The Changing Effects of Education on Family Formation during a Period of Rapid Social Change

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This study demonstrates how broad societal-level change not only alters the composition of individual-level characteristics in a population, but also affects the relationship between mechanisms and behavior. Focusing on post-Soviet Ukraine, this paper examines how massive economic, political, and social transformations changed individual-level childbearing decision-making. Specifically, I investigate how social change in Ukraine altered the effects of one institution – education - on the timing of first and second births and marriage. I find that whereas previously more highly educated women would have had higher first birth rates once school enrollment and marriage were controlled, after Independence women with higher education delayed childbearing. The rates of second births and marriage also declined after Independence. Explanations for the changing effects of education on family formation include the restructuring of the educational system, shifting opportunity costs, and exposure to new ideas and values.

I would like to thank Barbara Anderson, William Axinn, and Pamela Smock for providing helpful comments and suggestions on earlier drafts.

Central to the field of sociology is how social and economic change promotes change on the individual level – in human behavior, decision-making, and interpersonal relationships (Thornton and Lin 1994, Axinn and Yabiku 2001). Social change has been found to be a leading cause of changes to the family (Notestein 1945, Caldwell 1982, Lesthaeghe and Surkyn 1988, Kirk 1996, Thornton and Lin 1994, Axinn and Yabiku 2001, Bumpass 1990). The effects of social change on behavior typically operate through intervening mechanisms, such as institutions, organizations, and economic activities (Axinn and Yabiku 2001). This study focuses on the changing effects of one institution – education – which has had a substantial impact on the family in a number of settings (Axinn and Barber 2001, Kasarda, Billy, and West 1986, Lloyd *et al*. 2000). The context of this study – post-Socialist Ukraine - is well-suited to examining the effects of social change. During the period before and after Ukraine separated from the Soviet Union, social, economic, and political structures rapidly transformed. Therefore, this study provides an unusual opportunity to observe how the influence of education reverses during a period of rapid social change, resulting in the emergence of very low fertility.

In this paper, I examine how the massive transformations that occurred in post-Socialist Ukraine changed individual-level childbearing decision-making. After describing the setting and situating Ukraine within the context of other lowest-low fertility countries, I present a theoretical framework outlining the specific ways that the effects of education on fertility changed during the transition period. The study employs a research design which compares the influence of education on fertility during periods before and after a major macro-level event: Ukrainian independence. By creating comparable samples, I analyze how the influence of education changes over time, as well

as how variation emerges. I posit that the transition to a labor market changes the effects of education on both the timing and level of childbearing: the transition to parenthood and the birth of additional children. This two-period approach is then extended to an analysis of marriage, a behavior closely associated with childbearing, especially in this setting. I expect that social change will also alter the relationship between education and marriage, but to a lesser degree. Taken as a whole, the study demonstrates how broad societal-level change not only alters the composition of individual-level characteristics in a population, for example increasing the proportion of the highly educated population, but can also affect the relationship between mechanisms and behavior, i.e. reversing the effects of higher education on fertility.

THE CASE OF UKRAINE

Post-Soviet Ukraine is a prime example of a society which experienced massive social change in a relatively short time period – during the decade after Independence, which occurred in August 1991. The transition from a communist to capitalist economic system, along with the associated processes of democratization and changing social environment, has required massive adjustment. While some may argue that the change has led to positive outcomes, such as greater political freedom and free-market opportunities, social and economic change has had a primarily negative impact, at least in the short-term, on the average Ukrainian's standard of living and quality of life (UNDP Ukraine 2002). Ukraine gained independence in 1991, but the ensuing economic turmoil left the population struggling for a decent standard of living. Between 1991 and 1998, Ukraine failed to experience a single year of economic growth; the country's percent

change in GDP was consistently negative. As a result, the GDP per capita declined by 60% and unemployment rates rose to at least 12%. The proportion of the population living below the poverty line increased, with 45.2% living on less than one dollar a day in 1999 (UNDP Ukraine 2002: 14-37). Wage inequality increased substantially from 1986-2003, especially for women (Ganguli and Terrell 2005). The pressure of economic restructuring has taken a toll on the population, in terms of self-reported health (Gilmore et al 2002), life expectancy (UNDP 2003), and high levels of distress, or anxiety and self-deprecation (Kohn et al 2002).

Since the new millennium, the macro-economic situation has improved in Ukraine, although it is yet to be determined how much this has trickled down to the individual. In 2000 the GDP growth rate in Ukraine increased to 5.8%, one of the fastest rates in the world (UNDP 2002). The Ukrainian data in this study cover the beginning of the economic upturn; hence, some of the findings may show the influence of economic recovery on behavior.

Situating Ukraine within lowest-low fertility in Europe

It is important to note that historical, political, and cultural underpinnings lead individuals to make decisions which make setting-specific sense (Greenhalgh 1995). For example, the rational response to economic uncertainty in Italy and the Czech Republic may be to postpone childbearing, but Ukrainian women may reason that it is better to have children young, when their bodies are most suited for reproduction and their parents are able to assist with monetary transfers and childcare (Perelli-Harris 2005). These differences in individual utility underscore the differential effects of culture and situation-

specific influences. By providing evidence of contextual influences on the process of childbearing decision-making, this study situates Ukraine within the broader trajectory of change sweeping across Europe.

Ukraine is one of the 26 countries in Southern, Central, and Eastern Europe and Asia which has experienced a Total Fertility Rate less than 1.3 (Caldwell and Schindlmayr 2003). The TFR dropped from 1.8 in 1991 to 1.1 in 1999 (Derzhkomstat 2001), a level so low as to lead to rapid population decline that is difficult to reverse (Lutz, O'Neill, Scherbov 2003). The circumstances leading to this phenomenon, however, are very different from Western Europe and Asia, and individual-level decision-making processes likely differ as well. First, the underlying age pattern of fertility in Ukraine has historically been younger and continues to be younger than that of Western European populations. In 2000, the mean age at first birth was 22.8 and the majority of childbearing occurred between the ages of 20 and 24. In comparison, the mean age at first birth in Japan was 28.9 in 2004 (Japan 2005), Italy was 28.7 in 1997, and 29.1 in Spain in 2000 (Council of Europe 2003). In Ukraine, there is consistent evidence of postponement of first births only after 1997 (Perelli-Harris 2005). While the mean age of first births may now be increasing in Ukraine, these shifts did not occur early enough to produce the large tempo effects associated with the decline to very low period fertility in Central and Southern Europe. Instead, Ukraine's very low fertility is primarily linked to the postponement or elimination of second and higher-order births (Perelli-Harris 2005). Unlike couples in Southern and Central Europe who may not have enough reproductive years left to have higher parity children, Ukrainian women forego higher parity children for a number of other reasons; for example, respondents in a cross-

sectional study conducted in 1996 reported that low income, insufficient living space, lack of time, and inadequate maternity benefits prohibited them from having children (Chuiko 2001). In order to understand the entire reproductive history and changes in fertility, this study compares the timing of first and second births.

Second, the effects of social change have varied widely across Europe, even within Central and Eastern Europe, which endured massive economic and political change after the collapse of the Soviet Union. Researchers tend to lump Ukraine together with the other countries of Central and Eastern Europe (Caldwell and Schindlmayr 2003, Kohler, Billari, and Ortega 2002), (although some do acknowledge the variation in the region (see Sobotka 2004, Macura 2004)). The distinction between these countries, however, is important. In Central European countries, the conversion to the new system was peaceful and swift (Macura 2004). Many former Eastern bloc countries, including the Czech Republic, Hungary, Poland, and Slovakia, experienced lower levels of economic stagnation, earlier economic recovery, and higher levels of foreign investment. Due to their proximity to Western Europe, young people from Central Europe had more opportunities to travel and witness Western lifestyles, as well as experience new education and employment prospects (Sobotka et al 2003). For these reasons, Central European populations were more likely to experience behavioural and ideational shifts similar to those which occurred in Western Europe and sometimes referred to as the "Second Demographic Transition" (Sobotka et al 2003). Overall, there is more evidence that the "Second Demographic Transition" is occurring in Central Europe than in Ukraine (Lesthaeghe and Surkyn 2002).

THE CHANGING EFFECTS OF EDUCATION ON FERTILITY

Past research consistently shows that education exhibits a strong effect on fertility (Axinn and Barber 2001, Kasarda, Billy, and West 1986, Lloyd et al 2000). The specific effects of higher education, however, are cultural, setting, and time-specific. In some settings, higher education delays childbearing, even after school enrollment is controlled (Rindfuss, Morgan, and Offutt 1996). Individuals with higher levels of education may delay childbearing in favor of career opportunities that are dependent on the latest skills and training. In other settings, once an individual leaves school, higher levels of education increase the rates of childbearing (Ghimire 2003). For example, women could be trying to achieve culturally proscribed norms of age at first birth (Perelli-Harris 2005). These contradictory findings illustrate that the effects of education on fertility are not uniform across cultures, or stable across time.

The following theoretical framework explains how the effects of education on fertility changed in Ukraine throughout the transition to a labor market. First, I describe possible reasons for early childbearing in Soviet Ukraine, especially among highly educated women. I then argue that the transformations brought about by the break up of the Soviet Union changed the nature of the educational system, the calculation of the costs and benefits of education, and the perceived costs of educating future children. In these sections I include a discussion of changing maternity benefits and childcare subsidies and access to contraception and abortion. I then discuss how higher education could be associated with the less conventional attitudes brought about by ideational change. Finally, I discuss the effects of social change on marriage and the changing relationship between marriage and childbearing. Taken as a whole, the theoretical

framework shows how social change influences fertility through the mechanism of education.

The timing of childbearing in Soviet Ukraine. Before the breakup of the Soviet Union, the vast majority of Ukrainian women gave birth to a first child in their early twenties, regardless of level of education (Perelli-Harris 2005). This early childbearing could have occurred for a number of reasons. First, women may have wanted to give birth closer to the ideal age at first birth (around age 20), which was a norm based on historical patterns of family formation (Hajnal) and beliefs about the optimal biological time to give birth (Perelli-Harris 2005). These widespread beliefs meant that women who postponed childbearing due to school enrollment may have felt the need to start childbearing immediately after graduation. Second, women and men with professional degrees were often assigned to remote posts under the system of *raspredilenie* (distribution). Marriage and childbearing were one way to avoid such deployment. Third, pro-natalist policies in the late 1980s encouraged women to have children by providing three years of maternity leave, housing allowances, and other child-benefits (Zakharov and Ivanova 1996); highly educated women may also have felt the desire to take advantage of these policies. These policies and societal norms pushed all women to start childbearing earlier, or at least provided no incentive to postpone. Thus, I expect that once school enrollment is controlled, more highly educated women in the Soviet period would have had higher first birth rates than their lesser educated counterparts.

The changing nature of the educational system. With the breakup of the Soviet Union, many institutions deteriorated or fundamentally changed, including the social safety net, state-sponsored health care, and the pension system (Field and Twigg 2000).

According to a nationwide survey conducted in 2002, respondents ranked the state of the educational system higher than other local services, but on average they thought the quality of education had also deteriorated over the past decade (UNDP Ukraine 2003). During the transition, the educational system suffered from funding cuts, lower teacher salaries, textbook shortages, and poor maintenance of facilities. These setbacks affected every level of education and brought on widespread disenchantment among teachers, students, and parents (UNDP Ukraine 2003).

Certain aspects of the educational system improved, however. The curriculum, methods of teaching, emphasis on problem-solving rather than rote memorization, and access to technology became more in line with Western standards. To meet the demands of a new economy, and students who wanted to succeed in that economy, higher education institutes, including new private colleges, adopted new specializations such as law, business, and market economics (UNDP Ukraine 2003). The new educational opportunities and demand for education led to higher enrollment. Total university enrollment nearly doubled between 1990 and 2002, and the gross enrollment rate as a percentage of the relevant age group increased by 22% (UNDP Ukraine 2003). This evidence indicates that the economic and social transformations occurring in Ukraine impacted the nature of and demand for higher education

Individual-level calculations of the costs and benefits of education. In the following section, I argue that the transition to a market economy altered the influence of education on individual childbearing decision-making in three ways. First, new employment opportunities in the labor market raised the opportunity costs of childbearing and rearing; more highly educated women were in a better position to take advantage of

these opportunities. Second, the rising costs of education and disappearance of guaranteed free higher education, pushed young couples to secure employment before having children, especially in light of decreasing maternity benefits and increasing childcare costs. Third, the increasing costs of children's future education led parents to limit their own fertility.

New opportunity costs. One of the primary ways in which education leads to lower fertility is by changing the calculation of the costs and benefits of childbearing and rearing (Becker 1991). Demographers argue that when faced with competing opportunities such as career prospects or status attainment, women reduce childbearing (Kasarda *et al,* 1986, Easterlin and Crimmins 1985). In the new post-socialist economy, highly educated women may realize that it makes more economic sense to start working immediately after the completion of education, when newly acquired skills are most relevant. Unlike under the Soviet Union, when employment was guaranteed after maternity leave, women may now realize that delaying employment in favor of parenting could limit future career opportunities.

The deterioration of economic conditions has also altered opportunity costs by limiting state-subsidized childrearing support. Previously the state would have provided maternity benefits and childcare, but now couples must provide childcare themselves, or rely on relatives. Mothers of young children are still guaranteed three years of maternity leave, but it is unlikely the government would force companies to adhere to these policies. Also, after the dissolution of the Soviet Union, the childcare allowance declined substantially to just cover "a single packet of Pampers" (focus group research), and state-

subsidized childcare facilities declined by a third since 1990 (UNDP Ukraine 2003)[1]. While previously couples could afford to start childbearing directly after completing education, couples may now feel inclined to establish financial stability, rather than relying on the state to provide childrearing support.

*New costs of parents' education***.** Whereas a free education, including a stipend for living expenses, had been guaranteed under the Soviet Union, now many university students must pay tuition, even at public universities. As of 2004, students still received a minimal stipend (100 hryvna or US$20 per month – not enough to live on) and discounts on public transportation (Bulhak 2004), but only the most exceptional students studied for free; most paid tuition and bribes to ensure fair grades. Even when working part-time, many students can barely make ends meet. I expect that these changing conditions have altered expectations about who pays for education and living expenses while in school and may be pushing couples to establish decent living standards, which may take a few years, before having children.

Costs of children's future education. Couples in many societies have limited the "quantity" (number) of children by focusing on the "quality" (educational attainment) of their children (Becker 1991, Willis 1973). Evidence of the influence of children's schooling on parental childbearing behavior can be seen in societies transitioning from high to low fertility (Axinn and Barber 2001). In the context of Ukraine, parents have leaned towards "quality" children for decades – the Total Fertility Rate has hovered around 2.0 since the 1960s (Steshenko 2001). Only recently, however, has the cost of educating children become a direct component of childrearing calculations.

[1] Part of this decrease, however, was due to lowered demand brought about by lower birthrates and higher unemployment among mothers (UNDP Ukraine 2003).

According to focus group discussions (Perelli-Harris 2003), parents of school-age children worry about classroom fees, the costs of textbooks and uniforms, and other school-related expenses. The younger parents said their parents were rarely concerned about covering such costs when they were children. Older generations concurred, expressing sympathy for current parents raising children in these expensive times. Even parents of pre-school children reported thinking about these new educational expenses when considering having additional children. Rising educational costs were often repeated as one of the largest economic factors influencing parents to have only one child. Therefore, I expect the cost of children's future education to be a limiting factor in having second births, particularly among more highly educated couples who would have greater educational aspirations for their children and would care more about the costs than their lesser educated counterparts. Evidence of these effects could be seen if more highly educated women limited second births more now than in the past..

New values and beliefs. Education has long been seen as a mechanism for the ideational change that leads to lower fertility (Caldwell 1982, Cleland and Wilson 1987). Schools are often conduits for the transmission of new beliefs and values, especially those that are "Western" (Caldwell 1982). Some of these values may be associated with the "Second Demographic Transition," such as autonomy and self-interest (Surkyn and Lesthaehge 2004). As the educational system in Ukraine becomes more market-oriented, students are more likely to be exposed to Western European ideas, including the rationalization of postponing childbearing in light of economic uncertainty or the desire to pursue careers like their Western counterparts. Of course, those people who choose to attend higher institutes of learning may be predisposed to adopting new values, especially

in an environment of rapid social change. In any case, it is reasonable to assume that those who are more highly educated will be more likely to hold new, "unconventional" values. In turn, these people will be more likely to be innovators of behavioral change, such as waiting longer to have children.

The relationship between marriage and childbearing.

During this period of intense economic and social restructuring, the relationship between marriage and childbearing changed. Before the break up of the Soviet Union, marriage was usually a precondition for childbearing, but not necessarily for conception (Perelli-Harris 2005). As has happened in many countries (Wu and Wolf 2001), the link between marriage and childbearing has eroded in the past decade and nonmarital childbearing has increased. The proportion of nonmarital births increased from 11% in 1990 to 19% in 2002 (Derzhkomstat 2004). Thus, an analysis of nonmarital childbearing is included to show changes in the timing of nonmarital childbearing and any effects of education. Unfortunately, the data does not allow for a distinction between births to mothers living alone or mothers in cohabiting relationships.

In addition, the postponement of first marriage is likely to have a direct effect on the postponement of first births. Since the disintegration of the Soviet Union, "registered"[2] marriage rates have declined substantially (Derzhkomstat 2004). At this time, it is impossible to know whether marriages are being postponed, more people are remaining without partners, or whether couples are choosing to cohabit instead of marry. Also, given that the official marriage rates include all marriages; the decline could be due to a reduction of remarriages. The processes described above may be affecting marriage

[2] In the Russian language, "registered" marriage refers to official, legal marriages, while "unregistered" marriages refer to cohabiting relationships.

timing as well as the timing of childbearing. In particular, women with higher education may feel they are better able to support themselves in the new economy, or shifting values may lead them to enjoy their independence longer (see Oppenheimer 1997 for a review of explanations that focus on the role of women's rising economic independence). On the other hand, most of the evidence has shown that women with higher education have higher propensities to marry, which could be due to women with greater resources conducting more extensive searches for a partner (Oppenheimer 1997) or being more attractive on the marriage market. The analyses below will show to what extent marriage rates have declined over the past decade, and whether women's education is an explanatory factor in this change.

ANALYTIC STRATEGY

The Ukrainian Longitudinal Monitoring Survey (ULMS), a nationally representative survey of the working age population of Ukraine, is used to show the changing influence of education on fertility. This analysis uses the first round, which was conducted in 2003. The primary purpose of the ULMS is to describe the population's economic activity by collecting retrospective work histories and information about work in the past week. The individual survey includes birth and marital histories, detailed questions about education and training, and some broad political and health questions. The ULMS conducted interviews with 8641 individuals in 4056 households and had a 66% response rate (KIIS 2003).

While birth histories are available for both men and women, I restrict the sample to women, since women bear children, tend to be younger than their male partners and

have children closer to the period of school enrollment. The analyzed outcomes include first birth rates, also decomposed into marital and non-marital first birth rates, second birth rates and marriage rates. The analysis compares individuals in two periods separated by a particular point in time – September of 1991 or the month after Ukrainian Independence. The date of Independence acts as a distinct date of treatment, as opposed to a continuous period of change. Although social change associated with the break up of the Soviet Union was always a continuous process, it is necessary to choose a particular event to divide the periods. Many argue that the beginning of the transition period started in the late 1980s, during the reforms introduced by Gorbachev, or *perestroika*. Using the date of independence as a starting point underestimates effects, however, since any changes that would have occurred before 1991 would reduce the differences between the two periods.

Because the members of the later period are exposed to 138 months of risk from time of the "treatment" (Ukraine's independence) to the time of the interview, I restrict the earlier period to 138 months before September 1991, which dates back to February of 1980. For the first birth analysis, any woman who turns 17 between February 1980 and September 1991 is included in the earlier period, and any woman who turns 17 between September 1991 and the interview date (approximately April 2003) is included in the later period. In the analysis of marital first births only, any woman who is married between February 1980 and September 1991 is included in the earlier period, and any woman who is married between September 1991 and the interview is included in the later period. For the second birth analysis, any woman who has a first birth between February 1980 and September 1991 is included in the earlier period, and any woman who has a

first birth between September 1991 and the interview is included in the later period. In the first marriage analysis, any woman who turns 17 between February 1980 and September 1991 is included in the earlier period, and any woman who turns 17 between September 1991 and the interview is included in the later period.

For first births, the hazard analysis starts at exact age 17, the age at which plotted survival curves show that the first birth rates of the two periods begin to diverge. The end month of the hazard model is either first birth or the month of censoring (September 1991 or month of interview). If a woman turns 17 between 1980 and 1991, but has her first birth after September 1991, she is censored from the model in 1991. While this approach does not include women who have first births after age 28, it captures the majority of first births, which occur at a relatively young age in this setting (mean age at first birth was 22.8 in 2000 (Perelli-Harris 2005)). I also include a comparison of non-marital and marital first births. The non-marital first birth models begin when the woman turns 17, and censoring occurs at marriage, birth, or censor date. Marital first birth models start with the month of marriage and continue until a woman has a birth or is censored. Never-married women are not included in the marital first birth models.

As described above, I also conduct separate analyses of second births and first marriages. The second birth hazard model begins with the birth of the first child and ends at the second birth or censor date. The second birth models do not include women who have not had a first birth. The first marriage models begin when a woman turns 17 and end when she marries or is censored from the model.

To analyze the hazard of having a child, I use a discrete-time hazard model:

$$\log (p_i/1\text{-}p_{it}) = \alpha_\tau + \beta_\iota x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + \ldots + \beta_\kappa x_{ik},$$

where p is the probability that a woman has a birth, $p_i/1\text{-}p_i$ is the odds that a woman has a birth, x_k represents explanatory variables, β_κ represents the effects-parameters associated with the explanatory variables, and α_τ is the constant (Allison 1995). The marriage models have the same form, except that p is the probability that a woman marries, and $p_i/1\text{-}p_i$ is the odds that a woman marries.

The analysis focuses on the woman's behavior and characteristics, even though childbearing decision-making usually occurs at the couple level. Only women's education levels are included, while men's education and employment opportunities can be very influential to a couple's decision to have a child, especially second children. I limit the models, however, because I am specifically interested in the woman's educational attainment, which usually occurs before the man becomes an integral part of the woman's life. In addition, data limitations make it difficult to reconstruct husbands' educational histories.

Independent variables

Period. As described above, this study employs a specific research design to compare two periods composed of equal numbers of years. The earlier period includes women who turned 17 or had a first birth between February 1980 and September 1991. The later period includes women who turned 17 or had a first birth between September 1991 and the interview date. Because it captures period changes, this measure can be considered an indicator of broader social change.

Educational accumulation. In this paper, I hypothesize that the effects of education on fertility change between the two time periods specified above. As in other studies, I

distinguish between enrollment in school in a given month and total school accumulation (Blossfeld and Huinink 1991, Thornton, Axinn, and Teachman1995). In the ULMS, the measure of total educational accumulation is relatively straightforward, since the survey asks the date of graduation or dropout from high school or educational institution. The models evaluate the impact of level of education completed; the analysis does not take into account any education attained after censoring. I treat highest level of education achieved as a time-varying categorical covariate, and I assume that level of education does not change until the graduation date specified in the interview. Table 1 shows the distribution of women by educational category at the time of censoring for the three types of models: all first births, marital first births, and non-marital first births[3]. Because I am interested in the changing effects of higher education on fertility rather than distinctions between lower levels of education, I have combined categories for less than high school and high school only. I have also combined categories for baccalaureate degree and master's degree due to small sample size. Because these measures reflect the respondents' level of education during the period of risk, which in some cases may be as early as 17, the educational distribution does not reflect final levels of education for the population as a whole.

(Table 1 about here)

Table 1 shows that educational attainment does not differ substantially by marital status of birth, with the exception of higher education: only 2% of women who had a non-marital birth completed higher education, while 10% of those who had a marital birth completed higher education. Approximately 18% of women completed high school plus

[3] Each model includes different numbers of respondents based on selection criteria. For example, women who married before age 17 or married before February 1980 were not included in the non-marital birth model. Only married women were included in the marital birth models.

technical school, 20% completed high school plus vocational school, and 50% of women had a high school or lower education.

School enrollment. Studies examining the effects of education on fertility need to consider temporal ordering and control for school enrollment. Women enrolled in school may feel the need to finish their education before starting a family. Family formation is frequently viewed as an adult activity, requiring role responsibilities incompatible with school (Thornton, Axinn, and Teachman 1995). In Ukraine, however, a substantial proportion of women may think they are able to combine childrearing with school; the ULMS data show that 18% of women gave birth while still in school. Other evidence shows that relative to less than secondary education, college delayed childbearing by only 3.04 years (Perelli-Harris 2005), less of a delay than expected for completion of four or five years of college (the average number of years spent in college was 4.4 years). Also, focus group respondents reported that it seemed that many of their peers started having children in their last year of college, when they were more flexible and could depend on other relatives to care for the baby. Nevertheless, because the majority of students found motherhood to be incompatible with studying, and I am interested in the total effects of educational accumulation, school enrollment is an important factor that needs to be controlled.

Measuring enrollment in school in a given month is not straightforward in the ULMS. I must make a number of assumptions about the continuity of schooling, based on a series of questions related to school or institute graduation or dropout dates, and number of years spent in a given institute. The question referring to number of years in a given institute was poorly worded, allowing for different interpretations of what

constituted a break from school. The question specified that maternity leave and army service not be included, and that the respondent not round up months of schooling, but it did not provide specific instructions on whether summer months should be included. If respondents attended school for four entire years, they usually reported studying for four years and include summers. But others, who had inconsistent school tenure, for example those who took off three months for maternity leave or those interviewed in the middle of the school year, counted the exact number of months enrolled in school. To account for these inconsistencies and breaks, I make four assumptions about the continuity of schooling.[4] In the analyses below, the magnitude of the results changes slightly based on these assumptions, but the direction or significance of the results is not influenced. Therefore, I present models in which all assumptions are included.

Marriage. As discussed above, I approach the relationship between marriage and childbearing in three ways. First, I analyze a model for all births and include a time-varying covariate for whether the respondent was married at the time of birth or censoring. This measure captures remarriages; if a respondent married, divorced, and remarried before the birth, she would be considered married at the time of the birth. Second, I analyze a model that includes only married women; the hazard model starts at the time of first marriage. Third, I restrict the model to non-marital births and censor respondents at the time of marriage. The three approaches allow for a detailed analysis of

[4] The analysis for assumption 1includes all respondents who studied continuously, with less than a six month gap between age 17 and graduation/drop dates or interview date (1402, or 80% of respondents). Assumption 2 assumes that reporting a one year gap means respondent studied continuously (89). Assumption 3 assumes that the difference between reported years and graduation/dropout dates is due to rounding errors, even though the gap is greater than one year. In assumption 3, schooling is coded as "continuous" (103). In assumption 4 I include cases in which the difference between graduation dates and years at school is greater than one year. I assume that time off was taken directly after last graduation or drop-out date (i.e. high school) and that subsequent years of schooling were continuous until next graduation/drop-out date (163).

the effects of education on first births with and without marital constraints. Finally, I show a separate model of the timing of first marriage, with marriage as the dependent variable.

Time, time-squared, and timing of marriage and first birth. Time, or number of months since the respondent turned 17 and entered the hazard model, is included as a control variable in all models. Time-squared is also included to control for the functional form. The resultant quadratic form appears to best fit the survival curve[5]. In the marital first birth models I control for age at first marriage, and in the second birth models, I control for age at first birth.

RESULTS

The changing effects of education on first births. The models presented in Table 2 show that the effects of higher education on first births within marriage reversed during the transition to a labor-market economy. The significance and magnitude of the interaction between higher education and the earlier period (column 1) supports this assertion. The sum of the raw beta coefficients for the interaction term and main effects (not shown) indicates that once married and out of school, more highly educated women who gave birth in the earlier period entered into motherhood at rates 41% *higher* than other women in the model. In the later period, women with higher education had childbearing rates that were 43% *lower* than other women. There was no significant difference by period between women with lower education, and technical and vocational education were not significantly different from high school education or less. Column 2

[5] I also tested models including log of time and time alone. The models including time and time-squared in the models provided the best fit.

shows that without the interaction term, the effects of education disappear, supporting the findings of column 1 that the effects of higher education in the earlier and later periods cancelled each other out by operating in opposite directions.

(Table 2 about here)

Columns 1 and 2 (table 2) also show that women have a 38% lower odds of having baby when enrolled in school than when not in school. Other models (not shown) illustrate the change in the effects of school enrolment over time; in a model restricted to the earlier period, women who were enrolled in school had 31% lower odds of having a birth as those not enrolled, while women enrolled in school in the later period had a 50% lower odds than those not enrolled. This result suggests that over time, more individuals did not want to combine mother and student roles. The increase in contraceptive use may have promoted this outcome; after Independence, women had greater access to a variety of contraceptives (KIIS, 2001), which most likely would have been capitalized upon by women still in school.

The survival distributions in figure 1 illustrate how the relationship between education and first birth timing changed during the post-Soviet period. The later period curve for lower education starts to diverge from the earlier period curve around 30 months (19.5 years), indicating that women with lower education have slightly lower first birth rates, although the difference mostly disappears by age 28. The difference between the earlier and later period curves for higher education, however, is much more extreme. After accounting for school enrolment delay, more highly educated women in the earlier period have very steep first birth rates and nearly catch up with their lesser educated counterparts. The curves for more highly educated women in the later period indicate a

significant delay. Thus, these curves confirm the hazard analysis results and illustrate how women with higher education started to delay childbearing.

(Figure 1 about here)

Columns three and four of table 2 reveal how these effects differ by marital status. Results limited to marital births (column 3) are consistent with those for all births, although the levels of significance and magnitude are not as large. Model four, on the other hand, which censors respondents at marriage, shows that education and period had no effect on non-marital births. This lack of results could be due to small number of events, but non-marital births in Ukraine seem to be less dependent on level of education. Women enrolled in school had non-marital first births rates that were 73% lower than those not enrolled in school. The significant results for time, but not time-squared, indicate that non-marital first birth rates slowly increase with age, as illustrated in Figure 2. Unlike in the United States where non-marital childbearing is strongly associated with teenage pregnancies (Morgan and Rindfuss 1999), non-marital births in Ukraine are spread throughout the reproductive lifespan. As in Western Europe, these births may be occurring in cohabiting unions, suggesting that non-marital childbearing is associated with new patterns of family formation and shifts towards unconventional values (Lesthaeghe and Surkyn 2002). Unfortunately, the ULMS did not include a retrospective history of cohabitation to test this hypothesis.

(Figure 2 about here)

Overall, the results for first births are consistent with predicted hypotheses, indicating that period effects had considerable consequences for childbearing decision-making, but that these effects primarily influenced more highly educated women. During

the Soviet period, married women who had completed higher degrees would have had children earlier, perhaps to achieve the ideal age of motherhood or take advantage of pro-natalist policies and maternity benefits. After Ukrainian independence, women who attained higher degrees altered their childbearing decision-making – rather than hastening childbearing they delayed it - possibly due to the new opportunity costs associated with advancing careers in a newly competitive environment, or to secure an income after the expenses of higher education, especially given that the value of maternity benefits had declined.

The influence of social change and education on second births. Column 1 of table 3 shows that on average, women in the earlier period had second birth rates 2.3 times higher than women in the later period. These results correspond with other studies showing that second births were dramatically curtailed after Ukraine gained Independence (Perelli-Harris 2005). The interaction term between education and period is not significant, indicating that more highly educated women were not delaying additional childbearing more in the later period. However, when the interaction term between higher education and earlier period is not included in the model (column 2), the coefficient for higher education is 0.64 and significant at the 0.01 level, indicating that women with higher education have lower second birth rates than their lesser educated counterparts. This result suggests that the interaction term (column 1) is picking up some of the effects of higher education for the earlier period and cancelling out the effects.

(Table 3 about here)

Figure 3 shows that the gap between first and second births dramatically increased in the later period. While before Independence, 72% of women had a second birth within

12 years of the birth of their first child, after Independence only 52% of women had second births within 12 years after the first. Because 12 years is a large gap between children, second births will most likely never be recuperated. Figure 3 also illustrates how the second birth rates of lesser educated women in the post-Soviet period are lower than those of more highly educated women in the Soviet period. Although there is some difference between second birth rates among women with higher and lower education, this graph supports the previous findings that the second birth rates in the later period do not significantly differ by education.

(Figure 3 about here)

These results support the hypothesis that social change influenced the timing of second births, although it is unclear to what extent this change operated through education. Contrary to the hypothesis suggested above, it is unlikely that women with higher education now calculate the costs of educating future children more than women with less education and therefore delay second births. Instead, because of the very low second birth rates, it is more likely that women with lower education cannot afford to have second births and are either postponing or eliminating second births similar to women with higher education. Further research needs to be conducted to determine the precise mechanisms of social change that have led to the dramatic reduction in second births.

The influence of social change and education on marriage. As discussed above, changes in the timing of childbearing could be driven by delays in marriage, and could be occurring through the mechanism of education. Therefore it is useful to look at how marriage timing has changed after Ukrainian Independence. An analysis of the influence

of education on the timing of first marriage (table 3, column 3) shows that first marriage rates declined significantly between the earlier and later periods. Marriage rates in the earlier period are 50% higher than those in the later period, indicating that social change had a great effect on marriage timing. This change, however, can not be explained by education. The interaction term between period and education is not significant, indicating that the effects of education on marriage have not changed over time.

The main effects of education on marriage have continued to be significant throughout the period. Once school enrolment is controlled, women with higher levels of education have rates of marriage that are 68% higher than women with high school education or less. Women with high school plus technical school education have rates that are 27% higher than their lesser educated counterparts (separate analyses show that the effects of higher education on first marriage are not significantly different from those of high school plus technical education). The effects are not significantly different for women with high school plus vocational school and high school or less.

Figure 4, which shows a dichotomous comparison of women with higher education and less than higher education by period, illustrates these results. While women with less education start to marry earlier, women with higher education have a much steeper marriage slope, especially once out of school. These results indicate that once women complete school, they no longer delay marriage; marriage is compressed into a few years and quickly reaches the level of their uneducated counterparts. The steepness of the slope suggests that women with higher education are more attractive on the marriage market, have fewer difficulties finding marriage partners, or were dating someone in school and married that person soon after graduating.

(Figure 4 about here)

Discussion.

This study illustrates how social change influences marriage and childbearing; first and second birth rates and first marriage rates declined dramatically in Ukraine after Independence. The study also shows how education influences multiple types of family formation; education significantly lowered second birth rates and raised first marriage rates. The key contribution of this study, however, is that it reveals how social change can reverse the direction of an important influence on behavior. The two-period analytic design allows for an interaction between period and education. The significance of the interaction term indicates that the effects of education on first birth rates reversed after Ukrainian Independence. While before Independence married women with higher education, once out of school, had higher first birth rates, after Independence more highly educated married women delayed childbearing.

The more highly educated married women, therefore, are the primary drivers of the delay in childbearing. Whereas before they would have sped up their childbearing, now they can be considered innovators in behavior, those most likely to start and continue the postponement of childbearing. As outlined in the theoretical framework, the postponement of first births could be a response to several aspects of social change. First, similar to couples in Southern and Western Europe (Kohler et al 2002, Blossfeld et al 2005), more highly educated women could be more sensitive to economic uncertainty and want to secure careers and households before starting a family. After having had to pay higher fees for education and living a frugal life as students, young couples may want

to establish themselves before taking on additional childrearing expenses. Second, young well-educated women could be experiencing the changing opportunity costs related to new career prospects in an expanding and competitive economy. Young women, even when married, may want to spend time investing in a career while their education is still relevant, rather than risk losing this educational advantage while having a child. Third, either because of selection effects or experiences while in the educational system, more highly educated women could be more exposed and receptive to ideational change, adopting the new behaviors and values associated with "the Second Demographic Transition" (Lesthaeghe and Surkyn 2002). These explanations overlap and could be occurring in some combination. Unfortunately, with this data I have no way of testing factors directly related to economic uncertainty, changing opportunity costs, or ideational change.

It is important to note that more highly educated women have not started to postpone first marriage more than their lesser educated counterparts. Throughout the transition period marriage rates declined for all women, regardless of education level, indicating that social change might be affecting all women similarly. Again, the decline in marriage rates could be the result of economic uncertainty or poor employment prospects, or it could be based on ideational factors that would promote remaining single. Also, during the Soviet period marriage was often a response to pregnancy (Perelli-Harris 2005); with increasing access to reliable contraception, couples are able to reduce unintended pregnancies and postpone marriage to a more suitable time. These factors may be leading all women to postpone marriage, regardless of level of education.

This analysis corroborates previous findings that the very low total fertility which emerged after Ukraine's independence is primarily due to the postponement or elimination of second births (Perelli-Harris 2005). Women of all education levels significantly curtailed their higher-parity childbearing behavior, and it is improbable that these births will be recuperated. The analysis shows that compared to lesser educated women, women with higher levels of education had lower second birth rates before the break up of the Soviet Union; after Independence, the difference between more highly educated and less highly educated women disappeared. Therefore, in the post-Soviet period, women with lower education may have postponed second births at similar rates as more highly educated women, because of economic difficulties. Further research needs to be conducted to account for the dramatic reduction in second births across all parities.

Again, it is important to remember that Ukraine is very different from other lowest-low fertility countries. Although the postponement of childbearing has begun for some groups, the Ukrainian mean age at first birth is very young relative to that of Western Europeans. The societal transformations that occurred in Ukraine after the breakup of the Soviet Union led to new marital and childbearing decision-making processes, but many of the traditional patterns and rationalizations have remained intact. This analysis shows that the institution of education has been one of the main conduits for social change, resulting in fertility patterns more closely resembling those in other developed countries. Before the break up of the Soviet Union, completion of higher education led to higher first birth rates, opposite to what occurred in Western Europe and the United States where education usually lowered the rate of entry into motherhood (Liefbroer and Corijn 1999). After Ukraine gained Independence, the effects of higher

education on first birth rates began to converge with those in Western Europe. This reversal occurred very rapidly – within the course of a decade. Therefore, this paper provides evidence that social change in Ukraine has led to the postponement of marriage and second births for women with all levels of education, but women with higher levels of education are the ones radically postponing the entrance into motherhood.

Table 1. Distribution of female respondents by educational category at the time of birth for first, non-marital, and marital births.

	First births [a]	Marital first births [b]	Non-marital first births [c]
N Total	1810	1528	1778
N births	866 (48%)	1302 (85%)	105 (6%)
Avg. age at birth	20.80	22.53[f]	20.42
Total respondents in earlier period [d, e]	891 (49%)	917 (60%)	877 (49%)
Baccalaureate and/or Masters degree	50 (6%)	124 (10%)	2 (2%)
H.S. plus technical school	157 (18%)	226 (17%)	19 (18%)
H.S. plus vocational school	182 (21%)	243 (19%)	20 (19%)
H.S. or less	450 (52%)	572 (44%)	58 (55%)
Missing	27 (3%)	137 (11%)	6 (6%)

a: The first birth model starts at age 17 and continues until respondent has a birth or is censored (at Sept. 1991 or at interview, depending on period).
b: The marital birth model only includes married respondents and starts at date of first marriage. Respondents are censored from the model when they give birth or at the censor date (Sept. 1991 or interview). These models do not take into account divorces that occur between first marriage and censoring.
c: The non-marital first birth model starts at age 17, but respondents are censored from the model when they marry, give birth, or at the censor date (Sept. 1991 or interview).
d: In first birth and non-marital first birth models, the earlier period refers to respondents who turn 17 between Feb. 1980 and Sept. 1991, while respondents in the later period, or the reference category, turned 17 between Sept. 1991 and interview.
e: In the marital birth model, the earlier period refers to respondents who marry between Feb. 1980 and Sept. 1991, while respondents in the later period, or the reference category, married between Sept. 1991 and interview.

f: The martial mean age at first birth is substantially higher than in the first birth model, because the hazard models start at the date of first marriage rather than age 17. Hence, the marital models include a later period of exposure to risk and would capture births that occurred after the age of 28.

Table 2. Cox regression hazard model estimates of the influence of education on first birth rates.

	1.	2.	3.	4.
Model	**First births with interaction term [a]**	**First births without interaction term [a]**	**Marital first births [b]**	**Non-marital first births [c]**
Interaction (higher education and earlier period)	2.36** (2.69)	-----	1.56* (2.21)	0.00 (-0.02)
Earlier period [d, e]	1.06 (0.75)	1.11 (1.48)	1.11 (1.55)	0.86 (-0.76)
College or higher education	0.57* (-2.10)	0.93 (-0.41)	0.71* (-2.02)	0.56 (-0.78)
H.S. plus technical school	0.86 (-1.49)	0.86 (-1.51)	0.95 (-0.65)	1.17 (0.55)
H.S. plus vocational school	0.84 (-1.82)	0.84 (-1.85)	0.94 (-0.74)	0.93 (-.25)
In school in a given month	0.62*** (-4.78)	0.62*** (-4.77)	0.73*** (-3.39)	0.27*** (-4.75)
Married in a given month	26.76*** (30.32)	26.66*** (30.29)	-------	-----
Age at first marriage	-----	-----	0.97* (-2.44)	-----
Time	1.03*** (5.34)	1.03*** (5.32)	1.06*** (8.27)	1.03* (2.08)
Time squared (multiplied by $10^{3)}$	0.78*** (-5.56)	0.78*** (-5.56)	0.30*** (-9.23)	-.16 (-1.33)
Chi-sq	2018.32***	2010.58***	248.28***	63.52***
N (months of exposure)	81,216	81,216	25,386	65,913
N (births)	839	839	1165	99

Note: Estimates are presented as odds ratios, with t-statistics in parentheses.
* p<.05; ** p<.01; ***p<.001 (one-tailed tests)
a: The hazard models for columns 1 and 2 start at age 17 and continue until respondent has a birth or is censored (in Sept. 1991 or at interview, depending on period).
b: Model 3 only includes married respondents and starts at the date of first marriage. Respondents are censored from the model when they give birth or at the censor date (Sept. 1991 or interview). These models do not take into account divorces that occur between first marriage and censoring.
c: Model 4 starts at age 17, but respondents are censored from the model when they marry.
d: In models 1, 2, and 4, the earlier period refers to respondents who turn 17 between Feb. 1980 and Sept. 1991, while respondents in the later period, or the reference category, turned 17 between Sept. 1991 and interview.
e: In model 3, the earlier period refers to respondents who marry between Feb. 1980 and Sept. 1991, while respondents in the later period, or the reference category, married between Sept. 1991 and interview.

Table 3. Cox regression hazard model estimates of the influence of education on second birth and first marriage rates.

	1. Second Births with interaction term [a]	2. Second births without interaction term [a]	3. First marriage [b]
Interaction between higher education and earlier period	0.955 (-0.16)	---	0.86 (-0.51)
Earlier period [c, d]	2.30*** (8.94)	2.29*** (9.40)	1.50*** (5.87)
College or higher education	0.67 (-1.68)	0.64** (-3.20)	1.68* (2.17)
H.S. plus technical school	0.82 (-1.92)	0.82 (-1.91)	1.27* (2.31)
H.S. plus vocational school	0.95 (-0.50)	0.95 (-0.50)	0.97 (-0.29)
In school in a given month	0.42*** (-3.53)	0.42*** (-3.53)	0.45*** (-9.54)
Age at first birth	0.96*** (-3.41)	0.96*** (-3.37)	-----
Time	1.06*** (9.91)	1.06*** (9.91)	1.03*** (6.99)
Time squared (multiplied by $10^{3)}$	1.60*** (-8.87)	1.60*** (-8.87)	0.73*** (-6.81)
Chi-square	249.61***	249.58***	313.62***
N total person months	82,425	81,805	69,232
N births/marriages	620	620	932

Note: Estimates are presented as odds ratios, with t-statistics in parentheses.
* p<.05; ** p<.01; ***p<.001 (one-tailed tests)

a: The hazard model for second births starts at the respondent's first birth and continue until respondent has a second birth or is censored.
b: The first marriage model starts at age 17 and continues until respondent marries or is censored.
c: In the second birth model, earlier period refers to respondents who have a first birth between Feb. 1980 and Sept. 1991, while respondents in the later period, or the reference category, had a first birth between Sept. 1991 and interview.
d: In the first marriage model, earlier period refers to respondents who turn 17 between Feb. 1980 and Sept. 1991, while respondents in the later period - the reference category - turned 17 between Sept. 1991 and interview.

Figure 1. Comparison of first birth survival distributions by period and education (whether female respondent turned 17 before or after 1991). Periods restricted to events occurring between Feb. 1980-Sept. 1991, and Sept. 1991-Apr. 2003.

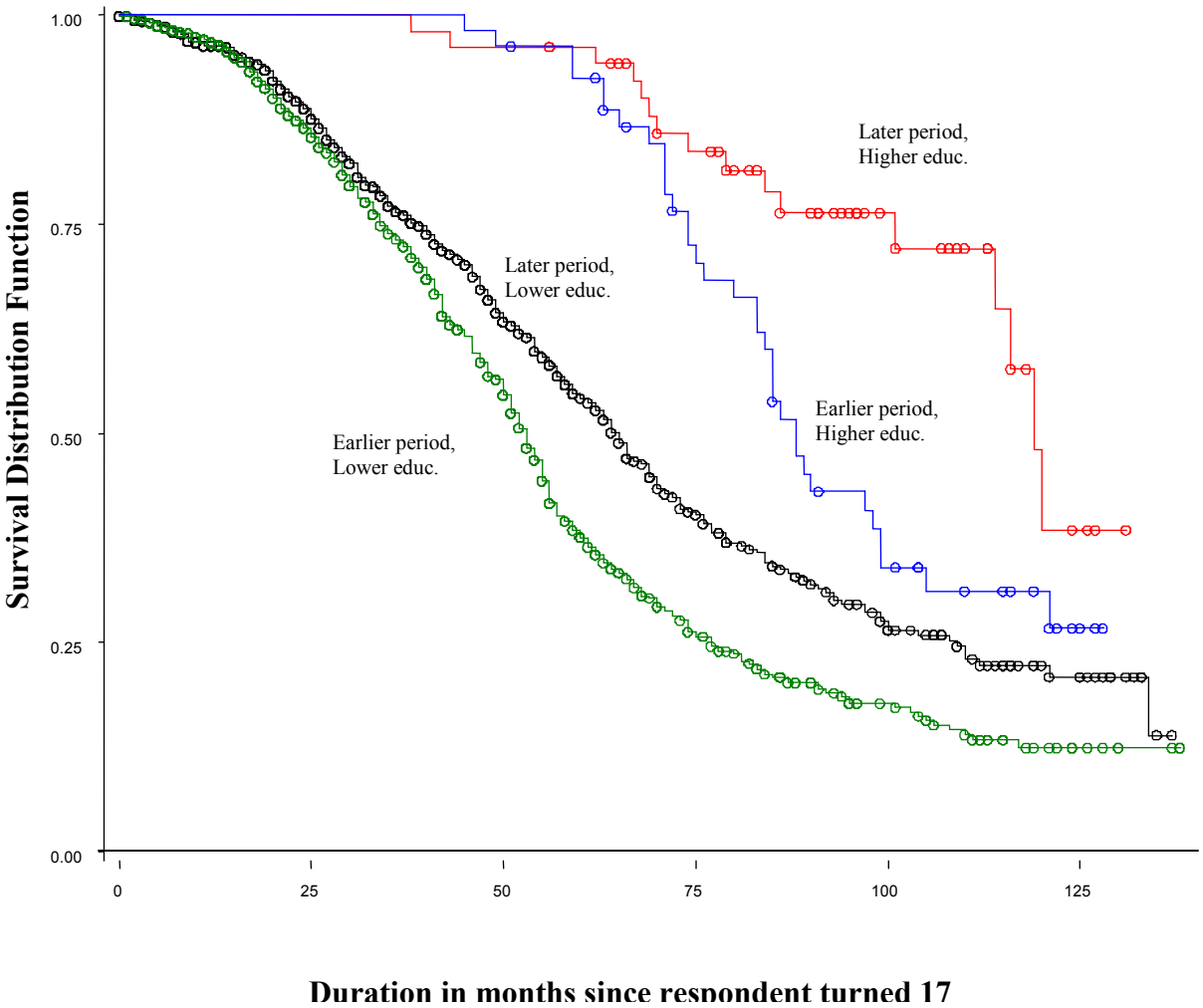


Figure 2. Comparison of first birth survival curves by period (those who had first births between Feb. 1980 and Sept. 1991 or Sept. 1991 and interview) and marital status at the time of birth.

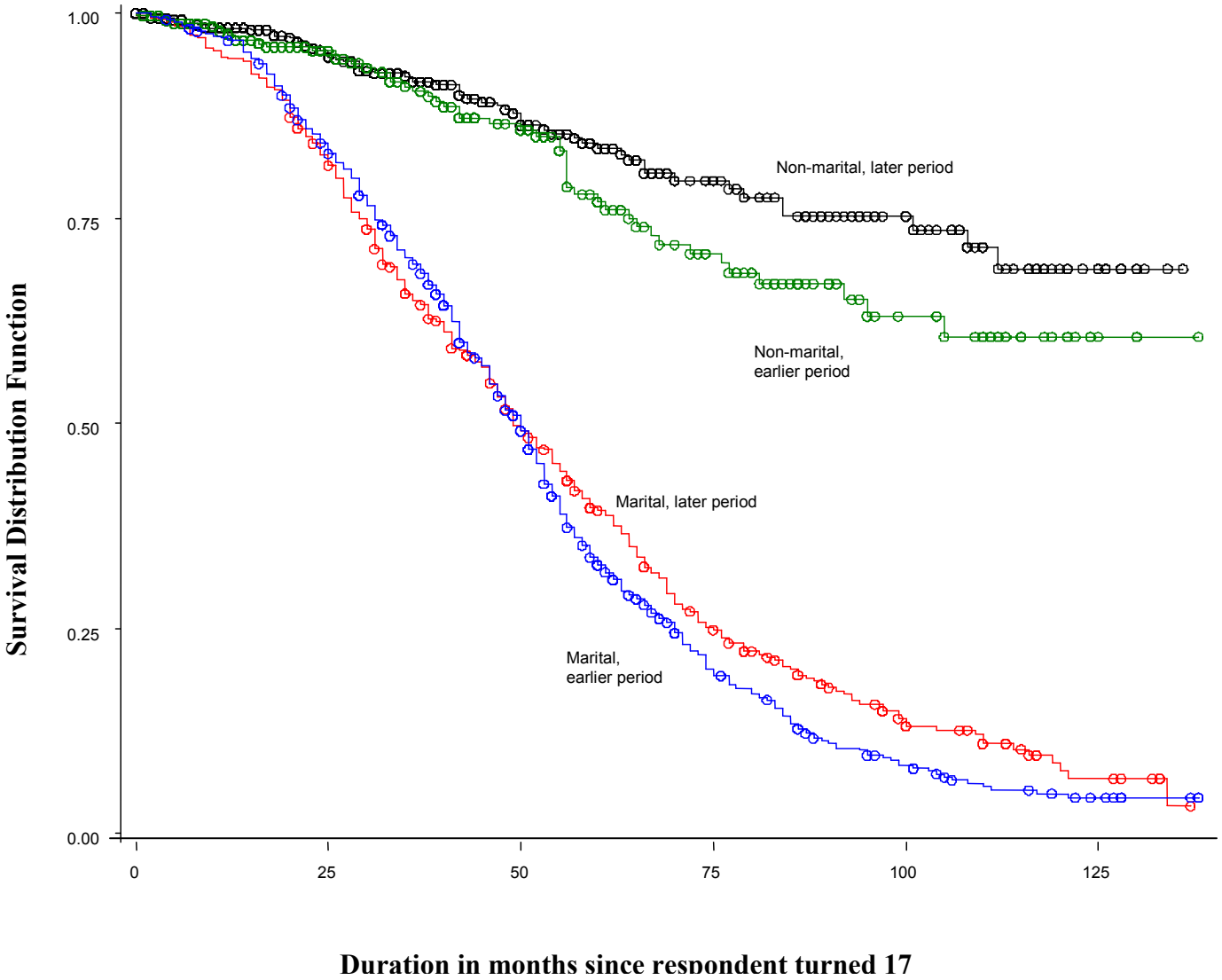


Figure 3. Comparison of second birth survival curves by period (those who had first and second births between Feb. 1980 and Sept. 1991 or Sept. 1991 and interview) by educational accumulation.

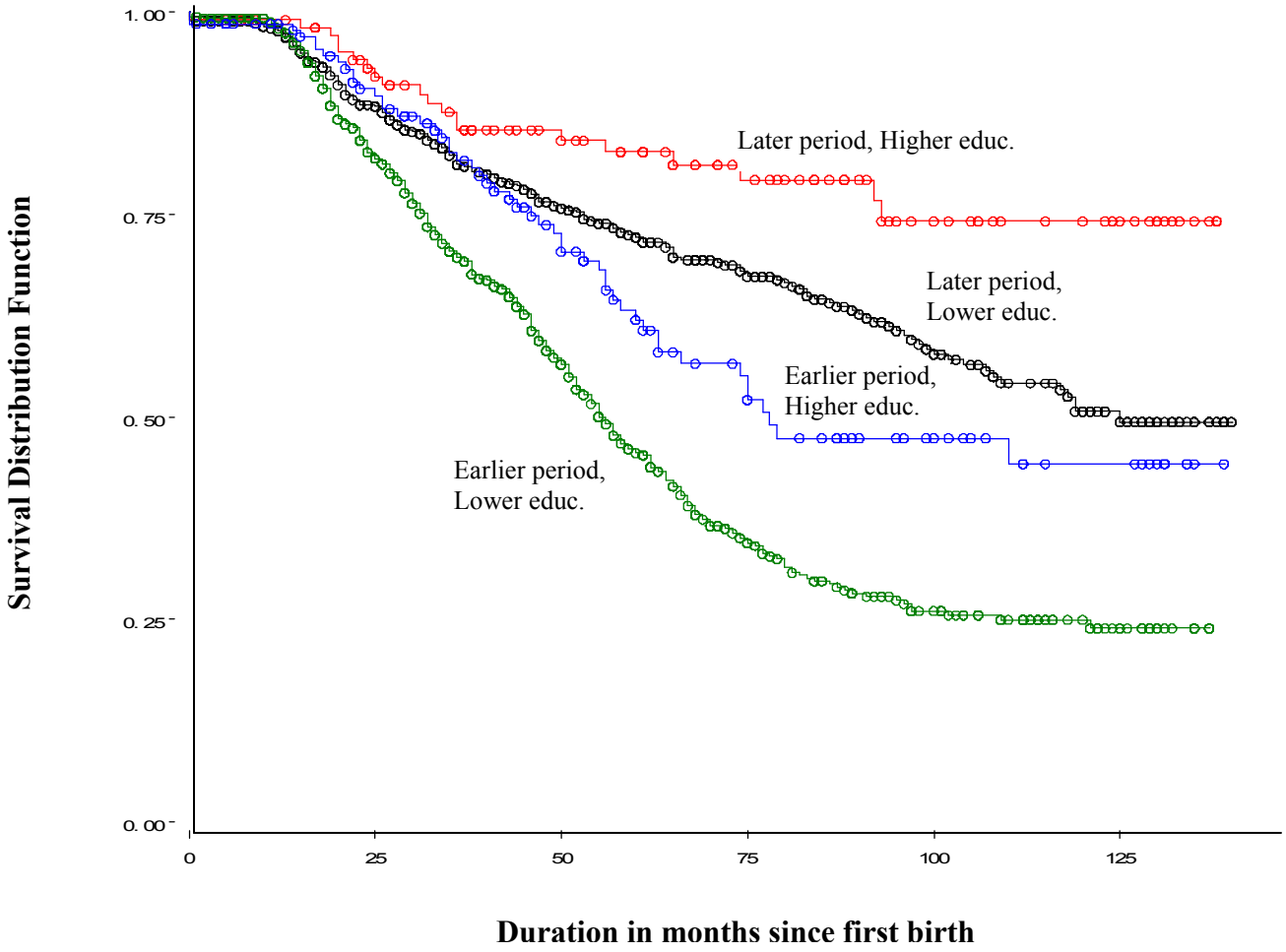
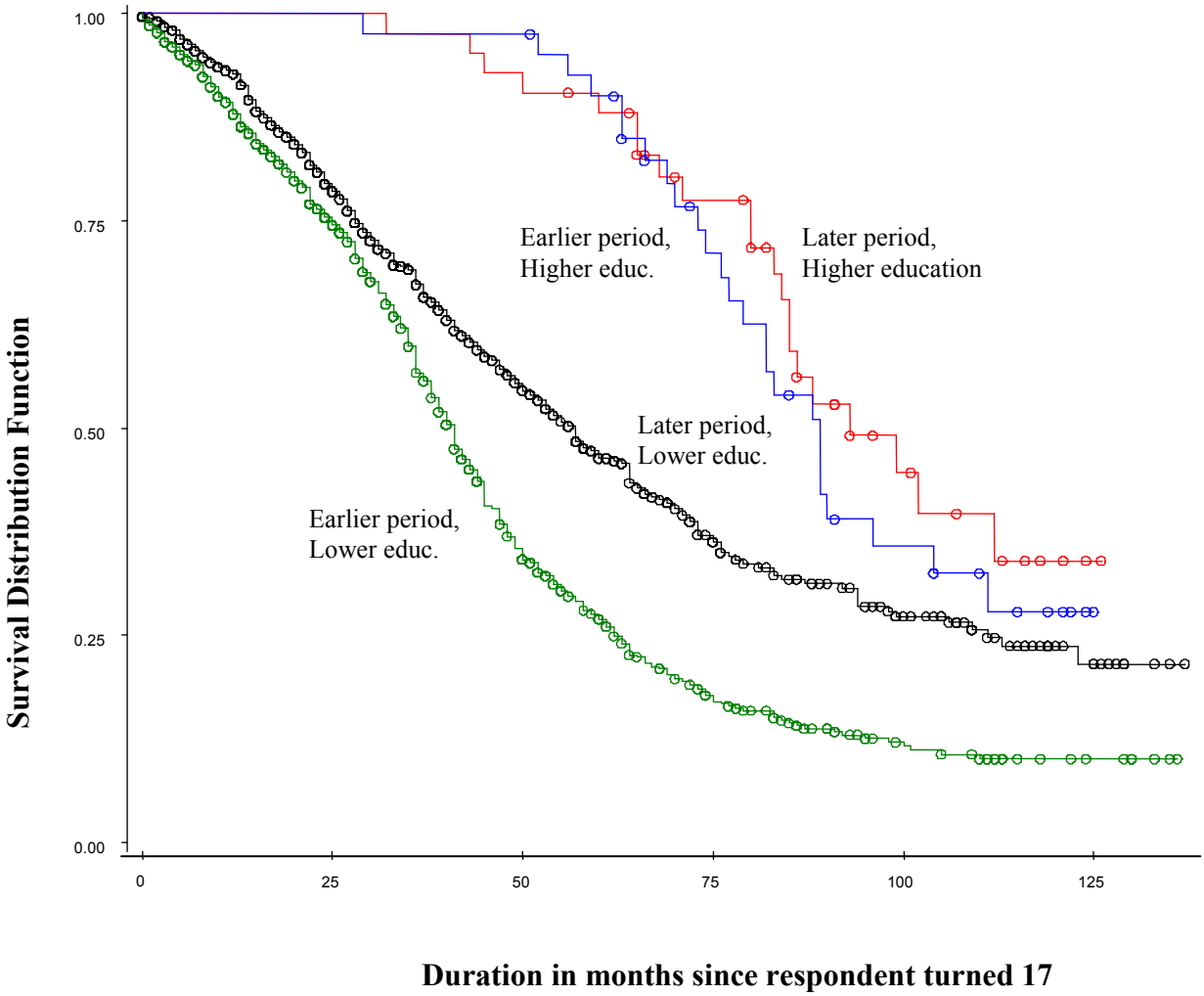


Figure 4. Comparison of first marriage survival curves by period (those who had first and second births between Feb. 1980 and Sept. 1991 or Sept. 1991 and interview) and educational attainment.



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