The Supply of Birth Control Methods, Education and Fertility: Evidence from Romania *

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Abstract

This paper investigates the effect of the supply of birth control methods on fertility behavior by exploring the effects of Romania's 23-year period of continued pronatalist policies. Between 1957 and 1966 Romania had a very liberal abortion policy and abortion was the main method of birth control. In 1966, the Romanian government abruptly decided to make both abortion and family planning illegal. This policy was sustained until December 1989 with only minor modifications. The implementation and repeal of the restrictive regime provide a useful and plausibly exogenous source of variation in the cost of birth control methods that is arguably orthogonal to the demand for children.

Following the lifting of the restrictions in 1989 the immediate decrease in fertility was 30%. Women who spent most of their reproductive years under the restrictive regime experienced large increases in lifecycle fertility of about 0.5 children or a 25% increase. Less educated women had bigger increases in fertility after policy implementation and larger fertility decreases following the lifting of restrictions in 1989, when fertility differentials between educational groups decreased by fifty percent. These findings strongly suggest that access to abortion and birth control are quantitatively significant determinants of fertility levels, particularly for less educated women.

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1 Introduction

The contribution of supply-side factors (access to abortion and modern contraceptive methods) in the demographic transition associated with modern economic growth and development has been an important research question. Besides its intrinsic theoretical value, the answer to this question is of obvious policy interest because it is directly related to the debate on whether family planning programs have an effect on fertility. The debate tends to be polarized between those who believe that good family planning programs can work everywhere and those who contend that programs have little effect (Freedman and Freedman, 1992). It has proven difficult to convincingly isolate the effects of family planning programs unambiguously from other possible factors that reduce fertility, given that the large decreases in fertility in many developing countries of the world in this century were associated with concurrent increases in education and labor market opportunities for women, decreases in mortality, and improvements in the technology and diffusion of birth controls methods (Gertler and Molynueax, 1994 and Miller, 2004).

Another open research question in demography is to understand how changes in access to abortion and birth control methods affect the fertility of women with different levels of education. Understanding the relationship between the supply of birth control methods, education and fertility could help understand the mechanisms that underlie the robust negative association between female education and fertility that has been established in many countries at different points in time. Moreover, if easy access to fertility control has a much larger effect on women with less education, then distributional goals could provide additional reason for the provision of methods of fertility control.

This paper uses Romania's distinctive history of changes in access to birth control methods as a natural experiment to isolate and measure supply-side effects, and to test if they have a differential impact by educational levels. Between 1957 and 1966 Romania had a very liberal abortion policy and abortion was the main method of contraception. In 1966, the Romanian government abruptly made abortion and family planning illegal. This policy was sustained, with only minor modifications, until December 1989, when following the fall of communism, Romania reverted back to a liberal policy regarding abortion and modern contraceptives.

Previous work using the same Romanian context (Pop-Eleches, 2006) has focused on

socio-economic outcomes of additional children born in 1967 as a result of the unexpected ban on abortions introduced at the end of 1966. After taking into consideration possible crowding effects due to the increase in cohort size, and composition effects resulting from different use of abortions by certain socio-economic groups, I provide evidence that children born after the ban on abortions had significantly worse schooling and labor market outcomes. While the focus in Pop-Eleches (2006) was on child outcomes, the present paper attempts to understand the impact of the Romanian abortion ban on female fertility. In related work, Levine and Staiger (2004) looking at changes in abortion policies in Eastern Europe in the 1980's and early 1990's find that in countries that changed from very restrictive regimes to liberal regimes had significant increases in pregnancies and abortions and decreases in births of about 10%. The present paper extents this work in a number of ways. First, unlike in other Eastern European countries, Romania restricted access not just to abortion but also to other birth control methods. Secondly, Romania's 23 year period (1967-1989) of restricted access to abortion and birth control methods also allows for an evaluation of the long term fertility impacts of supply restrictions. Finally, the heterogeneous effect of the policy by educational status can be explored with detailed reproductive microdata.

The main empirical strategy is to study reproductive outcomes of women in the period 1988-1992, just before and after the policy shift legalizing abortion in December 1989 in Romania, and to compare those outcomes with outcomes of similar women in neighboring Moldova. Since the majority of the population in Moldova is ethnically Romanian it is an appropriate comparison country. Furthermore, abortion and modern contraceptives were legally available in Moldova both before and during the economic transition that started in 1990. As additional evidence, I will also analyze monthly fertility patterns in Romania during 1990 to explore immediate effects six months after the announcement of the policy change. Finally, I will also examine longer term patterns of fertility levels across policy regimes looking at cohorts of Romanian and Hungarian women in Romania, compared to similar cohorts from Hungary.

My analysis shows that the supply of birth control methods has a large effect on fertility levels and explains a large part of the fertility differentials across educational groups. In the short run the lifting of the restrictive ban in 1989 decreased fertility by

30%. Results from Romania's 23 year period of continued pronatalist policies suggest large increases in lifecycle fertility for women who spent most of their reproductive years under the restrictive regime (about 0.5 children or a 25% increase). This result, which given the nature of the policy is an upper bound on the possible supply side effects of birth control methods, is significant especially given that women with 4 or more children had access to legal abortions. The data also shows bigger increases in fertility for less educated women after abortion was banned in the 1960's and larger fertility decreases when access restrictions were lifted after 1989. Indeed, after 1989 fertility differentials between educational groups decreased by about fifty percent. These results are providing evidence for the important role played by supply-side factors in explaining fertility levels and the relationship between education and fertility.

The paper is organized as follows. Section 2 provides background information on the Romanian context. In section 3, I describe the data and the empirical strategies. Section 4 presents the main results and section 6 addresses possible explanations for the change in fertility differential by educational groups. The final section presents conclusions.

2 Abortion and birth control policies regimes in Romania

During the period 1960-1990 unusually high levels of legally induced abortions characterized the communist countries of Eastern Europe. These countries, following the lead of the Soviet Union, were among the first in the world to liberalize access to abortions in the late 1950s (David, 1999). Compared to other countries in the region, Romania has long been a "special situation" in the field of demography and reproductive behavior, because of the radical changes in policy concerning access to legal abortion (Baban, 1999, p.191). Prior to 1966, Romania had the most liberal abortion policy in Europe and abortion was the most widely used method of birth control (World Bank, 1992). In 1965, there were four abortions for every live birth (Berelson, 1979).

Worried about the rapid decrease in fertility[1] in the early 1960's (see Figure 1) Roma-

[1]The rapid decrease in fertility in Romania in this period is atributed to the country's rapid economic and social development and the availability of access to abortion as a method of birth control. Beginning

nia's dictator, Nicolae Ceausescu, issued a surprise decree in October 1966: abortion and family planning were declared illegal and the immediate cessation of abortions was ordered. Legal abortions were allowed only for women over the age of 42, women with more than four children, women with health problems, and women with pregnancies resulting from rape or incest. At the same time, the import of modern contraceptives from abroad was suspended and the local production was reduced to a minimum (Kligman, 1998).

The results were dramatic: crude birth rates increased from 14.3 in 1966 to 27.4 in 1967 and the total fertility rate increased from 1.9 to 3.7 children per woman in the same period (Legge, 1985). As can be seen in Figure 1, the large number of births continued for about 3-4 years, after which the fertility rate stabilized for almost 20 years, albeit at a higher level than the average fertility rates in Hungary, Bulgaria and Russia. The law was strictly enforced until December 1989, when the communist government was overthrown.[2] This trend reversal was immediate with a decline in the fertility rate and a sharp increase in the number of abortions. In 1990 alone, there were 1 million abortions in a country of only 22 million people (World Bank, 1992). During the 1990s Romania's fertility level displays a pattern remarkably similar to that of its neighbors.[3]

Following the introduction of the ban on abortions and modern contraceptives, the use of illegal abortions increased substantially. One good indicator of the extent of illegal abortions is the maternal mortality rate: while in 1966 Romania's maternal mortality rate was similar to that of its neighbors, by the late 1980s the rate was ten times higher than any country in Europe (World Bank, 1992).

This legislative history enables me to study how the changes in the supply of birth control methods affect the pregnancy, birth and abortion behavior of women. The main part of the analysis uses the liberalization of access to abortion and contraception in December 1989 as a natural experiment to estimate the effect of birth control methods on reproductive outcomes.

The government's ban of abortions and modern contraception in 1966 was also ac-

with the 1950s, Romania enjoyed two decades of continued economic growth as well as large increases in educational achievements and labor force participation for both men and women.

[2]The increase in fertility after 1984 is due to further restrictions of the abortion regime. In addition to stricter monitoring of pregnant women, the minimum abortion age was increased from 42 to 45 years and the minimum number of births in order to be able to receive a legal abortion from 4 to 5.

[3]Kligman (1998) is a very interesting ethnographic study of Romania's reproductive policies.

companied by the introduction of limited pronatalist incentives. The main incentives provided were paid medical leaves during pregnancy and a one time maternity grant of about $85, which is roughly equal to an average monthly wage income. The increases in the monthly child allowance provided by the government to each child was increased by $3, a very small amount compared to the cost of raising a child.[4] One potential concern with my identification strategy is that these financial incentives, although very small in magnitude, might have changed the demand for children. Since my analysis will mainly focus on changes in fertility behavior following the liberalization of abortions and modern contraceptives in 1989, the confounding effect of financial pronatalist incentives on fertility would be a potential worry only if the government had abolished these incentives concurrently with the liberalization of abortion and modern contraceptive methods. According to a study on the provision of social services in Romania (World Bank, 1992), no major reforms had taken place in the provision of maternity and child benefits in the first three years following the fall of communism.

Since the liberalization of access to birth control methods in 1989 coincided with the start of the transition process, changes in fertility behavior could also be caused by changes in the demand for children due to the different social and economic environment following the fall of communism. Data from neighboring Moldova, which did not experience changes in abortion and contraceptive regime in this period, is used to account for possible changes in demand for children induced by the transition process. Finally, I will assess the robustness of the findings using data from the Romanian and Hungarian census, by comparing fertility behavior of women who spent different fractions of their reproductive years under the restrictive regime.

3 Data and econometric framework

The primary dataset for the present analysis is the 1993 Romanian Reproductive Health Survey[5]. Conducted with technical assistance from the Center for Disease Control, this survey is the first representative household-based survey designed to collect data

[4]Kligman (1998, p.73) provides further evidence on how small the financial pronotalist incentives were compared to the cost of raising children.

[5]Serbanescu et al. (1995) provides extensive discussion and documentation of the data.

on the reproductive behaviors of women aged 15-44 after the fall of communism. For each respondent the survey covered their socioeconomic characteristics, a history of all pregnancies, their outcomes (birth, abortion, miscarriage etc.) and the planning status of the pregnancies (unwanted or not).

The dataset has a number of important advantages for my purposes. First, the retrospective survey covers the reproductive outcomes of women both before and after the ban on abortions and birth control was lifted in December 1989. Secondly, since at the time of the interviews in late 1993, abortions had already been legalized for a number of years, women were a lot more likely to report their use of illegal abortions prior to 1989. In fact according to the Final Report of the Reproductive Health Survey (Serbanescu et al. 1995), the reporting of abortion levels in the survey prior to 1990 matches very closely government aggregate data on official, spontaneous and estimated illegal abortions.

Table 1 presents summary statistics for the main variables used in the study. About 24% of women finished only primary school, 63% attended at least some secondary school and 13% had attended a tertiary education institution. The proportion of women with only primary education is larger (32%) for women who are over 30 years old and this reflects the increase in educational attainment over time in Romania. Since all the variables measuring educational and socio-economic status are measured at the time of the survey in 1993, one potential worry is the endogeneity of these variables with respect to the reproductive outcomes measured in the period 1988-1992. To deal with this issue most of the analysis will use a simple educational variable, indicating whether a person has more than primary education (8 years of schooling). Since the vast majority of Romanians finish primary school prior to age 15 and do not have children before that age, potential endogeneity issues are reduced to a minimum. The other more endogenous controls (such as socio-economic status) will also be included in the analysis to test the robustness of the effect of education on reproductive outcomes.

In order to assess the robustness of the results, the analysis will include data from three additional sources. Data from the 1997 Moldova Reproductive Health Survey will be used to control for possible demand driven changes in fertility behavior. The choice of Moldova as an appropriate comparison country is fourfold. First, Moldova did not restrict access to abortion and modern contraception either before or after the fall of

communism (Serbanescu et al. 1999) and therefore the country did not experience any policy induced changes in the supply of birth control methods. Secondly, the majority of the population in Moldova is ethnically Romanian, allowing to control for potentially important religious and cultural factors. (Most of the territory of the Republic of Moldova and the north-eastern region of Moldova in present day Romania share a common history prior to the Ribbentrop-Molotov Pact of 1939). Thirdly, Moldova also experienced the economic and political transition from communism in the 1990's. Since the fall in output and increase in poverty in Moldova during this period has been more drastic than in Romania[6], the effect of economic distress on fertility in Moldova was arguably larger, which would bias the results against finding an effect of changes in the supply of birth control methods. Finally, the Moldavian survey used in 1997 was also carried out under the technical assistance of the Center for Disease Control and its format is remarkably similar to the 1993 Romanian survey. Since the Moldavian data was collected for a sample of 5412 women aged 15-44 in 1997[7], fertility behavior in the period 1988 to 1992 can only be studied for the age group 15-34. The detail of information about each pregnancy outcome is less detailed than in the Romanian case and includes for each pregnancy just the outcome (birth, abortion, miscarriage etc.) and not the planning status (unwanted or not).

The two additional sources used are a sample of the 1992 Romanian Census and the 1990 Hungarian Census. One of the census questions in both countries asks women about the number of children ever born and is thus a good measure of lifetime fertility for women over 40 years old. The census data will be used to check some of the findings of fertility behavior by comparing the lifetime fertility of women who spent most of their reproductive years with access to birth control methods with that of women who spent most of their reproductive years under the restrictive regime. Finally, the 1992 Romanian census will also be used to calculate total fertility rates by education in the period 1988-1991 using the Own-Children Method estimation developed by Cho et al. (1986).

To investigate how the liberalization of access to abortion and modern contracep-

[6]GDP per capita in Romania in 1999 was at 76% of the 1989 level, compared to only 31% in the case of Moldova (EBRD,2000).

[7]In the Moldovan sample, 13% finished primary education, 71% secondary education and 16% tertiary education.

tion affects reproductive behavior, I estimate:

(1) $OUTCOME_{it} = \beta_0 + \beta_1 \cdot education_{it} + \beta_2 \cdot after_t + \beta_3 \cdot education_{it} \cdot after_t$
$+\beta_4 \cdot agegroup_{it} + \beta_5 \cdot agegroup_{it} \cdot after_t + \varepsilon_{it}$

$OUTCOME_{itr}$ is the number of pregnancies (or births or abortions) that occur to a particular person (i) in a given year (t). In some specifications, only unwanted outcomes will be analyzed. *Education* is a dummy measuring if an individual had more than primary school (more than 8 years of schooling). $After$ is dummy taking value 1 if an event occurred between 1991 and 1992, 0 otherwise. Finally, the regressions include 5 *agegroup* dummies, with the 20-24 years dummy dropped. The unit of observation is a person year and the period of study is 1988 to 1992, with year 1990 dropped since the fertility drop happened in the middle of the year. The sample includes all the women aged 15 or higher in a particular year.

Within this framework, the overall impact of the change in abortion and modern contraception regime on the reproductive outcome of interest for the less educated (those with 8 or fewer years of schooling) is captured by the coefficient β_2 and the effect on the educated is $\beta_2+\beta_3$[8]. The difference in outcomes between less educated and more educated women prior to the reform is captured by the coefficient β_1, while the differential across educational groups after the reform is captured by $\beta_1 + \beta_3$.

4 Results

4.1 Graphical analysis and regression results

The overall impact of the liberalization of abortions and modern contraception in December 1989 can be illustrated visually[9]. Figure 2 shows the total pregnancy rate[10] for three educational groups during the two years prior to the policy change (1988-1989) in comparison to the period 1991-1992. The pattern of change in pregnancy behavior

[8]To be more precise, the coefficients refer to the impact of the policy on the age group 20-24.

[9]See also Serbanescu et al. (1995a) and Serbanescu et al. (1995b) for a discussion of the impact of the policy change after 1989 in Romania.

[10]The total pregnancy rate is the average total number of pregnancies that would be born per woman in her lifetime, assuming no mortality in the childbearing ages, calculated from the age distribution and age-specific pregnancy rates of a specified group in a given reference period (United Nations, 2002). The total fertility rate (TFR) and total abortion rate (TAR) are defined in a similar way.

is similar across groups: women of primary, secondary and tertiary education experience large increases in their total pregnancy rate of about 1.5. Figure 4 shows the total fertility rate for the three groups. While all the groups experienced decreases in fertility after 1990, the effect is uneven across groups. For women of secondary education, the decrease in fertility is from 1.93 to 1.38 children, while for university-educated women the decrease is from 1.41 to 1.02 children. The overall impact on women with primary education is a lot larger and goes from 3.22 to 2.10 children. Since pregnancy rates increased similarly across groups after the policy change while the birth rates decreased more for the uneducated population, one expects abortions to have increased more for the uneducated women. Figure 3 confirms this outcome: women with primary education had an increase in their total abortion rate of 2.86, while the increase for the more educated groups was much smaller (2.17 for secondary and 1.78 for tertiary education). Since women with secondary and tertiary education experienced similar fertility responses to the policy, for the rest of the paper they will not be analyzed separately.[11]

Table 2 presents the first set of regression estimates for the impact of the policy change on reproductive behavior for the basic equation (1). Each column in the table reflects the effect on a particular outcome. The first three columns confirm the graphical analysis: columns 1-3 reflect the large increases in pregnancies and abortion after 1990 and the large decreases in fertility during this period.[12] The coefficient in the birth regression on $after$ is -.068 implying that for uneducated women in the age group 20-24 the yearly decrease in the probability of giving birth after the lifting of the ban was 7%.[13] At the same time, the impact was differential across educational groups: the interaction of *education* and $after$ in column 2 is large and positive for the births regression (.029) and more than twice as large as the coefficient on education (-.051). These results represent the two main findings of this paper: (1) the supply of birth control

[11]Another reason for merging women with secondary and tertiary education into one group is the relatively small number of women with tertiary education (13%).

[12]The current analysis only measures the effect of the policy change on changes in fertility levels. An alternative approach would be to analyze percentage changes in fertility as a result of the policy change. The effects are similar but smaller in magnitude to the level effects: less educated women have larger percentage changes in fertility.

[13]The results in the first three columns of the table are in line with Levine and Staiger (2002), who view abortion as an insurance mechanism that protects women from unwanted births: a decrease in the cost of abortion increases abortion and pregnancy rates and reduces birth rates.

methods has a large impact on fertility levels and (2) it explains a large part (more than 50% in this specification) of the fertility differential between educated and uneducated women.[14]

Columns 4 and 5 of Table 2 analyze the pregnancies ending in abortions in more detail. In column 3 one observes a reduction in the overall number of abortions Column 4 presents the results for legal abortions, which prior to the reform were allowed either for medical reasons or for women older than 45 or with more than 5 children.[15] In column 5 a similar regression is presented for illegal or provoked abortions. The results confirm the large increases in legal abortions and the virtual disappearance of illegal abortions after the policy change, since the coefficient on after in the last column of Table 2 is similar in size to the constant.

Table 3 studies pregnancy outcomes identified by the respondents as "unwanted". The use of unwanted pregnancy outcomes would be better suited for the current analysis if respondents would ex post truthfully reveal the planning status of their pregnancies. A comparison of the results in Table 2 and 3 seems to imply that women tend to underreport unwanted births given that the coefficients on $after$ and the interaction of *education* and $after$ are much larger for births than for unwanted births.[16] However, the corresponding coefficients in the abortion regressions are remarkably similar in size.

The models used so far do not control for other measures of socio-economic status that are likely to be correlated with our education variable and could have an independent effect on the pregnancy outcomes. For example, educated women are more likely to live in higher income or urban families, which could facilitate easier access to abortion under a restrictive regime. In columns 4-6 of Table 4, I present regressions, which include a number of controls (a socio-economic index for basic household amenities as well as urban, region and religion dummies) and their respective interactions with $after$.[17] The

[14]The impact of the change in policy on pregnancy, birth and abortion behavior was similar across age groups, particularly for women aged 20 to 34, who have most pregnancies and births.

[15]It is likely that a large number of abortions prior to 1990 were illegal but reported as legal by the respondents. In fact, a large number of non-medical abortions reported as legal by the respondents did not occur to women over 40 or with more than 4 children.

[16]A possible alternative explanation of the difference between these coefficients could be changes in demand for children during this period. In a later section I will check the validity of this claim using data from Moldova to control for possible demand driven explanations.

[17]There is of course the potential worry about the endogeneity of these controls since they are measured

coefficients on *education*, $after$ and the interaction of *education* and $after$ do not change significantly once we include these controls into the regression framework. Despite the robustness of the results to the inclusion of observable controls, one cannot rule out the existence of unobserved "ability" bias in these regressions. However, information on whether women with more education acquired or were born with different skills to control their fertility levels should not be important for targeting family planning programs or for understanding the distributional effects of such programs.[18]

Another potential worry is that of reverse causality, given that the birth of a child may have a negative effect on a woman's educational achievement (Katz and Goldin (2002)). Since the vast majority of Romanians finish primary school prior to age 15 and do not have children before that age, this effect is potentially very small. To deal with this issue, the regressions for pregnancy and births are estimated again restricting the sample to individuals aged 20 or higher during each risk period. The coefficients in columns 1-3 of Table 4 are very similar to the earlier results. As an additional robustness check, columns 7-9 of Table 4 analyze the effect of the policy regime on fertility behavior by using fixed effects regressions. The coefficients on $after$ and the interaction of *education* and $after$ are comparable in sign, size and significance to the earlier results and hence appear to confirm our previous findings.

4.2 Economic transition vs. birth control access: comparison with Moldova

An alternative hypothesis for changes in fertility behavior in Romania after 1990 arises from changes in the demand for children due to the different social and economic environment following the fall of communism. This effect might be potentially important given that basically all former communist countries experienced decreases in fertility, which have been attributed to adverse social and economic conditions during the transition years (David et al, 1997).[19] To assess this alternative interpretation, I use similar

at the time of the survey and so after the pregnancy outcomes have occurred.

[18]However, given the potential presence of "ability" bias, one cannot infer from these results whether the best way to decrease fertility levels is by increasing spending on education or family planning programs.

[19]A priori, the effect of the transition period on fertility is ambigous since higher expectation about the future should raise fertility while the short run economic decline and uncertainty should lower it.

data to compare changes in Romania and Moldova, a former Soviet Republic that did allow free access to abortion and modern contraception throughout this period and where Romanians are the largest ethnic group.

I estimate a variant of equation (1) that uses similar micro data from Romania and Moldova:

$$(2)\ OUTCOME_{itr} = \theta_0 + \theta_1 \cdot education_{itr} + \theta_2 \cdot after_t + \theta_3 \cdot education_{itr} \cdot after_t$$
$$+\theta_4 \cdot romania_r + \theta_5 \cdot romania_r \cdot after_t + \theta_6 \cdot romania_r \cdot education_{itr}$$
$$+\theta_7 \cdot romania_r \cdot after_t \cdot education_{itr} + \theta_8 \cdot agegroup_{it}$$
$$+\theta_9 \cdot agegroup_{it} \cdot after_t + \varepsilon_{itr}$$

where $education$[20], $after$ and $agegroup$ are the same as before and $romania$ indicates that an observation is from the Romanian data. $OUTCOME_{itr}$ is the number of pregnancies (or births or abortions) that occur to a particular person (i) in a given year (t) in a given country (r) . The time period covered is 1988-1989 and 1991-1992. In this specification the coefficients of interest (θ_5, θ_6 and θ_7) describe the responses in reproductive behavior after 1990 for different educational groups that are particular for Romania after controlling for common trends in the two countries.

Estimates of equation (2) shown in Table 5, confirm the robustness of the earlier results. In the birth regression reported in column 2 of Table 5 the coefficient θ_5 ($romania \cdot after$) is negative and significant indicating that the decrease in fertility was larger in Romania relative to Moldova after the fall of communism. Similarly, the coefficient θ_7 ($romania \cdot after \cdot education$) is positive and significant and thus implies that the decrease in births was more pronounced for the uneducated group in Romania. Column 5 of Table 5 presents results using a fixed effects specification which are very similar to those in column 2 of the same table. Similar regressions using pregnancies ending in abortions (columns 3 and 6 of Table 5) are consistent with our earlier results, although θ_7 ($romania \cdot after \cdot education$) is significant only in the fixed effects specification. In Table 5 I used the first year (1990) of sharp decline in GDP to date the start of the transition process in both countries. As a specification test I have run similar regression models where Moldova's transition is defined to start in 1991, the year the country declared its independence from

[20]The external validity of the education variable in this regression is an additional concern if the selection into different educational levels differs between Romania and Moldova.

the Soviet Union. The results (not reported) are similar to those presented in Table 5 although the triple interaction ($romania \cdot after \cdot education$) while still economically sizable is not quite significant at conventional levels (p-value of .17).

However, the estimates in Table 5 do indicate that some of the decreases in fertility after 1990 can be attributed to changes in demand for children possibly due to the negative impact of the transition process. The coefficient on $after$ is negative and large (and significant in the fixed effects specification) and they imply that Moldova also experienced decreases in fertility during this time. However, the interaction of *education* and $after$ is negative suggesting that if anything demand driven factors would widen fertility differentials across educational groups.[21]

4.3 The immediate fertility response in Romania in 1990

An additional way to separate the effect of the lifting of the ban on birth controls methods on fertility in Romania after 1990 from the confounding effect of the political and economic changes during the transition period is to analyze the fertility response in the months immediately following the policy change. Assuming that the population has immediate access to information about the lift of the ban and that hospitals do not face supply constraints in offering abortion services, the fertility impact should be observed immediately after June of 1990, that is six months after the announcement of the policy change in December of 1989. The six month lag between policy announcement and the fertility response results from the fact that a pregnancy lasts about nine months and abortions are generally performed within the first 3 months of pregnancy.

The economic and political transition could have two different effects on fertility behavior. The first effect could be immediate after the regime change and would reflect the change in expectations about the future as a results of the change from a repressive regime to a democratic society. The second effect is potentially more gradual and would reflect how the continuing worsening in socio-economic conditions (unemployment, income, social insurance) affects the decision to have children. The consensus among demographers working in Eastern Europe (David 1999) is that in no countries where access to birth con-

[21] The second panel of Table 5 presents results using a fixed effects specification which are very similar to those in the first columns of the same table.

trol methods was easily available was the fall in communism associated with a change fall in fertility in the year of regime change. Instead the decline in fertility during transition was gradual in the region and reflected the continuous worsening of economic conditions.

While the Romanian Reproductive Health Survey does not have a large enough sample to study the fertility changes in Romania in 1990 in fine detail, I make use of the 1992 Romanian Census to shed light on the dynamics of the response. Figure 5 plots the number of children born in a particular months for the period 1989-1991. One can observe an abrupt one time drop in fertility of about 30% starting six months after the lift of the ban (July of 1990) without any apparent trend in the birth rates during this period. In addition we use the Own Children Method of fertility estimation[22], by matching children to mothers in the data and scaling the number of births by the number of women of reproductive age, to calculate fertility rates by the education of the mothers. Figure 6 presents the monthly total fertility rates[23] by education groups for the period January 1988 to December 1991.[24] The results provide convincing evidence that the fertility response was a lot larger for women with primary education and provides evidence on a large reduction in the fertility gap between educational groups following the reform. Figures 5 ad 6 also highlight that fertility rates are stable and not trending in the period prior to the policy change. In sum, these results provide additional evidence that the patterns of fertility changes are the results of changes in access to birth control methods and are unlikely driven by the confounding effects of the transition period.[25]

4.4 Long-term impact of the restrictive policy

The two main findings of the analysis so far, namely that the lift of the ban on abortions and modern contraception methods was associated with large decreases in fertility and a significant reduction in the fertility differential between education groups, are based on short term responses to the sudden change in policy. An alternative way to check

[22]This method was developed by demographers (Cho et al., 1986) to measure fertility rates with the help of census data in countries where birth records are not readily available.

[23]The monthly TFR is calculated just like the commonly used yearly TFR, but the reference period is the month rather than the year.

[24]The census was took place in January 1992, so the last month with available data is December 1991.

[25]The results in this section also provide additional evidence that the pronatalist incentives implemented by the Romanian government cannot explain the changes in fertility levels.

the robustness of these results is to track changes in fertility levels over time for women who have spend different fractions of their reproductive years during the 23 year period (1966-1989) of restrictive access to contraception. One would naturally expect the long-term implications of the restrictive policy in 1966 to have produced the opposite effect: increases in overall birth levels and larger differentials between educated and uneducated women for those cohorts who spend more time affected by the restrictive policy. One caveat with the interpretation of these longer term fertility effects is that they might be driven not just by changes in the supply of birth control methods but also by the pronatalist demand type incentives introduced by the government after 1966. As argued earlier, these incentives were small and therefore unlikely to affect fertility levels by a lot.

Similarly to the previous section an attempt is made to establish what would have happened in the absence of the restrictive policy by selecting a comparison population that displays close similarities to the treated group. A good comparison group for whom data is available is the Hungarian population living in Romania and the population of Hungary.[26] The Hungarian population living in Hungary and in the Romanian region of Transylvania shared a common economic, cultural, social, and religious tradition within the borders of the Austrian Hungarian empire until 1918, when Transylvania became part of Romania. At the same time both countries had communist governments after World War II with similar development trajectories but different population policies, since access to birth control methods was easily available in Hungary throughout this period.

The data used for looking at long term trends in fertility levels is based on information from the national census of Romania and Hungary. The 1992 Romanian census asked women about the number of children ever born and thus for women who were over 40 in 1992 (or born prior to 1952) this variable is a good proxy for lifetime fertility. In Figure 7, I display the average number of children by year of birth for women born between 1900 and 1955. For women born between 1900 and 1930 I see a gradual and significant decline in fertility, which is broadly consistent with the timing of Romania's rapid demographic transition after World War II. The fertility impact of the restrictive policy can be observed for women born after 1930. Women born around 1930 were in their late thirties in 1967 and thus towards the end of their reproductive years at the time of the policy change. In

[26]Census data from Moldova is unfortunately not available for research use.

contrast, the cohorts born around 1950 were in their late teens in 1967 and thus spent basically all their fertile years under the restrictive regime. The difference in fertility between these two cohorts is about 0.4 children and is probably a lower bound of the supply side impact since Romania's rapid economic development in this period probably decreased demand for children. To account for these demand changes, Figure 7 also plots the mean number of children born to Hungarians living in Romania (from the 1992 Romanian census) and to the population in Hungary (from the 1990 Hungarian census). The figure shows similar trends in fertility for Hungarians in both countries for women born prior to 1930 as well as the divergence in fertility levels afterwards.[27] A comparison of fertility levels of cohorts in Romania and Hungary born around 1930 and 1950 show that women who spent most of their reproductive years under the restrictive regime had a lifetime increase in fertility of about 0.5 children or a 25% increase.[28] The magnitude of this result is large given that women with 4 or more children had access to legal abortions, and it provides, given the nature of the policy, an upper bound on the possible supply side effects of birth control methods. Since the short run responses in birth rates following the lift of the ban might overstate the longterm fertility impact of the policy, these results from the census data provides a better way to establish the lifecycle fertility impacts.

Figure 8 presents evidence of increases in the fertility differential between educated and uneducated women in Romania over time.[29] The fertility differential between educated and uneducated women experienced a gradual decline over time for cohorts born prior to 1930 followed by a gradual increase for cohorts born afterwards. The differential almost doubled from about .5 to 1 child when comparing cohorts born around 1930 and 1950 and is consistent with my earlier results. Taken together the results provide additional support for the important role played by the supply of birth control methods in explaining fertility levels and the relationship between education and fertility.

[27]The similarity in trends for women born prior to 1930 provides additional support that the population of Hungary is a good comparison group.

[28]In regressions not reported in the paper, we have confirmed the magnitude of the results presented in Figure 7.

[29]The relatively small number of uneducated Hungarians in the Romanian census sample and the inability to properly match educational levels between the Romanian and Hungarian data prevented an analysis of fertility differentials over time for the Hungarian population.

5 Conclusion

The effect of the supply of birth control methods on fertility and its differential impact across educational groups has received wide attention from demographers and economists around the world. However, an empirical investigation of these issues requires a source of variation in the cost of birth control methods that is orthogonal to the demand for children.

In this paper I argue that the introduction (in 1967) and the repeal (in 1989) of pronatalist policies in Romania, which drastically restricted access to abortion and other contraceptives for large groups of women, provide a useful source of variation in the cost of birth control methods. Using data from a variety of sources I provide evidence that these pronatalist policies caused large increases in fertility. The data reveal larger fertility increases for less educated women after birth control restrictions were introduced and larger fertility decreases when access restrictions were lifted after 1989. These findings show the significant importance that the supply of birth control methods play in understanding fertility levels and the effect of education on fertility.

Our preferred estimates imply a 30% reduction in fertility in Romania six months after the lifting of the ban and a 25% reduction in lifetime fertility. These results are large compared to the 10% reduction in fertility in other Eastern European countries following changes in their abortion laws in the 1990's (Levine and Staiger, 2004) and the reductions in short term and lifecycle fertility of less than 5% in the US associated with Roe v. Wade (Levine et al, 1999, Ananat, Gruber and Levine, 2007). The results imply that at least in the Romanian case where there is a lot of demand for fertility control methods, the provision of birth control methods can have large effects on fertility levels. Moreover, since the least educated women seem to benefit most, distributional goals could provide an additional reason for the provision of methods of fertility control.

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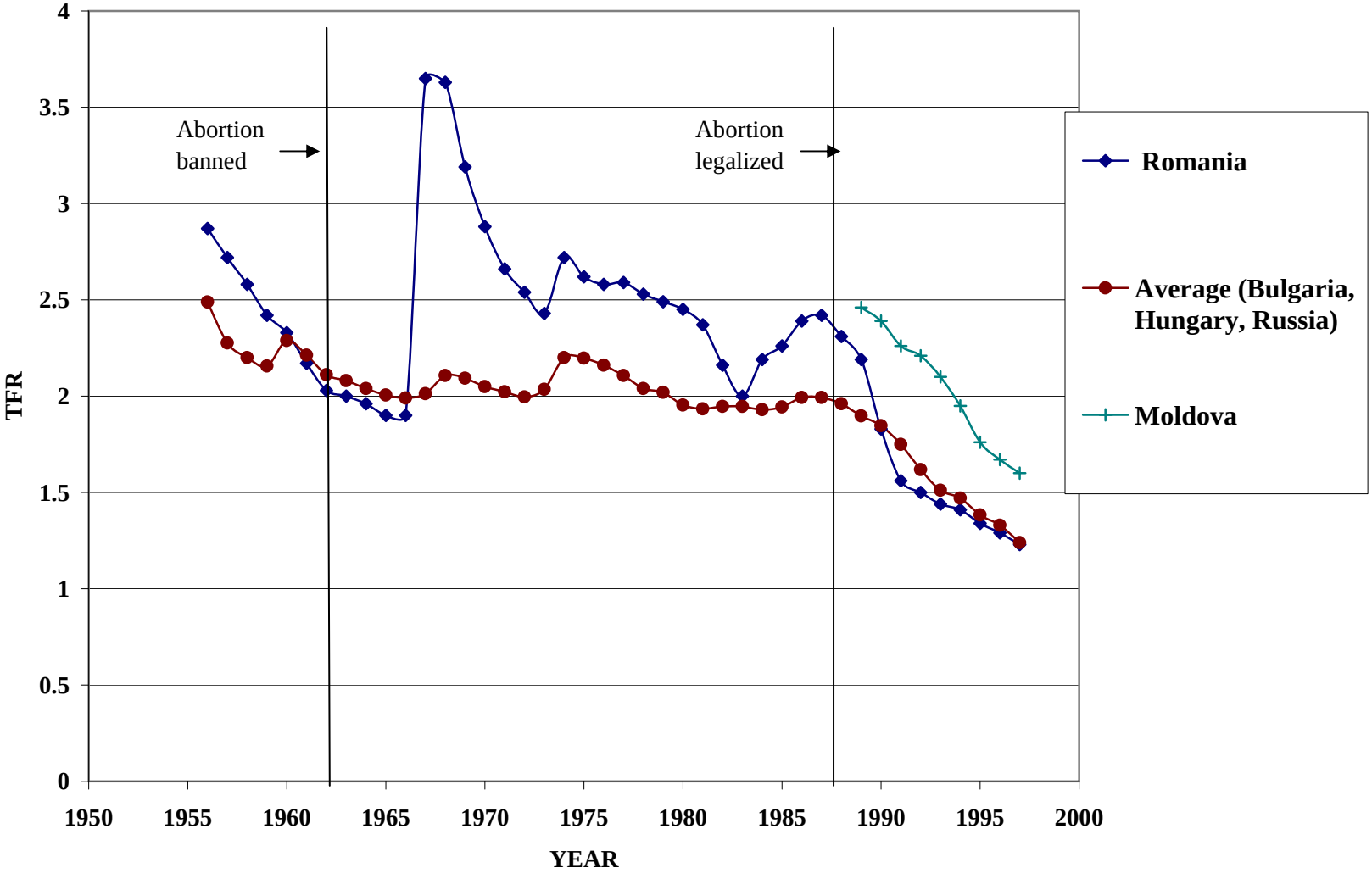
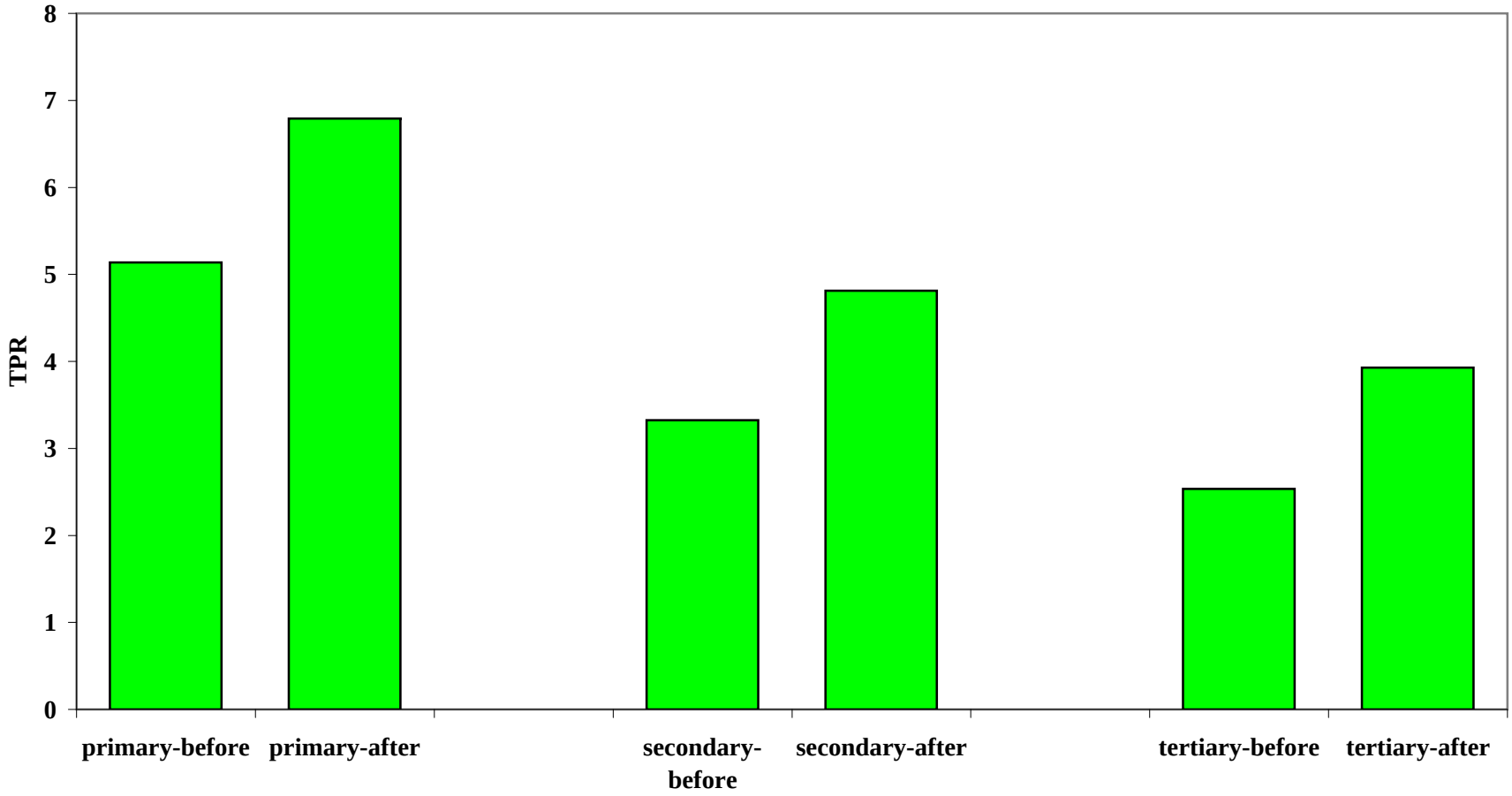
FIGURE 1: TOTAL FERTILITY RATES



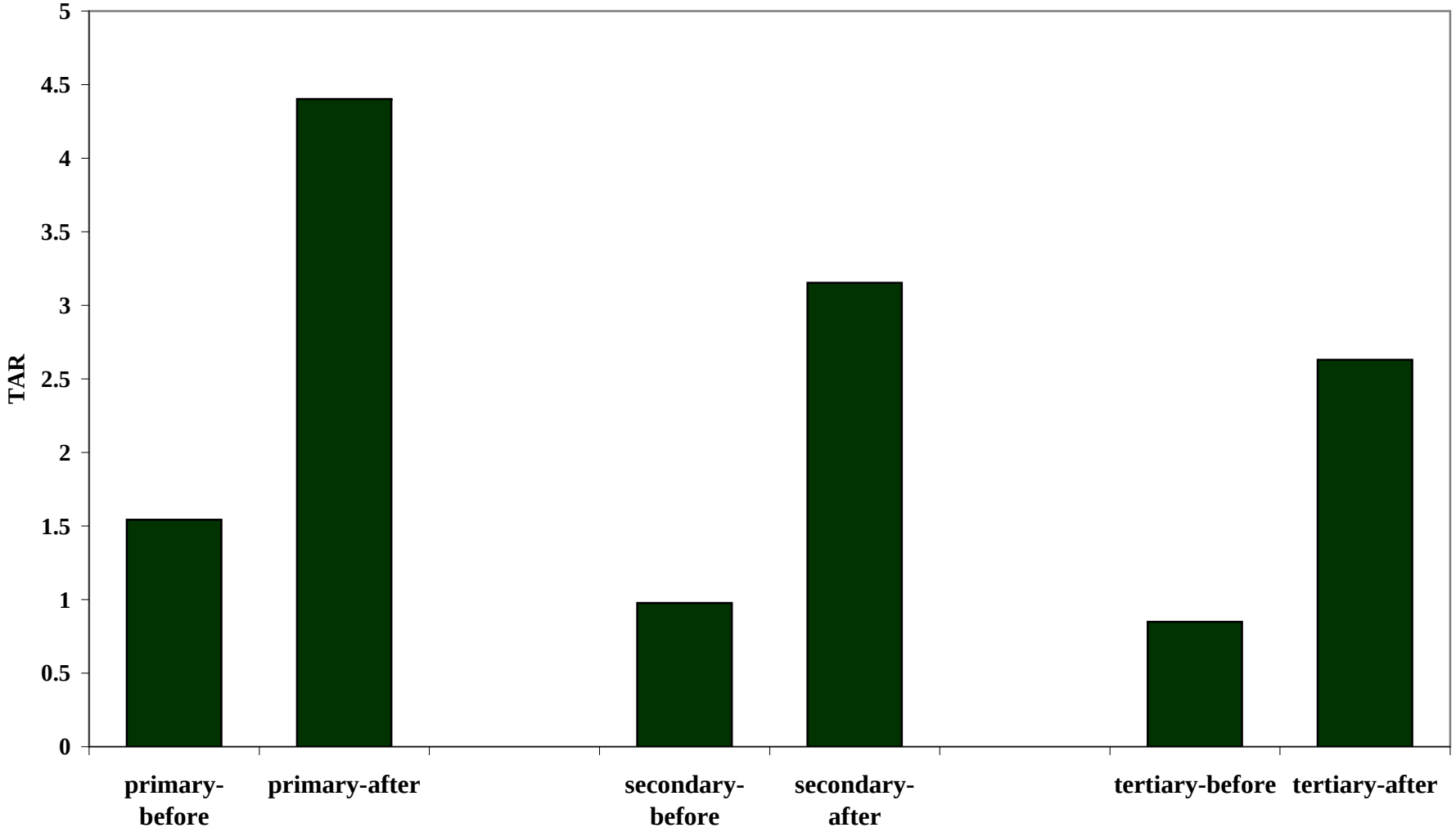
Notes: The total fertility rate is the average total number of births that would be born per woman in her lifetime, assuming no mortality in the childbearing ages, calculated from the age distribution and age-specific fertility rates of a specified group in a given reference period. Source: UN (2002).

FIGURE 2: TOTAL PREGNANCY RATES - BEFORE (1988-1989) AND AFTER (1991-1992)



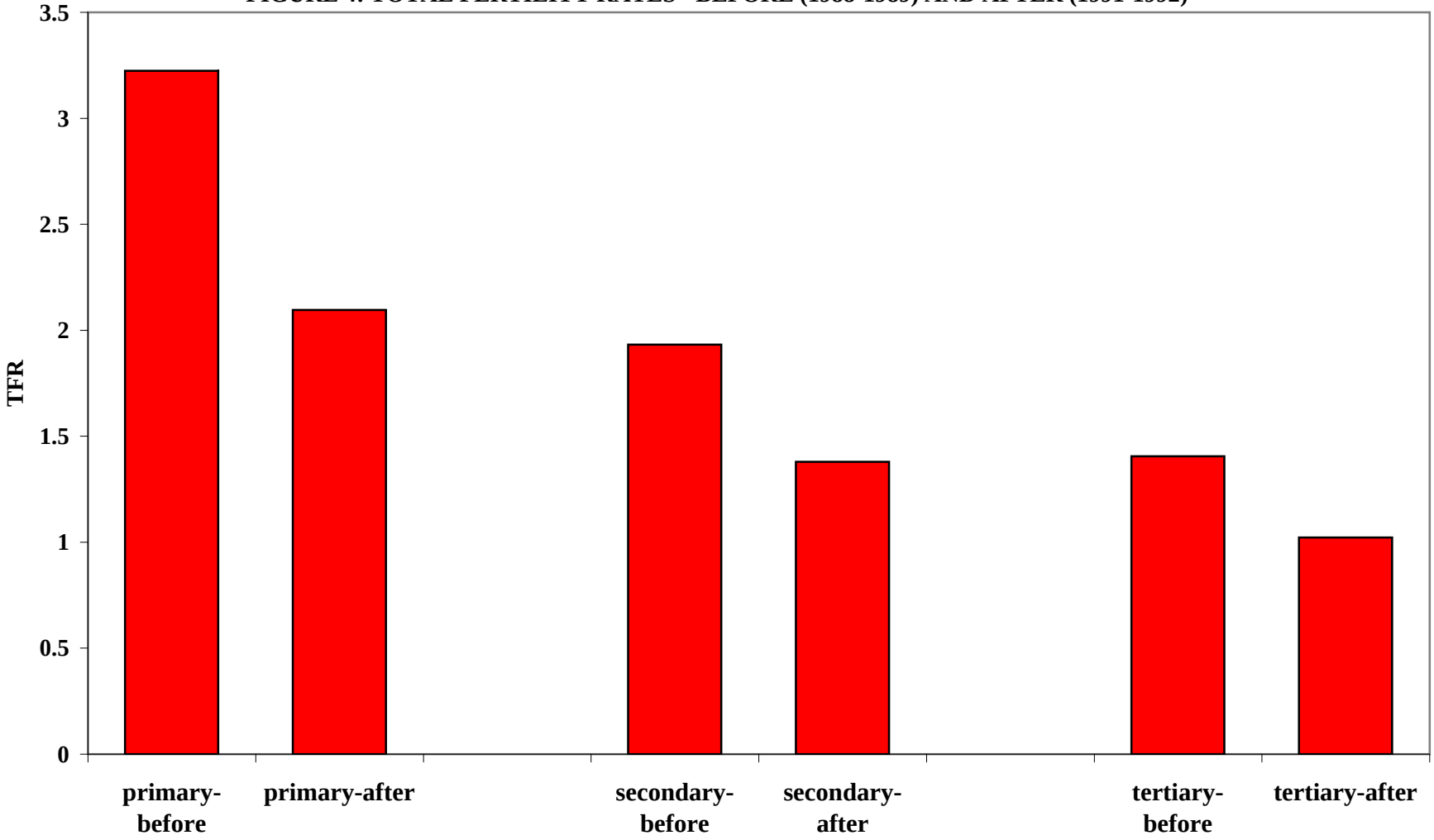
Notes: The total pregnancy rate is the average total number of pregnancies that would be born per woman in her lifetime, assuming no mortality in the childbearing ages, calculated from the age distribution and age-specific pregnancy rates of a specified group in a given reference period (United Nations, 2002). Source: Author's calculations based on 1993 RHSR

FIGURE 3: TOTAL ABORTION RATES - BEFORE (1988-1989) AND AFTER (1991-1992)



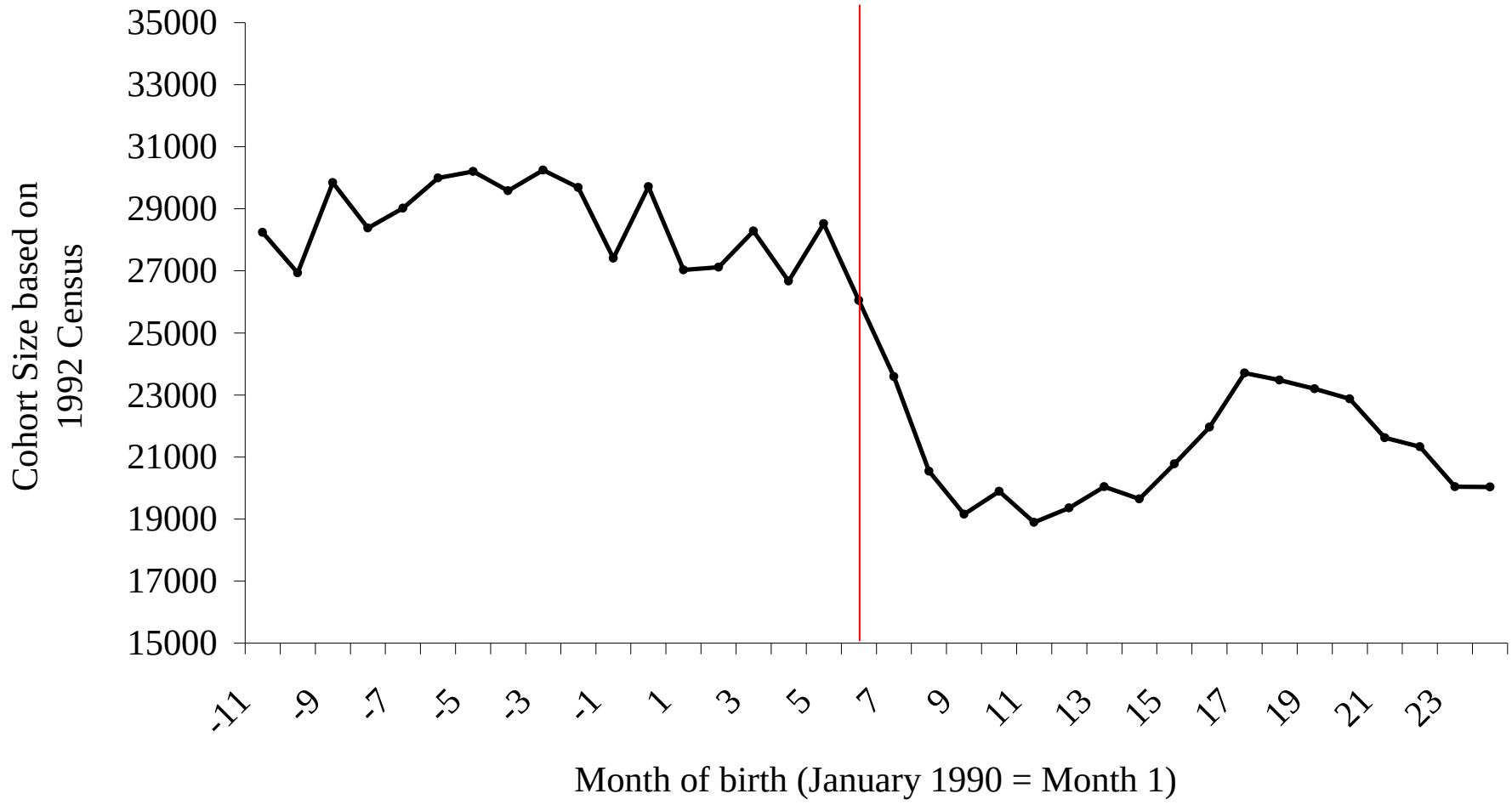
Notes: The total abortion rate is the average total number of abortions that would be born per woman in her lifetime, assuming no mortality in the childbearing ages, calculated from the age distribution and age-specific abortion rates of a specified group in a given reference period (United Nations, 2002). Source: Author's calculations based on 1993 RHSR.

FIGURE 4: TOTAL FERTILITY RATES - BEFORE (1988-1989) AND AFTER (1991-1992)



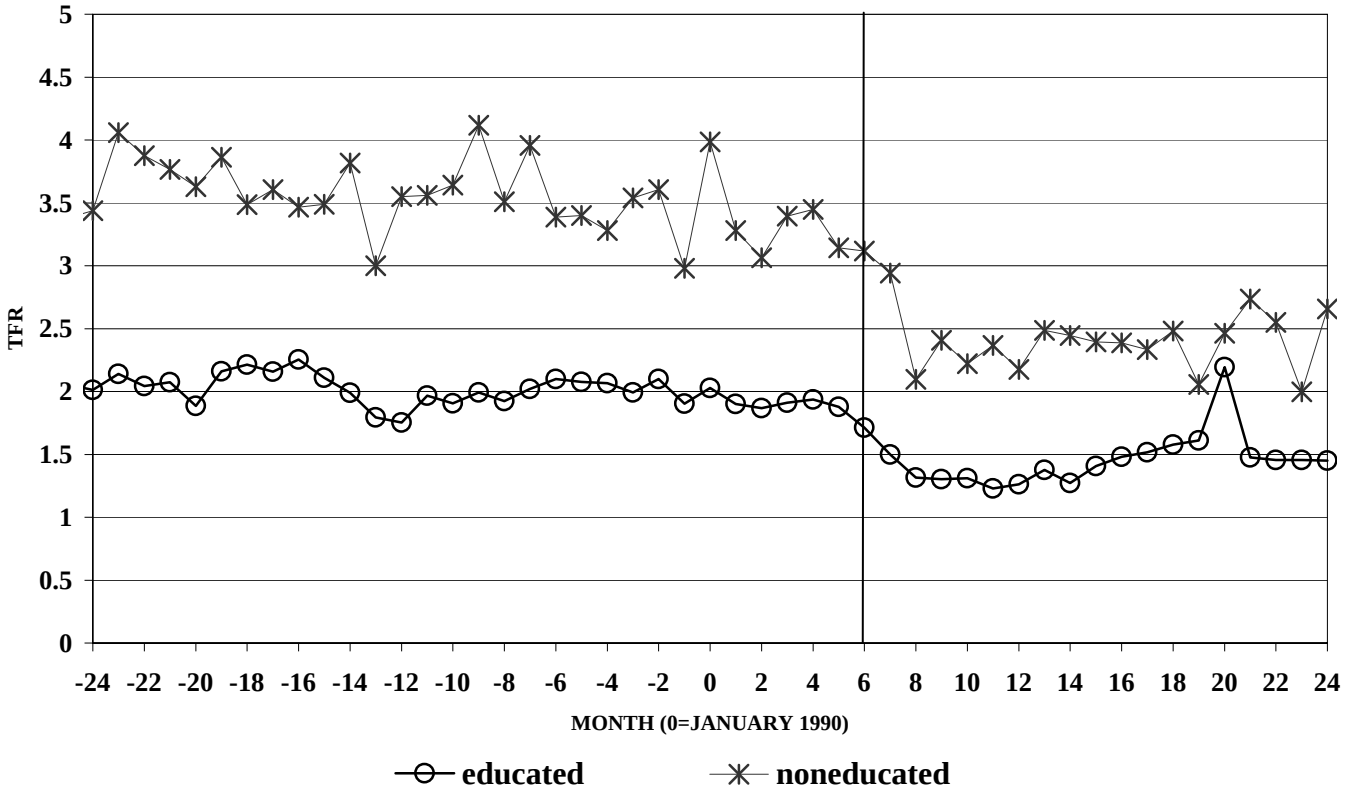
Notes: The total fertility rate is the average total number of births that would be born per woman in her lifetime, assuming no mortality in the childbearing ages, calculated from the age distribution and age-specific birth rates of a specified group in a given reference period (United Nations, 2002). Source: Author's calculations based on 1993 RHSR.

Figure 5: Cohort Size for Children Born 1989-1991



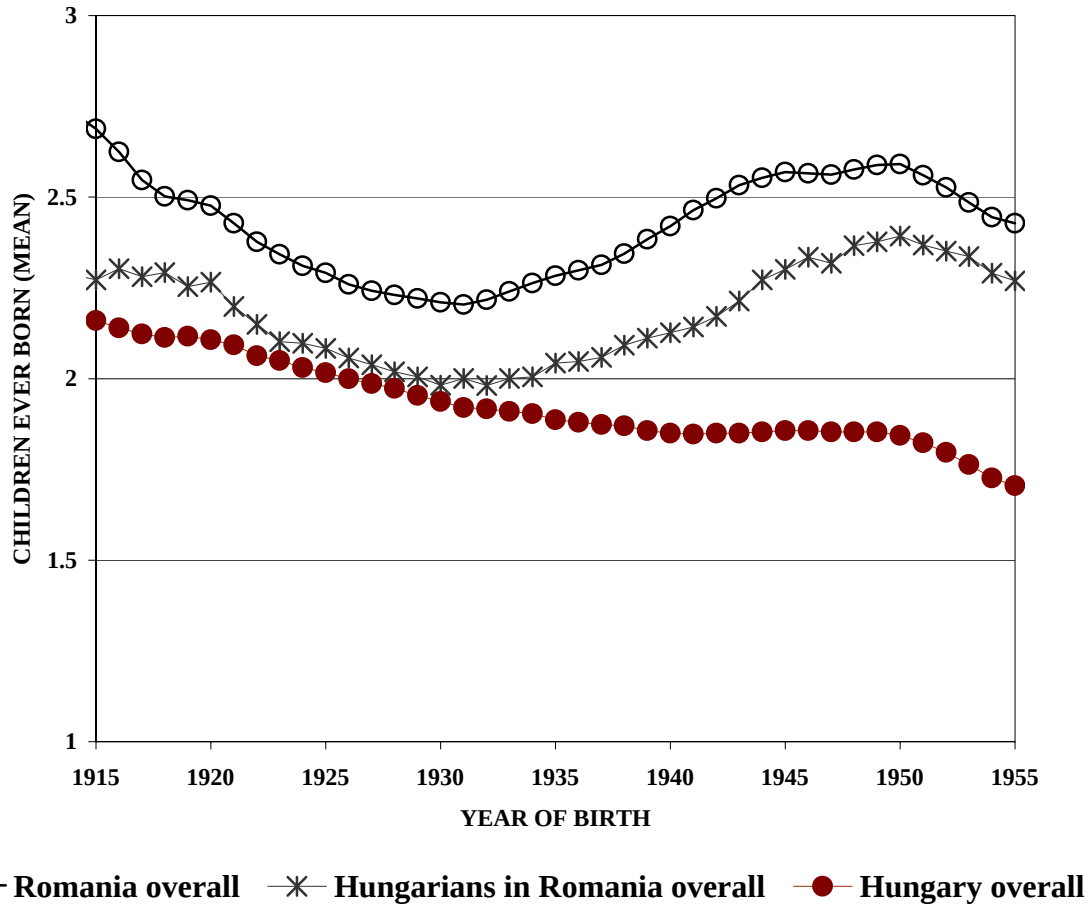
Notes: The monthly size of cohorts in Romania in the period 1989-1991 are based on the 1992 Romanian Census.

FIGURE 6: MONTHLY TOTAL FERTILITY RATE IN ROMANIA FROM 1988 TO 1991



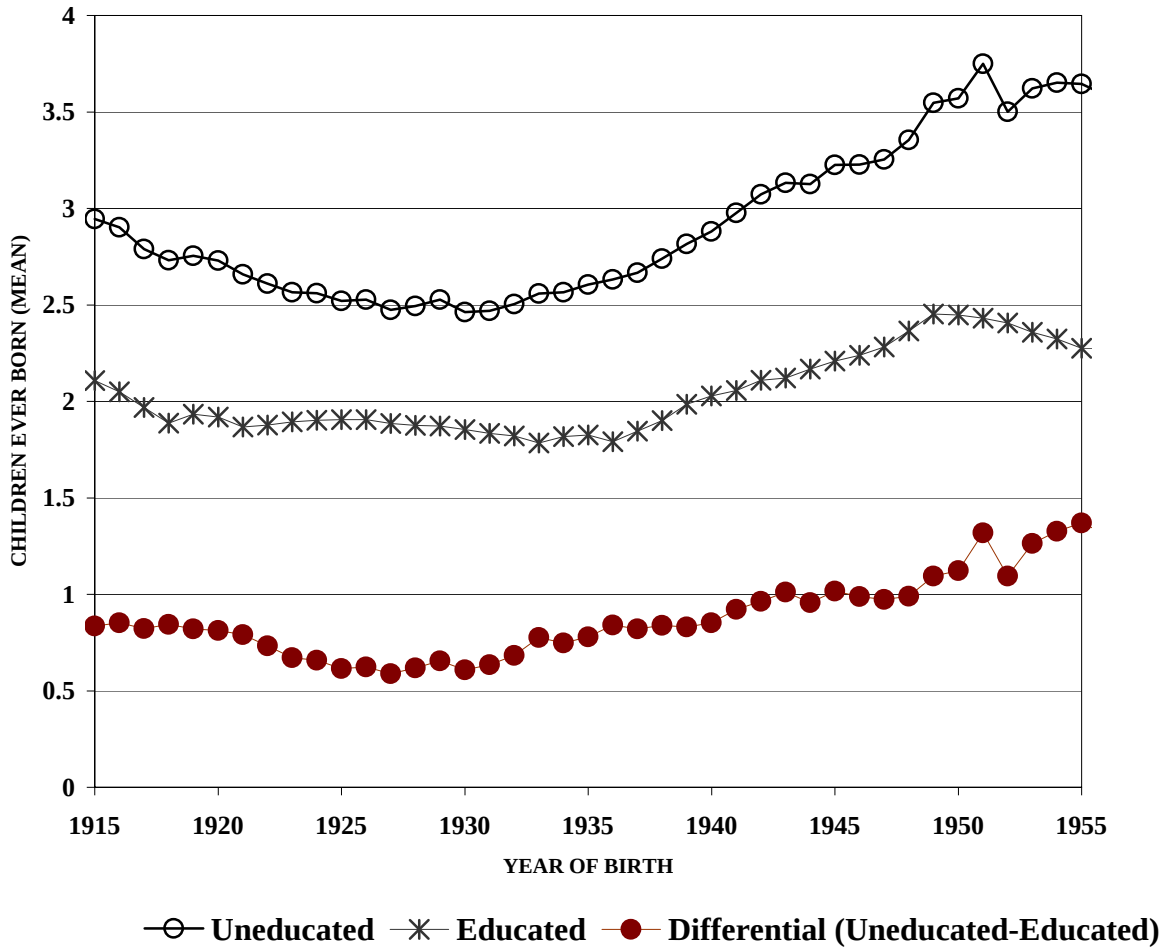
Notes: This graph plots the Total Fertility Rate (TFR) by month of birth and educational level of mothers using the own-children method of fertility estimation for the period January 1988 to December 1991. The abortion ban was lifted at the end of December 1989 and the fertility drop can be observed roughly 6 months later. Source: 1992 Romanian Census.

FIGURE 7: FERTILITY LEVELS OF WOMEN BORN BETWEEN 1900-1955



Notes: This graph plots the average number of children born in Romania by year of birth of the mother. Similar data is shown for the Hungarian minority in Romania and for Hungary. Hungary did not implement a similar restriction during this time period. Source: 1992 Romanian Census, 1990 Hungarian Census.

FIGURE 8: FERTILITY LEVELS IN ROMANIA BY EDUCATION



Notes: This graph plots the average number of children born by year of birth of the mother and educational level.
Source: 1992 Romanian Census.

Table 1. Summary Statistics for the 1993 Romanian Reproductive Health Survey.
The sample of 4861 observations is representative of the female population aged 15-44.

EDUCATION:		**SOCIOECONOMIC INDEX:**	
primary	0.24	low	0.33
secondary	0.63	medium	0.54
tertiary	0.13	high	0.13

	BEFORE (1988-1989)	**AFTER (1991-1992)**
TOTAL PREGNANCY RATES		
all	3.64	5.16
primary	5.14	6.79
secondary	3.32	4.81
tertiary	2.54	3.93
TOTAL BIRTH RATES		
all	2.10	1.47
primary	3.22	2.10
secondary	1.93	1.38
tertiary	1.41	1.02
TOTAL ABORTION RATES		
all	1.16	3.42
primary	1.54	4.40
secondary	0.98	3.15
tertiary	0.85	2.63

Table 2. Determinants of Pregnancy Outcomes

Dependent Variable:		*Pregnancy ending in:*			
	Pregnancy	*Birth*	*Abortion*	*Legal Abortion*	*Illegal Abortion*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Educated	**-0.06860*** **	**-0.05077*** **	**-0.01750** **	**-0.01903*** **	**0.00153**
	(0.01207)	(0.00842)	(0.00785)	(0.00610)	(0.00504)
After	**0.07045*** **	**-0.06848*** **	**0.13924*** **	**0.17170*** **	**-0.03246*** **
	(0.02330)	(0.01522)	(0.01806)	(0.01761)	(0.00665)
Educated * after	**-0.00082**	**0.02986*** **	**-0.02887** **	**-0.02719** **	**-0.00168**
	(0.01654)	(0.01013)	(0.01397)	(0.01358)	(0.00513)
Constant	**0.29842*** **	**0.21835*** **	**0.05818*** **	**0.02365*** **	**0.03453*** **
	(0.01561)	(0.01203)	(0.00872)	(0.00602)	(0.00643)
Observations	17521	17521	17521	17521	17521
R-squared	0.06	0.04	0.05	0.06	0.01

Notes: The table presents the results of OLS regressions.The sample contains individuals age 15 or higher in the period 1988-1992 in the 1993 Romanian Reproductive Health Survey. The unit of observation is a person year. The dependent variables are dummy variables taking value 1 for a particular outcome (pregnancy or pregnancy ending in birth, abortion, legal abortion or illegal abortion). The independent variables are: (1) After dummy taking value 1 for the period 1991-1992, 0 otherwise; (2) Education dummy taking value one if an individual had more than primary education; (3) Interaction dummies of education with after; (4) 5 age group dummies and their interactions with after. The year 1990 was dropped because it was a transition year. Standard errors are shown below the coefficients in parentheses and are clustered at the individual level. Regressions were weighted using the sampling weights. * indicates statistical significance at the 10% level, ** at 5% and *** at 1%.

Table 3. Determinants of Unwanted Pregnancy Outcomes

Dependent Variable:	*Unwanted Pregnancy*	*Unwanted Pregnancy ending in:*			
		Birth	*Abortion*	*Legal Abortion*	*Illegal Abortion*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Educated	**-0.02558*** **	**-0.01163*** **	**-0.01430***	**-0.01767*** **	**0.00337**
	(0.00885)	(0.00415)	(0.00735)	(0.00594)	(0.00437)
After	**0.10342*** **	**-0.02296*** **	**0.12980*** **	**0.15801*** **	**-0.02821*** **
	(0.02005)	(0.00696)	(0.01767)	(0.01684)	(0.00592)
Educated * after	**-0.02063**	**0.00522**	**-0.02561***	**-0.02165***	**-0.00397**
	(0.01505)	(0.00450)	(0.01379)	(0.01310)	(0.00448)
Constant	**0.09950*** **	**0.04210*** **	**0.05024*** **	**0.02102*** **	**0.02923*** **
	(0.01115)	(0.00639)	(0.00825)	(0.00588)	(0.00587)
Observations	17245	17245	17245	17245	17245
R-squared	0.04	0.01	0.05	0.06	0.02

Notes: The table presents the results of OLS regressions.The sample contains individuals age 15 or higher in the period 1988-1992 in the 1993 Romanian Reproductive Health Survey. The unit of observation is a person month. The dependent variables are dummy variables taking value 1 for a particular outcome (unwanted pregnancy or unwanted pregnancy ending in birth, abortion, legal abortion or illegal abortion). The independent variables are: (1) After dummy taking value 1 for the period 1991-1992, 0 otherwise; (2) Education dummy taking value one if an individual had more than primary education; (3) Interaction dummies of education with after; (4) 5 age group dummies and their interactions with after. The year 1990 was dropped because it was a transition year. Standard errors are shown below the coefficients in parentheses and are clustered at the individual level. Regressions were weighted using the sampling weights. * indicates statistical significance at the 10% level, ** at 5% and *** at 1%.

Table 4. Determinants of Pregnancy Outcomes - Robustness

Dependent Variable:		*Pregnancy ending in:*			*Pregnancy ending in:*			*Pregnancy ending in:*	
	Pregnancy	*Birth*	*Abortion*	*Pregnancy*	*Birth*	*Abortion*	*Pregnancy*	*Birth*	*Abortion*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
Educated	**-0.04537*** **	**-0.02963*** **	**-0.01758** **	**-0.05761*** **	**-0.03716*** **	**-0.01697** **			
	(0.01233)	(0.00802)	(0.00868)	(0.01263)	(0.00887)	(0.00796)			
After	**0.07974*** **	**-0.05963*** **	**0.13844*** **	**0.06743** **	**-0.07472*** **	**0.14351*** **	**0.12473*** **	**-0.06137*** **	**0.18203*** **
	(0.02433)	(0.01509)	(0.01941)	(0.02740)	(0.01713)	(0.02203)	(0.03132)	(0.02178)	(0.02444)
Educated * after	**-0.01162**	**0.01958** **	**-0.02796***	**0.00413**	**0.02989*** **	**-0.02719***	**-0.00243**	**0.03481*** **	**-0.03539** **
	(0.01787)	(0.00983)	(0.01549)	(0.01730)	(0.01075)	(0.01423)	(0.02033)	(0.01185)	(0.01792)
Constant	**0.27823*** **	**0.19997*** **	**0.05826*** **	**0.29587*** **	**0.19214*** **	**0.08076*** **	**0.11293*** **	**0.11466*** **	**-0.01535**
	(0.01574)	(0.01181)	(0.00929)	(0.01773)	(0.01324)	(0.01072)	(0.02546)	(0.01816)	(0.01964)
Ages included	>20	>20	>20	>15	>15	>15	>15	>15	>15
Fixed effects	NO	NO	NO	NO	NO	NO	YES	YES	YES
Controls included	NO	NO	NO	YES	YES	YES	NO	NO	NO
Observations	14293	14293	14293	17509	17509	17509	17521	17521	17521
R-squared	0.05	0.05	0.04	0.06	0.05	0.06	0.4	0.29	0.4

Notes: The first six columns present the results of OLS regressions, while the last three are from person fixed effects regressions. The sample contains individuals age 15 or higher in the period 1988-1992 in the 1993 Romanian Reproductive Health Survey, except for the first three columns where the sample is restricted to ages 20 or higher. The unit of observation is a person month. The dependent variables are dummy variables taking value 1 for a particular outcome (pregnancy or pregnancy ending in birth, abortion, legal abortion or illegal abortion). The independent variables are: (1) After dummy taking value 1 for the period 1991-1992, 0 otherwise; (2) Education dummy taking value one if an individual had more than primary education; (3) Interaction dummies of education with after; (4) Age group dummies and their interactions with after; and (7) The control variables are : two socio-economic index dummies, an urban dummy, 3 regional dummies and 2 religion dummies. The year 1990 was dropped because it was a transition year. Standard errors are shown below the coefficients in parentheses and are clustered at the individual level. Regressions were weighted using the sampling weights. * indicates statisti

Table 5. Determinants of Pregnancy Outcomes

Dependent Variable:		*Pregnancy ending in:*			*Pregnancy ending in:*	
	Pregnancy	*Birth*	*Abortion*	*Pregnancy*	*Birth*	*Abortion*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Educated	**-0.00737**	**-0.01703**	**0.00757**			
	(0.01868)	(0.01464)	(0.01071)			
After	**0.01647**	**-0.02830**	**0.03751****	**-0.05381**	**-0.05835****	**0.00899**
	(0.02617)	(0.01936)	(0.01522)	(0.03706)	(0.02758)	(0.02182)
Educated * after	**-0.03719**	**-0.01362**	**-0.02326***	**-0.02896**	**-0.01683**	**-0.01578**
	(0.02432)	(0.01864)	(0.01290)	(0.03284)	(0.02509)	(0.01795)
Romania	**0.02284**	**0.01969**	**0.00803**			
	(0.02302)	(0.01743)	(0.01396)			
Romania * after	**0.09491*****	**-0.03949***	**0.14193*****	**0.12097*****	**-0.06740****	**0.18601*****
	(0.03221)	(0.02232)	(0.02309)	(0.04368)	(0.03071)	(0.03232)
Romania * educated	**-0.08341*****	**-0.04797*****	**-0.02894****			
	(0.02423)	(0.01831)	(0.01463)			
Romania * after * educated	**0.01169**	**0.03932***	**-0.02509**	**-0.00889**	**0.06419****	**-0.05686***
	(0.03402)	(0.02360)	(0.02437)	(0.04599)	(0.03236)	(0.03400)
Constant	**0.25474*****	**0.15386*****	**0.06874*****	**0.20042*****	**0.13076*****	**0.04058*****
	(0.01925)	(0.01510)	(0.01112)	(0.01723)	(0.01308)	(0.01193)
Fixed effects	NO	NO	NO	YES	YES	YES
Observations	28990	28990	28990	28990	28990	28990
R-squared	0.04	0.03	0.04	0.38	0.28	0.40

Notes: The first three columns present the results of OLS regressions, while the last three are from person fixed effects regressions. The sample contains individuals age 15-34 in the period 1988-1992 in the 1993 Romanian Reproductive Health Survey and the 1997 Moldova Reproductive Health Survey. The unit of observation is a person year. Standard errors are clustered at the individual level. The dependent variables are variables indicating the number of a particular outcome in a given year (pregnancy or pregnancy ending in birth or abortion). The independent variables are: (1) After dummy taking value 1 for the period 1991-1992, 0 otherwise; (2) Romania dummy taking value 1 for an individual living in Romania, 0 otherwise (2) Education dummy taking value one if an individual had more than primary education; (3) Interaction dummies of education with after and romania dummies; (4) Interaction dummies of after with the Romania dummy; (5) Interaction dummy of education, Romania and after dummies; (6) 3 age group dummies and their interactions with after. The year 1990 was dropped Standard errors are shown below the coefficients in parentheses and are clustered at the individual level. Regressions were weighted using the sampling weights. * indicates statistical significance at the 10% level, ** at 5% and *** at 1%.