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MPIDR WORKING PAPER WP 2013-007
MAY 2013

Recent features of cohabitational and marital fertility in Romania

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Recent features of cohabitational and marital fertility in Romania

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Abstract: Until the late 1980s there was little non-marital cohabitation in Romania; time in consensual unions constituted only a few per cent of the total time spent in unions every year. After the fall of state socialism, the overall fraction in consensual unions grew steadily, and by 2005 it had reached some ten per cent. This development had consequences for the patterns of childbearing. The purpose of the present paper is to display selected features of fertility in consensual and marital unions in Romania over the period 1985-2005 based on the data from the national Generations and Gender Survey of 2005. To this end we use underlying fertility rates specified by union duration and utilize a metric based on an aggregation of such rates over all durations, irrespective of parity. We also highlight groups of women who have been particularly prone to have children outside marriage. This turns out to be women with a low educational attainment and women of a rural origin. Women in consensual unions in these two groups were especially strongly affected by the dramatic changes in family policies around 1990, and their aggregate fertility in cohabitational unions in subsequent years is largely of the same size order as in marital unions. For the fertility of partnered women in the two groups it does not seem to matter much whether they are married.

Keywords: fertility in consensual unions, marital fertility by length of premarital cohabitation, fertility by educational attainment and union type, fertility rates aggregated over all durations, event-history modeling, GGS, Romania.

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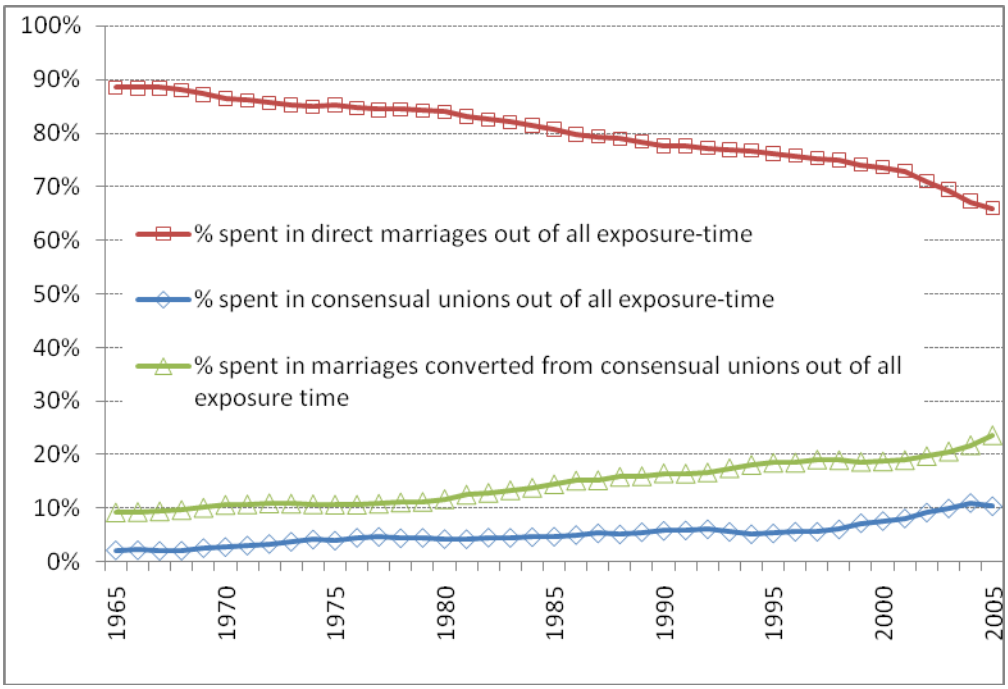
1: Introduction

Until the late 1980s, time spent in non-marital cohabitation in Romania only constituted a few per cent of the total time spent in unions every year, but since the late 1980s, consensual unions have become much more prevalent, and by 2005 the overall fraction of time spent in such unions had increased to some ten per cent while the fraction of time lived in direct marriages (i.e., marriages not preceded by a consensual union between the two partners) had dropped from around 90% to some 70% (Figure 1). Similar developments were common all over Eastern Europe: cohabitation increased and direct marriage dropped toward the end of the socialist period (Thornton and Philipov 2009, Philipov and Jasilioniene 2008, Spéder 2005, Hoem et al. 2009ab) and the change-over between family forms accelerated after the change of political regime in each country, though the pattern of change was far from uniform. Romanian women have consistently entered their first partnership as a direct marriage much more often than (say) Hungarians, Bulgarians, or Russians, and as a cohabitational union much less often (Hoem et al. 2009ab, 2010). More than in other post-communist countries, Romanian consensual unions have also tended to be converted into marriages relatively quickly.

As part of such developments, births in consensual unions have increased all over Europe in recent decades and have given a much greater contribution to the non-marital births than single women without a co-residing partner (Kiernan 2004, Thomson 2005, Sobotka and Toulemon 2008). In other words, we have witnessed a decoupling of marriage and parenthood in many European countries, but not a separation of partnership and parenthood (Kiernan 2004: 43-44).[5] In older Romanian cohorts, births to non-partnered women dominated what little recorded non-marital fertility there was, but the pattern has changed in more recent cohorts. The importance of consensual unions for non-marital childbearing has risen and childbearing in consensual unions has become increasingly prevalent, as has been noted by several demographers (Mureşan 2008; Rotariu 2009, 2010, 2011; Hoem et al. 2009ab; Hărăguş 2010, 2011; Perelli-Harris et al. 2010).

[5] For the most recent period (1995-2004), 12% of all births were to cohabiting women in Romania and 4% of all births were to non-partnered mothers, Bulgaria had 22% and 8%, respectively, Hungary 18% and 4% (for the period 1995-2001), and Russia 17% in cohabitation and 15% to non-partnered mothers (Perelli-Harris et al. 2012, Table 1: 173).

Figure 1. Share of exposure time spent in consensual unions and in marriages. Romania 1965-2005



Cohabitation has remained rather strongly linked to marriage in Eastern Europe, and a pattern with conception in cohabitation followed by (shot-gun) marriage has been slower to change than elsewhere (Perelli-Harris et al. 2012, Potârcă et al. 2013). Non-marital cohabitation has been a prelude to marriage (with relatively short duration and low frequency of childbearing) or has appeared as a stage in the marriage process (usually leading to marriage, often after childbirth) (Heuveline and Timberlake 2004). Even in countries with low shares of births in cohabitation (such as Romania), once women give birth in this union type, they are persistent in their non-marital behavior: three-quarters still cohabit one year after birth, and a similar proportion still cohabits three years after birth (Perelli-Harris et al. 2012). In all countries the main factor that has triggered a marriage for a cohabiting couple consistently has been a pregnancy (Berrington 2001, Blossfeld and Mills 2001, Hoem et al. 2009b).

It is particularly attractive to study (group-specific) trends in fertility in Romania as we do in this paper, because its population was subject to unusually dramatic changes in family policies during the period of state socialism. The main purpose of the present paper is to pay more attention than before to developments of childbearing in consensual unions and in marriages in Romania, and to study effects of educational attainment and urban/rural origin. In this investigation it has been a particular challenge to overcome the difficulties posed by the rarity of cohabitational childbearing in early years. Because of such difficulties we concentrate on the period 1985-2005 in what follows.

2: Background

2.1: Mechanisms for choosing cohabitation instead of marriage at union formation

There has been much social-status heterogeneity in the trajectories of parenthood in Eastern Europe (Sobotka 2008, Kiernan 2004, Kiernan and Mensah 2010). During the growth of cohabitation and non-marital childbearing, there have been pronounced differences across post-communist countries (Billingsley 2010) and across social groups (Sobotka and Toulemon 2008). In investigations of such features, education has most often been used as a proxy for social and economic resources and opportunities, in a reflection of the social stratification that defines basic groups (Perelli-Harris et al. 2010).

Good resources (stable employment, housing of a certain quality) are important for a marriage, as the institution of marriage includes expectations about economic roles. When people are confronted with instability and uncertainty in their lives, as has often been the case in Eastern Europe, they may choose the adaptive strategy of starting a union by cohabitation instead of by marriage formation (Oppenheimer 2003, Perelli-Harris et al. 2010). In this picture, non-marital cohabitation appears as a temporary and reversible living arrangement with less binding obligations and greater compatibility with uncertainty in a number of life domains (Mills et al. 2005, Kalmijn 2011, Perelli-Harris et al. 2010). On the other hand, the severity and duration of uncertainty and economic instability have been found to influence the extent and the manner in which fertility declined in Eastern Europe (Billingsley 2010).

In Western Europe, uncertainty in family life trajectories is connected mainly to the globalization process and to the changing nature of youth employment (Blossfeld and Mills 2005). In Eastern Europe, people have additionally been confronted with the crisis of transition from a centrally planned to a market economy and its social consequences. The fall in the standard of living and the impoverishment of a large number of people (Dorbritz 2003) have been among the most important features of such developments. The change of the political regime and the economic transition that followed in Romania as in other Eastern European countries brought rising unemployment and the loss of many welfare provisions connected to the socialist regime, posing increased challenges in the life course of young people. During socialism young persons in Romania were allocated into jobs directly or soon after the graduation from secondary or tertiary education, and almost all welfare benefits were linked to employment status (Popescu 2004). After the change of the political regime, the state retrenched its support (Mureşan et al. 2008) and young adults' lives became marked by economic insecurity. Under these conditions, investments in one's human capital (education) became the essential means of protection against the risks associated with unemployment (Kohler et al. 2002, McDonald 2006). The least educated were the most vulnerable and most exposed to economic insecurity.

With fewer resources and fewer economic opportunities, low-educated women have persisted in living in a non-marital arrangement while higher-educated women, who have more resources and

economic opportunities, have been able to choose the more stable life style signaled by marriage (Perelli-Harris et al. 2010).

2.2: The negative educational gradient of first entry into cohabitation

Accounts of the growing trend that cohabitation is chosen as the initial format of a first union in Europe in recent decades are most often embedded in the framework of the second demographic transition (SDT). This framework predicts that the forerunners of new behavior are the socio-economically better off. High or prolonged education is a key element in the SDT account: Lesthaeghe and Surkyn (1988) found for Western Europe that educational attainment was positively associated with central notions of the SDT such as nonconformism, permissiveness in personal matters, post-materialism, protest-proness and so on, as well as with non-traditional family forms. A high level of education, and especially prolonged education, should act as a mechanism for value change and for choosing cohabitation as a framework for childbearing and childrearing. For former socialist countries, researchers like Perelli-Harris and Gerber (2011) have found that new family behaviors like the postponement of marriage and childbearing (or even voluntary childlessness) were initiated by higher-educated women, just as in other European countries, but other aspects of behavior (cohabitation and non-marital childbearing) were more often started by lower-educated individuals (see also Sobotka 2008, Mureşan 2008, Potârcă et al. 2013). Studies of partnership formation in Eastern Europe have shown a negative educational gradient for the choice of cohabitation as a first union: Highly educated women have had a higher propensity towards direct marriage, while the low-educated have had higher intensity of entering cohabitation as a first union instead. These patterns have been documented for Romania (Hoem et al. 2009b), Bulgaria (Kostova 2007, Koytcheva and Philipov 2008), and Hungary (Brădăţan and Kulcsar 2008). A substantially different effect was found for Russia, in that Russian women with a tertiary education have had higher (not lower) rates of entry into cohabitation than women with a secondary or lower education (Kostova 2007). Higher education is also associated with a higher inclination to transform a consensual union into marriage, while lower-educated women more often tend to stay in cohabitation and to refrain from marriage (Hoem et al. 2009b for Romania, Brădăţan and Kulcsar 2008 for Hungary).

2.3: The negative educational gradient of childbearing in cohabitation

Several authors have found evidence of a negative educational gradient of childbearing in cohabitation for a number of European countries (Konietzka and Kreyenfeld 2002 for Germany; Kiernan 2004, Kiernan and Mensah 2010 for the UK; Spéder 2005 for Hungary; Perelli-Harris and Gerber 2011 for Russia; Rotariu 2009, 2010, 2011, Hărăguş 2010, 2011, and Hoem and Mureşan 2011a for Romania; Perelli-Harris et al. 2010 for eight European countries). The negative association holds not only for post-socialist countries but also for Western European countries with a long tradition of cohabitation as a type of partnership. Perelli-Harris et al. (2010) found the strongest evidence for this pattern in Norway, Russia, the UK and the Netherlands, while for France, Austria, and West Germany

the educational gradient, although negative, was not significant, which suggests a higher similarity between cohabitation and marriage in these countries. They also found that in countries with a longer experience of alternative forms of partnership, such as France, at the initial stages of the development of cohabitational childbearing there was a positive educational gradient, but as the phenomenon spread, a negative educational gradient became the predominant pattern. Other studies, like those reported by Toulemon and Testa (2005), have shown that when one controls for age, number of children, and fertility intentions, the probability of having a child was largely the same for cohabiting or married people in France during 1998-2003. The negative educational gradient does not characterize births in cohabitation only; it is well documented for births to non-partnered mothers also (especially for the US, but even for Europe). Regarding fertility in general, building on Becker's ideas about a quality-quantity trade-off and women's opportunity costs of having children, many authors have argued that due to the accumulation of human capital, women with higher education are more prone to concentrate on their careers and on their earning power, which results in lower economic incentives to marry and have children (Balbo et al. 2013). Moreover, the opportunity costs of childbearing and childrearing increase with increasing human capital, so highly educated women should be more likely to postpone marriage and births. In many European countries they have the highest levels of childlessness and the lowest levels of fertility (Sobotka 2008). Perelli-Harris et al. (2010) found a negative educational gradient for marital births too, but their main result is that the gradient for births in cohabitation is much steeper than for marital births.

At different levels of educational attainment, people may have different reasons for adopting unconventional family behaviors, and this may also be the case in comparisons between urban and rural environments. Such reasons reflect their attitudes, opportunities, or constraints (Perelli-Harris et al. 2010). In Eastern Europe, younger, urban, and higher-educated women show the most positive attitudes toward new forms of partnership and to childbearing in different contexts, but they are the last to translate these attitudes into actual behavior (Rotariu 2006, 2009, Hărăguş 2008 for Romania; Sobotka 2008 for other countries in the region). Using vital statistics, Rotariu (2009, 2011) has shown that in Romania, non-marital births are more frequent among women who have a low level of education, who live in poverty, and who are from rural areas, and that their births appear at much lower ages than marital births do. Highly educated, professional women are less prone to give birth outside marriage: Among children whose mothers have a tertiary education and are employed, and whose fathers work outside agriculture, only 4.7% are born outside marriage (Rotariu 2011, based on data for 2006-2009). Hărăguş (2011), using the Romanian GGS data, has also found a strongly negative association between educational attainment and having the first birth in cohabitation, and this association is much more visible than for first marital births.

3: Data and method; first results

3.1: Data

As is evident from the literature quoted above, there is already much information about family developments in Romania. Our own contribution to this picture is based on data from the Romanian Generations and Gender Survey (GGS) of 2005. Its total 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 own interest is concentrated on the 5,847 women that belong to the Romanian and Hungarian ethnic groups. In these groups we focus on women at ages 15 through 40 since childbearing is very rare after age 40 in Romania.

We have cleaned our sub-sample by removing a few records, as follows. We have excluded 162 women who were of other ethnicities (including Roma) because of their very special union formation and childbearing behavior; they are too few for a reliable separate analysis. We have also eliminated 22 records because they had improper marital or educational histories, and also the record of the sole woman who was born and grew up outside of Romania. Our final sample has 5,824 women, which seems to be a normal size order for a GGS survey.[6] In our experience, this sample size, which is relatively large as sample surveys go in general, still turns out to be on the small side for the analysis of cohabitational fertility, which therefore is a challenge for normal GGS data. Fortunately, a simple smoothing technique has allowed us to reveal interesting patterns in the data nevertheless.

One can get an impression of the size and structure of the raw data available to us from our Appendix, where Table 1 contains occurrences and exposures recorded by calendar year for each union status, and Table 2 lists the number of consensual unions recorded at the beginning of each duration year for groups of calendar years. In Table 2 '1^{st} y' means the number of consensual unions initiated in the period, i.e., the number of such unions recorded at the beginning of the first union year. Similarly '2^{nd} y' means the number of such unions remaining at the beginning of the second year of the union, '3^{rd} y' means the number remaining at the beginning of the third year, and so on, through the fifteenth duration year. In 1995-99 no unions were recorded beyond the 11^{th} duration year and in 2000-2005 no unions where recorded beyond the sixth year, in both cases because the data were collected in 2005.

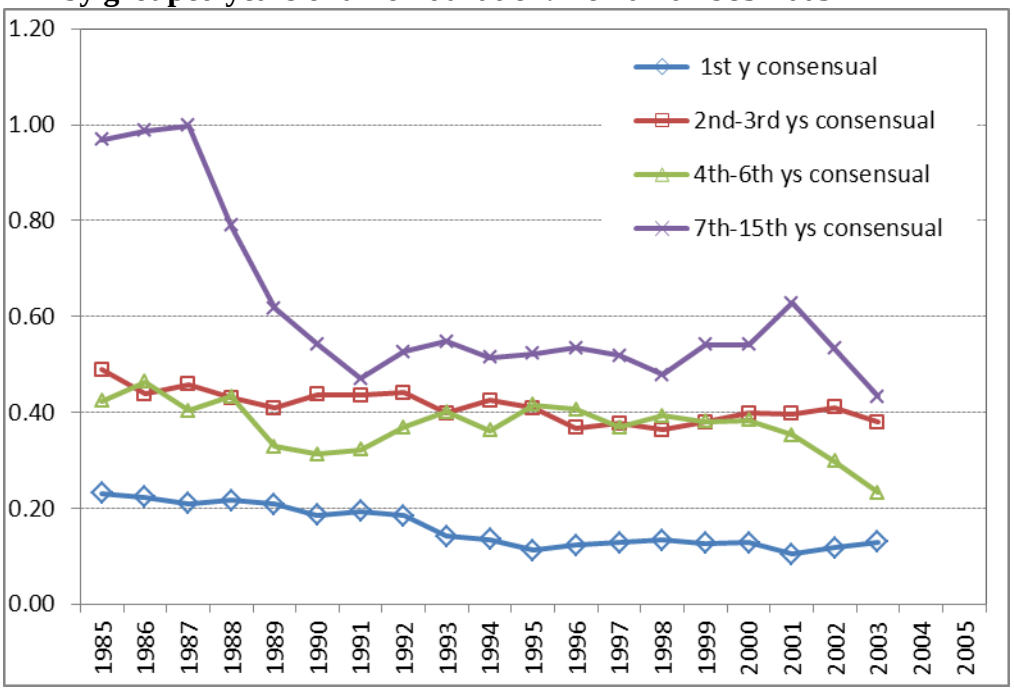
[6] As sample sizes go, the GGS compares unfavorably with the 12-14 000 used by Breton & Prioux (2005), the 40 000 of Rallu (1986), the 91 000 of Hosseini et al. (2006), and the 200 000 used by Murhpy & Berrington (1993). The latter study is only outdone by Scandinavian-type register data.

3.2: Fertility measures. Fertility trends in consensual unions

To analyze fertility for a selected population subgroup *g*, such as women in a consensual union, we have first computed conventional occurrence/exposure rates $f^{g}_{d,raw}(t)$ of fertility for women of all parities in the group, separately for each of a number of union duration intervals indexed by *d*. We have done this for each single calendar year *t* in our period of observation (1985-2005), and for good measure also for each of the years 1980-84.[7] We have worked with combined duration intervals consisting of the first twelve months of the union (*d*=1), the second and third year of the union (*d*=2), the fourth through sixth year (*d*=3), and the seventh through fifteenth year (*d*=4). Even with this broad grouping, the raw values initially computed for the years *t* have turned out to be too strongly influenced by random variation for our liking. We have therefore replaced the raw values by smoothed values $f^{g}_{d}(t) = \sum_{s=-5}^{5} f^{g}_{d,raw}(t+s)/11$, except in the right-hand tail of the curve, where we have used fewer terms (down to five) in the unweighted centered moving average that this procedure represents. Such special treatment was not needed in the left tail because we have data going back to well before 1985. The resulting values of the smoothed rates $f^{g}_{d}(t)$ for women in consensual unions are displayed in Figure 2, which essentially contains a decomposition (by intervals of union duration) of the aggregate fertility that we will introduce below (Section 3.3).

[7] We also have data for 1965-1979 but have omitted all results for those early years because there may have been problems with the reliability of partnership histories in survey data so far back due to recall errors and because of the selective out-migration which is so important (but only after 1989) for the Romanian population. Note that the rates for 1980-1984 are used only in the smoothing computations for years 1985 through 1989 and are not otherwise reported here.

Figure 2. Rates of fertility in consensual unions, by grouped years of union duration. Romania 1985-2005



Moving average graduation is a classical technique used for smoothing curves to reveal their underlying structure.[8] We would expect smoothed curves to display general levels and trends in fertility but only to give a pale reflection of the sudden perturbations that followed from the abrupt changes in family policies in Romania. Fortunately Figure 2 is a bit better than this. It shows a strong drop in fertility at long cohabitational durations from a level just below 1 to a level around one-half in the late 1980s; fertility at those long durations remains quite stable after the fall of communism. We also see a gradual fertility decline at shorter durations.

Note that women in consensual unions live in a strongly dynamic situation: First of all the group of cohabiting women is decimated steadily both by union dissolution and by union conversion, i.e., in any month cohabiting women may stop living in a consensual union or alternatively may convert their consensual union into a marriage. (These decrements are reflected visibly in our Appendix Table 2.) Second, at duration 0 the group of cohabiting women continuously receives an in-flow of recruits who begin a (new) consensual union. Whenever a woman leaves a cohabitational or marital union and starts a new union (perhaps later), she is counted among the corresponding recruits at the start of the new union. One great advantage of our approach is that it smoothly allows such

[8] This quite standard general smoothing method has also been used before for parity progression by Breton and Prioux (2005) for a data set where the sample of women was about twice as big as ours, and by Hoem and Mureşan (2011a) for the very data set that we have at our disposal.

dynamics to take place without producing the complex structure of details that normally result from an event-history analysis that accounts for both parity and partner dynamics.

3.3: Aggregation over durations

For comparisons between population subgroups and to study trends in a more compact format, it is convenient to also introduce fertility rates aggregated over all durations, in the nature of $F^g(t) = \sum_d f_d^g(t)$. (In our case, the aggregation is made through the fifteenth duration year, except that aggregation stops at the duration reached when the data were collected in 2005.) Such aggregation will facilitate our later study of fertility differentials by educational attainment and by character of region of origin (women from urban origins vs. women from rural origins; on our study, a woman's origin is defined by the character of her region of domicile at age 15). The aggregation is inspired by the practice of computing the usual Total Fertility Rates (TFRs) by aggregating age-but-not-parity-specific fertility rates across all ages; in fact Hoem and Mureşan (2011a) would call a quantity like $F^g(t)$ a duration-based TFR to distinguish it from the usual age-based TFR. Hoem, Jalovaara, and Mureşan (2013) have adopted this terminology. We have been advised, however, that using a name that contains a TFR designation for the present quantities may invite undesirable associations for some readers, so we have decided to avoid the TFR terminology in this paper.

An aggregate like $F^g(t)$ can also be seen as a development of the notions of parity-progression ratios. The basic idea behind a parity-progression ratio is of course that a group of individuals who have reached a given childbearing parity is followed and that the fraction of the group who ever attains the next higher parity is recorded. The parity-progression fraction can be computed from rates of parity progression added up over durations since the index parity was attained. In its simplest version this is applied to a real childbearing cohort (say) of women, but more often the rates are aggregated over durations in a synthetic cohort. In our application we avoid the concentration on a selected parity and count progressions across all parities in synthetic cohorts. (Most previous investigations of Romanian fertility have only studied first births, as is common.) The whole computation can be restricted to married or to cohabiting women, in which case the first duration is counted from (type-specific) union formation; otherwise the first duration is counted from age 15. We have used the latter practice for never-partnered women.

Parity-progression ideas have a strong pedigree with roots going back to Ryder (1951), Henry (1951), and Brass (1974). Duration-specific rates and their sums were pervasive in the work around the World Fertility Survey already; see, e.g., Rodriguez and Hobcraft (1980), Hobcraft et al. (1982), and

Hobcraft and Casterline (1983). The same notions have been used subsequently by a number of authors, such as Blayo (1986), Rallu (1986), Ní Bhrolcháin (1987), Feeney and Yu (1987), and Murphy and Berrington (1993), and again recently by Breton and Prioux (2005), Barkalov (1999, 2005), and Hosseini-Chavoshi et al. (2006), and surely by many others. In most applications, the parity progression is computed for single-year intervals (say) in discrete time, but for us it has been more natural to follow Hoem and Mureşan (2011ab) and use rates for intervals in continuous time. This variant has allowed us to take transitions between the various types of unions smoothly into account without getting involved in describing the complexities that characterize transitions between union forms (Hobcraft et al. 1982).

3.4: Trends in aggregate marital fertility

Applying the above notions we have calculated fertility for directly married women and have aggregated the rates over all marital durations. We have done the same for women who married their cohabitant after some time in a consensual union, grouped separately by duration of pre-marital cohabitation. The outcome is shown in Figure 3. The curve marked with little triangles is for women who start with a consensual union which they convert to a marriage in their first year of cohabitation; the curve marked with open rings is for women who married during their second or third year of cohabitation, and so on. These curves have been smoothed (again by an 11-term centered unweighted moving average as explained above), but there seems to be just too few married women with most lengths of pre-marital cohabitation in our data to produce useful results. The way we read this diagram, it provides functional aggregate-fertility values for the directly married (which anyway is by far the largest group of those who ever marry) and for married women with up to one year of cohabitation before marriage, but hardly for women with longer durations of pre-marital cohabitation.[9] The curve for the group with seven or more years of pre-marital cohabitation was useless. For the rest of our discussion we concentrate on the directly married and ignore all other groups.[10] Our analysis additionally ignores the aggregate-fertility contributions for women outside of any (consensual or

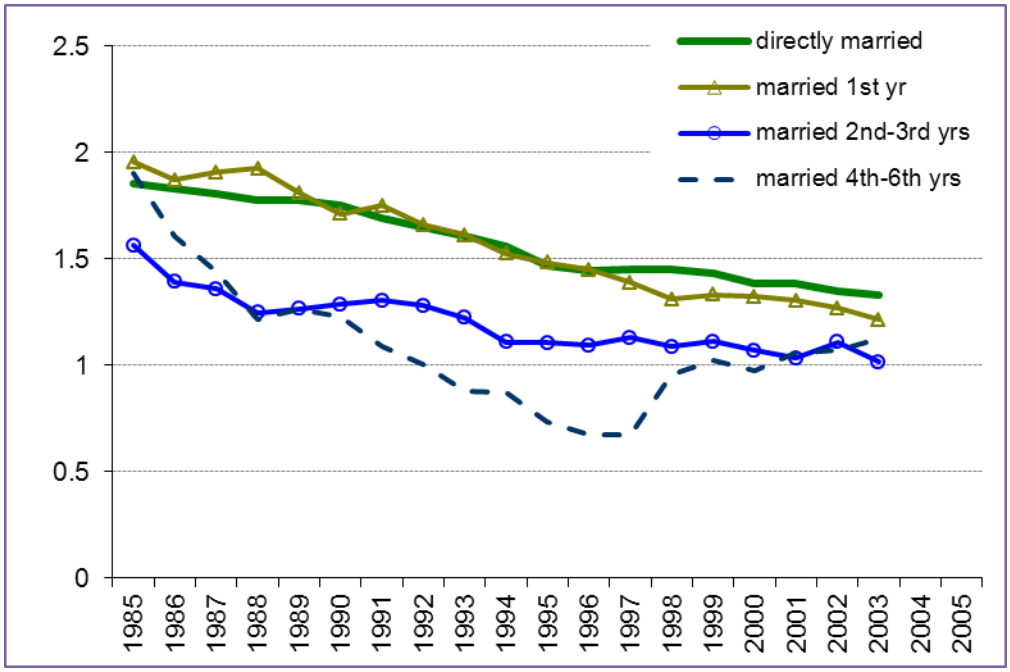
[9] During the period of 1985-2005, we have counted a total of 668 marriages with pre-marital cohabitation. We have found union conversions as follows: 384 consensual unions were converted into marriages during the first year of cohabitation, 180 during the 2nd or 3rd year of cohabitation, 67 during the 4th to 6th year of cohabitation, and 37 during the 7th or later years of cohabitation. For the same period we have recorded 2795 direct marriages and 660 consensual unions.

[10] Figure 3 pertains to married women. The curves represent their aggregate fertility as produced in marriage only. Any childbearing before the marriage is left out of account. To get a woman's complete aggregate fertility we need to add her contribution from any premarital cohabitation to the contribution derived for Figure 3. The two contributions are easily spliced together, as explained by Hoem, Jalovaara, and Mureşan (2013, Section 2), but there is no need to go into such detail here when we ignore the fertility in post-cohabitational marriages anyway. For the directly married there is of course no period of pre-marital cohabitation and no corresponding contribution to fertility.

marital) union because they are very small and contribute little to the women's lifetime fertility computed across all union types.

Irrespective of all the details, Figure 3 demonstrates effectively that marital fertility has declined gradually over our period of observation.

Figure 3. Aggregate marital fertility by duration of any pre-marital cohabitation. Married Romanian women, 1985-2005.



3.5. Control variables

In previous work about Romanian fertility (Mureşan and Hoem 2010, Hoem and Mureşan 2011a) the analysis has contained control variables like starting age, starting parity, and union order, whose effects have been given as relative risks. Our use of group-specific rates as the basis for aggregated fertility computations is the key to an easy extension of this nature, whose potential we want to point out, particularly as it gives rise to quantities similar to those denoted PDTFR, PATFR, and PADTFR by Rallu and Toulemon (1994) in their systematic overview of the methodology of period-specific fertility measures. The procedure goes as follows:

Instead of letting the $f^{g}_{d,raw}(t)$ be straightforward occurrence/exposure rates, one can first fit some piecewise-constant model (say) with covariates to the occurrences and exposures in the original data, using union duration as process time, and then add the fertility rates predicted by the model over

the values of *d* to get initial aggregate fertility rates $F^{g}_{raw}(t)$ for each group *g* defined by the model regressors. The model-defined raw aggregates can then be smoothed as needed.

We use this approach in our study of the effects of educational attainment and urban/rural origin, motivated as in Section 2.3 above. We have experimented with additional covariates and (not surprisingly) have found that group-specific aggregate fertility declines systematically with an increasing age at union formation. Otherwise, findings reported in earlier work (including the paper by Hoem and Mureşan 2011a) have turned out to be quite robust against model or data re-specification. In the present report we pay little attention, therefore, to additional covariates.

4: Further results

4.1: The effect of educational attainment

Following up earlier work mentioned above, we now turn to one of the most interesting covariate effects that can be illuminated by our data, namely that of educational attainment. For the present purpose we distinguish between the three educational levels 'low' (which means no formal qualifications beyond compulsory school), 'middle' (which covers those who have completed high school or have taken a vocational certificate), and 'high' (tertiary degree or higher). (For more exact definitions, see Mureşan and Hoem 2010.) We would also have liked to compute aggregate fertility for women who are under education, but this status is too badly recorded in GGS data for the most part, and we have avoided including it in our analyses.[11]

The patterns of aggregate fertility for married women appear in Figure 4, and for cohabiting women in Figure 5. (There are too few cohabitants among the highly educated women in our data for us to include a curve for them in Figure 5.) These diagrams display the now well-known negative gradient by educational attainment in that for both partnership types the curve for each level of attainment lies below the corresponding curve for lower attainments.[12] The low-level educational group also stands out by having fertility developments that remarkably are much the same in consensual unions as in direct marriages (Figure 6), except that low-educated women in consensual unions must have been visibly the more sensitive to political developments around the time of the fall of state socialism. (This feature is visible in Figure 5 already.) In fact these women depended more on police-

[11] Since complete educational histories are not available, to include this status we would need to record a woman as under education even in periods where she has interrupted her studies, and this would be particularly inadequate for later study periods for the highly educated.

[12] Negative educational gradients are also reported by the 2002 census of Romania. At age 50-54 it found an average number of children by the mother's educational level as follows: without any studies 3.2 children, primary school 3.1, gymnasium 2.6, high school 1.7, and tertiary education 1.4 children.

type actions of the forced pro-natalist policies in earlier years, since they had less resources to escape them. In addition, childcare allowances often were, and still are, the main living resources for this poor population segment, which has also been less successful on the marriage market. One can notice a strong decrease of fertility in this group of women from a level around 2.3 before the fall of communism to a new level around 1.7 thereafter (Figures 5 and 6).

All in all, births in consensual unions seem to be more characteristic of women with a low educational attainment. Romanian society has started to accept modern behavior like consensual unions and non-marital births in wealthy cities like Bucharest, but only recently (Dohotariu 2010). Otherwise, consensual unions in Romania more frequently take the forms of "concubinage", which is specific for couples with a low socio-economic status and a low level of education, living most often in rural settlements.[13] Among cohabiting women, those with the highest education, with the highest socio-economic status, and with residence in urban areas rather tend to be childless (Hărăguş 2008).

The share of women with a low level of education is (and always has been) relatively high in the Romanian population, even if this share is on the decrease. For example, the female sample of the GGS has 31% of women without any degree or certificate of education, 58% have high school or a vocational degree, and only 11% have a tertiary degree. The share of women of rural origin has changed in a similar manner. In the GGS, 71 per cent of the women were born and grew up in rural areas. We now turn to this background variable.

[13] For this interpretation, see Rotariu (2009, 2010, 2011), who studied vital statistics, and Hărăguş (2010), who worked with the same data set as we do, as we have mentioned already.

Figure 4. Aggregate fertility of directly married women, by level of education. Romania 1985-2005

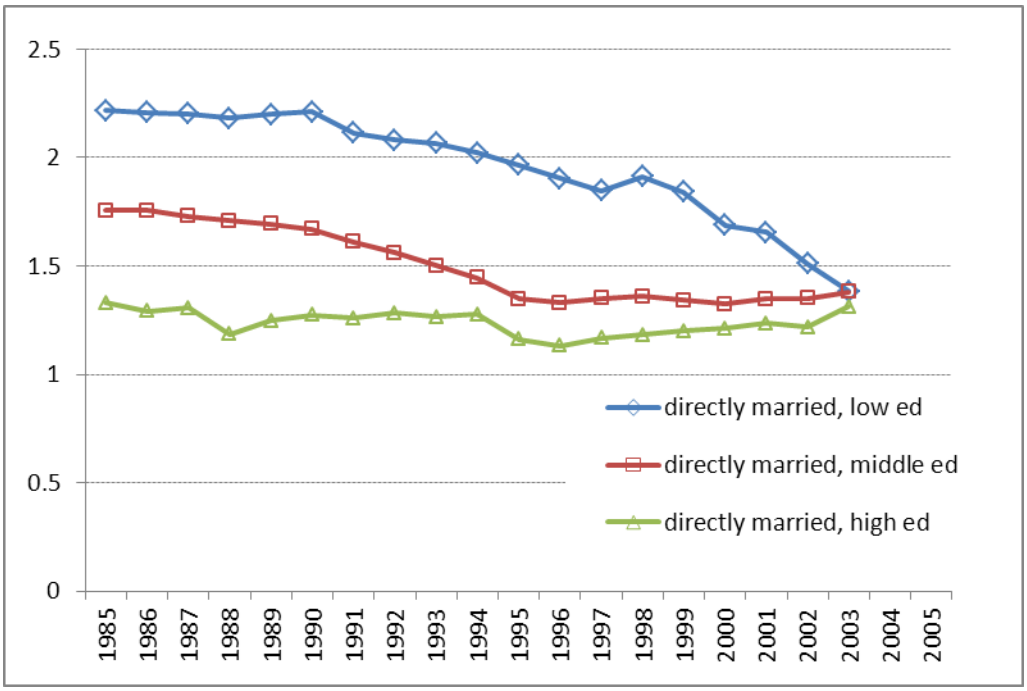


Figure 5. Aggregate fertility for women in consensual unions, by level of education (low and middle). Romania, 1985-2005.

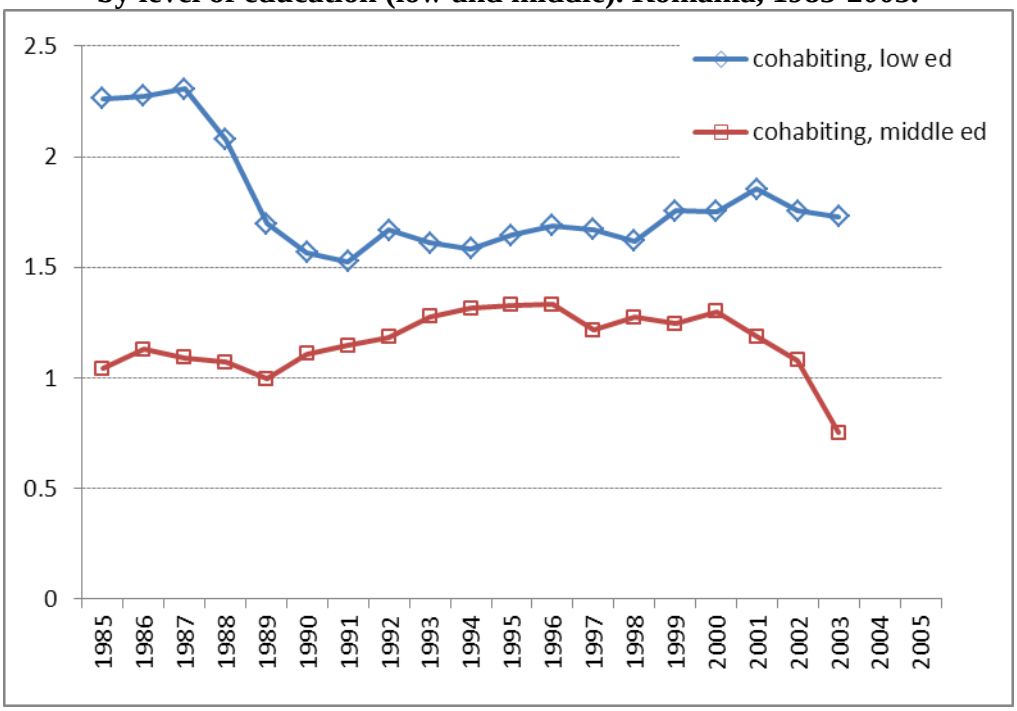
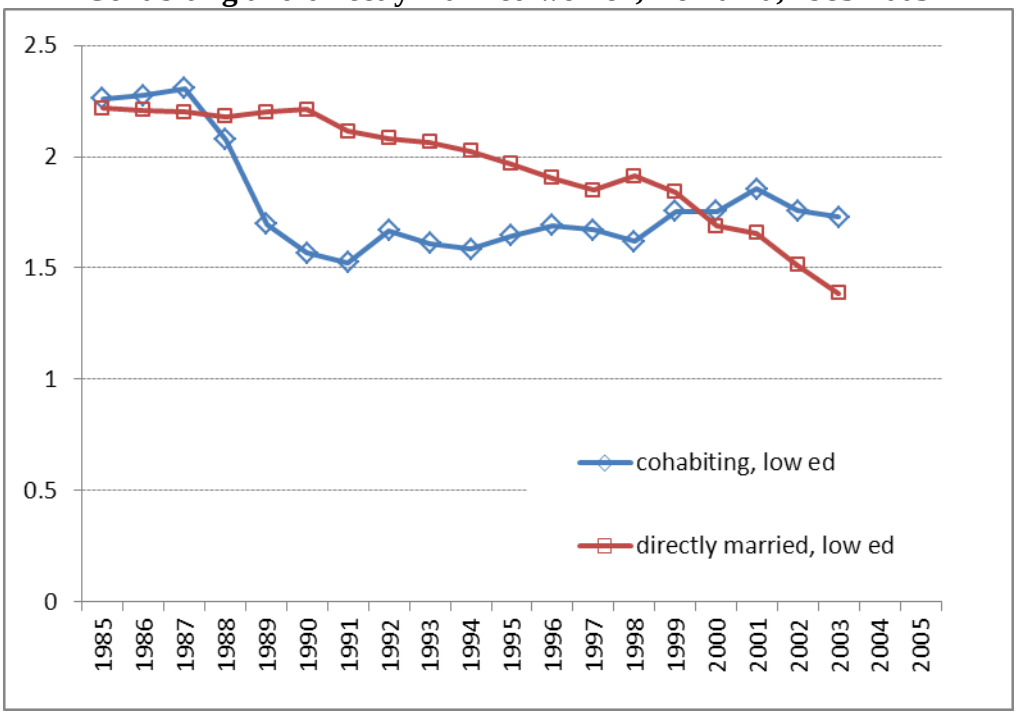


Figure 6. Aggregate fertility specific for low educational attainment. Cohabiting and directly married women, Romania, 1985-2005



4.2: Women of rural vs. urban origin

We have already indicated the importance of a rural origin for fertility behavior in Romania. The large socio-economic differences between urban and rural settlements in the country motivate the use of the type of original residence as another criterion for social stratification. Urban-rural differences are partly due to compositional factors (Kulu 2013): fewer people with higher education live in rural settlements, and economic opportunities are also fewer compared to what they are in urban settlements. In line with our previous arguments about the negative educational gradient of births in cohabitation, where education was a proxy for resources and opportunities, we argue that fertility should be higher in cohabitation for similar women in rural than in urban settlements. This true in our data, but aggregate-fertility levels for women of rural and urban backgrounds have approached each other over time both for directly married women (Figure 7) and for cohabitants (Figure 8). Historical differences are in the process of being eliminated. Meanwhile, some urban/rural differentials seem to have survived, in that the sudden fertility drop among cohabitants when state socialism fell was concentrated to those who had a rural background (Figures 8 and 9). Figure 9 further shows that rural women have roughly the same fertility levels among cohabitants as among the directly married, a similarity quite parallel to those with a low level of education (Figure 6).

Figure 7. Aggregate fertility for directly married women of rural and urban origin. Romania, 1985-2005

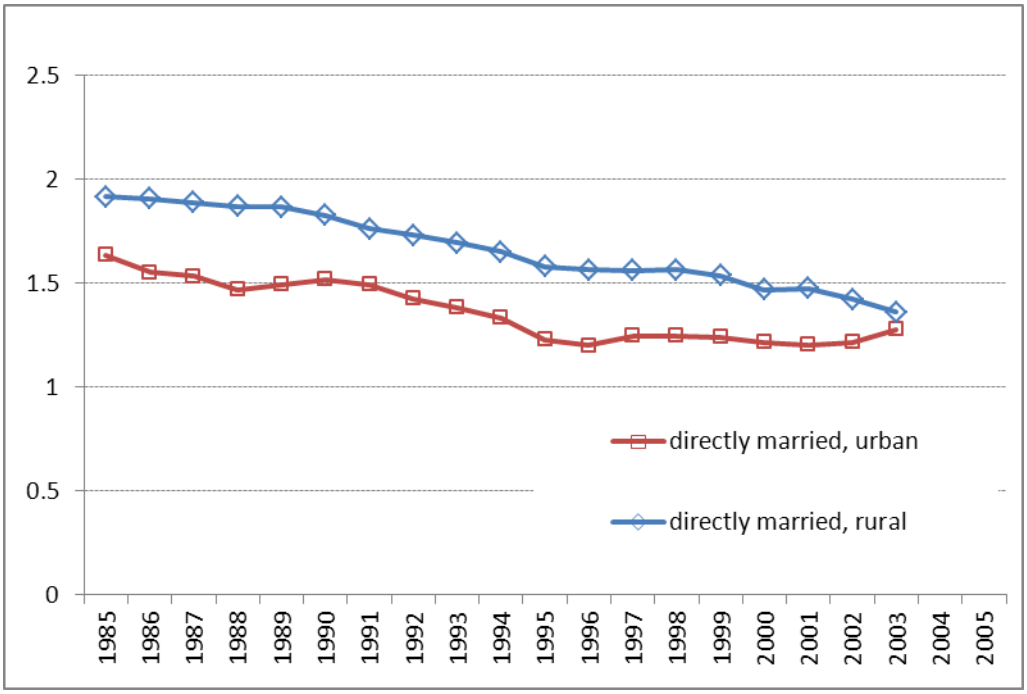


Figure 8. Aggregate fertility for cohabiting women of rural and urban origin. Romania, 1985-2005.

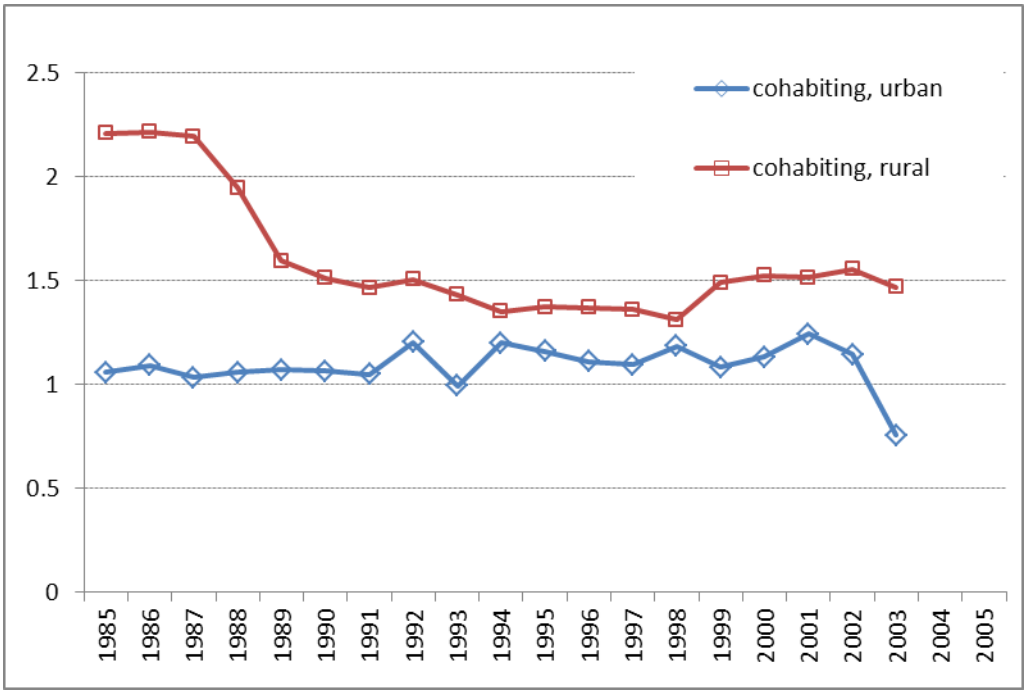
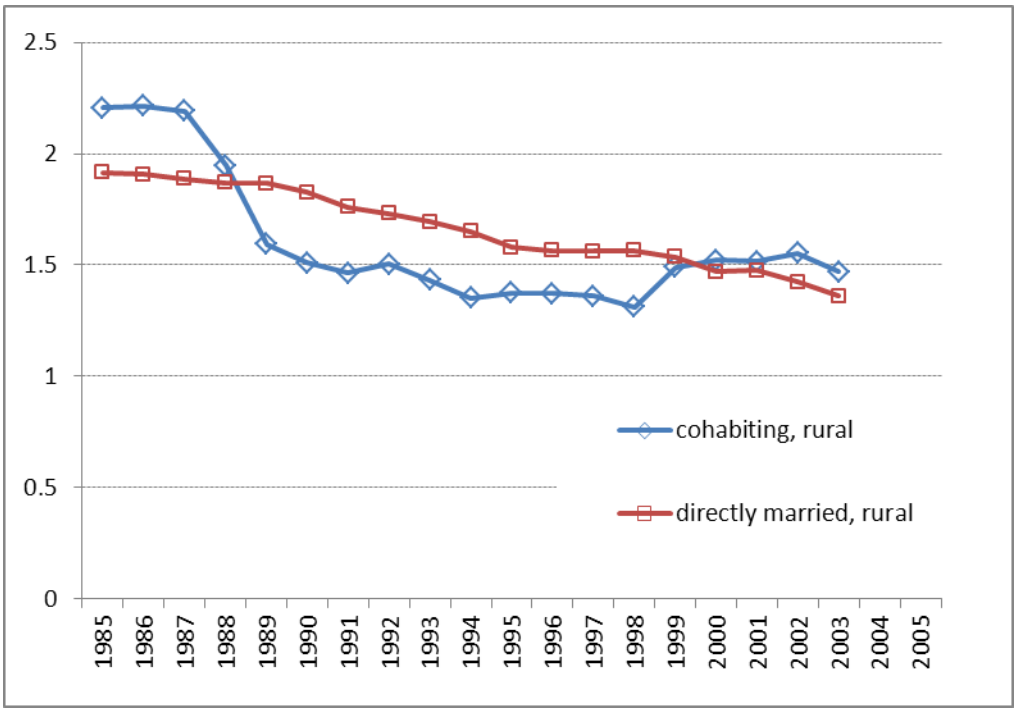


**Figure 9. Aggregate fertility specific for rural origin.
Cohabiting and directly married women, Romania, 1985-2005.**



5: Discussion

Among the fertility patterns that our current investigation has revealed or confirmed are the following:

(a) In our data, duration-based aggregate fertility decreases monotonically as educational attainment increases, both for cohabiting and for directly married women, as noted before by Mureşan and Hoem (2010) for all women taken together. This covers births of all orders. Similar results for first births to cohabiting women have been documented by Perelli-Harris et al. (2010).

(b) Women with a rural background consistently have had a higher aggregate fertility than women with an urban background both in cohabitational unions and in direct marriages, net of educational attainment. Urban women have been forerunners in the new fertility trends.

(c) More remarkably, we have found that among women with a low educational attainment, as well as among women of a rural origin, the aggregate fertility in marital and in cohabitational unions are largely of the same size order. To such women their marital status has been less important for their fertility than the fact that they have been partnered.

Our findings neatly complement those of official Romanian statistics, where the 2002 census showed an average number of 1.97 children to couples in consensual unions and the lower average number of 1.72 children to married couples.

There remains the question *why* Romanian women with a low socio-economic status and low educational attainment more often choose alternative living arrangements and bear children outside marriage. Rotariu (2011) has emphasized that most of the growth in non-marital childbearing after the fall of the state-socialist regime is not due to the spread of the post-modern values and attitudes, as posited by second-demographic-transition arguments. He maintains that instead they result from the revival of some behaviors that were manifest also during past centuries in Romania. He argues that in this cultural area the modernization process was incomplete and that births outside marriage have always existed as a socially almost-accepted behavior, at least in some communities.[14] The socio-economic crisis that followed the recent change of political regime favored the spread of this behavior mainly in the cultural areas where it existed already.[15]

Acknowledgements

Economic support for Cornelia Mureşan from the Max-Planck-Gesellschaft is gratefully acknowledged. The work of Mihaela Hărăguş and in part for Cornelia Mureşan was supported by a grant of the Romanian National Authority for Scientific Research, CNCS – UEFISCDI, project number PN-II-ID-PCE-2011-3-0145. We have been influenced by comments from four referees working for *Population* and are particularly grateful for the mapping of the parity progression literature that a referee made for us. We are grateful to Kim Lindoff Jansson for early research assistance.

[14] Kok (2009) also mentions the high level of illegitimacy around 1900 in provinces that form the present Romanian territory and connects it with the family system in the region, arguing that the cohabitation and non-marital childbearing seen nowadays seem to be a return to old traditions.

[15] Rotariu (2009, 2011) also points out that non-marital births have a high incidence in the Roma population, which has a very low living standard, and whose social integration is deeply deficient. Due to its small size we have excluded the Roma population from our analysis.

References

Balbo N., Billari F. C., Mills M., 2013, ”Fertility in Advanced Societies: A Review of Research. *European Journal of Population* (published online), DOI 10.1007/s10680-012-9277-y, pp.1-38.

Barkalov N. B., 1999, “The fertility decline in Russia, 1989-1996: A view with parity-progression ratios”, *Genus,* 55 (3-4), pp. 11-60.

Barkalov N. B., 2005, “Changes in the quantum of Russian fertility during the 1980s and early 1990s”, *Population and Development Review* 31(3), pp. 545-556.

Berrington A., 2001, ”Entry into parenthood and the outcome of cohabiting partnerships in Britain”, *Journal of Marriage and Family,* 63, pp. 80–96.

Billingsley S., 2010, “The Post-Communist Fertility Puzzle”, *Population Research and Policy Revue,* 29, pp. 193-231.

Blayo C., 1986, “La constitution de la famille en France depuis 1946”, *Population* (French Edition), 41(4-5), pp. 721-747.

Blossfeld H.-P., Mills M., 2001, “A causal approach to interrelated family events: A cross-national comparison of cohabitation, nonmarital conception, and marriage”, *Canadian Studies in Population,* Special Issue on Longitudinal Methodology, 28(2), pp. 409-437.

Brădăţan C., Kulcsar L., 2008, ”Choosing between marriage and cohabitation: Women's first union patterns in Hungary”, *Journal of Comparative Family Studies,* 39(4), pp. 491-507.

Brass W., 1974, “Perspectives in population prediction: Illustrated by the statistics of England and Wales”, *Journal of the Royal Statistical Society, Series A,* 137 (4), pp. 532-583.

Breton D., Prioux F., 2005, “Two children or three? Influence of family policy and socio-demographic factors”, *Population-E* 60(4), pp. 415-445.

Dohotariu A., 2010, “Avec deux, ne faire qu’un: couple et cohabitation hors mariage dans le postcommunisme roumain”, (“Two only make up one: The couple and cohabitation about marriage in the Romanian postcommunism”), *Romanian Journal of Population Studies,* 1, pp. 25-38.

Dorbritz J., 2003, ”Social, political and economic transformation”, In Dimiter Philipov and Jürgen Dorbritz, *Demographic consequences of economic transition in countries of central and eastern Europe*, Population studies, 39, Strasbourg: Council of Europe Publishing, pp. 21-68.

Feeney G., Yu J., 1987, “Period parity progression measures of fertility in China”, *Population Studies*, 41(1), pp. 77-102.

Hărăguş M., 2008, “*Tranziţia la statutul de părinte în Europa. Evoluţii recente şi posibili determinanţi”* (“Transition to parenthood in Europe. Recent evolutions and possible determinants”). Presa Universitară Clujeană: Cluj-Napoca.

Hărăguş M., 2010, “Nonmarital childbearing in Romania”, *Romanian Journal of Population Studies* 2, pp. 44-64.

Hărăguş M., 2011, “Naşterile în contexte diferite de cel marital” (“Childbearing in contexts different from marriage”), *Calitatea Vieţii*, 4/2011, pp. 379-396.

Henry L., 1951, ”La fécondité des mariages au Japon”, *Population*, 8(4), pp, 711-730.

Heuveline P., Timberlake J.M., 2004, ”The role of cohabitation in family formation: the United States in comparative perspective”, *Journal of Marriage and Family* 66(5), pp. 1214-1230.

Hobcraft J. N., Goldman N., Chidambaram V. C., 1982, ”Advances in the P/F ratio method for the analysis of birth histories”, *Population Studies,* 36 (4), pp. 291-316.

Hobcraft J. N., Casterline J. B., 1983, “Speed of reproduction”, *World Fertility Survey Comparative Studies*, 25, ISI, Voorburg, The Netherlands.

Hoem J. M., 1987, “Statistical analysis of a multiplicative model and its application to the standardization of vital rates: A review”, *International Statistical Review,* 55 (2), pp. 119-152.

Hoem J.M., Jasilioniene A., Kostova D., Muresan C., 2009a, “Traces of the second demographic transition in selected countries in Central and Eastern Europe: Union formation as a demographic manifestation”, *European Journal of Population*, 25(2), pp. 123-156.

Hoem J.M., Kostova D., Jasilionine A., Mureşan C., 2009b, “The structure of recent first-union formation in Romania” *Romanian Journal of Population Studies* III(1), pp. 33-44.

Hoem J. M., Gabrielli G., Jasilioniene A., Kostova D., Matysiak A. 2010, "Levels of recent union formation: Six European countries compared", *Demographic Research*, 22, pp. 199-210.

Hoem J. M., Mureşan C., 2011a, "The Total Marital Fertility Rate and its extensions", *European Journal of Population*, 27(3), pp. 295-312.

Hoem J. M., Mureşan C., 2011b, "An extension of the conventional TFR", *European Journal of Population*, 27 (4), pp. 389-402.

Hoem J. M., Jalovaara M., Mureşan C. 2013, "Recent fertility patterns of Finnish women by union status: A descriptive account", *Demographic Research*, 28 (14), pp. 409-420.

Hosseini-Chavoshi M., McDonald P., Abbasi-Shavazi M. J., 2006, "The Iranian fertility decline, 1981-1999: An application of the synthetic parity progression ratio method", *Population-E* 61(5-6), pp. 701-718.

Kalmijn, M., 2011, „The influence of men's income and employment on marriage and cohabitation: Testing Oppenheimer's theory in Europe," *European Journal of Population* 27, pp. 269–293.

Kiernan, K., 2004, "Unmarried cohabitation and parenthood: here to stay? European perspectives," In Moynihan D. P., T. M. Smeeding, and L. Rainwater (eds.), *The Future of the Family*. New York: Russell Sage Foundation, pp. 66-95.

Kiernan K., Mensah F.K., 2010, "Unmarried parenthood, family trajectories, parent and child well-being". In Hansen K., Joshi H., Dex S. (eds.), *Children of the 21st Century: From Birth to Age 5.* Policy Press, pp. 77-94.

Kohler H.-P., Billari F. C., Ortega J. A., 2002, "The emergence of lowest-low fertility in Europe during the 1990s", *Population and Development Review*, 28(4), pp. 641-680.

Kok J., 2009, "Family Systems as frameworks for understanding variation in extra-marital births, Europe 1900-2000". In Fauve-Chamoux A., Bolovan I. (eds.) "*Families in Europe between the 19th and the 21st Centuries. From Traditional Model to Contemporary PACS*", Cluj-Napoca: Presa Universitara Clujeana, pp. 13-38.

Konietzka D., Kreyenfeld M., 2002, "Women's employment and non-marital childbearing: a comparison between East and West Germany in the 1990s", *Population-E*, 57(2) pp. 331-358.

Kostova D., 2007, "The emergence of cohabitation in a transitional socio-economic context: Evidence from Bulgaria and Russia"**,** *Demográfia, English Edition*, 50(5), pp. 135-162.

Koytcheva E., Philipov D., 2008, “Bulgaria: Ethnic differentials in rapidly declining fertility.” *Demographic Research,* 19, pp. 361-402.

Kulu H., 2013, ”Why do fertility levels vary between urban and rural areas?” *Regional Studies* (published online), DOI:10.1080/00343404.2011.581276, pp.1-18.

Lesthaeghe R., Surkyn J., 1988, “Cultural dynamics and economic theories of fertility change”, *Population and Development Review,* 14 (1), pp. 1-45.

McDonald P., 2006, “Low fertility and the state: the efficacy of policy,” *Population and Development Review,* 32, pp. 485–510.

Mills M., Blossfeld H.-P., Klijzing E., 2005, ”Becoming and adult in uncertain times: A 14-country comparison of the losers of globalization”. In Blossfeld H.-P., Klijzing E., Mills M., Kurz K. (Eds.), *Globalization, uncertainty and youth in society*, pp. 423–441, London: Routledge.

Mureşan, C., 2008, “Cohabitation, an alternative for marriage in contemporary Romania: a life table description”, *Demográfia, English Edition, 51(5),* pp. 36–65.

Mureşan C., Hoem J. M., 2010, “The negative educational gradients in Romanian fertility”, *Demographic Research,* 22(4), pp. 95-114.

Murphy M., Berrington A., 1993, “Constructing period parity progression ratios from household survey data”. In Ní Bhrolcháin, M, (Ed.), *New Perspectives on Fertility in Britain*, London: HMSO, pp. 17-33.

Ní Bhrolcháin M., 1987, “Period parity progression ratios and birth intervals in England and Wales, 1941-1971: A synthetic life table analysis”, *Population Studies,* 41(1), pp. 103-125.

Oppenheimer V. K., 2003, ”Cohabiting and marriage during young men’s career-development process”, *Demography,* 40(1), pp. 127-149.

Perelli-Harris B., Sigle-Rushton W., Kreyenfield M., Lappegård, Keizer R., Berghammer, C., 2010, ”The educational gradient of childbearing within cohabitation in Europe,” *Population and Development Review*, 36(4), pp. 775-801.

Perelli-Harris B., Gerber T. P., 2011, “Non-marital childbearing in Russia: second demographic transition or pattern of disadvantage?” *Demography,* 48 (1), pp. 317-342.

Perelli-Harris B., Kreyenfeld M., Sigle-Rushton W., Keizer R., Lappegård T., Jasilioniene A., Berghammer C., DiGiulio P., 2012, “Changes in union status during the transition to

parenthood in eleven European countries, 1970s to early 2000s", *Population Studies*, 66(2), pp. 167-182.

Philipov D., Jasilioniene A., 2008, "Union formation and fertility in Bulgaria and Russia: A life table description of recent trends", *Demographic Research* 19 (62), pp 2057-2114.

Popescu L., 2004, "*Politici sociale Est-Europene între paternalism de stat şi responsabilitate individual"* ["Eastern European social policies between state paternalism and individual responsibility"], Cluj-Napoca: Presa Universitară Clujeană.

Potârcă G., Mills M., Lesnard L., 2013, "Family Formation Trajectories in Romania, the Russian Federation and France: Towards the Second Demographic Transition?", *European Journal of Population* (published online), DOI: 10.1007/s10680-012-9279-9, pp. 1-33.

Rallu J. L., 1986, "Descendance des générations françaises et probabilities d'agrandissement", *Population* 41 (4-5), pp. 763-802.

Rallu J. L., Toulemon L., 1994, "Period fertility measures: The construction of different indices and their application to France, 1946-89", *Population, An English Selection*, 6, pp. 59-94.

Rodriguez G., Hobcraft J., 1980, "Life table analysis of birth intervals in Columbia: An illustrative analysis", *World Fertility Survey Scientific Report* No. 16 , ISI Voorburg, The Netherlands.

Rotariu T., 2006, "Romania and the Second Demographic Transition; the traditional value system and low fertility rates", *International Journal of Sociology*, 36(1), pp. 10-27.

Rotariu T., 2009, "Marital and extramarital fertility in latter-day Romania", In Fauve-Chamoux A., Bolovan I. (eds.), *Families in Europe between the 19th and the 21st Centuries. From Traditional Model to Contemporary PACS*, Cluj-Napoca: Presa Universitară Clujeană, pp. 361-380.

Rotariu T., 2010, "Extramarital births in Romania versus other European countries - A few considerations", *Studia Sociologia* 2, pp. 37-60.

Rotariu T., 2011, "Naşterile şi concepţiile extramaritale în România anilor 2006-2008. Cazul primelor naşteri" ("Non-marital births and conceptions in Romania 2006-2008. The case of the first birth"). In Iluț P. (ed.), *Studii de sociopsihologie*, Cluj-Napoca, Presa Universitară Clujeană, pp. 17-38.

Ryder N. B., 1951, "*The Cohort Approach: Essays in the Measurement of Temporal Variations in Demographic Behavior"*, New York 1980: Princeton Ph. D. Dissertation.

Schoen R., Tufis P., 2003, “Precursors of nonmarital fertility in the United States”, *Journal of Marriage and Family,* 65(4), pp. 1030-1040.

Seltzer J. A., 2000, “Families formed outside of marriage”, *Journal of Marriage and Family,* 62(4), pp. 1247-1268.

Smock P. J., Manning W. D., 1997, “Cohabiting partners’ economic circumstances and marriage”, *Demography* 34, pp. 331-341.

Smock P. J., Greenland F. R., 2010, “Diversity in pathways to parenthood: Patterns, implications, and emerging research directions”, *Journal of Marriage and Family,* 72, pp. 576-593.

Sobotka, T., 2008, “Overview Chapter 6: The diverse faces of the Second Demographic Transition in Europe”, *Demographic Research,* 19, pp. 171-224.

Sobotka T., Toulemon L., 2008, “Overview Chapter 4: Changing family and partnership behaviour: Common trends and persistent diversity across Europe”. *Demographic Research,* 19: 85-138.

Spéder Z., 2005, “The rise of cohabitation as first union and some neglected factors of recent demographic developments in Hungary”, *Demográfia, English Edition,* 48, pp. 77-103.

Thomson E., 2005, “Partnerships & parenthood: A comparative view of cohabitation, marriage and childbearing”. In Booth A., Crouter A. C. (coord.), *The New Population Problem: Why Families in Developed Countries Are Shrinking and What It Means,* London, Lawrence Erlbaum Associates Publishers, pp 129-150.

Thornton A., Philipov D. 2009. “Sweeping changes in marriage, cohabitation and childbearing in Central and Eastern Europe: New insights from the Developmental Idealism Framework”, *European Journal of Population,* 25, pp.123–156.

APPENDIX.

Table 1. Exposure time and number of births for women by calendar year and union status. Romanian GGS sample, 1985-2005.

Person-months							
	1985	**1986**	**1987**	**1988**	**1989**	**1990**	**1991**
not in a union	9236	9353	9253	9038	8732	8261	7837
in a consensual union	813	861	917	881	955	1010	1030
directly married	14031	13753	13731	13622	13568	13578	13668
married 1st y	1473	1563	1573	1619	1674	1753	1809
married 2nd-3rd y	641	640	654	714	710	739	731
married 4th-6th y	258	256	251	251	246	247	247
married 7th+ y	154	168	168	167	147	165	124
Total person-months	**26606**	**26594**	**26547**	**26292**	**26032**	**25753**	**25446**

(continuation 1)

1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
7632	7442	7297	7228	6999	6661	6250
1067	964	877	887	924	914	981
13563	13294	13087	12755	12498	12295	12165
1789	1879	1969	1980	1999	2030	1942
801	803	753	752	691	717	755
241	238	261	261	267	278	286
111	112	114	113	106	99	103
25204	**24732**	**24358**	**23976**	**23484**	**22994**	**22482**

(continuation 2)

1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
5840	5406	5201	5163	4816	4186	3570
1153	1195	1234	1355	1397	1462	1182
11875	11580	11137	10479	9754	8972	7524
1925	1870	1804	1766	1748	1690	1491
746	784	812	850	838	854	794
263	252	246	250	250	282	280
64	49	48	51	66	87	134
21866	**21136**	**20482**	**19914**	**18869**	**17533**	**14975**

Number of births

	1985	1986	1987	1988	1989	1990	1991
not in a union	7	1	4	3	6	3	2
in a consensual union	6	10	22	13	14	9	10
directly married	146	144	148	155	182	128	129
married 1st y	16	22	24	25	21	24	17
married 2nd-3rd y	6	5	6	14	5	6	5
married 4th-6th y	3	5	4	3	3	2	1
married 7th+ y	1	1	0	0	2	0	1
Total births	**185**	**188**	**208**	**213**	**233**	**172**	**165**

(continuation 1)

1992	1993	1994	1995	1996	1997	1998
2	2	3	2	4	2	2
9	7	7	17	9	13	8
133	107	124	109	94	99	90
22	18	16	11	25	14	15
8	6	7	5	7	3	4
0	0	1	2	1	3	1
2	1	0	1	0	1	1
176	**141**	**158**	**147**	**140**	**135**	**121**

(continuation 2)

1999	2000	2001	2002	2003	2004	2005
1	4	2	7	1	1	0
15	14	12	13	13	13	11
87	72	64	71	68	44	35
14	14	15	7	11	13	7
7	7	5	7	5	5	5
2	2	1	2	4	1	0
0	1	0	0	0	0	0
126	**114**	**99**	**107**	**102**	**77**	**58**

Table 2. Number of consensual unions at the start of the duration year, by groups of calendar years of initiation and by union duration

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2005
1st y	107	145	153	141	146
2nd y	57	79	80	89	88
3rd y	34	50	56	61	57
4th y	28	39	43	50	33
5th y	22	31	31	45	16
6th y	17	30	27	35	6
7th y	14	25	24	32	
8th y	14	21	23	23	
9th y	13	18	23	14	
10th y	11	14	22	7	
11th y	10	11	20	4	
12th y	9	9	16		
13th y	8	8	10		
14th y	6	7	5		
15th y	5	6	4		