institutionalized Children, INSEE, Romania.

Fig. 4 – Abandoned Children Relative to the Cohort Size at Birth, by Month of Birth, July 1989- June 1991



Notes: July 1989 = Month 1. The monthly size of cohorts of births of the abandoned Romanian children, period July 1989 – June 1991 based on the 1997 Romanian Census of the Institutionalized Children, INSEE, Romania.

Table 1. Descriptive statistics of the sample (including comparison of means)

Variables	Control group (July 1989 – June 1990)	Treatment group (July 1990- June 1991)	Difference: treatment-control	Mean	Standard deviation
Mother's characteristics					
Mother's age at birth	24.842	24.208	-0.634***	24.414	5.390
Mother's education					
Primary	0.361	0.312	-0.048**	0.336	0.472
Secondary	0.599	0.642	0.043*	0.621	0.485
Tertiary	0.040	0.045	-0.004	0.042	0.202
Mother's ethnicity:					
Romanian	0.907	0.906	-0.001	0.907	0.290
Rooma/Gypsy	0.071	0.073	-0.002	0.073	0.259
Other	0.020	0.019	0.001	0.020	0.141
Household economic conditions					
Log of total consumption	12.224	12.210	-0.014	12.217	0.766
Number of durables	5.356	5.333	-0.023	5.345	2.941
Child's characteristics					
Gender: girl	0.470	0.471	0.001	0.470	0.499
Child's age (in months)	54.561	44.704	-9.857***	49.546	6.506
Place of birth: rural	0.481	0.484	0.003	0.483	0.500

Notes: Significance levels are 1% (***), 5% (**) and 10% (*). Total number of observations is 1,875.
Source: Authors' calculations using the 1994-95 and 1995-96 RIHS.

Table 2. Before-after estimates of the effect of the 1989 abortion legalization on children birthweight (July 1989 - June1991)

A. Birthweight

	All		Girls		Boys		Urban		Rural	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Born after July 1990	0.019	0.019	-0.010	-0.003	0.047	0.037	0.013	0.032	0.013	0.006
	(0.020)	(0.020)	(0.028)	(0.029)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.029)
Background controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Number of observations	1,875	1,875	882	882	993	993	970	970	905	905
R^2	0.0005	0.0720	0.0002	0.098	0.0027	0.095	0.0002	0.111	0.0002	0.114

B. Low birthweight

	All		Girls		Boys		Urban		Rural	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Born after July 1990	-0.033*	-0.033*	-0.018	-0.019	-0.047*	-0.040	-0.037	-0.044*	-0.029	-0.019
	(0.019)	(0.019)	(0.029)	(0.029)	(0.025)	(0.025)	(0.026)	(0.026)	(0.028)	(0.029)
Background controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Number of observations	1,875	1,875	882	882	993	993	970	970	905	905
Pseudo-R^2	0.0015	0.063	0.0004	0.0942	0.0034	0.083	0.0019	0.105	0.0011	0.0878

Notes: Panel A presents the results of OLS regressions. Panel B presents the results of Probit regressions; for continuous variables, the coefficient represents the marginal effect of variables evaluated at their mean; for dummy variables the coefficients capture the effect of switching the value from 0 to 1. Robust standard errors are shown in parentheses, while significance levels are 1% (***), 5% (**) and 10% (*). Background controls include an indicator for the child's gender, two indicator variables for mother's education, two indicator variables for mother's ethnicity, a rural dummy for the place of birth of the child, 46 regions of birth dummies, log of total consumption, number of durables, number of children in the household and a survey year indicator.

Source: Authors' calculations using the 1994-95 and 1995-96 RIHS.

Table 3. Difference-in-difference estimates of the effect of the 1989 abortion legalization on children birthweight (using the 1990 and 1991 birth cohorts)

A. Birthweight

	All		Girls		Boys		Urban		Rural	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Born second semester	-0.049*	-0.050*	-0.057	-0.055	-0.028	-0.049	-0.079	-0.098**	-0.018	-0.009
	(0.028)	(0.029)	(0.036)	(0.040)	(0.043)	(0.045)	(0.041)	(0.045)	(0.038)	(0.040)
Born in 1990	-0.033	-0.265	0.005	-0.355	-0.066	-1.135	-0.040	-0.269	-0.025	-0.171
	(0.027)	(0.425)	(0.036)	(0.663)	(0.039)	(0.600)	(0.039)	(0.656)	(0.038)	(0.590)
Born second semester * born in 1990	0.047	0.046	0.005	0.015	0.072	0.098*	0.074	0.102*	0.019	0.015
	(0.039)	(0.039)	(0.053)	(0.056)	(0.057)	(0.059)	(0.056)	(0.059)	(0.054)	(0.057)
Background controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Number of observations	1,994	1,994	978	978	1,016	1,016	1,019	1,019	975	975
R^2	0.002	0.090	0.004	0.138	0.003	0.140	0.003	0.157	0.001	0.150

B. Low birthweight

	All		Girls		Boys		Urban		Rural	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Born second semester	0.054*	0.058**	0.098	0.108***	-0.001	0.015	0.071*	0.088**	0.038	0.046
	(0.028)	(0.028)	(0.041)	(0.041)	(0.037)	(0.028)	(0.039)	(0.041)	(0.040)	(0.042)
Born in 1990	0.050**	0.211	0.056	-0.125	0.043	0.364	0.043	0.056	0.057	-0.389
	(0.025)	(0.364)	(0.039)	(0.592)	(0.032)	(0.383)	(0.035)	(0.457)	(0.036)	(0.576)
Born second semester * born in 1990	-0.080**	-0.079**	-0.090	-0.099*	-0.060	-0.058*	-0.115**	-0.118**	-0.053	-0.073
	(0.038)	(0.032)	(0.056)	(0.045)	(0.049)	(0.030)	(0.053)	(0.044)	(0.054)	(0.059)
Background controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Number of observations	1,994	1,994	978	978	1,016	1,016	1,019	1,019	975	975
Pseudo-R^2	0.003	0.079	0.006	0.114	0.004	0.127	0.005	0.123	0.002	

Notes: Panel A presents the results of OLS regressions. Panel B presents the results of Probit regressions; for continuous variables, the coefficient represents the marginal effect of variables evaluated at their mean; for dummy variables the coefficients capture the effect of switching the value from 0 to 1. Robust standard errors are shown in parentheses, while significance levels are 1% (***), 5% (**) and 10% (*). Background controls include an indicator for the child's gender, two indicator variables for mother's education, two indicator variables for mother's ethnicity, a rural dummy for the place of birth of the child, 46 regions of birth dummies, log of total consumption, number of durables, number of children in the household. We also include interactions between our independent variables and year 1990 dummy.
Source: Authors' calculations using the 1994-95 and 1995-96 RIHS.

Table 4. Before-after estimates of the effect of the 1989 abortion legalization on children z-scores (July 1989 - June1991)

A. Weight-for-height z-score

	All		Girls		Boys		Urban		Rural	
	(1a)	(1b)	(2a)	(2B)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Born after July 1990	0.093	-0.079	0.223**	-0.014	-0.021	-0.164	0.140	0.013	0.045	-0.147
	(0.072)	(0.120)	(0.101)	(0.159)	(0.101)	(0.181)	(0.098)	(0.170)	(0.104)	(0.177)
Background controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Number of observations	1,875	1,875	882	882	993	993	970	970	905	905
R^2	0.001	0.088	0.006	0.155	0.000	0.095	0.002	0.090	0.000	0.142

B. Height-for-age z-score

	All		Girls		Boys		Urban		Rural	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Born after July 1990	-0.073	-0.032	-0.108	-0.030	-0.042	-0.011	-0.120	-0.127	-0.021	0.029
	(0.068)	(0.111)	(0.097)	(0.147)	(0.096)	(0.171)	(0.096)	(0.162)	(0.097)	(0.159)
Background controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Number of observations	1,875	1,875	882	882	993	993	970	970	905	905
R^2	0.01	0.13	0.01	0.18	0.00	0.14	0.01	0.16	0.00	0.16

Notes: Panel A and B present the results of OLS regressions. Robust standard errors are shown in parentheses, while significance levels is 1% (***), 5% (**) and 10% (*). Background controls include an indicator for the child's gender, child' age when being interviewed, two indicator variables for mother's education, two indicator variables for mother's ethnicity, a rural dummy for the place of birth of the child, 46 regions of birth dummies, log of total consumption, number of durables, number of children in the household.

Source: Authors' calculations using the 1994-95 RIHS.

Table 5. Difference-in-difference estimates of the effect of the 1989 abortion legalization on children z-scores (using the 1990 and 1991 birth cohorts)

A. Weight for height z-score

	All		Girls		Boys		Urban		Rural	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Born second semester	0.012	-0.221*	-0.075	-0.257	0.118	-0.202	-0.110	-0.382**	0.144	-0.065
	(0.101)	(0.120)	(0.138)	(0.165)	(0.149)	(0.174)	(0.142)	(0.173)	(0.144)	(0.170)
Born in 1990	-0.161*	0.337**	-0.353***	0.000	0.021	0.721***	-0.323**	0.254	0.013	0.507**
	(0.094)	(0.171)	(0.134)	(0.226)	(0.130)	(0.267)	(0.128)	(0.240)	(0.137)	(0.254)
Born second semester * born in 1990	0.071	0.071	0.266	0.240	-0.140	-0.126	0.276	0.301	-0.149	-0.159
	(0.139)	(0.137)	(0.190)	(0.185)	(0.204)	(0.202)	(0.195)	(0.195)	(0.200)	(0.198)
Background controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Number of observations	1,994	1,994	978	978	1,016	1,016	1,019	1,019	975	975
R^2	0.002	0.084	0.009	0.147	0.001	0.109	0.006	0.099	0.001	0.139

b. Height for age z-score

	All		Girls		Boys		Urban		Rural	
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Born second semester	0.140	0.236**	0.289**	0.294*	-0.033	0.162	0.211	0.206	0.077	0.244
	(0.102)	(0.120)	(0.140)	(0.170)	(0.151)	(0.179)	(0.145)	(0.167)	(0.144)	(0.169)
Born in 1990	0.180**	-0.009	0.174	0.248	0.186	-0.240	0.292**	0.084	0.058	-0.108
	(0.089)	(0.162)	(0.129)	(0.207)	(0.124)	(0.257)	(0.124)	(0.231)	(0.127)	(0.238)
Born second semester * born in 1990	-0.181	-0.187	-0.264	-0.297*	-0.069	-0.076	-0.313	-0.249	-0.049	-0.106
	(0.136)	(0.132)	(0.188)	(0.180)	(0.200)	(0.198)	(0.197)	(0.190)	(0.189)	(0.184)
Background controls	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Number of observations	1,994	1,994	978	978	1,016	1,016	1,019	1,019	975	975
R^2	0.002	0.115	0.005	0.164	0.003	0.125	0.005	0.170	0.001	0.127

Notes: Panel A and B present the results of OLS regressions. Robust standard errors are shown in parentheses, while significance levels is 1% (***), 5% (**) and 10% (*). Background controls include an indicator for the child's gender, two indicator variables for mother's education, two indicator variables for mother's ethnicity, a rural dummy for the place of birth of the child, 46 regions of birth dummies, log of total consumption, number of durables, number of children in the household.
Source: Authors' calculations using the 1994-95 RIHS.