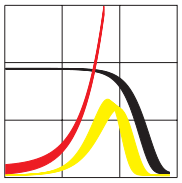

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# Educational attainment and second births in Romania

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**Content**

# Educational Attainment and Second Births in Romania

**Cornelia Mureşan**

**Abstract**

This study investigates the effect of educational attainment and educational enrolment on the risks of second birth in Romania, using data from the Generations and Gender Survey of 2005. Looking at the 1950-2005 period, we found a persistently negative effect of education on second birth, i.e., women with a relatively high level of education have lower risks of birth. Being in education significantly reduces the risk of second birth compared to women with no educational qualification. The risk is not lower, however, when we compare women who are still enrolled in education with individuals who have a high level of education. The strong negative effect of age at first birth observed when we do not control for personality weakens once we control for unobserved heterogeneity. We also show the extent to which changes in the socio-political regime, in family policies, and in the educational system affect the impact of education on second births.

## *1. Introduction*

The drastic decrease in fertility in Romania after 1989 is not an unusual trend in the European context. It is common to all Central and Eastern European countries which have undergone economic and social transitions since the fall of communism. However, there are few studies assessing differences in fertility among women with different educational levels either in communist times or after years of continuous transformation. Empirical research about Romania is scarce and what is available is based mainly on aggregate macro data which cannot be used effectively to investigate either the effect of educational level on motherhood or the extent to which motherhood can be combined with fulfilling educational aspirations. The influence of the two different contexts could be substantial in either communist or in more democratic times. In the former, the pro-natalist demographic policy not only encouraged the combining of work and family, but

also had a strong coercive side, forbidding family planning and abortion and discouraging divorces. At the same time, education programs for the working population were implemented, especially at low and medium levels of education. Nowadays, in democratic and market economy oriented times, political intervention in private life no longer exists. However, governments are trying to develop programs allowing motherhood to be combined with work. They are also continuously restructuring the education system, to give it more flexibility (especially for higher education), to broaden the coverage of education available to the population, and to align it more strongly with labor market demands.

In this paper we will address the following questions:

What are the main changes in the transition to a second child when childbearing interacts with educational level and aspirations during two different political and socio-economic regimes?

Does a higher education level increase second order fertility or not?

Are more highly educated women, who normally finish their educational careers later in life, more in a hurry to have their second child?

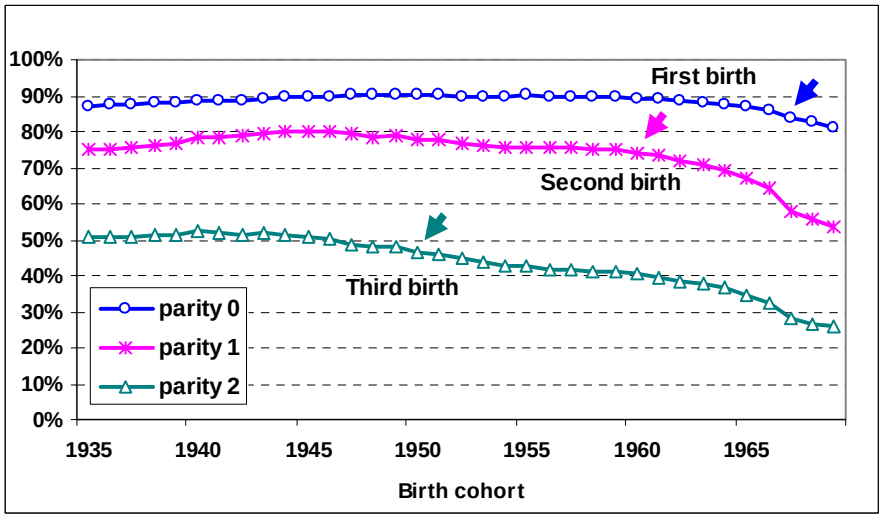
To what extent does the variability in the personal characteristics of women, and their greater or lesser degree of proneness toward motherhood, affect the birth risk?

## *2. Country background*

Like other Eastern European countries, Romania experienced a considerable and rapid drop in fertility after the end of the communist regime, but since the mid 1990s the total fertility rate has stabilized, surprisingly, at 1.3 children per woman. In fact, viewed from a longer time perspective, since the onset of the communist regime after the Second World War, the development of period fertility is much more complex, with many ups and downs depending on the development of family policies, on abortion legislation, on changes in political regime, and on the emergence of a market-oriented economy. The cohort fertility is much smoother, but a deeper insight into how fertility changed over time is given by parity fertility. Cohort parity progression ratios (Figure 1) suggest that third order fertility started to decline with every cohort born after the Second World War,

even when increasing first and second order births sustained the overall fertility. The two child family norm has been in place for a long time. The generations born after 1960 began to change the norm by reducing the numbers of their offspring. However, childbearing remained universal, with the probability of having a first birth remaining close to 90%. But, starting with women born in the late 1960s, childlessness began to spread. To what extent childlessness will be prevalent in succeeding generations remains to be determined from future data since, at the time of the last census (2002), the younger birth cohorts, not included in Figure 1, have yet to complete their reproductive periods.

**Figure 1**
*Parity progression ratios by birth cohort, for women born between 1935 and 1969*

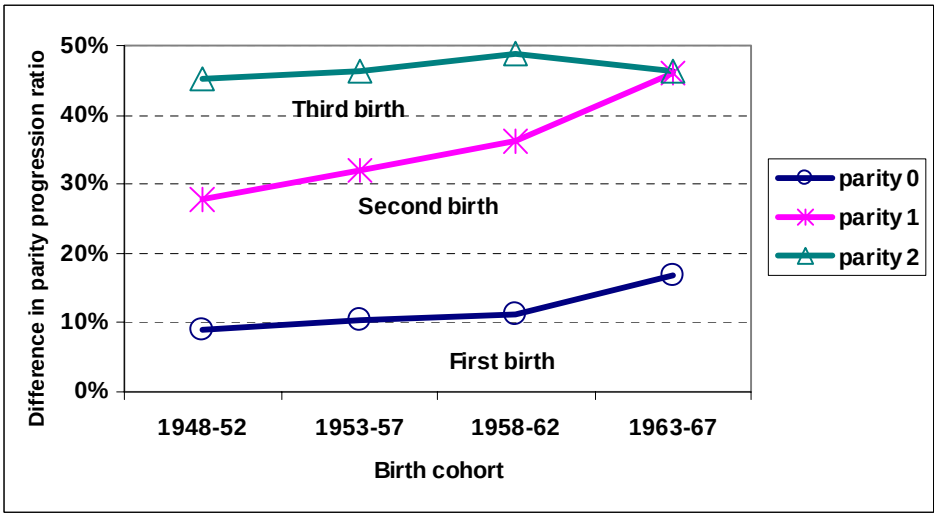



*Source: Census data, NIS (1994; 2003) (author's calculations)*

Undoubtedly, in all the trends detailed above there are forerunners and laggards, and we suspect, along with many other authors (Hoem 1986, Hoem and Hoem 1989, Hoem, Prskawetz and Neyer 2001, Kantarova 2004, Köppen 2006, Koytceva 2006, Kravdal 2001, Kreyenfeld 2002, Zabel 2007), that educational attainment is one of the most important criteria differentiating between them. Indeed, the difference in parity progression ratios between women with a low level of education (those without no academic qualifications) and those who are highly educated (with a university degree) is particularly large for second and third births (Figure 2). High educational attainment seems to be an important predictor for low second and third order fertility. The

importance of education in fertility decisions has increased over recent generations. It remained important in respect of a third birth, but it increased particularly in the case of decision for a second birth. For highly educated women, aged 35-39 at the time of the 2002 census (1963-1967 birth cohorts), the probability of them having a second child is lower by 45% than that of their less educated counterparts. This difference has increased from the 25% which differentiated such women born between 1948 and 1952. In the younger cohorts, educational differentials in term of second births became as large as the differences for third births (which are almost unchanged over time).

**Figure 2**
*Difference in parity progression ratios between women without any academic qualification and those with a university degree, by birth cohort.*




*Source:* *Census data, NIS (1994; 2003) (author's calculations)*

In conclusion, our interest in studying the impact of educational attainment on second births is justified by the rapid development of educational differentials over cohorts. This does not mean that we are less interested in the impact of education on first births, since education seemingly affects when women first become mothers (an issue for a further study). However, we do consider the indirect impact of education on second births when compared to first births, and we will control for age at entry into motherhood, considering this as a suitable proxy for this dimension.

## 3. Education system in Romania

### *3.1. Structure of the education system*

Since the collapse of state socialism in 1989, the educational system has been changing continuously; practically every government has tried to reform it. However, the structure which lasted between 1978 and 1995 covers the major portion of the time under study, so in the following we will focus on this period, emphasizing, where appropriate, the major changes introduced by the post-socialist reforms (especially those between 1995 and 2003)[1].

Compulsory education includes primary education (grades 1-4, ISCED level 1), and lower-secondary education (grades 5-10, ISCED level 2) which itself has two phases, phase I (middle school, grades 5 to 8) and phase II (lower-secondary, grades 9 to 10). These latter constitute the lower cycle of high school or of vocational education. Compulsory education begins with the first grade of primary school. Pupils were enrolled in this grade if they had turned or would turn 7 during the calendar year. In 2003 the age for compulsory enrolment was lowered to 6 years. Pupils must have reached this age by the beginning of the school year. Enrolment at age 6 was possible also before year 2003, upon the request of parents of children who met the relevant psychosomatic development standard. For children who, for various reasons (social or health problems), have not finished the first four grades of compulsory education by the age of 14, "second chance" classes are created. Exceptionally, for those who are more than two years older than the average age of the relevant grade, lower-secondary education can also be organized in the form of evening classes or part-time education. Compulsory education (grades 1-10) normally ends by the age of 17. For economic reasons, between 1995 and 1999, the duration of compulsory education was first reduced to 8 years and then increased to 9 years. Since 2003 it is once again 10 years.

Vocational education (ISCED level 3), organized as full-time education or as evening classes, lasts 3 or 4 years. Since 2003, vocational education has been reduced to three years. Middle school education graduates can enroll in the vocational education

[1] One can find on the Romanian Ministry of Education and Research website www.edu.ro more details about the actual structure of the education system.

program. Admission is granted on the basis of predominantly practical tests, specific to the selected profession. The courses end with an occupational proficiency certificate.

Alternatively, pupils can pursue a high school education (ISCED level 3). This covers grades 9 to 12 or 13 and is organized as full-time education, or as part-time and evening classes for working people. There are three main high school education branches: (i) theoretical, (ii) technological (e.g. informatics, business, administrative, primary or pre-school teaching, industrial, agricultural), and (iii) vocational (e.g. arts, sports, religion). Enrolment is possible on the basis of an entrance examination. Successful high school studies end with a diploma[2].

After high school, students can continue their studies with advanced vocational training for 1 to 3 more years (ISCED level 4), specializing in domains required by various companies or institutions..

Tertiary education (ISCED levels 5 and 6) include short-cycle university education, long-cycle university education, and advanced tertiary education.

Short-cycle university education (3 years, ISCED level 5b) leads students to a lower-academic degree. The graduates can continue their studies in the long-cycle university education in their initial specialization or in a related specialization. Short-cycle university education was underdeveloped during state-socialism, but has been increasingly revitalized after its fall.

Long-cycle university education (4 to 6 years, depending on the domain, ISCED level 5a) leads to an upper-academic degree or diploma (e.g. physicians, high school teachers, psychologists, engineers). Admission is granted on a competitive basis, following an entrance examination. However, the number of places was very small during state-socialism, and few people were able to fulfill their educational aspirations. From 1990 to 2002 the number of undergraduate students has increased fourfold. Until 1993 only public universities existed and they were completely free of charge. The first forms of fee-based tertiary education appeared with the private universities in 1993, but as of the 1998/1999 academic year the state universities have offered, in addition to the

[2] After passing the “examen de bacalaureat”, organized at national level, the graduates get the “diploma de bacalaureat”.

enrollments financed from the budget, places for fee-paying students. All students benefit from reduced transportation and medical services costs, and those with good results or those in poor financial circumstances could receive grants, free accommodation, and meals from the state universities. However, the proportion of those who receive this kind of support is small. Similar financial support for students was also available during state-socialism. As well as introducing places for fee-paying students, many universities in 1998/1999 developed distance-learning forms of higher education, particularly for the new professions demanded by the market economy. Increasingly more people partake in this form of educational improvement, practically doubling the number of undergraduate students. For example, there were 110,000 new tertiary education graduates at the end of the 2003/2004 university year, in contrast to the 63,000 at the end of 1998/1999. Students enrolled in distance-learning higher education courses pay fees.

Advanced tertiary education (ISCED level 6) was developed after 1995. This level of education includes advanced studies in a specialization (2-3 semesters) or masters studies integrating several domains of specialization (2-4 semesters). It also includes doctoral studies. During state-socialism, advanced tertiary education was underdeveloped. Advanced studies were organized occasionally, masters programs were non-existent, and doctoral ones were very rare. Admission into doctoral studies was organized once every few years, very few places were available, candidates had to be members of the communist party, and success was granted not only on academic merit, but also on high-level party connections. This is not the case any more, following the fall of the socialist regime. Since then various forms of advanced tertiary education have gradually developed, with the number of different offerings increasing to meet the rising demand.

Beginning in 2005, the structure of tertiary education was revised to conform to the framework of the Bologna process.

### *3.2. Characteristics and changes*

In the early 20th century the modernized Romanian educational system compared favorably with those in other countries. To be educated has long been highly prized in

Romania, and a good education is still associated with an elevated status and position in society.

The 1947 educational reform, which was based largely on the Russian system and methods, drastically changed the scope of education, turning the schools and universities into institutions of Marxist ideology.

During Ceausescu's communist regime (1965-1989), the Romanian system of education encompassed a series of primary objectives characterizing the system: "the high degree of inclusion of school age populations in the education system, the duration of compulsory education, the process of gradually extending pre-school and pre-university education etc." (Miroiu et al. 1998). Within the limits of the realities of a totalitarian social and political system, the functioning of the Romanian education system as an ideological and administrative project suffered some changes in response to the pressure of the society's elite. The changes concerned particularly the development of Information Technology (IT) and the study of foreign languages (Agabrian 2007). Apart from this, as education was considered unproductive, it was underfinanced, the infrastructure was outdated and dilapidated, and the teaching staff was undervalued and underpaid. Yet, Romanian education was essentially conceived to prepare the manpower which was necessary for socialist industry and to ensure staff for the communist party.

After 1989 the institutional structure of education in Romanian society, as inherited from the communist regime, underwent many changes, unfortunately without a clear policy or perspective. The problem is consistently analyzed in many empirical research works as well as in diagnoses which outline the current situation of the Romanian education system. Miroiu et al. (1998) find the very first post-socialist reorganization in the education system as misdirected toward endogenous needs instead of society’s needs. They show its contra-European tendency in the reduced periods of schooling, and point to the rigid character of the system as a whole. The changes wrought to graduation exams and to the content of the education grid during the subsequent 15 years of continuous re-organization were evaluated by Stoica (2006) as creating chaos for the students in the final grades of the school cycle. The relationship between school, on

the one hand, and family and society on the other, is identified as remaining critical by Zamfir (2000) and Agabrian (2007).

Education in rural areas represents the most vulnerable part of the system, in the opinion of Agabrian (2007). If we take into account the fact that almost half of the population lives in rural areas, then we can talk about a crisis. In rural areas, the inherited, conformist character of education, which prepared compliant individuals who simply acted as directed, is the hardest aspect to change. This is due to a lack of appropriately qualified teachers, a lack of interest and involvement of parents in establishing quality relations with schools, and a lack of financial resources. The emerging, democratized society in Romania demands that individuals make their own decisions, and take responsibility for those decisions. With such expectations, an education which is over-directive does not prepare young people well for life in such a society. Young people growing up in rural areas have greater difficulties to obtain higher education or to obtain safe jobs. These difficulties may influence their fertility decisions. Also, many young parents have recently left Romania to work abroad and the children they have left behind at home do not always grow up in conditions appropriate for children.

The "Development Strategy for Pre-university Education in 2001-2004"[3], updated in 2002, and the "Strategy for Romanian Higher Education in 2002-2004"[4], attempt to take reform forward on the basis of a series of general principles formulated at European level for the period 2001-2010, as well as objectives and priorities developed by several international bodies, such as the OECD, World Bank, UNESCO, UNICEF, etc. The outcome of the combination of the earlier piecemeal adjustments and this later strategic revision needs some time to be realized.

## *4. Theoretical considerations*

The increasing *level of education* for women has been suggested as a major factor behind declining fertility rates. The argument links educational level with demographic

[3] Available on the website of Romanian Ministry of Education and Research: www.edu.ro [Date of access: June 6, 2007].
[4] ibid.

behavior via economic considerations, assuming that higher education leads to a higher wage and therefore to a greater opportunity cost of childbearing. The thinking has been dominated by the theory of "new home economics" (Becker 1991). The extent to which the assumptions of that theory and the assumption of incompatibility between childbearing and employment in particular are met, vary significantly between societies. However, the two main behavioral mechanisms suggested by economic theory, namely the "income effect" (higher income providing better opportunities to cover the cost of children) and the "price effect" (the opportunity cost of childrearing) need to be taken into account in analyses of demographic behavior. Education is an important measurable component in an individual's earning potential.

Many authors (see e.g., Blossfeld and Huinick 1991) point out that the impact of education level on birth transition is largely explained by the longer time spent in education by the highly educated. A large number of empirical studies demonstrate that birth risks are lower during studies, which is interpreted as the incompatibility of *enrolment in education* with parenthood.

Highly educated women could have a different risk of second birth, simply because of their late entry into motherhood. The influence of education on the first birth can be considered as an *indirect effect* on the second birth. In his book "Postponement of Childbearing and Low Fertility in Europe" Sobotka (2004) cites a study where Beets at al. (2001) found that highly educated women were the "forerunners" in postponing the first birth in European countries, and estimated that the increasing educational level explains about half of the increase in the mean age of entry into motherhood among Dutch women born between the periods 1931-40 and 1961-65. Age at first birth could either increase or reduce the second birth risk. An increase would be expected when highly educated women have their first child only after finishing education, when they are usually older than other women, so that they have less time at their disposal before reaching the biological limits of fertility. Such a time-squeeze hypothesis could increase the transition rate to the second child, as has been assumed in the West German case (Kreyenfeld 2002). In contrast, late entry into motherhood in countries where early childbearing is the norm may induce older women to give up on the idea of a second birth. This latter hypothesis could play some role in the modern Romanian context.

In accordance with our theoretical considerations we will investigate all three aspects of the impact on second birth in Romania namely educational level, educational enrolment, and indirect influence of educational attainment versus age at first birth In a further step we will look at how changes in the socio-political regime, in family policies, and in the educational system affect the impact of education on second births. We will also be alert to when birth risks start to fall, in order to assess when the first manifestations of "second demographic transition"[5] become apparent. Finally we will control for other demographic and social-background factors, as well for unobserved heterogeneity in order to assess the true dynamic of the impact of education on second birth risk in Romania.

## *5. Data and methods*

### *5.1. Sample*

This study is based on data collected by the Generations and Gender Survey (GGS) at the end of 2005[6]. The sample consists of 11,986 respondents (5,977 men and 6,009 women) aged from 18 to 79 years at the time of interview, but our interest is focused on the 4,913 women who had had at least one child and thus were at risk of having a second child. In fact, our final sample has only 4,778 female respondents, 135 being excluded for various reasons. We eliminated 46 respondents without proper childbearing, union-formation or educational histories, 31 who became mothers either before the age of 15 or after 40, 27 mothers of twins at first birth, and 31 new mothers whose children were less than 9 months old at the time of interview as they were not at risk of a second birth. There were 3,016 second births.

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[5] The "second demographic transition" theory is well known and we do not intend to document it here. The interested reader may consult some of the most popular studies on the topic like Lesthaeghe and Van de Kaa (1986), Lesthaeghe (1995), or Lesthaeghe and Neidert (2006).

[6] *Generations and Gender Survey* (GGS) was carried out in Romania within the framework of the *Generations and Gender Programme* (GGP) with the financial support of the United Nation Fund for Population Activities (UNFPA) and the Max Planck Institute for Demographic Research (MPIDR). More details about the program can be found on the website of the Population Activities Unit of the United Nations Economic Commission for Europe (UNECE PAU), http://www.unece.org/pau/ggp, the coordinator of the whole project, and also on the website of MPIDR, http://www.demogr.mpg.de.

### *5.2. Variables*

#### *5.2.1. Dependent variable*

In the GGS questionnaire, respondents were asked to report the date (month and year) of each event. Consequently, our timing estimates have the precision of one month. We assumed the middle of the month as the exact time of the second birth, our dependent variable. One-child mothers are exposed to risk only after 9 months from the previous birth[7]. We right censored observations after 15 years, if the woman was past 40, or if she had not had a second birth by the date of the interview. We also eliminated from the analysis the few child mothers, younger than 15 years at the time of their first child, for consistency reasons, since we previously excluded such very young mothers from the analysis of first birth risk and our last model jointly considers first, second and third births, looking for the effect of selectivity.

#### *5.2.2. Educational attainment and enrolment*

Our key explanatory variable is educational attainment. Unfortunately, we do not have complete educational histories as only the highest educational level at the time of interview and the year and month of completion are reported. With such a *final educational level* used as the time-constant covariate, the results would be strongly biased for several reasons discussed, for example, by Kravdal (2004) or Hoem and Kreyenfeld (2007) in their papers about anticipatory analysis. A better solution can be chosen in life-course approaches, by constructing a *current educational level*, which is time-varying and whose value changes every time the respondent completes a superior educational level. The new variable can be constructed when we have a complete educational history, with an exact time for the ending and starting of successive levels of education. Not only is the date of ending of a new spell of education important, but also the date of starting it is of interest, especially if, as is usual, individuals have interruptions in their educational careers. Only in this way can we distinguish between the effect of being in education and the effect of education level.

[7] Instead of considering the time to second birth as dependent variable and the exposure to risk since 9 months from the previous birth, we might have considered the time to second conception (finalized in live-birth) as dependent variable and the time at first birth as start of exposure to risk. Since we cannot be sure if women conceive knowing that they will end soon the education or they end the education knowing that they are pregnant, both the mentioned strategies are equally good.

Given the lack of complete educational histories, what we can do to construct a current educational level from our GGS data is to first separate for each individual the time spent in education from the time out of education, and then distinguish among those out of education by educational level. Only those having at least a lower-secondary education level (which is compulsory in Romania) have reported the date of achieving it, so for those without education or only primary education we have had to impute the date for ending education. We set this date as the June following the respondent's $12^{th}$ birthday, an age to be reached before being susceptible to the risk of giving birth. Every respondent is considered to be enrolled in education all the time until her declared final educational level is attained. Such a definition of educational enrolment still remains strongly anticipatory, i.e. it assumes that the respondent will not return to take more education. Until the late 1990s, when alternatives to daytime higher education started to emerge, there were limited opportunities to return to the educational system and thus we can have confidence in our results. In contrast, strong anticipatory bias could affect our findings post 2000, since increasingly more students, especially women, including mothers, have returned to the educational system in order to gain a first degree diploma as required by the new market economy professions. Without further assumptions we can not distinguish between women currently enrolled in high school, vocational school, or undergraduate studies. Those who were in education at the time of interview are considered to be enrolled full time. After completion, the respondent is assigned the reported educational level.

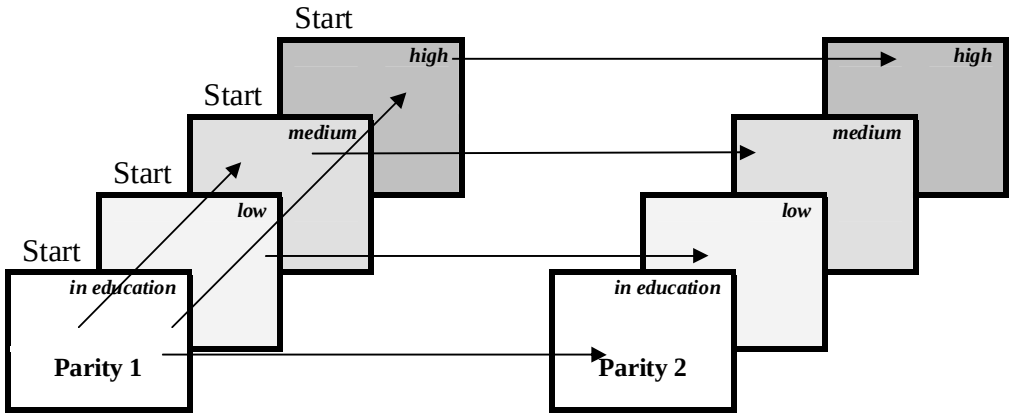
For the sake of simplicity we grouped the educational levels into just three categories, low, medium, and high, as follows:

- "Low level of education" means no academic qualification. Respondents who did not graduate from high school, but who attended primary school, middle school, and high-school (first cycle only, giving a maximum of 10 grades, ISCED levels 0, 1, and 2) are in this category. They have no more than compulsory education.
- "Medium level of education" means high school or a vocational qualification. High school graduates with "diploma de bacalaureat" and lower or advanced vocational education graduates (ISCED levels 3 and 4) are in this category.

- "High level of education" means a university degree. All holders of an academic degree are in this category, as are graduates of short-cycle and long-cycle university programs, and advanced tertiary education (ISCED levels 5 and 6).

In total we have four educational statuses, three of them categorized as out of education and one additional category which amalgamates the status of being currently enrolled no matter at which level of education. Our universe of educational statuses is inspired by Hoem and Kreyenfeld's (2006) study. There are no transitions between education levels (Figure 3), except from the status "in education" into "medium" or "high" education levels (the diagonal lines). Transition to parity 2 (the horizontal lines) is possible from each of the four educational statuses, without changing the educational level (there are no simultaneous changes regarding both the educational and parity statuses).

**Figure 3**
*Status-and-transitions diagram for education and second birth*




The distribution of exposure time over the time-varying current educational level is depicted in Table 1. The share of exposure time for highly educated women is only 6% which is no more than the share of the exposure time for the "in education" category. However we must remember that our sample covers a period of not less than 58 years - from the start of the first exposure in 1948 until the date of interview in late 2005. Over

such an extended period, the proportion of highly educated people increased, particularly if we consider the selected smaller group of highly educated, one-child mothers.

**Table 1.**
*Exposure time and number of second births in the sample, by current educational status*

| Woman's education | Person-years | Failures | % Exposure |
|---|---|---|---|
| *Out of education* | | | |
| no qualification | 14 585 | 1 764 | 48% |
| high school or vocational qualification | 12 089 | 1 010 | 40% |
| university degree | 1 803 | 102 | 6% |
| *In education* | 1 724 | 140 | 6% |
| **Total** | **30 200** | **3 016** | **100%** |

*Source: GGS 2005 Romania (author's calculations)*

Table 2 details the distribution of exposure time by educational level and period and shows (as well) the significant change over time in the population distribution in favor of the more educated. For example, the exposure time of women with university degrees increased from 1%, in the earliest period, to 10% in the most recent one, while the share of person-years of mothers with low level of education decreased from 84% to 24% during the same period.

**Table 2.**
*Distribution of exposure time by current educational status and period*

| Woman's education | 1948-1956 | 1957-1966 | 1967-1979 | 1980-1984 | 1985-1989 | 1990-1994 | 1995-1999 | 2000-2005 |
|---|---|---|---|---|---|---|---|---|
| *Out of education* | | | | | | | | |
| no qualification | 84% | 80% | 64% | 40% | 34% | 29% | 24% | 24% |
| high school or vocational qualification | 9% | 14% | 28% | 49% | 53% | 56% | 59% | 58% |
| university degree | 1% | 2% | 4% | 7% | 8% | 8% | 8% | 10% |
| *In education* | | | | | | | | |
| no qualification so far | 6% | 3% | 3% | 2% | 2% | 2% | 2% | 1% |
| some qualification so far | 0% | 1% | 1% | 2% | 4% | 6% | 8% | 8% |
| **Total** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |

*Source: GGS 2005 Romania (author's calculations)*

Not only has the distribution by educational level changed over time, but the social significance of being in education has changed as well. In the earliest period covered by the study, 1948-1956, more women pursuing a low or medium level of education were at risk of a second birth while studying (6% of exposure time, as the last rows of Table 2 shows) than in the early 1980s when students with no academic qualification so far and those with some academic qualification so far have equal shares

(2%) of the exposure time of the enrolled population. In the late 1980s the share of exposure time of undergraduate student mothers holding a high school or vocational qualification exceeds the share of time spent in education by mothers not yet having any academic qualification, and in the most recent times it is the highest proportion by far. All the above considerations are based on an additional assumption made about our data set. This additional assumption is the fixing of the date for completing high school education of those with a final university level education as the June following the respondent's 17$^{th}$ birthday.

*5.2.3. Period*

Another crucial covariate for our study is the period. We want to contrast childbearing behavior in socialist times with that in post-socialist times. Although the fall of the communist regime at the end of 1989 is an important node for our calendar, it is not sufficient, since other breaks, such as social policy changes, feature in Romanian history. Abortion legislation is important. Abortion was legalized in 1957 and widely used since then in limiting family size. In 1967 it was banned, which resulted in a doubling of the number of births in the very next year. Abortion was again legalized in 1989 on the eve of new socio-political regime. Family policy changes are important as well. The first forms of financial support for children were introduced in 1956, but the pro-natalist, Romanian policy was only implemented from 1967. The policy had both incentive and enforcement measures aimed at increasing fertility. At the same time women's participation in the labor force was also encouraged. After 23 years of an authoritarian communist-regime, 1990 marked the start of freedom and of a re-definition of family policies. One year of childcare leave (unpaid) for working mothers was introduced in 1990 and this became paid leave and was prolonged to 2 years in 1997. Paternity leave was introduced in 1999, childcare benefits for "insured" mothers in 2003, and other incentives are being continuously introduced (Mureşan et al. 2007), targeted to increase the low level of fertility.

In order to cover all the above mentioned changes we use eight periods defined as follows:

- before 1957 – after the period of war, the installation of the communist regime, illegal character of abortion
- 1957-1966 – socialist times, legal and free-of-charge abortion, before the onset of pro-natalist policies, Soviet inspired educational system
- 1967-1979 – socialist times, a "parenthesis" in the natural development of reproductive behavior, with both incentive and coercive aspects included in demographic policies
- 1980-1984 – socialist times, revised educational system
- 1985-1989 – last years of socialist period
- 1990-1994 – post-socialist times, old family policies, but without coercive aspects
- 1995-1999 – post-socialist times, changing family policies, continuously reformed educational system
- 2000-2005 – post-socialist times, relatively generous family policies, emergence of alternatives to the full-time form of higher education.

*5.2.4. Other covariates*

Among other covariates with the age at first birth, we aim to capture all indirect influences of educational attainment on the transition to a second birth from the first, since education affects the entrance into motherhood. It is a time-constant variable.

We also use a third time-varying covariate, beside educational status and period, namely marital status. It is an important proximate determinant of childbearing, whatever birth order one studies, and for us it has five categories: single mother; in first cohabitation; in first marriage; separated; in a further union (no matter if it is cohabitation or marriage).

Additionally we introduce social background characteristics known to have an influence on fertility decisions, i.e. place of living until the age 15, and number of siblings.

### *5.3. Methods*

We apply a hazard regression to model the transition to a second birth as a function of an underlying risk modified by a vector of covariates. The hazard function,

$\ln h_i(t)$, is a log-hazard of the occurrence of the event at time $t$ for $i^{th}$ woman and is defined as:

$$\ln h_i(t) = y(t) + z_a(a_i(0) - a_{\min}) + \sum_j \beta_j x_{ij}(t) + \sum_k \beta_k x_{ik}$$

where $y(t)$ is the baseline hazard of time $t$ that has passed since the previous birth. We model it as a duration spline (Lillard and Panis 2003). The other regressor spline, $z_a$, measures the effect of age at first birth, $a_i(0)$, and its effect is expressed relative to a specific age, $a_{min}$, usually the minimum value of entry into motherhood in the sample. Occasionally, we use a second duration spline, for catching the effect of calendar time. This is described later. All duration hazards are piece-wise linear splines in the log-hazards (generalized Gompertz model). The categorical covariates are either time-varying, $x_{ij}(t)$, or time-constant, $x_{ik}$. The $\beta_j$ coefficient expresses the relative risk of experiencing a second birth for individuals from category $x_{.j}$ at time $t$, for a time-varying factor, as compared to a baseline category. The $\beta_k$ relative risks have the same meaning, with the only, formal, difference that $x_{.k}$ is a time-constant factor.

Our initial three models estimate, first, the direct influence of educational level, $x_{i1}(t)$, second, the indirect influence of education through age at entry into motherhood, $z_a$, and last, the effect of calendar time, $z_c$. The argument $c_i(0)$ of the calendar duration spline is the year when individual $i$ starts to be exposed to risk, i.e. the calendar year of the first birth. Each additional factor is introduced step by step in the hazard regression equation (see below). Table 3 reports the results of the three "Starting Models".

Starting Models: $\ln h_i(t) = y(t) + \beta_1 x_{i1}(t) + z_a(a_i(0) - 18) + z_c(c_i(0) - 1950 + t)$

Then, we interact education, $x_{i1}(t)$, with period, $x_{i2}(t)$, in order to estimate how passing time and changes over time in educational system and in family policies affect

the impact of educational attainment on the risk of a second birth. We call this model the "Basic Model".

Basic Model: $\ln h_i(t) = y(t) + z_a(a_i(0) - 18) + \beta x_{i1}(t) * x_{i2}(t)$

Note that $z_c$ has disappeared here because calendar period is represented by $x_{i2}(t)$. Before controlling for unobserved heterogeneity we further introduce other covariates known to influence childbearing, in order to see wether this induces the effect of education to disappear. This "Enhanced Model" includes marital status, $x_{i3}(t)$, and a number of time-constant social background characteristics, $x_{ij}$.

Enhanced Model: $\ln h_i(t) = y(t) + z_a(a_i(0) - 18) + \beta\ x_{i1}(t) * x_{i2}(t) + \beta_3 x_{i3}(t) + \sum_j \beta_j x_{ij}$

Finally, we jointly estimate the "Enhanced Model" with similar models for first birth and third birth in order to estimate the effect of an unobserved individual characteristic, $\varepsilon_i$, which would eventually encourage some individuals towards childbearing while discouraging others from it. If unobserved heterogeneity was the explanation of why women with different levels of education have different childbearing risks, the effect of educational attainment should change or even disappear.

Joint Model:

$$\ln h_i^{(1)}(t) = y^{(1)}(t) + \beta_1^{(1)} x_{i1}^{(1)}(t) + z_c^{(1)}(c_i^{(1)}(0) - 1950 + t) + \varepsilon_i$$

$$\ln h_i^{(2)}(t) = y^{(2)}(t) + z_a^{(2)}(a_i^{(2)}(0) - 18) + \beta^{(2)} x_{i1}^{(2)}(t) * x_{i2}^{(2)}(t) + \beta_3^{(2)} x_{i3}^{(2)}(t) + \sum_j \beta_j^{(2)} x_{ij}^{(2)} + \varepsilon_i$$

$$\ln h_i^{(3)}(t) = y^{(3)}(t) + \beta_1^{(3)} x_{i1}^{(3)}(t) + z_a^{(3)}(a_i^{(3)}(0) - 18) + z_c^{(3)}(c_i^{(3)}(0) - 1950 + t) + \varepsilon_i$$

The first equation of the "Joint Model" is the log-hazard of first birth, $\ln h_i^{(1)}(t)$, as a function of a baseline hazard of time *t* since reaching the age of 15, $y^{(1)}(t)$, of educational status, $x_{i1}^{(1)}(t)$, of calendar year, $z_c^{(1)}$ where $c_i^{(1)}(0)$ is the year when the $i^{th}$ woman reached age 15, and the term $\varepsilon_i$ is for the unobserved individual characteristic. The second equation is almost the same as our "Enhanced Model", but it incorporates a common term for heterogeneity, $\varepsilon_i$. The third equation in the "Joint Model" estimates the effect of the time *t* passed since the second birth, $y^{(3)}(t)$, of educational status, $x_{i1}^{(3)}(t)$, of age at second birth, $z_a^{(3)}$, and the effect of calendar year, $z_c^{(3)}$, on the risk of a third birth, $h_i^{(3)}(t)$. As before, $a_i^{(3)}(0)$ is the age of the i$^{th}$ woman at her second birth, and $c_i^{(3)}(0)$ is the year when the second birth occurred for her. Note that educational status $x_i(t)$ at time *t* needs to be specified separately in the three formulae because process time t depends on the birth order.

For the estimation of the hazard models we use aML software, Version 2.09 (Lillard and Panis 2003).

## *6. Empirical findings*

### *6.1. Overall effect and direct influence of educational level*

As a first step we estimate a model where we control only for the educational status of the respondent. Table 3, Model 1 reports the results from this model. Having a university degree decreases the risk of having a second child by 32% ((0.47/0.69-1)*100%) compared to respondents with a high school or vocational qualification, and by 53% compared to women without any qualification. This is a result that we would have expected based on home-economics theory or other previous studies (Gheţău and Arghişan 2006, Mureşan 2007).

As soon as we introduce the regressor spline for age at first birth into the model (No. 2), the direct effect of educational attainment weakens. However, with a 14%

((0.65/.76-1)*100%) lower risk of a second birth compared to women with a medium level of education, and a 35% lower risk compared to women with a low level of education, the respondents with a high level of education still behave as expected. Educational attainment has a strong and significant effect in lowering the risk of a second birth. This negative gradient does not change with the introduction of the third duration spline which captures the effect of the calendar year (Model 3).

**Table 3.**
*Event-history models of the transition to the second child. "Starting Models"*

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| **Baseline by duration since first birth:** | | | | | | |
| Intercept | -2.19 | *** | -1.90 | *** | -2.24 | *** |
| Slopes: | | | | | | |
| 0.75-2 years | 0.75 | *** | 0.75 | *** | 0.77 | *** |
| 2-4 years | -0.27 | *** | -0.26 | *** | -0.26 | *** |
| 4-6 years | -0.15 | *** | -0.14 | *** | -0.15 | *** |
| 6-15 years | -0.28 | *** | -0.29 | *** | -0.30 | *** |
| **Educational status** | | | | | | |
| Relative risks: | | | | | | |
| *Out of education* | | | | | | |
| no degree | 1 | | 1 | | 1 | |
| high school or vocational degree | 0.69 | *** | 0.76 | *** | 0.75 | *** |
| university degree | 0.47 | *** | 0.65 | *** | 0.65 | *** |
| *In educational improvement* | 0.60 | *** | 0.63 | *** | 0.64 | *** |
| **Regressor spline by age at first birth** | | | | | | |
| Slopes: | | | | | | |
| 15-22 years | | | -0.08 | *** | -0.07 | *** |
| 22-26 years | | | -0.07 | *** | -0.08 | *** |
| 26-30 years | | | -0.07 | ** | -0.07 | ** |
| 30-40 years | | | -0.08 | * | -0.08 | ** |
| **Duration spline by calendar year** | | | | | | |
| Slopes: | | | | | | |
| 1950-1957 | | | | | 0.04 | |
| 1957-1966 | | | | | -0.04 | *** |
| 1966-1968 | | | | | 0.40 | *** |
| 1968-1980 | | | | | -0.03 | *** |
| 1980-1985 | | | | | 0.04 | * |
| 1985-1990 | | | | | 0.00 | |
| 1990-1995 | | | | | -0.11 | *** |
| 1995-2000 | | | | | 0.03 | |
| 2000-2005 | | | | | -0.03 | |
| *Log-likelihood* | *-16573* | | *-16472* | | *-16395* | |

Notes: a) Method: event-history model; dependent variable: transition to second birth measured from 9 months after first birth
b) The covariates: educational status, age at first birth, and calendar year, are introduced successively
c) *** highly significant $p \leq 0.01$; ** significant $0.01 < p \leq 0.05$; * weakly significant $0.05 < p \leq 0.10$
[1] The nodes are exact ages 22, 26 and 30.
[2] The nodes are January 1st 1957, January 1st 1966, etc.
Source: GGS 2005 Romania (author's estimations)

The only changes concern the intercept of the duration baseline which increases (from Model 1 to Model 2) and decreases (from Model 2 to Model 3) because the baseline category becomes more specific; women aged 18 at first birth in Model 2 and women aged 18 at first birth and exposed to risk in calendar year 1950 in Model 3.

### *6.2. Effect of enrolment (or being involved in educational improvement)*

As discussed in the section concerning variables, we are interested in catching the institutional effect of being enrolled, in addition to the effect of the educational attainment itself. Many authors ignored this effect in their studies of transition to a second birth (Hoem and Hoem 1989, Hoem 1996, Hoem et al. 2001) arguing that such a factor has no influence since most respondents have completed their studies before the first child is born, and similarly before being at risk of second birth (Kreyenfeld 2002, p. 24). Other authors, like us, have included an educational enrolment variable so we can compare our results to theirs (Köppen 2006, Koytcheva 2006).

Even if, as expected, the risk of a second birth for enrolled women is significantly lower than for their counterparts with a low level of education (by about 40%), it remains as high as that of the women with an university degree. The estimate is robust even after controlling for age at first birth and calendar year (Model 3). We are a little surprised by such a high risk of a second birth for enrolled women, but we think that these women have placed themselves in a birth-prone category by having their first birth and being enrolled at the same time. Another explanation is that the educational system is such that it makes it relatively easy to combine motherhood with obtaining an education. In fact, with similar assumptions as ours for the time-varying educational status covariate, Köppen (2006: 317-318) finds that West German women who are enrolled have only a 23%-33% lower second birth risk than out-of-education women, and French mothers who are enrolled have only a 14% lower second birth risk than the highly educated, not-enrolled women and an even higher risk, 24%, when compared to those with a medium level of education. For Bulgaria, where the enrolment variable construction benefited from more detailed information about all interruptions in people's educational careers, the findings shows a lower (by 42%) birth risk for women in education compared to those out of education (Koytcheva 2006: 208). But when the enrolment variable was

constructed with assumptions similar to ours, the in education mothers were found to have only a 32% lower second birth risk than the out of education ones (Koytcheva 2006: 193).

Instead of wondering about the relatively high risk of birth for enrolled mothers we propose a deeper investigation of what it means in the Romanian context. Women having children and being enrolled, are considered to be either in a part-time or a distance learning type of enrollment, i.e. we mean a status of mothers who try to achieve their educational aspirations by attending high-school in the evenings and/or through correspondence, weekend, or distance learning tertiary education. All of these forms of alternative learning were available to a certain extent in socialist times, and, especially the latter, in the continuously developing educational environment of democratic Romania.

Even if for the socialist times we do not have to worry about anticipatory bias being introduced by the construction of our time-varying educational status covariate, we still have to be careful with the interpretation of the "in education" category, and be aware of the ambition of the socialist regime to provide working people with access to education, by organizing evening vocational and high schools for them. In such schools the rhythm of teaching was less demanding and the requirements relaxed, but the duration of study was longer than in usual full-time education. Young parents, forced by the need to leave day school early in order to support their families, still had the opportunity to continue their studies in evening high schools. Less possible, because of the very few places available, was part-time attendance at university; however, it did exist in the form of correspondence studies.

During all the times under consideration, post-socialist and socialist, alternative forms of education, including higher education at weekends and through distance learning, have existed and proved very popular with working people and those who were already parents. Their studies last longer, but they usually combine them with work and childbearing.

For the above reasons, the "in education" category in this study has to be associated with part-time education, evening schools, and distance/correspondence higher

education. To ensure that our results are compared with similar topics in the literature we propose to use the label “in educational improvement” rather than the label “in education” or “enrolled” as has been used in studies about first births in Germany (Hoem and Kreyenfeld 2007, Zabel 2007).

### *6.3. Indirect influence of education through first birth*

Because a woman’s education level influences transition to a second birth, it has an important effect on postponing motherhood.

We have shown earlier that by introducing a factor for the effect of age at first birth (in Model 2) the effect of educational status decreases, but remains negative and statistically significant. This means that both the direct influence of level of education and the indirect influence of postponed motherhood have their own roles in the transition to a second birth. All the slopes of the log-hazard functions, between the nodes (ages at first birth 15, 22, 26, 30, and 40), are negative and statistically significant, meaning that the linear spline decreases continuously. The older a woman is at her first birth the lower her second birth risk.

The different social meaning of age at first birth for different social groups could be ignored if absolute age at first birth is used in a study that analyses the effect of education on childbearing. We therefore followed a suggestion by B. Hoem (1996) who pointed out the relevance of using age at birth relative to the level of education at birth. Having a first child after the age of 25 may have en entirely different social meaning for university graduates than for women with compulsory education only. Therefore we used relative age instead of absolute age in a further model which was otherwise similar to Model 3. We partitioned women’s ages at first birth into the following quartiles for each level of education, “youngest”, “rather young”, “rather old”, and “oldest”. We assume that a woman who has had her first child much later than other women with the same level of education will have the lowest risk of producing another child, whereas those who become mothers comparatively early are more family-prone and therefore more likely to have a second child. If controlling for relative age causes the direct effect of educational level to change or even disappear, then we conclude that a woman’s educational level influences the age pattern of first birth, but is not important in

determining whether the woman has the second birth. If the direct effect of education does not change, than we conclude that the social meaning of becoming a mother at an older age depends more on the average meaning in the population as a whole, than it does for the different levels of education of the women.

As we see in Table 4, there is a gradually decreasing relative risk of a second birth from the youngest group to the oldest. The older the woman is among her similarly educated colleagues, the lower her risk of a second birth. In contrast, if there is no change concerning the direct influence of educational attainment or educational enrolment, then the social meaning of becoming a mother is the same for all mothers regardless of their education, and educational attainment continues to play a significant role in reducing second birth risks.

**Table 4.**
*Relative risks of second birth according to education status and relative age at first birth*

| | Relative risk | Sig. |
|---|---|---|
| **Relative age at first birth** | | |
| youngest | 1 | |
| rather young | 0.82 | *** |
| rather old | 0.69 | *** |
| oldest | 0.49 | *** |
| **Educational status** | | |
| *Out of education* | | |
| no qualification | 1 | |
| high school or vocational qualification | 0.76 | *** |
| university degree | 0.64 | *** |
| *In educational improvement* | 0.65 | *** |

Notes: a) Method: event-history model; dependent variable: transition to second birth measured from 9 months after first birth
b) Covariates: educational status, relative age at first birth, calendar year as a duration spline
c) *** highly significant $p \leq 0.01$; ** significant $0.01 < p \leq 0.05$; * weakly significant $0.05 < p \leq 0.10$
Source: GGS 2005 Romania (author's estimations)

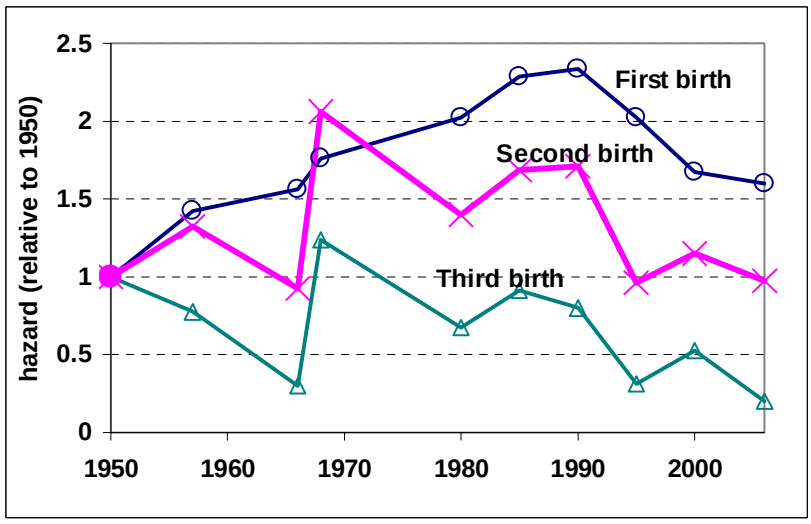
### *6.4. Effect of calendar year*

Before moving on to the effect of education by period, we investigate the effect of calendar year on second birth. As expected, the multiple changes in family policies that have taken place during the more than a half a century under study (1948-2005) strongly affected birth risks, regardless of the birth order (Figure 4).

A general assessment is that after the fall of the communist regime (end of 1989) all birth risks plummeted, and this decrease was more rapid for second and third births

than first births. While the first birth risk continued to decrease until 2000, the second birth risk (and the third birth risk as well) stopped falling in 1995. Since then the frequency of having a second child is as high as it was at the middle of 20th century when the birth deficit was well known. The deficit started during the Second World War and lasted through the years of regime change in a country that was included in the list of war losers and was consequently obliged to pay for that loss, particularly in its human work force. The second birth risk started to recover after 1950 (first births as well, but not third births) until 1957 when, following the trend in soviet-block countries, abortion was legalized and made free-of-charge. During 1957-1966 second and third birth risks fall, and one-child families start to gain adherents. It seems that first manifestations of the "second demographic transition" when women start to limit their family size are as early as the late 1950s in terms of second births, and even earlier in term of third births[8].

**Figure 4.**
*First, second, and third birth intensities. Duration splines by calendar year*




Notes: a) Method: event-history models; dependent variables: transition to first birth measured from age 15, transition to second birth measured from 9 months after first birth, and transition to third birth measured from 9 months after second birth
b) Covariates: educational status and calendar year. Models for second births and for third births additionally include age at previous birth as a duration spline.
c) Graph constructed on the basis of 3 separate models (one for each birth order)
Source: GGS 2005 Romania (author's estimations)

[8] The Total Fertility Rate decreased sharply between 1957 and 1966, reaching less than two births per women in 1964.

The sudden interdiction of abortion at the end of 1966 catches pregnant women unprepared and forces them to give birth (the total number of births doubled in 1967). Between 1966 and 1968, as we can see from the figures, the birth rate increases, and not only for second birth risks, but for third births as well, underlining the established practice of reducing family size by aborting second and third pregnancies. The "golden age" of Ceausescu's regime, with its declared demographic policies, lasted between 1967 and 1989. Emerging industry needed an increasing work force, which included women, and the Romanian family policy was set and developed in those years. Incentives and coercive measures together resulted in more births of any order, as compared to the periods before 1967 or after 1989. Moreover, the second birth risk was very sensitive to periodic re-enforcements of pro-natalist policies from 1974 and 1983 (see Mureşan 1996). The birth rate declines every time the corps-control weakens and it rises again when anti-illegal-abortion measures are strengthened. We can clearly see in Figure 4 the gradual decrease until 1967 of second birth risk and its upsurge in 1985-1989.

First birth risk development is much smoother than the more sensitive second and third birth risks. The general trend is to increase until 1990 and then to decrease after that time. Still the changes in family policies are remarkable, and our graph shows by the changes in slopes of the hazard function how first births were affected by changes in family policies. First signs of increasing childlessness, as the "second demographic transition" theory predicts, are not before the 1990s. Third birth risk development over time is very similar to the development of the second birth risk, with the important difference that it never returns again to its pre-Second World War level. The highest risk of a third birth during the period under study is in 1967, when it by chance equaled the already low risk of the post-war period.

As we have seen above, the "second demographic transition" would have manifested in Romania much earlier than after 1990 if the strongly coercive pro-natalist policies would not have interrupted the trend. However, analyzing the issue from the point of view of ideational changes which, according to the theory, go hand in hand with demographic development, Rotariu (2006) has shown that this is not (yet) the case for Romania, despite the clear drop in fertility and marriage rates and significant postponement in the timing of the two phenomena. His finding indicates that

demographic change does not follow from changes in the value system surrounding the family and the relationships among its members, nor is it necessarily associated with other behavioral changes, such as higher levels of cohabitation, increasing divorce rates, and higher instances of single motherhood. The "bourgeois family," which centers on the child, is still the dominant model in Romania.

The second birth risk is the most sensitive to family policies. It has been affected dramatically by every change. After the Second World War it increases; after abortion legalization it decreases; after the abortion ban it shoots up; it decreases gradually during the relaxation of the corps control of the pro-natalist regime, but increases again when the measures are reinforced; when the abortion ban legislation is abolished second birth risk falls off; implementation of new family policies in 1995 slightly increases the second birth risk, and it has leveled off since then.

### *6.5. Effect of education by period*

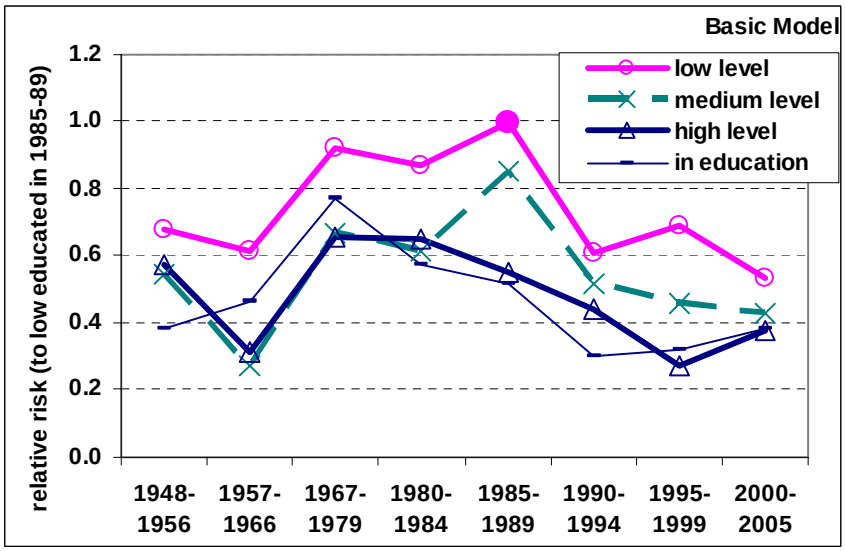
In such a changing context we are interested in the roles of educational attainment and enrolment in different periods. In order to get such insights we employ an interaction of women's educational status with a categorical variable for the period, instead of considering separately the current educational status variable and the calendar year spline (see "Basic Model" equation in section 5.3). The interaction effects of this model are shown in Table 5 and represented in Figure 5. The baseline is fixed to the women with a low level of education during 1985-1989, whose risk of second birth is therefore 1, the highest risk over all educational groups in any period.

**Table 5.**
*Interaction between education and period. "Basic Model"*

| | 1948 - 1956 | 1957 - 1966 | 1967 - 1979 | 1980 - 1984 | 1985 - 1989 | 1990 - 1994 | 1995 - 1999 | 2000 - 2005 |
|---|---|---|---|---|---|---|---|---|
| **Educational status** | | | | | | | | |
| *Out of education* | | | | | | | | |
| no qualification | 0.68 | 0.61 | 0.92 | 0.87 | 1 | 0.61 | 0.69 | 0.53 |
| high school or vocational qualification | 0.54 | 0.27 | 0.67 | 0.61 | 0.85 | 0.52 | 0.46 | 0.43 |
| university degree | 0.58 | 0.32 | 0.65 | 0.65 | 0.55 | 0.44 | 0.27 | 0.38 |
| *In educational improvement* | 0.38 | 0.46 | 0.77 | 0.57 | 0.52 | 0.30 | 0.32 | 0.38 |

Notes: a) Method: event-history model; dependent variable: transition to second birth measured from 9 months after first birth
b) Covariates: interaction between educational status and period, and age at first birth as a duration spline
Source: GGS 2005 Romania (author's estimations)

**Figure 5.**
*Second birth relative risks, by education and period. "Basic Model"*




Notes: a) Method: event-history model; dependent variable: transition to second birth measured from 9 months after first birth
b) Covariates: interaction between educational status and period, and age at first birth as a duration spline
Source: GGS 2005 Romania (author's estimations)

There are two ways of reading the table, and interpreting the figure. First, one can compare the relative risks along rows, and then pay attention to the columns. Alternatively, one fixes the educational level in order to investigate the differences within the period for the various educational categories. Second, one can read the table column-wise, and then observe the differences between points on the verticals. One then compares the effect of education by period.

Each line shape has its own specificity, meaning that women with different educational attainments and educational enrolments reacted in their own ways to major changes over time in family policies and/or in educational systems.

University degree holders have in general smoother changes in their second birth risk than other holders of qualification or those with no qualification. Their birth risk decreased continuously in the last two decades of the twentieth century, without a peak in the late 1980s, such as occurred for the women with a low or a medium level of education. The most probable explanation is that they have learnt, since 1967, how to control their reproductive behavior without relaying on abortion, in contrast to their lower

educated counterparts who have been more affected by the up and down corps control during the pro-natalist period and by the abolition of the abortion ban in 1990.

Women with a low level of education were less affected in the late 1950s and the early 1960s by the first legalization on abortion (in 1957), proving that the leading abortion users at that time were the more educated women. The birth risk decreases between 1957 and 1966 by 45% for women with a high level of education, by 50% for those with a medium level of education, but by only 10% for those in ”low level of education” category. In contrast, in 1990 when abortion became again legal and free of charge the women with a low level of education rely heavily on it, reducing by 40% their second birth risk. From 1995, the second order birth risk stops decreasing among women with no qualification, and levels off after than. The developing family policies seem to fit quite well with the expectations of women with a low level of education.

The women with a medium level of education in the early 1990s, when abortion was again available, are more like the those with a low level of education regarding the dramatic nature of the second birth risk decrease (by 39%). This is very different from the situation during the period when abortion was legalized for the first time (in the late 1950s) when they behaved more like the highly educated. Since the mid 1990s high school and vocational qualification holders seem to have profited from the updated family policies, slowing the reduction of their second birth risk which, up to 2005, remained as high as it was in the 10 previous years. However the risk is about 15%-30% less than that for women with no qualification.

For mothers in educational improvement, their second birth risk is more or less similar with that of the university degree holders. Depending on the period, those who combine motherhood with education have either slightly higher or slightly lower second birth risks than women with a university degree, but the general trend is the same. During the 1950s, 1960s, and 1970s, combining education and motherhood was slightly more compatible with a second birth than for holders of some academic qualification or a university degree. We can explain this by the efforts of the communist government, newly installed in power at the end of the 1950s, to give working people access to education, especially those coming from the “working classes”, workmen and peasants.

Large numbers of these people were enrolled in evening vocational education classes. By the 1980s, the situation has gradually changed. Those in educational improvement tend to be undergraduate students who have to be working people as well. They could have been enrolled in part-time, correspondence studies. Their second birth risk decreases and, during the early 1990s, it becomes significantly lower than the risk of the university degree holders. In the late 1990s, the increasing demand for the new professions and skills of the market economy push many mothers to enroll in distance-learning university education, and we can see (Figure 5) their second birth risk has stabilized since then, being at the same level as for higher educated women. Higher education, as well as educational improvement during motherhood seems to be a good predictor of low second birth risk.

If we now look at Table 5 column-wise and Figure 5 by vertical lines, we can see how second birth risk is affected by educational attainment in each period. A general assessment remains constant over time. More precisely, women with a low level of education always have a higher second birth risk than those with a high level of education ones. The difference between the two varies - sometimes being large, sometimes small. The women with a medium level of education behave sometimes more like those with a low level of education, some times more like those with a high level of education, or they can lie in between.

Let us see where the differences between women with a high level of education and those with a low level of education are larger or smaller as compared to the general 35% found previously in Model 3. We find the largest difference occurs during the last years of the socialist period, when women with university degrees have a 45% lower second birth risk as compared to women with no qualification, and not during the post-socialist times as might be expected. The late 1980s was the worst period for intellectuals who were discriminated against in favor of the less educated people who sometimes had better salaries and easier access to “rationed” food, and who cared less about different kinds of freedom. However, the negative educational gradient, firstly observed in the late 1980s, consolidates during market economy times. The smallest differences are during the years close to the Second World War (15%) and during the first years after the fall of the communist regime (28%), proving that times with widespread social disturbances

affect all kind of people equally, including in terms of second births. A similar small difference (28%) can also be observed during the last period of 2000-2005, but we refrain from any assessment for this period because we think that our results are strongly biased by the construction of our educational status variable which becomes strongly anticipatory and no longer suitable for times when there is a general return to the educational system after years of interruption.

As concerns second birth risk of the mothers with a medium level of education we find a perfect similarity with that of those with a high level of education until the mid 1980s, and an in-between position after then, i.e. lower risk than for mothers with a low level of education, but a higher risk than for those with a high level of education. The progressive modernization of the educational system, despite its weaknesses, left behind the older ideological propaganda and equalization character of education, introducing competition and merit criteria instead of political criteria for rewarding talent and work. This quiet and progressive change has been reflected in changed attitudes and birth control ability differences between people with various educational attainments, and we may think that it is manifest in the choice for a second birth (after 1980).

### *6.6. Other determinants of childbearing*

We have seen that until now, education has a significant negative effect on second birth risk regardless of the period under study. But childbearing is strongly influenced by marital status, an important proximate demographic determinant for any birth order risk, in all societies and at all times. We wondered if, by introducing marital status in our analysis, the effect of education disappears or not, or to what extent it is weakened. Our "Enhanced Model" includes marital status as a time-varying covariate (equation described in section 5.3). It includes other social background covariates, like character of place where respondent grew up until age 15, and number of siblings (both time-constant variables), as well.

We assume that marriage and having children are strongly connected in a society in which marriage is valued, as it is in Romanian society. The large majority of second order children, 91% in our sample, were born in a first marriage, but increasingly more

are born in first cohabitations or in second unions, so we are interested in evaluating the risks for these smaller groups of women as well.

Social background determinants can influence childbearing as well. Women who grew up in more traditional, family-oriented contexts, as rural regions are, are expected to have a higher risk of second births than those from urban areas. In Romania in 2005 about half the population was still living in rural areas (even if they were older than the urban population, and thus there are proportionally less women in their reproductive periods), so that knowing about childbearing differentiation is important in any studies. The number of siblings is another proxy for the social context in which a woman grew up. Those who have more siblings are socialized differently, they are accustomed to large families with many relatives, and they are expected to have more children when they form their own families.

**Table 6.**
*Relative risks of second birth by marital status and social background. "Enhanced Model"*

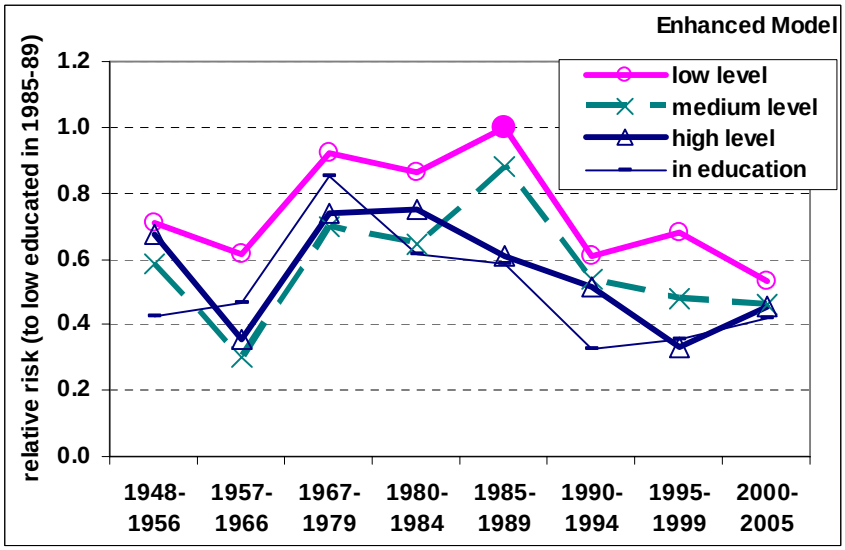
| | Relative risk | Sig. |
|---|---|---|
| **Marital status** | | |
| Lone mother | 0.70 | *** |
| Separated mother | 0.24 | *** |
| In a first marriage | 1 | |
| In a first cohabitation | 0.97 | |
| In a repeated union | 1.57 | *** |
| **Character of place where respondent grew up** | | |
| Rural | 1 | |
| Urban | 0.85 | *** |
| **Number of siblings** | | |
| No siblings | 1 | |
| One or more | 1.49 | *** |

Notes: a) Method: event-history model; dependent variable: transition to second birth measured from 9 months after first birth
b) Covariates: interaction between educational status and period, age at first birth as a duration spline, marital status, residency area, and number of siblings
c) *** highly significant $p \leq 0.01$; ** significant $0.01 < p \leq 0.05$; * weakly significant $0.05 < p \leq 0.10$
Source: GGS 2005 Romania (author's estimations)

Our expectations were only partially confirmed. Table 6 shows the results. The risk of having a second child is not greater in a first marriage than it is in a first cohabitation, not if other covariates are controlled for. However we have to be aware that it does not mean that there are as many births in the context of a first cohabitation as there are in a first marriage, since cohabitation is much less prevalent. Instead, a second birth to

a single mother is lower by 30% for women in a first marriage, and it is much less risky (by 76%) for a separated mother not yet in another union. The higher risk (157%) for an additional child for women in a repeated union compared to women in a first marriage shows how important it becomes for a re-partnered women to have a second child. The influence of social background characteristics operate in the more expected way. Women who grew up in rural areas have a 15% higher second birth risk, and those who have siblings have a 49% higher chance of having their own larger families.

**Figure 6.**
*Second birth relative risks, by education and period. "Enhanced Model"*




Notes: a) Method: event-history model; dependent variable: transition to second birth measured from 9 months after first birth
b) Covariates: interaction between educational status and period, age at first birth as a duration spline, marital status, residency area, and number of siblings
Source: GGS 2005 Romania (author's estimations)

Another interesting result, found by adding supplementary covariates to our "Basic Model", which is concerned only with the direct and indirect effect of education and period, is that adding marital status does not change the effect of education on second birth risk. However, by introducing the social-background covariates, our "Enhanced Model", the effect of education weakens inside every period (Figure 6). There is less variation, and sometimes the highly educated seem to have higher second birth risks than those with a medium level of education (especially in the period 1980-1984). However, the strong effect of period does not change. Every group of women with similar

educational attainments and educational enrolments have the same trajectory of risks over time as found by the "Basic Model".

### *6.7. Effect of selectivity*

Our last finding involving the effect of unobserved heterogeneity which, if not controlled, could bias our results, is very interesting. Living in rural areas during childhood and having sisters and brothers can contribute to the development of such a personal characteristic as being more "childbearing-prone" in these cases. If such an unobserved characteristic plays a main role in second births, as has been proved in some European societies like Norway (Kravdal 2001) or West Germany (Kreyenfeld 2002) for college educated women, then the role of education could vanish altogether. In contrast, in Bulgaria, unobserved heterogeneity does not play a similar role: Using both the 2001 Census data and the 2002 Social Capital Survey data, Koytcheva (2006, p. 227) does not find any significant differences between higher and secondary educated women, and the identified higher second birth risk of women with a low level of education increases when an unobserved individual characteristic is included in a Joint Model of transition from first to second births.

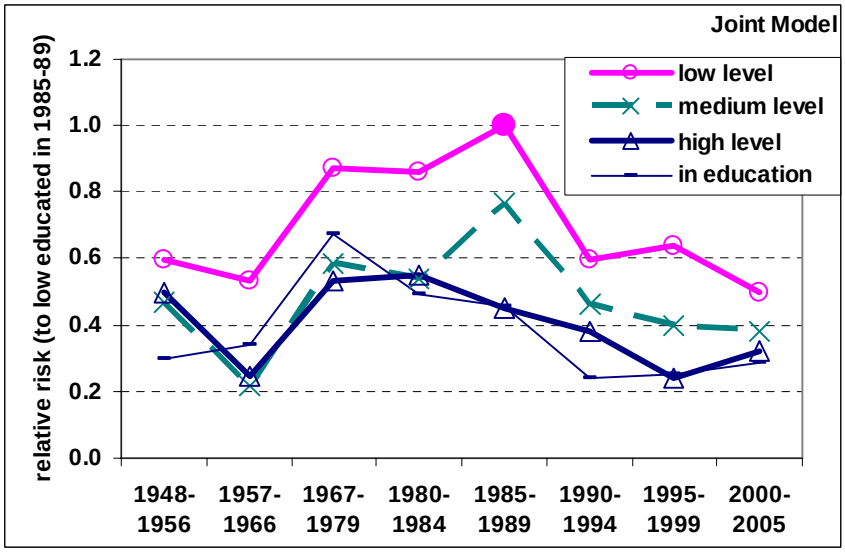
Our "Joint Model", as it was described in section 5.3, includes not only a variable for transition from first to second births, but one for transition to third births as well. We do so because first births in relationships are almost universal in Romania, or at least they were until very recently, therefore we need more repeated events in order to have confidence that the unobserved heterogeneity factor ($\varepsilon_i$) catches the "childbearing-oriented" individual characteristic.

The changes in the effect of level of education on birth risk are in the direction expected, as Figure 7 shows for the second births and Table 6 shows for first and third births. Far from vanishing, the differences between women with no academic qualification and those with university degree as a consequence of higher educational attainment become an even stronger predictor of lower births risks, as soon a term for unobserved heterogeneity is introduced. Now, the largest difference over time[9] is as large

[9] During 1995-1999

as 63% (it was 61% according to the "Basic Model" and diminished to 51% according to the "Enhanced Model"), but all other differences are accentuated. For example, during the period following the fall of communism, 1990-1994, it is 36% while the "Enhanced Model" found only a 16% difference. If, in Romania, there were no differences between women with a medium and a high level of education until the mid 1980s, as was the case in Bulgarian at about the same time (Koytcheva 2006), the differences appeared before the political regime changed, and they have held since then during the transition to a market economy and more democratic times. Those with no qualification have consistently had higher second birth risks than all the other women with an academic qualification or degree.

**Figure 7.**
*Second birth relative risks, by education and period. "Joint Model"*




Notes: a) Method: event-history model; dependent variables: transition to first birth measured from age 15, transition to second birth measured from 9 months after first birth, and transition to third birth measured from 9 months after second birth
b) Covariates: for first birth: educational status, calendar year; for second birth: interaction between educational status and period, age at first birth, marital status, residency area, number of siblings; for third birth: educational status, age at second birth, calendar year
c) All three models include a common jointly-estimated term of unobserved heterogeneity
Source: GGS 2005 Romania (author's estimations)

The effect of selectivity in western countries has also been shown to be important in analyzing second birth risk (Kreyenfeld 2002). But the results contrast with our results. In Austria (Hoem et al. 2001), in Great Britain (Kreyenfeld and Zabel 2005), in France (Köppen 2006), in Norway (Kravdal 2001), in Sweden (Hoem 1996, Hoem and Hoem 1989, Oláh 2003), and in West Germany (Kreyenfeld 2002, Kreyenfeld and Zabel 2005,

Köppen 2006), the second birth risk was found to be higher among highly educated women. Controlling for personality characteristics, the positive effect of education on second births usually disappears. In Romania the negative effect of education correspondingly becomes stronger. The explanation is similar. Highly educated women stay in education longer, have births later in life, and thus their fertility affects the later general birth risk than does the fertility of lower educated women. When one does not control for unobserved heterogeneity the results are biased, and they better reflect the behavior of those who become mothers early, i.e. the women with a low level of education and/or the more childbearing-prone ones. In western countries highly educated women have, in fact, similar second birth risks to those with a low level of education, but those who are more childbearing-prone have their second births sooner thus biasing the true effect of education. In Romania the university educated women have a lower risk of second births, but among them those who are more family-oriented have their second birth sooner, and this biases the true extent of the negative effect of education on second births.

As for second births, after controlling for the unobserved heterogeneity factor, the effect of education on first and third births appears accentuated, as one can see from Table 7. First birth risk is lower by 33% for women with high school or vocational qualifications, and by 49% for women with a university degree[10], compared to those with at most compulsory schooling. Moreover, it seems that third birth risk concerns mostly women with a low level of education since the risk is 69% higher than for women with a medium level of education and 82% higher than for an university degree holders.

[10] The estimate is not statistically significant, but it decreased (not increased) from the significant estimate of 68% in the "Separate Model", so we still consider it an important result.

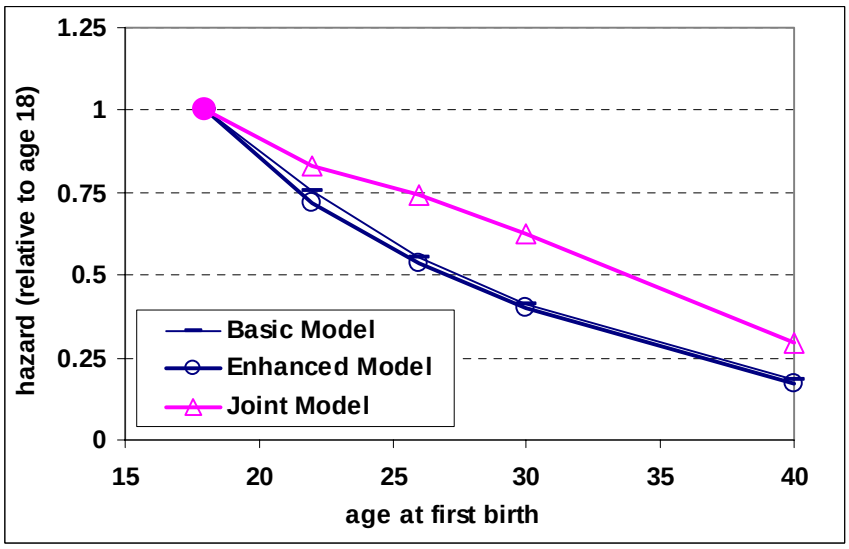
**Table 7.**
*Relative risks of first and third birth, by educational status." Separate and Joint Models"*

| | Separate Model | | Joint Model | |
|---|---|---|---|---|
| **Educational status** | | | | |
| **First birth** | | | | |
| *Out of education* | | | | |
| no qualification | 1 | | 1 | |
| high school or vocational qualification | 0.75 | *** | 0.66 | *** |
| university degree | 0.68 | *** | 0.51 | |
| *In educational improvement* | 0.28 | *** | 0.23 | *** |
| **Third birth** | | | | |
| *Out of education* | | | | |
| no qualification | 1 | | 1 | |
| high school or vocational qualification | 0.38 | *** | 0.31 | *** |
| university degree | 0.24 | *** | 0.18 | *** |
| *In educational improvement* | 0.50 | | 0.37 | |

Notes: a) Method: event-history model; dependent variables: transition to first birth measured from age 15, transition to second birth measured from 9 months after first birth, and transition to third birth measured from 9 months after second birth
b) Covariates: for first birth: educational status, calendar year; for second birth: interaction between educational status and period, age at first birth, marital status, residency area, number of siblings; for third birth: educational status, age at second birth, calendar year
c) The Joint Model differs from the Separate Model only by an additional term for unobserved heterogeneity
Source: GGS 2005 Romania (author's estimations)

The standard deviation of the unobserved heterogeneity term from the "Joint Model" is equal to 0.58 and is significantly different from zero. A "normal", woman, neither very childbearing-oriented nor against-childbearing, has a second birth risk according to her educational level as described above (Joint Model). The same model shows us, by the changed slopes of the regressor spline, illustrated in Figure 8, that age at first birth is not, in fact, so important in lowering the second birth risk,but the results have been biased by the "childbearing-oriented" women who enter motherhood at a low age. The bias arises from their large number in the sample and they seriously affect the results when one does not control for heterogeneity.

**Figure 8.**
*Second birth intensity, regressor spline by age at first birth*




The personal characteristics of the more "childbearing-oriented" women are an important factor in childbearing, and omitting the heterogeneity term in such an analysis leads to unwanted consequences, namely misleading results. Had we not controlled for it, we would not have seen the true importance of educational level in second birth risk, and we would not have realized how much a low level of education is associated with "childbearing-proneness", while career oriented persons have to choose between education and more children. Having an educational improvement status is relatively compatible with work and family, up to the point that university attainment allows the combination of work with a larger family, which is not so easy.

## *7. Conclusions*

The lower intensity of second births for women with high levels of education appears to be a true result and is not due to mis-specification, at least not in the domain covered by the covariates at our disposal. If this were not so, the effect would disappear or be reversed when other covariates are added, but this does not prove to be the case. The higher *opportunity cost* hypothesis of higher educated women, and not the higher

income hypothesis, from the “home-economics-theory”, seems to apply in Romania. However, the differentials between the fertility of women with different education levels do not show the same trends over different periods in Romanian history. Convergence is observed in periods of important political regime changes, but divergence is the trend during more stable periods. Family policies concerning abortion regulation have a strong influence on the fertility of women with a low or a medium level of education, but they have less influence on the fertility of women with university degrees (with the only exception of the sudden abortion ban in 1967 which found every category of women, regardless educational attainment, unprepared). The progressive remission of ideology and the development of a merit-based educational system introduced differences between the fertility of women with high school or vocational degrees and those with university degrees, for the first time in late 1980s, just a few years before the great revolt of intellectuals in December 1989 which paved the way for a more democratic society.

Our findings also document the institutional effect of education. Being “in educational improvement” significantly lowers the risk of a second birth if one compares those enrolled with the women with no qualification. However the risk is not lower when one compares those “in educational improvement” with the highly educated ones: Regardless of the period under observation, university degree holders and women in educational improvement have more or less similar risks of second births. Combining education with motherhood does not seem to be more “costly” than the opportunity cost paid by mothers with university degrees who decide on a second child.

The strong negative effect of the age at first birth, found if one does not control for a personality dimension when modeling the second birth, weakens once we control for unobserved heterogeneity. More family-prone, highly educated women self-select from among those who start their childbearing-career earlier, as do those with no academic qualification, having a second birth sooner, and their birth risk biases the true impact of education on second order fertility (when one neglects the role of self-selectivity). Women with university degrees try to catch up on the time out of motherhood that they spent in education, by having at least one birth before their 30s, but more often than not they limit their offspring to a single child, sufficient for personal fulfillment and meeting the “requirement” in a society where childbearing is universal.

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## References

Agabrian M. (2007). "Relationships between School and Family: The Adolescents' Perspective." *Forum: Qualitative Social Research* [On-line Journal] 8(1), Art. 20. Available at: http://www.qualitativeresearch.net/fqs-texte/1-07/07-1-20.

Becker G. (1991). A Treatise on the Family. Cambridge: Harvard University Press.

Beets G, Dourlejin E, Liefbroer A, Henkens K. (2001). De timing van het eerste kind in Nederland en Europa. Raport No. 59. Den Haag: NIDI.

Blossfeld H, Huinick J. (1991). "Human Capital Investments or Norms of Role Transition? How Women's Schooling Careers Affect the Process of Family Formation." *American Journal of Sociology,* 97: 143-168.

Gheţău V, Arghişan L. (2006). "Behind the Surprising Stability of Romanian Fertility." *Entre Nous,* 63: 24-26.

Hoem B. (1996). "The Social Meaning of the Age at Second Birth for Third-Birth Fertility: A Methodological Note on the Need to Sometimes Re-specify an Intermediate Variable." *Yearbook of Population Research in Finland,* 33: 333-339.

Hoem B, Hoem JM. (1989). "The Impact of Women's Employment on Second and Third Births in Modern Sweden." *Population Studies,* 43: 47-67.

Hoem JM. (1986). "The Impact of Education on Modern Family-Union Initiation." *European Journal of Population,* 2: 113-133.

Hoem JM, Prskawetz A, Neyer G. (2001). "Autonomy or Conservative Adjustment? The Effect of Public Policies and Educational Attainment on Third Births in Austria." *Population Studies,* 55: 249-261.

Hoem JM, Kreyenfeld M. (2006). "Anticipatory Analysis and its Alternatives in Life-Course Research. Part 1: The Role of Education in the Study of First Childbearing." *Demographic Research,* 15, 16: 461-484.

Kantorova V. (2004). "Education and Entry into Motherhood: The Czech Republic during State Socialism and the Transition Period (1970-1997)." *Demographic Research,* Special Collection 3, 10: 245-270.

Köppen K. (2006). "Second Births in Western Germany and France." *Demographic Research,* 14, 14: 295-330.

Koytcheva E. (2006). Social-Demographic Differences of Fertility and Union Formation in Bulgaria Before and After the Start of Societal Transition. Doctoral dissertation. University of Rostock, Germany.

Kravdal O. (2001). "The High Fertility of College Educated Women in Norway: An Artifact of Separate Modeling of Each Parity Transition." *Demographic Research,* 5, 6: 185-215.

Kravdal O. (2004). "An Illustration of the Problems Caused by Incomplete Education Histories in Fertility Analyses." *Demographic Research,* Special Collection 3, 6: 135-154.

Kreyenfeld M. (2002). "Time-Squeeze, Partner Effect or Self-Selection? An Investigation into the Positive Effect of Women's Education on Second Birth Risks in West Germany." *Demographic Research,* 7, 2: 15-47.

Kreyenfeld M, Zabel C. (2005). “Female Education and the Second Child: Great Britain and Western Germany Compared.” *Zeitschrift für Wirtschafts und Sozialwissenschaften/Schmollers Jahrbuch*, 125: 145-156.

Lesthaeghe R., Van de Kaa D. (1985). Twee demografische transities? In: D.J. Van de Kaa and R. Lesthaghe, editors. Bevolking: Groei en Krimp. Van Loghum Slaterus, Deventer: 9-24.

Lesthaeghe R. (1995). The Second Demographic Transition in Western Countries: an Interpretation. In: K.O. Mason, A.M. Jensen, editors. Gender and Family Change in Industrialized Countries. Oxford: Clarendon Press: 17-62.

Lesthaeghe R, Neidert L. (2006). “The Second Demographic Transition in the United States: Exception or Textbook Example?” *Population and Development Review*, 32, 4: 669-698.

Lillard L, Panis C. (2003). aML Multilevel Multiprocess Statistical Software, Version 2.0. EconWare, Los Angeles, California.

Ministry of Education and Research [Romania] (2001). The Romanian Education System. The National Report. Bucharest. Available at www.ibe.unesco.org/International/ICE/natrap/Romania.pdf [Date of access: June 06, 2007].

Miroiu A, Pasti V, Codiță C, Ivan G, Miroiu M, editors. (1998). Învățământul românesc azi (Romanian Education Today). Iaşi: Polirom.

Mureşan C. (1996). « L'évolution Démographique en Roumanie: Tendances Passées (1948-1994) et Perspectives d'Avenir (1995-2030). » *Population*, 4-5: 813-845.

Mureşan C, Hărăguş PT, Hărăguş M, Schroder C. (2007). Romania: Childbearing Metamorphosis within a Changing Context. In: T. Frejka, editor. *Childbearing Trends and Policies*, forthcoming.

Mureşan C. (2007). “Family Dynamics in Pre- and Post-Transition Romania: a Life-Table Description.” *MPIDR working paper*, WP-2007-018.

NIS (National Institute of Statistics) [Romania] (1994). Recensământul populației şi locuințelor din 7 ianuarie 1992. Bucharest.

NIS (National Institute of Statistics) [Romania] (2003). Recensământul populației şi locuințelor din 18 martie 2002. Bucharest.

Oláh L. (2003). "Gendering Fertility: Second Births in Sweden and Hungary." *Population Research and Policy Review,* 22, 2: 171-200.

Rotariu T. (2006). "Romania and the Second Demographic Transition. The Traditional Value System and Low Fertility Rate." *International Journal of Sociology,* 36, 1: 10-27.

Sobotka T. (2004). *"Postponement of Childbearing and Low Fertility in Europe." Population Studies*. Amsterdam: Dutch University Press.

Stoica L. (2006). Politica educațională ca sursă a dezvoltării sociale. România în context european.(Educational Policies as Source of Social Development. Romania in European Context.) In: Zamfir C, Stoica L, editors. O nouă provocare: dezvoltarea socială. Iaşi: Polirom: 240-250.

Zabel C. (2007). Do Imputed Educational Histories Provide Satisfactory Results in Fertility Analysis in the West German Context? *MPIDR Working Paper*, WP-2007-022.

Zamfir C. (2000). Politica socială în România în tranziție.(Social Policies in Romania in Transition) In: Zamfir E, Bădescu I, Zamfir C, editors. Starea societății româneşti după 10 ani de tranziție. Bucharest: Expert.