1 Introduction

What are the roles of demand-side factors (demand for children) and supply-side factors (access to abortion and modern contraceptive methods) in the demographic transition associated with modern economic growth and development? Which factors explain the striking empirical regularity that less educated women have greater fertility?

The answer to the first 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.

Understanding the differential impact of access to birth control methods across education groups also helps us identify the sources of fertility differences by education. Although the negative association between female education and fertility is a robust correlation that has been established in many countries at different points in time, it is less clear what mechanism underlies this relationship. This negative association is consistent with two broad explanations, which are not mutually exclusive: (1) more educated and less educated women have a different demand for children; and (2) more educated and less educated women are differentially effective in using birth control

technologies to control fertility.

The link between education and fertility explained by demand factors can arise from a number of channels: (1) the price of time effect from the household model (Becker, 1981); (2) a taste effect of education for fewer, better educated children; or (3) an increase in age at marriage, because women who go to school marry later. The interaction of education and the supply of birth control methods resulting in lower fertility can also be explained by a number of factors: (1) educated women have greater access to contraception, (2) they could face lower psychic costs of using a particular contraceptive method; or (3) they are potentially more efficient at using a particular contraceptive method.

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 help explain differences in fertility by education. 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.

The basic empirical strategy is to study reproductive outcomes of women 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 Moldova. Moldova is an appropriate comparison country since the majority of the population in Moldova is ethnically Romanian. Furthermore, abortion and modern contraceptives were legally available in Moldova both before and during the economic transition that started in 1990. 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. Results from Romania's 23 year period of continued pronatalist policies suggest large increases in fertility for women who spent most of their reproductive years under the restrictive regime (about 0.5 children or a 25% increase). The data 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 almost fifty percent.

The paper is organized as follows. Section 2 reviews the channels through which the supply of birth control methods affects fertility levels and the fertility differential by education and summarizes previous findings. Section 3 provides background information on the Romanian context. In sections 4 and 5, I describe the data and the empirical

strategies. Section 6 presents the main results and section 7 provides robustness checks incorporating similar data from Moldova. Section 8 addresses possible explanations for the change in fertility differential by educational groups. Section 9 presents long term impacts of the policy using information from the 1992 Romanian Census and the 1990 Hungarian Census. The final section presents conclusions.

2 Conceptual framework

2.1 Abortion and fertility behavior

In a recent paper, Levine and Staiger (2002) provide a theoretical framework that captures the impact of abortion on fertility behavior. The effect of abortions on pregnancy and birth outcomes might differ from other methods of birth control because abortion is the only method which allows a woman to avoid a birth once pregnant, while other contraceptive methods regulate birth outcomes through changes in pregnancy behavior. Their theoretical framework implies that greater access to abortion provides value in the form of insurance against unwanted births and also reduces the incentive to avoid pregnancy. The model implies that pregnancy and abortion rates are inversely related to the cost of abortion. The effect on birth rates is ambiguous, given that both pregnancy and abortion rates go up, but if the change in cost of abortion is great (as

in the case of Romania) it will lead to lower birth rates as well[1].

Levine and Staiger (2002) also provide empirical evidence from the US and Eastern Europe that supports their model. In particular they find that Eastern European countries that changed from very restrictive regimes to liberal regimes had significant increases in pregnancies and abortions and decreases in births of about 10%. Further evidence from the US on the impact of access to abortion on birth rates (especially for teenagers) is provided by Levine et al. (1999).

While the current analysis explores and confirms the predictions of the model and empirical findings of Levine and Staiger (2002), the focus of my paper is different. In particular, I will argue that Romania's 23 year period (1967-1989) of restricted access not just to abortion but also to all other modern contraceptives can be used to investigate the effect of the supply of birth control methods on fertility and its differential impact across educational groups.

2.2 Demand for children versus the supply of birth control methods

Following the terminology in the literature (Easterlin, 1978 and Easterlin, Pollak and Wachter, 1980), I define "desired fertility" as the number of children demanded

[1] Thus, their model is similar to Peltzman (1975), who argued that mandated seat belts might lead to more accidents because drivers are less careful once they use seat belts.

in a world with costless birth control. In such a situation, the "desired fertility" level might be affected by factors such as the opportunity cost of the mother's time, family income, public retirement and transfer system, the rate of infant mortality, or societal and personal tastes for children. If birth control is costly, however, a woman will include the cost of fertility control into her reproductive decision-making, which determines her "optimal fertility" level. As long as the "optimal fertility" level exceeds the "desired fertility" level, an increase in the cost of contraception, due for example to restrictions in the supply of contraceptive methods, will increase fertility levels.

Econometrically it has been generally hard to separate the relative importance of the demand for children and the supply of birth control methods in determining fertility levels. Part of this difficulty is due to the fact that finding exogenous changes in the price of contraception has been difficult (Birdsall, 1989), in part because the placement of family planning programs is usually non-random. A relatively recent survey of the effect of family planning programs on fertility (Freedman and Freedman, 1992) concludes that the extent of the independent role of family planning programs in reducing fertility is still controversial.

Romania's 23 year period of restrictive access to abortion and modern contraceptives provides a useful place to measure the impact of restrictions on access to birth control methods on fertility levels. The introduction and the repeal of the restrictive policy can be used to measure the short-term impact of changes in access to birth con-

trol methods on fertility levels.[2] More interestingly, the long duration of the restrictive regime can be used to assess the long-term impact of limited access to birth control methods on fertility levels.

Understanding whether the supply of birth control methods affects fertility levels is important not only for helping us understand whether family planning programs can work. At the family level, unwanted fertility can negatively affect educational or career decisions of the mother (Goldin & Katz, 2002, Angrist & Evans, 1999). Alternatively, a child that was unwanted at birth might suffer adverse developmental effects that could in turn cause inferior socio-economic outcomes. In a companion paper to this one (Pop-Eleches, 2002), I use the same Romanian context to examine educational and labor market 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. Additionally, I provide some suggestive evidence linking unwantedness at birth to higher infant mortality and increased criminal activity later in life.

[2] See for example the studies by Levine et al. (1999) for the US and Levine and Staiger (2002) for the US and Eastern Europe.

2.3 Effects of education on fertility

There are many channels through which education may affect fertility. First, one reason why an educated woman might demand fewer children is the price of time effect from the household model of Becker (1981). For women who are both active in the labor market and responsible for childcare, earning a higher wage (due to higher education) increases both income and the cost of raising children. Generally it is believed that the price effect more than offsets the income effect and therefore a higher wage income implies lower levels of fertility (Birdsall, 1989). Second, education might alter the taste of individuals such that they desire fewer, better-educated children. For example, a person going to school might potentially be exposed to role models (such as teachers or peers) with life-styles that favor small families. Finally, women who choose to be in school are less likely to want to have children. Schooling decisions might delay marriage and childbearing for a number of years, which could have a negative impact on lifetime fertility outcomes.

There are also, however, a number of supply-side reasons for why more educated women might have lower fertility levels. One link goes directly through the financial costs of contraceptives: an educated woman has presumably more resources to afford costly birth control methods. Second, certain contraceptive methods might be associated with psychic costs that could be lower for educated women. As an example, the use of condoms or traditional methods, such as the calendar method or the withdrawal

method, might require the cooperation of the husband. An educated woman has potentially more bargaining power within the family and thus could be more successful at using these methods if other alternatives are not available. Alternatively, an educated person may have lower psychic cost of reducing sexual activity if access to birth control methods is limited. Finally, educated women may be more efficient at using particular contraceptive methods, especially in settings where information about the proper use of a contraceptive technology is not readily available or where the only methods of birth control available have high failure rates and need to be used with extreme care, such as in the case of traditional methods. Similarly, educated women might be more adept at critically evaluating and adapting new birth control technologies, especially when the old technologies (such a legal abortions) are no longer available (Schultz, 1964, Welch, 1970).

The above mentioned supply-side channels, which might explain why more educated women have lower fertility, should be particularly important in an environment where access to abortion and modern contraceptives is restricted, just like in the case of Romania. To be more specific, following a law change that allows easy and free access to abortion, the financial and psychic costs of birth control are eliminated especially for women with low income, low bargaining power in the family or reduced ability to abstain from sexual activity. Thus, while under a restrictive regime, more or less educated women might face very different costs of birth control, lifting the ban on

abortions and modern contraceptives could reduce this cost to a minimum for both groups.

While the negative association between education and fertility is generally accepted to be very robust (Birdsall, 1989), it has proven difficult to distinguish between demand-based and supply-based mechanisms. As an example, measuring the opportunity cost of the mother's time with her wage rate is problematic because labor market decisions are clearly influenced by birth rates. Some evidence on the efficiency channel is provided by Rosenzweig and Schultz (1985), who use US data to show that more educated women have lower failure rates when using contraceptive methods with large scope of misuse.

3 Abortion and birth control policy 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[3] in the early 1960's (see Figure 1) Romania'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 45, 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[4] increased from 14.3 in 1966 to 27.4 in 1967 and the total fertility rate[5] 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

[3]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 with the 1950's, 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.

[4]The crude birth rate is the number of births per 1,000 population in a given year.

[5]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 (United Nations, 2002).

and Russia. The law was strictly enforced until December 1989, when the communist government was overthrown. 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.[6]

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 accompanied by the introduction of limited pronatalist incentives. The main incentives provided were paid medical leaves during pregnancy and a one time maternity grant of

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

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.[7] 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

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

and Hungarian census, by comparing fertility behavior of women who spent different fractions of their reproductive years under the restrictive regime.

4 Data

The primary dataset for the present analysis is the 1993 Romanian Reproductive Health Survey[8]. Conducted with technical assistance from the Center for Disease Control, this survey is the first representative household-based survey designed to collect data on the reproductive behaviors of women of 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). At the same time, for the period January 1988 through June 1993, the questionnaire included a monthly calendar of contraceptives used. The monthly calendar and the pregnancy histories were combined to create a history of monthly use of contraceptives and pregnancy outcomes for the period January 1988 to December 1992.[9]

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

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

[9] Of the 4861 observations in the sample, we successfully merged the monthly contraceptive calendar with the pregnancy outcomes for 4792 of cases. The data for 1993 was not used because for most pregnancies the pregnancy outcome was uncertain at the time of the survey in the second half of 1993.

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. First, data from 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 threefold. First, Moldova did not restrict access to abortion and modern contraception either before or after the fall of communism (Serbanescu et al. 1999). Secondly, the majority of the population in Moldova is ethnically Romanian, allowing to control for potentially important religious and cultural factors. 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, fertility behavior in the period 1988 to 1992 can only be studied for the age group 15-34. Finally, 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.) Neither the planning status (unwanted or not) nor the method of contraception used is available for the period 1988 to 1992.[10]

The two additional sources used are a sample of the 1992 Romanian Census and

[10]In both surveys, detailed questions about the pregnancy outcomes, their planning status and the monthly calendar of contraceptives used are available for only the six years prior to the survey date. This explains why the 1993 Romanian data has a lot more information for the period 1988-1992 than the 1997 Moldovian data.

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.

5 Econometric framework:

To investigate how the liberalization of access to abortion and modern contraception affects reproductive behavior, I estimate:

$$(1)\ OUTCOME_{it} = \beta_0 + \beta_1 \cdot education_{it} + \beta_2 \cdot after_t + \beta_3 \cdot education_{it} \cdot after_t$$
$$+\beta_4 \cdot transition_t + \beta_5 \cdot education_{it} \cdot transition_t + \beta_6 \cdot agegroup_{it}$$
$$+\beta_7 \cdot agegroup_{it} \cdot after_t + \beta_8 \cdot agegroup_{it} \cdot transition_t + \varepsilon_{it}$$

$OUTCOME_{it}$ is a dummy variable taking value 1 if in a given month there occurred one of the following outcomes: start of a pregnancy or start of pregnancy ending in a birth, abortion, legal abortion, or an illegal abortion. 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. $Transition$ takes value 1 for the year 1990, 0 otherwise. Finally, the regressions include 5 *agegroup* dummies,

with the 20-24 years dummy dropped. Only months during which a person is at risk of becoming pregnant were included in the analysis, therefore I drop the months of pregnancy (except the first one) and the three months following a pregnancy resulting in birth. The unit of observation is a person month and the period of study is 1988 to 1992. The sample includes all the women aged 15 or higher in a particular month.[11]

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 $\beta_2 + \beta_3$[12]. 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 $\beta_1 + \beta_3$.

6 Results

6.1 Graphical analysis

The overall impact of the liberalization of abortions and modern contraception in December 1989 can be illustrated visually[13]. Figure 2 shows the total pregnancy rate[14]

[11] The use of person month as the unit of observation will be useful in a later section of the paper, which looks at pregnancy behavior by contraceptive methods used.

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

[13] 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.

[14] 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

for three educational groups during the two years prior to the policy change (1988-1989) in comparison to the period 1991-1992[15]. The pattern of change in pregnancy behavior is similar across groups: women of primary, secondary and tertiary education experience large increases in their total pregnancy rate of about 1.5. Figure 3 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 4 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.[16]

---

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.

[15] I dropped the year 1990 because it is a transition year where women adapt to the new policy, but I will include it in the regression framework.

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

6.2 Regression results

Table 2A 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.[17] These results 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.

At the same time, the impact was differential across educational groups: the interaction of *education* and $after$ is large and positive for the births regression (column 2) and large and negative for the abortion regression (column 3). These results represent the two main findings of this paper: (1) the supply of birth control methods has a large impact on fertility levels and (2) it explains a large part (almost 50% in this specification) of the fertility differential between educated and uneducated women.[18]

Columns 4 and 5 of Table 2A analyze the pregnancies ending in abortions in more detail. Column 4 presents the results for legal abortions, which prior to the reform

[17] 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.

[18] 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.

were allowed either for medical reasons or for women older than 40 or with more than 4 children.[19] In column 5 a similar regression is presented for illegal or provoked[20] abortions. The results confirm the large increases in legal abortions and the virtual disappearance of illegal abortions after the policy change.[21] The response in abortion behavior was immediate and it happened already in 1990, as the coefficient on the *transition* dummy indicates.[22]

Table 2B studies pregnancy outcomes identified by the respondents as "unwanted". The results are similar to the previous table and they confirm my earlier results. In column 2, the coefficient on $after$ is negative, large and significant while the coefficient on the interaction of *education* and $after$ is positive and significant. 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 2A and 2B seems to imply that women tend to underreport unwanted births given that the coefficient on $after$ is much larger for births than for unwanted births.[23] However, the corresponding coefficients in the abortion

[19] 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.

[20] "Provoked" was the term used in the survey question.

[21] An abortion after the policy change can theoretically still be considered illegal if, for example, it is not performed in a hospital, as the new abortion law requires.

[22] Appendix A presents an alternative way to measure 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.

[23] A possible alternative explanation of the difference between these coefficients could be changes in

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 Table 3, 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 $after$.[24] The coefficients in column 3 (for pregnancy) and column 6 (for birth) on *education*, $after$ and the interaction of *education* and $after$ do not change significantly once we include these controls into the regression framework.

Another potential worry is the endogeneity of education, 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 2 and 5 of Table 3 are very similar to the earlier results.

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.

[24]There is of course the potential worry about the endogeneity of these controls since they are measured at the time of the survey and so after the pregnancy outcomes have occurred.

7 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). To assess this alternative interpretation, I use similar 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 $education, after$[25] and $agegroup$ are the same as before and $romania$ indi-

[25] I use the first year (1990) of sharp decline in GDP to date the start of the transition process in both countries. The results of the analysis are not affected if Moldova's transition is defined to start

cates that an observation is from the Romanian data. $OUTCOME_{it}$ is the number of pregnancies (or births or abortions) that occur to a particular person in a given year. 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 4, confirm the robustness of the earlier results. In the birth regression reported in column 2 of Table 4 the coefficient π_3 ($romania \cdot after$) 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 π_4 ($romania \cdot after \cdot education$) is positive and significant and thus implies that the decrease in births was more pronounced for the uneducated group in Romania. The same regression using pregnancies ending in abortions (column 3 of Table 4) is also consistent with our earlier results.

However, the estimates in Table 4 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

in 1991, the year the country declared its independence from the Soviet Union.

education and $after$ is negative suggesting that if anything demand driven factors would widen fertility differentials across educational groups.[26]

8 What explains the change in fertility differential by education?

8.1 Contraceptive specific pregnancy rates

In a previous section I have argued that lack of easy access to abortion and modern contraceptives might be particularly harmful to women with low bargaining power in the family, reduced ability to abstain from sexual activity, and low efficiency in using methods of birth control which have high failure rates. To the extent that these characteristics are affected by the educational level of a woman, these factors could explain the reduction in the fertility differential following the lift of the restrictive ban.

One way to explore this hypothesis is to measure the failure rates of different contraceptive methods for the more and less educated women both before and after the liberalization of abortions and modern contraception. The information on the types of contraceptives used is taken from the monthly calendar of birth control methods used. Each person-month pregnancy outcome observation in the dataset is linked to

[26] Appendix B presents results using a fixed effects specification which are very similar to those in Table 4.

the contraceptive method used the previous month. I divide contraceptive methods into four categories. The first category uses traditional methods of contraception (calendar, rhythm or a combination of the two), the second category uses modern methods (IUD, pill, condom, diaphragm etc.) and a very small proportion uses other methods (such as local spermicides). Finally a majority of women are using no method of contraception. The interpretation of the results for this group is difficult because it includes both women who do not use contraception because they want to get pregnant and women who want to avoid pregnancy but do not know (or do not want to use) any contraceptive methods. The breakdown of methods used in the sample is as follows: no method (62%), traditional (29%), modern (7%) and other (2%).

In Table 5, I run regressions estimating the incidence of a pregnancy restricted to users of a particular method of pregnancy control. The two most interesting results are in columns 3 and 4: Educated women experienced a lot lower contraceptive failure rates when using traditional methods but this was not the case for modern contraceptives.[27] The coefficient on *education* in the regression for women using modern methods is positive and insignificant (see column 4 of Table 5).[28] These results are consistent with at least two interpretations: (1) educated women are more efficient at using contraceptive methods characterized by high failure rates and little information on

[27] These results are very similar to the findings of Rosenzweig and Schultz (1989).

[28] The results in this table need to be interpreted with care, since the choice of a particular contraception method is endogenous.

proper use, and (2) educated women face lower psychic costs of using a particular contraceptive method, either because they have a better bargaining position within the family or because they find it easier to abstain from sexual activity.[29]

8.2 Exposure to the restrictive policy

Another possible explanation for the narrowing of the fertility differential by education after the liberalization of access to abortion and birth control could be a mechanical effect: educated women are less exposed to the restrictive policy and therefore one would expect them to have a smaller behavioral response to the change in policy. For example, since educated women tend to marry later, they could spend less of their reproductive years trying to avoid unwanted pregnancies. Or patterns of sexual activity could differ between educational groups, with the less educated having on average more sex than the more educated. Finally, abortion could be a birth control technology used more frequently by the less educated women.

The best evidence that the less educated were not the group most exposed to the restrictive policy comes from studying the short-run fertility impact across educational groups of the introduction of the ban on abortions in 1966. The short-run fertility

[29] The adoption of modern contraceptives after 1989 has been surprisingly slow. The proportion of uneducated women using modern contraceptives increased by only 0.7% and the similar increase for the educated group was only slightly larger (1.7%). These results broadly imply that the change in reproductive behavior in Romania after 1989 has been affected mainly by the liberalization of abortions and not by the liberalization of access to modern contraceptives.

impact of the 1966 law has been described in detail in Pop-Eleches (2002). The period June - October of 1967 experienced fertility levels that were up to 3 times higher than the period January - May of the same year. More interestingly for the current analysis is that in the short-run educated women experienced the largest increase in fertility. One way to measure how different educational groups were affected by the policy is to compare the composition of women who gave birth before and after the introduction of the ban. Table 6 presents evidence of the size and the statistical significance of this composition effect by using a simple comparison of means of mothers' educational attainment that had children in the period January - October 1967. The proportion of mothers who gave birth after the ban on abortions came into effect and had only primary education decreased from 49.4% to 44.6%. For women with secondary education the increase was from 47.6 % to 52.1%. The percentage of women with tertiary education who gave birth between January and May was 3.0% whereas the percentage for the period June to October was 3.3%. The evidence indicates that the short-run and long-run impact of the policy on the composition of women who gave birth were different, and thus implies that, in the absence of easily available methods of birth control, educated women were more successful at controlling their fertility.

The number of reproductive years that women of different educational groups spend trying to avoid additional births is theoretically ambiguous. Less educated women tend to marry earlier, so they spend more time living with a partner and thus are exposed

to the risk of pregnancy for a longer time.[30] Results from the survey confirm that the average age at first union is 18.48 year for the less educated women and 20.7 for the more educated women. However, the less educated women also generally desire larger families. Therefore it is not clear which group reaches the desired level of fertility at an earlier age. For currently married women, the survey asked respondents the desired number of children at the time of marriage. This information is used with the available birth histories to calculate the average age at which they reached their desired fertility. More educated women reach their desired level of fertility at an average age of 23.35, while less educated women reach their desired fertility at an average age of 24.39. Thus, educated women need to spend more of their reproductive years trying to avoid unwanted pregnancies.

An alternative way to assess the extent to which different educational groups are exposed to different risks of pregnancy is to redo the previous regression analysis but restrict it to women who were in union during the period of study.[31] The results, which are not presented in the analysis, are qualitatively and quantitatively similar to those presented earlier, and they confirm that differences in pregnancy outcomes between educational groups cannot be explained by different exposure intervals to the

[30] In Romania's traditional society, sexual activity is largely happening within marriage.

[31] The survey did not ask women for their age at marriage, but it did ask them for the age at which they started to live in union with a partner. Given that in Romania's traditional society, cohabitation outside marriage is rare, this indicator variable and the current marital status can be used to construct a marriage indicator.

risk of pregnancy due to difference in the average age at marriage. Finally, the survey questionnaire asked women about the frequency of sexual intercourse in the year of the survey (1993). Controlling for different age and marriage patterns across groups, educated women have if anything more frequent sexual intercourse compared to less educated women.

The evidence in this section suggests that the larger behavioral responses in the fertility of less educated women after the lift of the ban on abortions cannot be accounted for by the fact that educated women were less exposed to the risk of pregnancy.

9 Long-term impact of the restrictive policy

To provide a more complete picture of the fertility impact of Romania's restrictive policy towards methods of birth control, this section uses census data from Romania and Hungary to track fertility levels over time. Since the liberalization of access to abortions and modern contraceptives after 1990 resulted in large decreases in fertility and a narrowing of the fertility differential across educational groups, 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.

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 5, 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 the their late thirties in 1967 and thus towards the end of their reproductive years at the time of the policy change. In 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. Figure 5 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). Hungary and the Hungarian population in Romania provide good comparison groups, since Hungary did not restrict access to birth control methods. Figure 5 shows the similar trend in fertility for Hungarians in both countries for women born prior to 1930 as well as the divergence in fertility levels afterwards.

Figure 6 presents evidence of increases in the fertility differential between educated and uneducated women over time. 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 when comparing cohorts born around 1930 and 1950 and is consistent with my earlier results.[32]

10 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

[32] 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.

1989. My findings suggest the significant importance that birth control methods play in understanding fertility levels and the effect of education on fertility.

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.

References

[1] Angrist, J. and Evans, W. (1999), "Schooling and Labor Market Consequences of the 1970 State Abortion Reforms", Research in Labor Economics, Vol. 18.

[2] Baban, A. (1999), "From Abortion to Contraception- Romanian Experience" in David H. P. (eds), From Abortion to Contraception, London: Greenwood Press.

[3] Becker, Gary S, A Treatise on the Family. Cambridge, MA: Harvard University Press, 1981.

[4] Berelson, B. (1979), "Romania's 1966 Anti-Abortion Decree: The Demographic Experience of the First Decade", Population Studies, 33,2, 209-222.

[5] Birdsall, N., (1989), "Economic Approaches to Population Growth," in Chenery H. and Srinivasan, T. N., (eds.), Handbook of Development Economics, Vol. I, Amsterdam: North-Holland, 477-542.

[6] David H. P. eds (1999), From Abortion to Contraception, London: Greenwood Press.

[7] Easterlin, R., Pollak, R. and Wachter, M.(1980), "Toward a More General Economic Model of Fertility Determination" In Easterlin, R. (eds), Population and Economic Change in Developing Countries, Chicago: University of Chicago Press, 1980.

[8] Easterlin, R.(1978), "The Economics and Sociology of Fertility: A Synthesis" In Tilley, C. (eds), Historical Studies of Changing Fertility, Princeton, NJ: Princeton University Press, 1980.

[9] Freedman, R. and Freedman, D. (1992), "The Role of Family Planning Programmes as a Fertility Determinant" In Philips, J. and Ross, J. (eds.), Family Planning Programmes and Fertility, Oxford: Oxford University Press.

[10] Goldin, C. and Katz, L. (2002), "The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions," , Journal of Political Economy, 110(4), 730-770.

[11] Kligman, G. (1998), "The Politics of Duplicity: Controlling Reproduction in Ceausescu's Romania", Berkeley, CA: University of California Press.

[12] Legge, J. (1985), Abortion Policy: An Evaluation of the Consequences for Maternal and Infant Health, Albany: State University of New York Press.

[13] Levine, P. Staiger, G. Kane, T. and Zimmerman, D. (1999), "Roe v. Wade and American Fertility," American Journal of Public Health, 89(2), 199-203

[14] Levine, P. and Staiger, D. (2002), "Abortion as Insurance", NBER working paper, no. 8813, Cambrige, MA

[15] Peltzman, S. (1975), "The Effects of Safety Regulation", Journal of Political Economy, 83(4), 677-725.

[16] Pop-Eleches, C. (2002), "Socio-Economic Outcomes of Unwanted Children: Evidence from a Change in Abortion Regime in Romania", Harvard University mimeo

[17] Rosenzweig, M. and Schultz, T. (1989), "Schooling, Information and Non-Market Productivity: Contraceptive Use and Its Effectiveness", International Economic Review, 30, 457-477.

[18] Schultz, T. W. (1964), Transforming Traditional Agriculture, New Haven, Conn.: Yale University Press.

[19] Serbanescu, F. et al., (1995), Reproductive Health Survey, Romania 1993, Final Report. Atlanta: Centers for Disease Control.

[20] Serbanescu F, Morris L, Stupp P and Stanescu A. (1995) "The Impact of Recent Policy Changes on Fertility, Abortion, and Contraceptive use in Romania", Studies in Family Planning, 26, 76-87

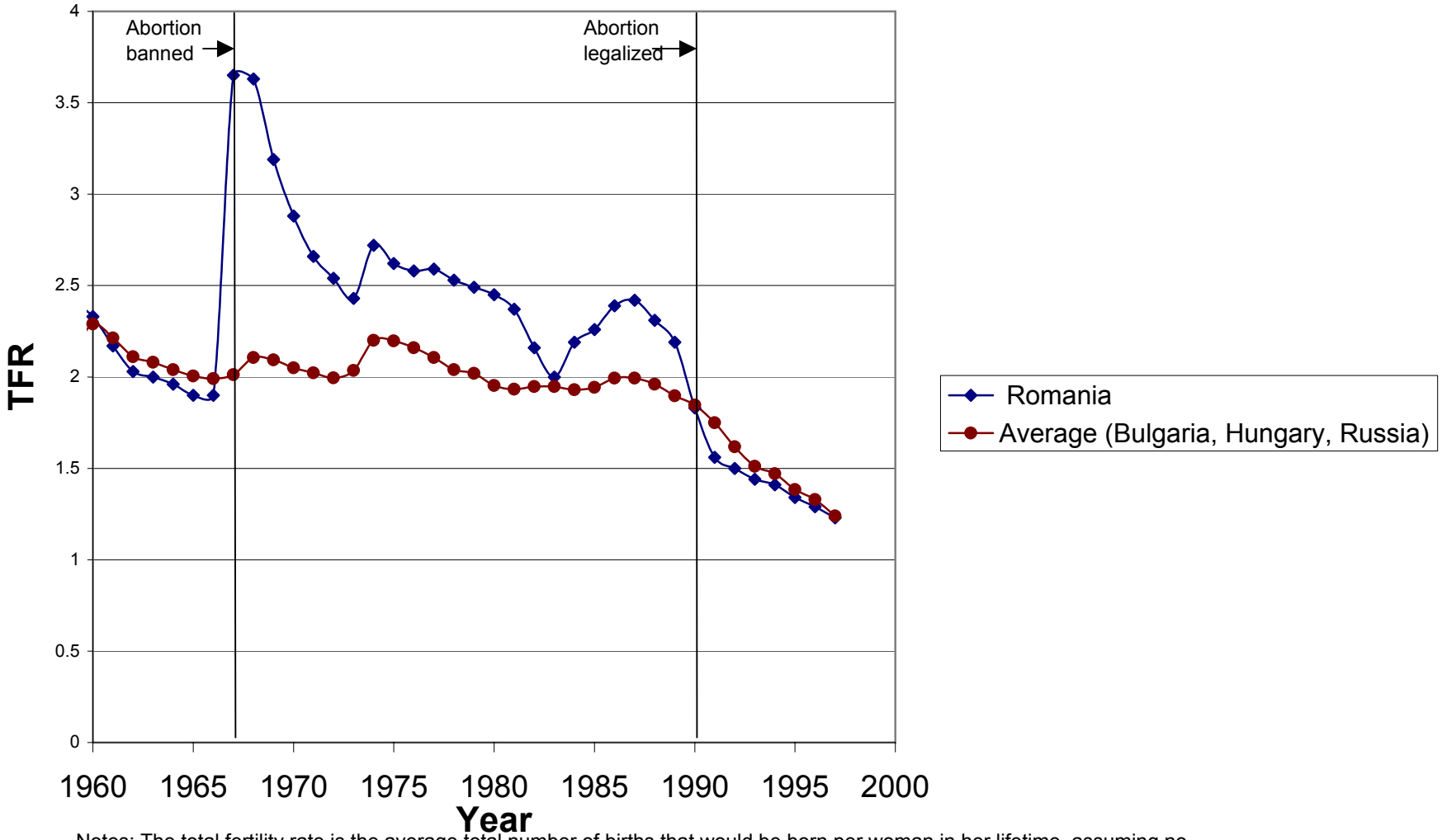
[21] Serbanescu, F. et al., (1998), Reproductive Health Survey, Moldova 1997, Final Report. Atlanta: Centers for Disease Control.

[22] Welch, F. (1970), "Education in Production", Journal of Political Economy, 78(1), 35-59.

[23] World Bank Country Study. (1992), Romania: Human Resources and the Transition to a Market Economy. Washington, DC.

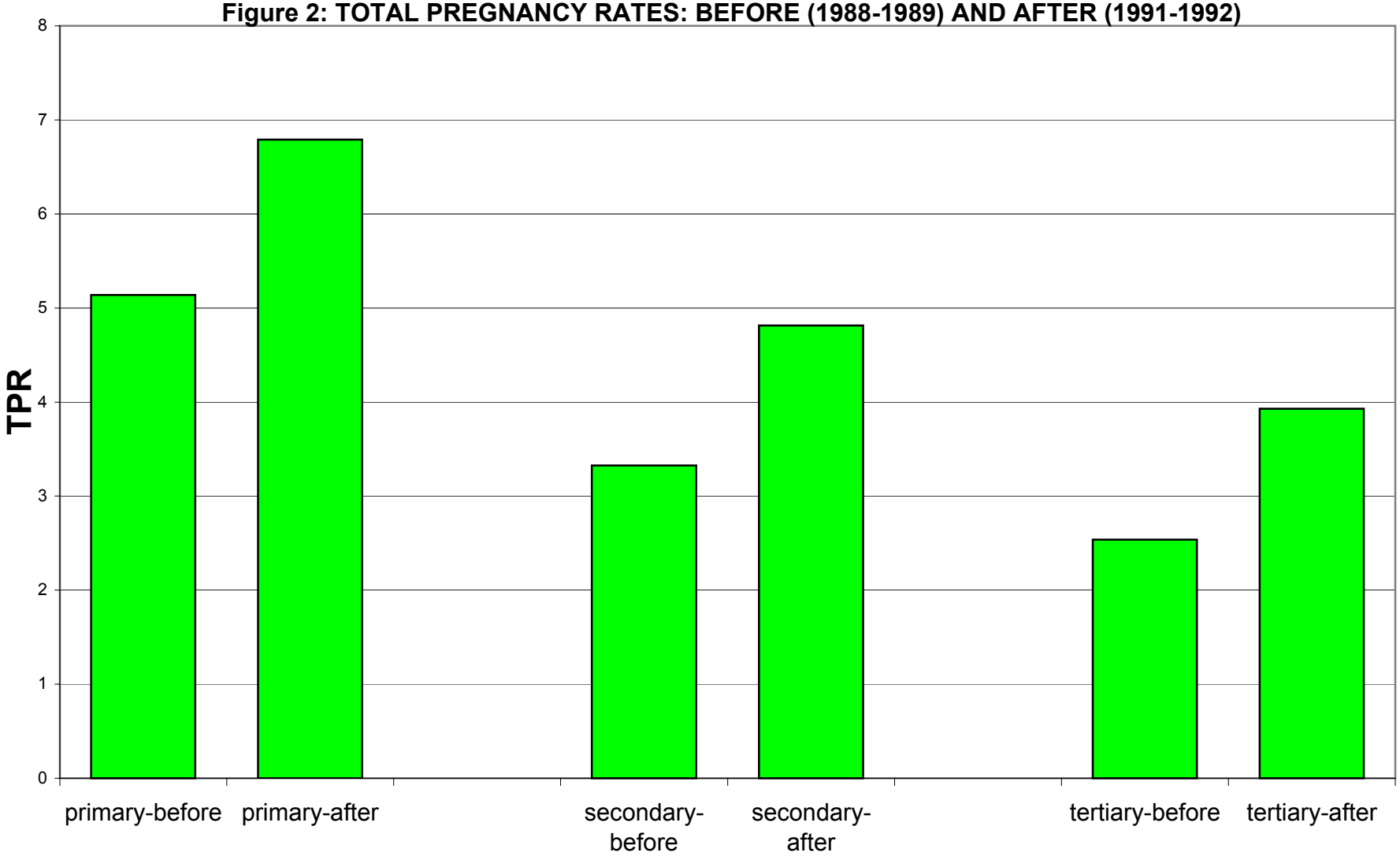
[24] World Bank. (1978-1998) World Development Report. New York: Oxford University Press for the World.

Figure 1: TOTAL FERTILITY RATES: 1960-1997



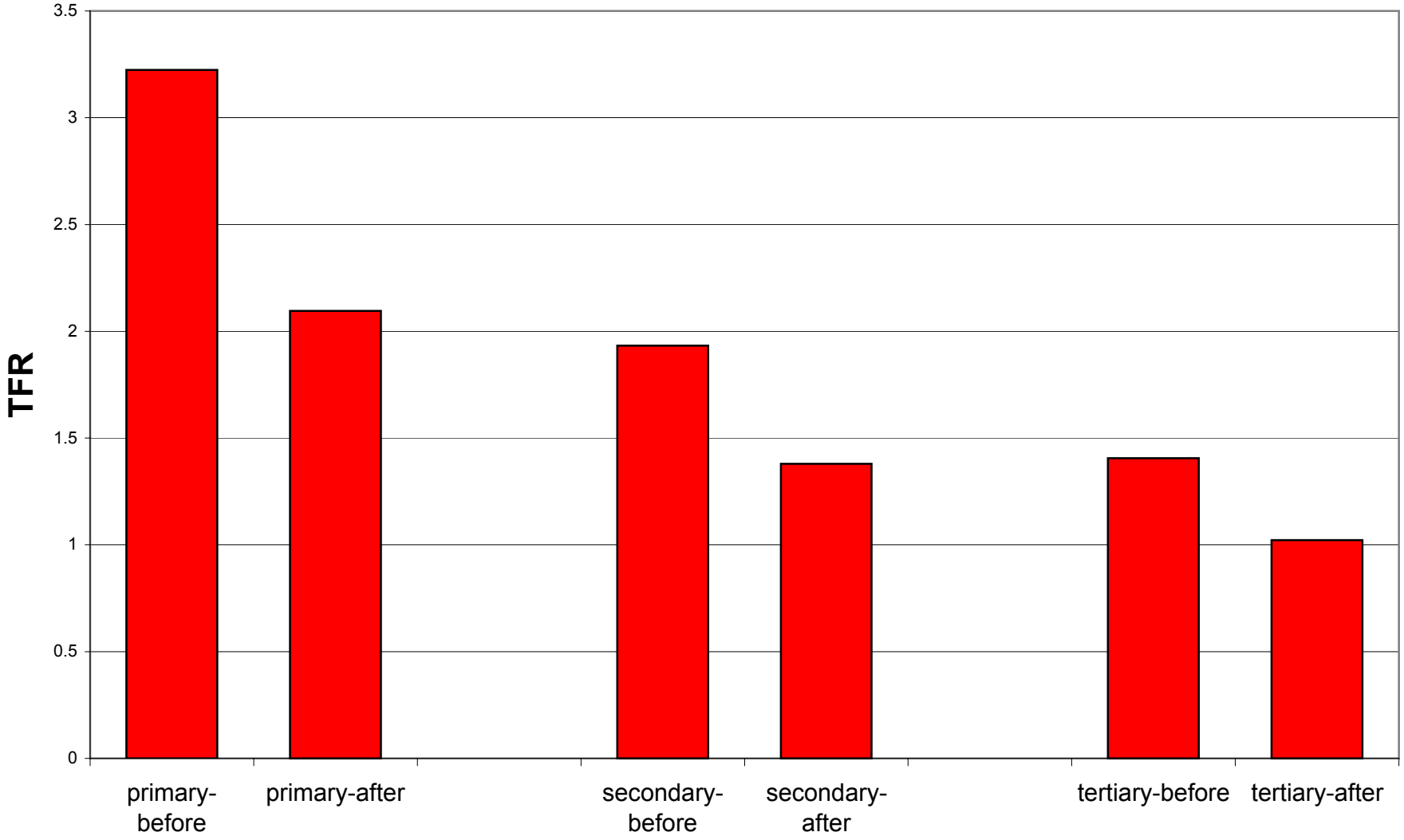
Notes: The total fertility rate is the average total number of births that would be born per woman in her lifetime, assuming no mortality in the childbearing ages, calculated from the age distribution and age-specific fertility rates of a specified group in a given reference period Source: UN (2002)

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



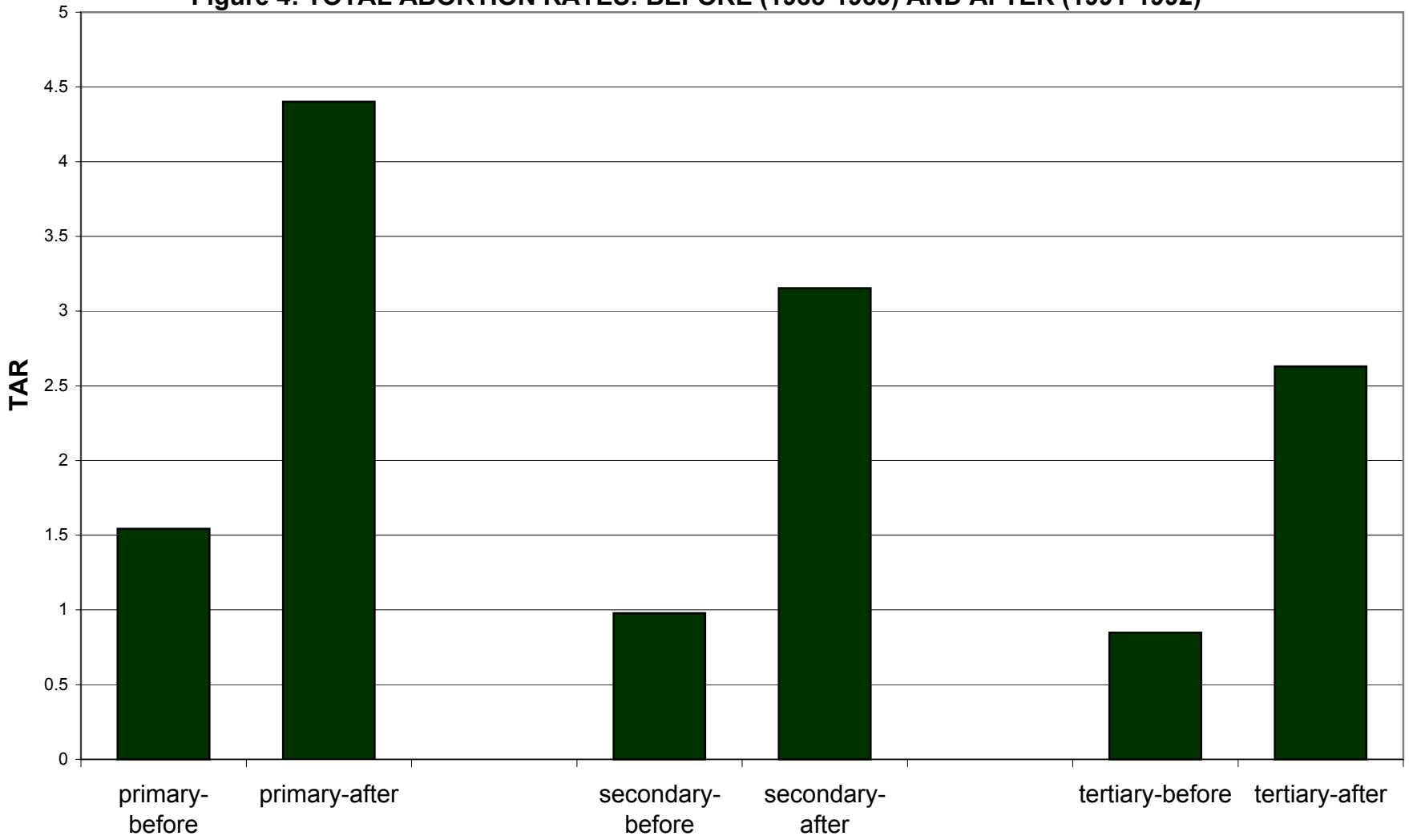
Notes: The total pregnancy rate is the average total number of pregnancies that would be born per woman in her lifetime, assuming no mortality in the childbearing ages, calculated from the age distribution and age-specific pregnancy rates of a specified group in a given reference period (United Nations,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

Figure 3: TOTAL FERTILITY RATES: BEFORE (1988-1989) AND AFTER (1991-1992)



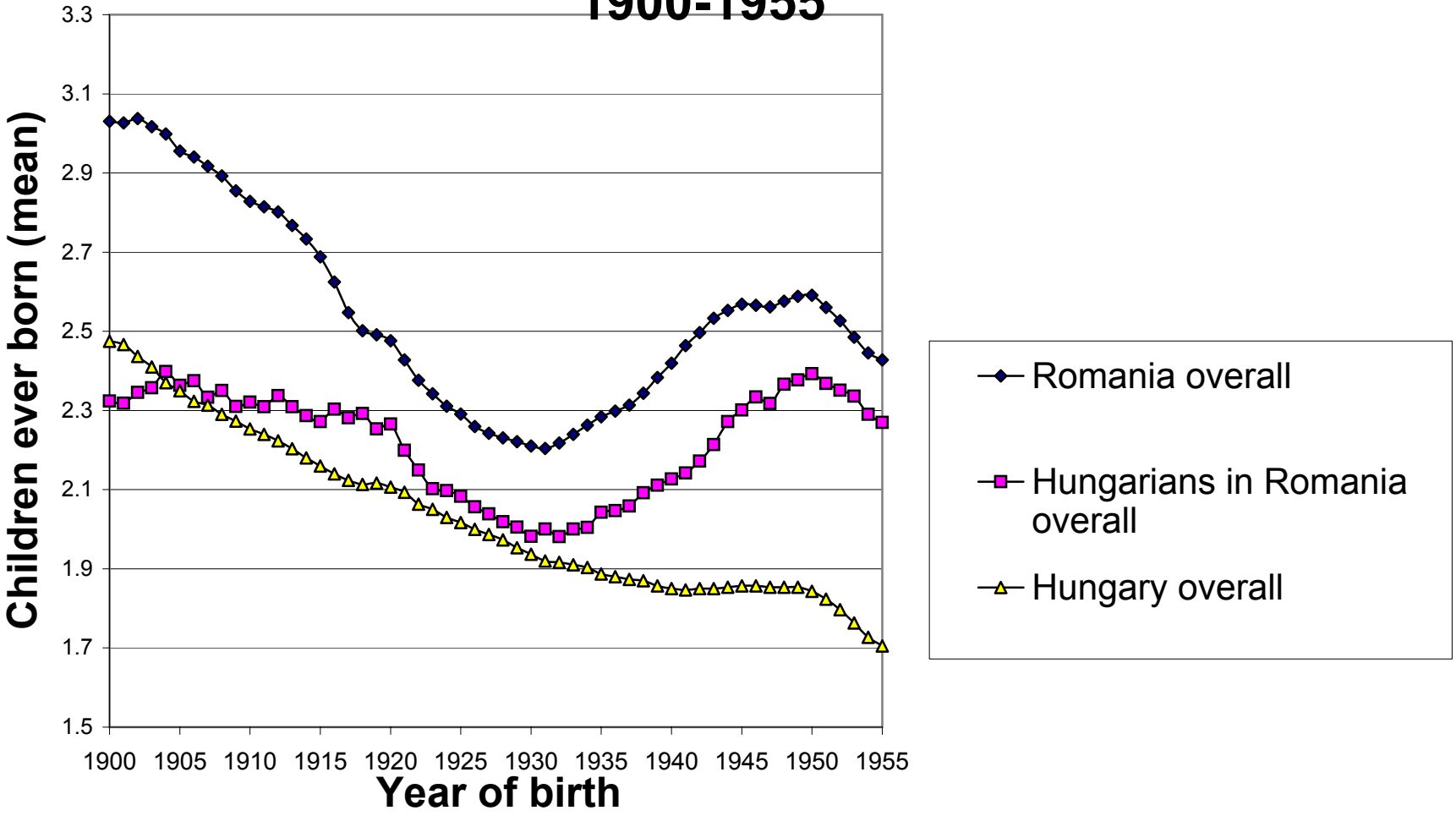
Notes: The total fertility rate is the average total number of births that would be born per woman in her lifetime, assuming no mortality in the childbearing ages, calculated from the age distribution and age-specific birth rates of a specified group in a given reference period (United Nations, 2002).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

Figure 4: TOTAL ABORTION RATES: BEFORE (1988-1989) AND AFTER (1991-1992)



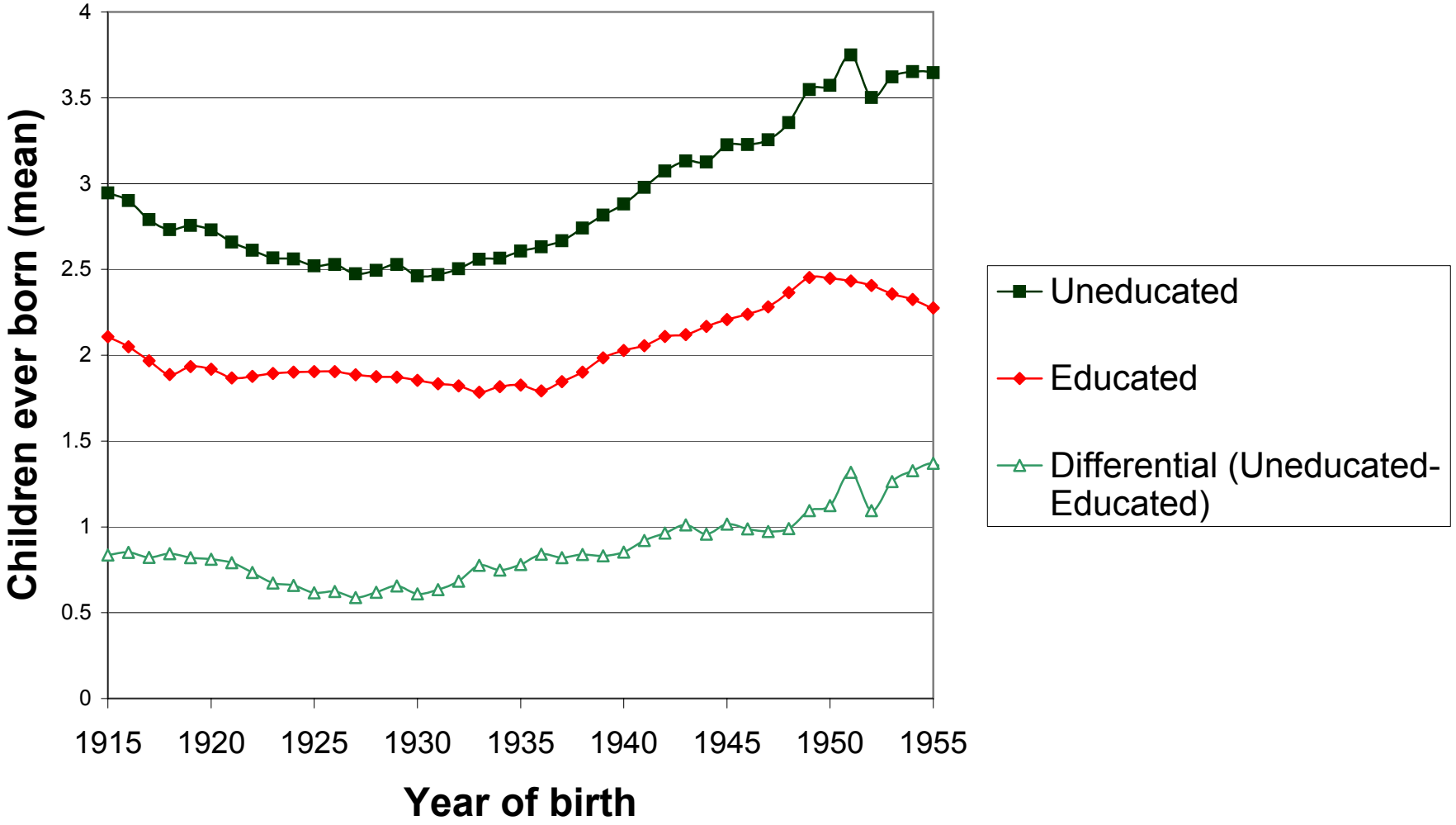
Notes: The total abortion rate is the average total number of abortions that would be born per woman in her lifetime, assuming no mortality in the childbearing ages, calculated from the age distribution and age-specific abortion rates of a specified group in a given reference period (United Nations,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

Figure 5: Fertility level of women born between 1900-1955



Notes: This graph plots the average number of children born 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 6: Fertility levels in Romania by education



Notes: This graph plots the average number of children born by year of birth of the mother for uneducated (less or 8 years of schooling) and educated (more than 8 years of schooling) women. 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:	
primary	0.24
secondary	0.63
tertiary	0.13
SOCIOECONOMIC INDEX:	
low	0.33
medium	0.54
high	0.13
% URBAN:	0.65

	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

Notes: Variables are further defined in Appendix C

Table 2A. Determinants of Pregnancy Outcomes

Dependent Variable:		*Pregnancy ending in:*			
	Pregnancy	*Birth*	*Abortion*	*Legal Abortion*	*Illegal Abortion*
Educated	**-0.00647*****	**-0.00408*****	**-0.00216*****	**-0.00226*****	**0.00010**
	(0.00117)	(0.00077)	(0.00078)	(0.00067)	(0.00040)
After	**0.00473****	**-0.00695*****	**0.01186*****	**0.01446*****	**-0.00262*****
	(0.00228)	(0.00157)	(0.00161)	(0.00151)	(0.00057)
Educated * after	**-0.00036**	**0.00195****	**-0.00250****	**-0.00230****	**-0.00018**
	(0.00150)	(0.00089)	(0.00122)	(0.00115)	(0.00040)
Transition	**0.00490***	**-0.00489****	**0.01061*****	**0.01289*****	**-0.00234*****
	(0.00272)	(0.00194)	(0.00196)	(0.00185)	(0.00073)
Educated * transition	**-0.00236**	**0.00022**	**-0.00271***	**-0.00212**	**-0.00053**
	(0.00192)	(0.00119)	(0.00151)	(0.00137)	(0.00066)
Constant	**0.02899*****	**0.02069*****	**0.00617*****	**0.00334*****	**0.00283*****
	(0.00168)	(0.00128)	(0.00090)	(0.00071)	(0.00055)
Observations	239765	239765	239765	239765	239765
R-squared	0.005	0.004	0.004	0.05	0.002

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 (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) Transition dummy taking value 1 for the year 1990, 0 otherwise (2) Education dummy taking value one if an individual had more than primary education; (3) Interaction dummies of education with after and transition dummies; (4) 6 age group dummies and their interactions with after and transition dummies. Variables are further defined in Appendix C. Standard errors are shown below the coefficients in parentheses. Standard errors are clustered at the individual level. Regressions were weighted using the sampling weights. * indicates statistical significance at the 5% level, ** at 5% and *** at 1%.

Table 2B. Determinants of Unwanted Pregnancy Outcomes

Dependent Variable:	*Unwanted Pregnancy*	*Unwanted Pregnancy ending in:*			
		Birth	*Abortion*	*Legal Abortion*	*Illegal Abortion*
Educated	**-0.00330*****	**-0.00118*****	**-0.00215*****	**-0.00229*****	**0.00014**
	(0.00089)	(0.00038)	(0.00077)	(0.00066)	(0.00039)
After	**0.00860*****	**-0.00234*****	**0.01111*****	**0.01362*****	**-0.00253*****
	(0.00182)	(0.00067)	(0.00158)	(0.00150)	(0.00054)
Educated * after	**-0.00172**	**0.00074***	**-0.00234***	**-0.00209***	**-0.00023**
	(0.00133)	(0.00040)	(0.00121)	(0.00114)	(0.00040)
Transition	**0.00742*****	**-0.00222*****	**0.00989*****	**0.01196*****	**-0.00213*****
	(0.00204)	(0.00077)	(0.00192)	(0.00181)	(0.00071)
Educated * transition	**-0.00223**	**0.00019**	**-0.00222**	**-0.00159**	**-0.00057**
	(0.00157)	(0.00053)	(0.00148)	(0.00134)	(0.00065)
Constant	**0.01048*****	**0.00399*****	**0.00597*****	**0.00336*****	**0.00262*****
	(0.00115)	(0.00062)	(0.00088)	(0.00070)	(0.00054)
Observations	239765	239765	239765	239765	239765
R-squared	0.004	0.001	0.004	0.005	0.002

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) Transition dummy taking value 1 for the year 1990, 0 otherwise (2) Education dummy taking value one if an individual had more than primary education; (3) Interaction dummies of education with after and transition dummies; (4) 6 age group dummies and their interactions with after and transition dummies. Variables are further defined in Appendix C. Standard errors are shown below the coefficients in parentheses. Standard errors are clustered at the individual level. Regressions were weighted using the sampling weights. * indicates statistical significance at the 5% level, ** at 5% and *** at 1%.

Table 3. Determinants of Pregnancy Outcomes - Robustness

Dependent Variable:	*Pregnancy*	*Pregnancy*	*Pregnancy*	*Pregnancy ending in:* *Birth*	*Birth*	*Birth*
Educated	**-0.00647*** **	**-0.00479*** **	**-0.00562*** **	**-0.00408*** **	**-0.00263*** **	**-0.00292*** **
	(0.00117)	(0.00118)	(0.00120)	(0.00077)	(0.00073)	(0.00082)
After	**0.00473** **	**0.00478** **	**0.00447***	**-0.00695*** **	**-0.00667*** **	**-0.00746*** **
	(0.00228)	(0.00231)	(0.00251)	(0.00157)	(0.00155)	(0.00165)
Educated * after	**-0.00036**	**-0.00043**	**0.00048**	**0.00195** **	**0.00162***	**0.00232** **
	(0.00150)	(0.00155)	(0.00156)	(0.00089)	(0.00084)	(0.00096)
Transition	**0.00490***	**0.00359**	**0.00900*** **	**-0.00489** **	**-0.00571*** **	**-0.00341**
	(0.00272)	(0.00277)	(0.00310)	(0.00194)	(0.00187)	(0.00209)
Educated * transitio	**-0.00236**	**-0.00093**	**-0.00283**	**0.00022**	**0.00110**	**0.00002**
	(0.00192)	(0.00196)	(0.00205)	(0.00119)	(0.00105)	(0.00126)
Constant	**0.02899*** **	**0.02751*** **	**0.02786*** **	**0.02069*** **	**0.01942*** **	**0.01764*** **
	(0.00168)	(0.00168)	(0.00180)	(0.00128)	(0.00126)	(0.00133)
Ages included	>15	>20	>15	>15	>20	>15
Controls included	NO	NO	YES	NO	NO	YES
Observations	239765	195120	239595	239765	195120	239595
R-squared	0.005	0.006	0.004	0.004	0.01	0.002

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 (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) Transition dummy taking value 1 for the year 1990, 0 otherwise (2) Education dummy taking value one if an individual had more than primary education; (3) Interaction dummies of education with after and transition dummies; (4) Age group dummies and their interactions with after and transition dummies; and (7) The control variables are : two socio-economic index dummies, an urban dummy, 3 regional dummies and 2 religion dummies. Variables are further defined in Appendix C. Standard errors are shown below the coefficients in parentheses. Standard errors are clustered at the individual level. Regressions were weighted using the sampling weights. * indicates statistical significance at the 5% level, ** at 5% and *** at 1%.

Table 4. Determinants of Pregnancy Outcomes

Dependent Variable:	*Pregnancy*	*Pregnancy ending in:* *Birth*	*Abortion*
Educated	**-0.00737**	**-0.01703**	**0.00757**
	(0.01868)	(0.01464)	(0.01071)
After	**0.01647**	**-0.02830**	**0.03751****
	(0.02617)	(0.01936)	(0.01522)
Educated * after	**-0.03719**	**-0.01362**	**-0.02326***
	(0.02432)	(0.01864)	(0.01290)
Romania	**0.02284**	**0.01969**	**0.00803**
	(0.02302)	(0.01743)	(0.01396)
Romania * after	**0.09491*****	**-0.03949***	**0.14193*****
	(0.03221)	(0.02232)	(0.02309)
Romania * educated	**-0.08341*****	**-0.04797*****	**-0.02894****
	(0.02423)	(0.01831)	(0.01463)
Romania * after * educated	**0.01169**	**0.03932***	**-0.02509**
	(0.03402)	(0.02360)	(0.02437)
Constant	**0.25474*****	**0.15386*****	**0.06874*****
	(0.01925)	(0.01510)	(0.01112)
Observations	28990	28990	28990
R-squared	0.04	0.03	0.04

Notes: The table presents the results of OLS 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. 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) 6 age group dummies and their interactions with after and transition dummies. Variables are further defined in Appendix C. Standard errors are shown below the coefficients in parentheses. Standard errors are clustered at the individual level. Regressions were weighted using the sampling weights. * indicates statistical significance at the 5% level, ** at 5% and *** at 1%.

Table 5. Determinants of Pregnancy Outcomes by Method Used

Dependent Variable:	*Pregnancy using contraceptive method :*				
	All Methods (incl. no method)	*No Method*	*Traditional*	*Modern*	*Other*
Educated	**-0.00647*****	**-0.00844*****	**-0.00407***	**0.00158**	**0.00532***
	(0.00117)	(0.00162)	(0.00210)	(0.00180)	(0.00315)
After	**0.00473****	**0.00210**	**0.00830***	**0.00289**	**0.01138**
	(0.00228)	(0.00288)	(0.00442)	(0.00502)	(0.01588)
Educated * after	**-0.00036**	**0.00035**	**0.00080**	**0.00040**	**-0.00802**
	(0.00150)	(0.00189)	(0.00290)	(0.00274)	(0.00607)
Transition	**0.00490***	**0.00385**	**0.00621**	**0.01147**	**0.02831**
	(0.00272)	(0.00362)	(0.00500)	(0.00902)	(0.03178)
Educated * transition	**-0.00236**	**-0.00448**	**0.00212**	**-0.00672**	**-0.00787**
	(0.00192)	(0.00276)	(0.00313)	(0.00673)	(0.00663)
Constant	**0.02899*****	**0.03188*****	**0.02715*****	**0.00803****	**0.01544**
	(0.00168)	(0.00227)	(0.00307)	(0.00374)	(0.00977)
Observations	239765	134581	78159	18653	5456
R-squared	0.01	0.01	0.01	0.004	0.007

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 (pregnancy or pregnancy using no contraceptive method, traditional, modern or other contraceptives). The independent variables are: (1) After dummy taking value 1 for the period 1991-1992, 0 otherwise; (2) Transition dummy taking value 1 for the year 1990, 0 otherwise (2) Education dummy taking value one if an individual had more than primary education; (3) Interaction dummies of education with after and transition dummies; (4) 6 age group dummies and their interactions with after and transition dummies. Variables are further defined in Appendix C. Standard errors are shown below the coefficients in parentheses. Standard errors are clustered at the individual level. Regressions were weighted using the sampling weights. * indicates statistical significance at the 5% level, ** at 5% and *** at 1%.

Table 6: Selection effects of the change in abortion legislation: comparison of means (with P-values for F-tests of difference in means)

	Control Group (Jan.-May 1967)	*Treatment Group (June-October 1967)*	*Difference*	*P-values*
Mother's Highest Educational Level				
Primary	**0.494**	**0.446**	**-0.048**	**0.000**
Secondary	**0.476**	**0.521**	**0.045**	**0.000**
Tertiary	**0.030**	**0.033**	**0.003**	**0.192**
Observations	8453	18732		

Notes: The sample contains women who had children born between January and October of 1967and living at home at the time of the census in 1992. The Control Group contains people born between January and May 1967. The Treatment Group contains people born between June - October 1967. Source: 1992 Romanian census.

Appendix A: Fixed Effects Analysis of Pregnancy Outcomes

Dependent Variable:		*Pregnancy ending in:*			
	Pregnancy	*Birth*	*Abortion*	*Legal Abortion*	*Illegal Abortion*
After	**0.00755*** **	**-0.00697*** **	**0.01402*** **	**0.01600*** **	**-0.00200*** **
	(0.00277)	(0.00203)	(0.00185)	(0.00178)	(0.00055)
Educated * after	**0.00046**	**0.00270** **	**-0.00262***	**-0.00234***	**-0.00026**
	(0.00173)	(0.00105)	(0.00135)	(0.00128)	(0.00042)
Transition	**0.00622** **	**-0.00521** **	**0.01175*** **	**0.01364*** **	**-0.00195** **
	(0.00298)	(0.00217)	(0.00210)	(0.00199)	(0.00076)
Educated * transition	**-0.00242**	**0.00037**	**-0.00285***	**-0.00219**	**-0.00059**
	(0.00214)	(0.00135)	(0.00160)	(0.00145)	(0.00070)
Constant	**0.01454*** **	**0.01245*** **	**0.00078**	**-0.00300** **	**0.00380*** **
	(0.00208)	(0.00161)	(0.00135)	(0.00126)	(0.00059)
Observations	239765	239765	239765	239765	239765
Number of Clusters	4702	4702	4702	4702	4702
R-squared	0.04	0.03	0.04	0.05	0.03

Notes: The table presents the results of fixed effect 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 (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) Transition dummy taking value 1 for the year 1990, 0 otherwise; (2) Interaction dummies of education with after and transition dummies; (4) 6 age group dummies and their interactions with after and transition dummies. Variables are further defined in Appendix C. Standard errors are shown below the coefficients in parentheses. Regressions were weighted using the sampling weights. * indicates statistical significance at the 5% level, ** at 5% and *** at 1%.

Appendix B. Fixed Effects Analysis of Pregnancy Outcomes

Dependent Variable:		*Pregnancy ending in:*	
	Pregnancy	*Birth*	*Abortion*
After	**-0.05381**	**-0.05835****	**0.00899**
	(0.03706)	(0.02758)	(0.02182)
Educated * after	**-0.02896**	**-0.01683**	**-0.01578**
	(0.03284)	(0.02509)	(0.01795)
Romania * after	**0.12097*****	**-0.06740****	**0.18601*****
	(0.04368)	(0.03071)	(0.03232)
Romania * after * educated	**-0.00889**	**0.06419****	**-0.05686***
	(0.04599)	(0.03236)	(0.03400)
Constant	**0.20042*****	**0.13076*****	**0.04058*****
	(0.01723)	(0.01308)	(0.01193)
Observations	28990	28990	28990
R-squared	0.38	0.28	0.40

Notes: The table presents the results of 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. 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) Interaction dummies of after with education and romania dummies; (3) Interaction dummy of education, Romania and after dummies; (4) 6 age group dummies and their interactions with after. Variables are further defined in Appendix C. Standard errors are shown below the coefficients in parentheses. Standard errors are clustered at the individual level. Regressions were weighted using the sampling weights. * indicates statistical significance at the 5% level, ** at 5% and *** at 1%.

Appendix C: Definition of the independent variables

This table describes the independent variables from the 1993 Romanian Reproductive Health Survey.

Definition of education variables:

Primary Education – this variable takes value 1 if an individual has less than or exactly 8 years of schooling, 0 otherwise

Secondary Education – this variable takes value 1 if an individual has attended some secondary education but did not attend a tertiary education institution, 0 otherwise.
Thus, this variable includes those individuals who received tertiary education.

Tertiary Education – this variable takes value 1 if an individual has graduated from university, 0 otherwise.

Educated – this variable takes value 1 if an individual has more than primary education, 0 otherwise.

Definition of control variables:

Socioeconomic Index– this variable takes value 1, 2 or 3 and is an indicator for high, medium and low socio-economic status. The indicator was constructed by Serbanescu et al (1995) and is based on the availability of certain household amenities.

Urban dummy– this variable takes value 1 if an individual lives in an urban area at the time of the survey, 0 otherwise.

Region dummy– these are a set of 4 regional dummies.

Religion dummy- this variable takes value 1 if an individual is Orthodox , 0 otherwise.

Definition of other variables:

After – this variable takes value 1 if a certain outcome occurred in 1991 or 1992, 0 otherwise

Transition – this variable takes value 1 if a certain outcome occurred in 1990, 0 otherwise

Age groups - these are a set of 6 age group dummies, for the following age groups: 15-19, 20-24, 25-29 *30*-34, 35-39, 40-44.

The variables *educated, age groups* and *after* are defined the same way for the 1997 Moldova Reproductive Health Survey.