# Population Review

## Educational Stratification of Marriage Entry under Different Political and Economic Regimes: Evidence from the Czech Republic during the Second Half of the 20th Century

**Author:** Martin Kreidl
**Affiliation:** Department of Sociology, Faculty of Social Studies, Masaryk University
**Corresponding author/address:** Martin Kreidl, Department of Sociology, Faculty of Social Studies, Masaryk University, Brno, Czech Republic (http://www.fss.muni.cz/en/site/index.html)
E-mail: kreidlm@fss.muni.cz

**Abstract**

This paper examines changes in the effect of education on respondents' odds of entering marriage in the Czech Republic in the second half of the 20th century. The paper evaluates two competing theoretical perspectives aiming at explaining post-socialist population change: the economic crisis argument and the second demographic transition theory. Using discrete-time event-history models to predict entry into first marriage, the analysis reveals that educational stratification of marital behavior increased in the post-socialist period among women, and most probably also among men: the least educated individuals postponed and avoided marriage to a greater degree than better qualified respondents, which supports the notion that post-socialist population change responded to structural economic forces. Yet, a detailed comparison of the timing of change in marital behavior across education groups suggests that ideational change (and perceived opportunity cost of early marriage) also played a role in the post-socialist demographic change.

**Keywords**

Marriage, population change, second demographic transition, Czech Republic, post-socialism

**Introduction**

The fall of the communist regimes in Central and Eastern Europe brought about many dramatic political, social, economic as well as demographic transformations. Population change, the major focus of this article, was rapid and far-reaching and included a significant retreat from marriage (Diewald, Goedicke, Mayer 2006; Sobotka et al. 2008; Thorton, Philipov 2009). This paper analyzes changes in the association between the socioeconomic standing of individuals (as approximated by their educational attainment) and their odds of entering marriage in the Czech Republic up until 2002. The paper evaluates two competing theories concerning this association: the economic crisis argument and the second demographic transition theory (SDT). Both lead to opposing predictions regarding the effects of education on marital behavior. The economic crisis thesis predicts a positive and growing effect of education on the odds of marriage entry, while SDT proposes that all individuals will change their marital behavior to the same degree, and thus the effect of education on marriage entry would remain constant.

The paper also considers the gender dimension of changes in the educational stratification of marital behavior. While most analyses emphasize gender differences – and convergence – in the effects of education on marital behavior (Becker 1981; Oppenheimer 1988; Sweeney 2002), the historical context of the Czech society – most importantly the historically high and persistent female labor force participation and the female advantage in education – lends some support to hypotheses of continued gender symmetry in the association of educational attainment and marriage entry rates, as well as to hypotheses regarding gender-symmetric trends in this association.

*Family and fertility change after the demise of socialism in the Czech Republic*

The post-socialist population change has been a multifaceted phenomenon that includes changes in fertility, mortality, as well as family formation (see e.g. Conrad, Werner 1996; Diewald, Goedicke, Mayer 2006; Fialová, Kučera 1997; Thorton, Philipov 2009). Family formation patterns of Czech men and women were altered rather rapidly and profoundly (Hamplová 2003; Kantorová 2004b). While marriage was an almost universal experience among men and women born between 1940 and 1960 (Sobotka et al. 2008), it became less universal in later cohorts. The number of new marriages declined from 90,953 in 1990 to 74,060 in 1992, and then continued to decline to 53,896 in 1996. Later it oscillated around this level (for instance, there were 52,732 new marriages in 2002), only to begin yet another slow decline until it dropped as low as 46,746 new marriages in 2010, i.e. 51 % of the 1990 level (see Czech Statistical Office 2011a). The crude marriage rate dropped from 8.8 in 1990 to 5.2 in 1996 and 4.4 in 2010 (Czech Statistical Office 2011a).

New marriages were being established at progressively older ages. The mean age at first marriage was 24 years among men and 21.4 years among women in 1990. It grew to 27.1 and 24.9 among men and women, respectively, in 1996 (Czech Statistical Office 2011c). The rise of the mean age at first marriage continued thereafter. On average men entered marriage for the first time at 29.7 years in 2002 and at 32.2 years in 2010 (Czech Statistical Office 2011c). Women experienced similar developments, with the mean age at first marriage reaching 27.3 years in 2002 and 29.4 years in 2010 (Czech Statistical Office 2011c).

Survival analyses applied to life history data collected in surveys also confirm the retreat from marriage in Czech population. For instance, Kreidl and Štípková (2012) use data collected in 2009

to estimate the proportion of individuals who had never experienced marriage by a given age. Comparisons by cohort revealed that 50 % of the members of the pre-1975 cohorts entered marriage by age 24, while only 20 % of the 1975-1984 cohort and less than 5 % of the post-1984 cohort did so. About 75 % of the oldest cohorts entered marriage by age 32, and only 50 % of the 1975-1984 cohort did so. Hence marriage has been progressively postponed and perhaps even foregone to a significant degree in cohorts that reached adulthood after the demise of socialism.

The diversification of partnership arrangements significantly contributed to delayed and foregone marriage (Hamplová 2003; Sobotka et al. 2008; Tomášek 2006). Unmarried cohabitation stands out as the main contributing factor. The rise of unmarried cohabitation – first as a prelude to marriage and later increasingly as a permanent alternative – began in the cohorts born immediately after World War II, and speeded up to a significant degree in the cohorts born after 1970. Four out of five members of the pre-1945 cohorts chose marriage as the first type of co-residential union. In the 1950-1954 cohort, 59 % of individuals entered marriage directly, while 36 % chose cohabitation as their first co-residential union. By the 1970-1974 cohort, cohabitation already prevailed as the first union (it was chosen by 62 % of young men and women, while direct marriage was favored by 32 % of this cohort, see Kreidl, Štípková 2012).

Fertility decreased and was postponed as much as marriage. While there were 130,564 live births in 1990, there were only 90,446 live births in 1996, a decline of 31 %. Fertility remained very low until 2002, when it began to rise somewhat (there were 117,153 live births in 2010, see Czech Statistical Office 2011a). Total fertility was below replacement levels before 1989 (TFR=1.87), yet the early stage of the post-socialist transformation brought a major decline (TFR=1.28 in 1995 and TFR=1.16 in 1998, Czech Statistical Office 2011c; Rychtaříková 2000). The mean age of mothers at their first childbirth was 22.5 years in 1990, and it grew to 25.6 in 2002, and to 27.6 in 2010 (Czech Statistical Office 2011c). This trend was accompanied by increasing out-of-wedlock fertility. Less than 9 % of all live births were to unwed mothers in 1990. This share grew to 25.2 % in 2002, and reached 40.3 % in 2010 (Czech Statistical Office 2011b). Among first-born children the share of out-of-wedlock births is even higher (it was 49.5 % in 2009, Czech Statistical Office 2010).

Interestingly, little is known about the changes in the demographic indices within various sub-populations. While the social stratification of fertility has been thoroughly examined (Kantorová 2004a), no similar analysis of marital behavior has yet been conducted (although some authors have addressed similar issues in the other post-socialist countries). This despite the fact that the change in the socioeconomic stratification of marital behavior is of enormous theoretical relevance and is even more fascinating in the context of the Czech post-socialist transformation, since this began under conditions of an extremely egalitarian distribution of economic resources (Večerník 1999) and very high female labor force participation (Hašková, Klenner 2010; Kozera 1997; Paukert 1995). Furthermore, women's participation in education surpassed that of men in the late 20th century (Kreidl 2004; Simonová 2009), with major implications for the nature of the marital bargain. However, we do not know if all subpopulations have experienced similar demographic changes, or if there has been a divergence in marital behavior. The obvious questions to ask are, for instance: Has marriage entry become more strongly conditioned upon economic prospects and educational attainment during the post-socialist transition? What categories of men and women have become more/less likely to enter marriage under the new social and economic circumstances?

The post-socialist socio-economic environment is radically different from the system as it was during the last decades of the communist rule (Švejnar 1995). Economic reforms introducing market principles began immediately after the old regime fell in November 1989, and were accompanied, among other things, by rapidly declining indicators of economic performance. Real wages and GDP plummeted over the first four years of the transition. For instance, between 1989 and 1994 GDP dropped by 18.9 % and real wages fell by 14.1 % in the Czech Republic (the situation was not much different in other post-socialist countries in the region, see Paukert 1995; Plessz 2007). Inflation rose sharply as a consequence of the massive price deregulation of 1990 and 1991. For example the consumer price index grew by 17 % in 1990 alone (Dyba, Svejnar 1991). The previously extremely egalitarian distribution of incomes and earnings gave way to rapidly increasing disparity (Bandelj, Mahutga 2010; Večerník 1999a; 2009). Unemployment, which practically did not exist under late socialism, rose to 4.5 % at the beginning of 1993[1] and 8.4 % at the beginning of 1999 (Frýdmanová et al. 1999; Mareš, Sirovátka, Vyhlídal 2003). The proportion of long-term unemployed (Frýdmanová et al. 1999; Mareš, Sirovátka, Vyhlídal 2003) and the incidence of poverty and fear of poverty (Večerník 1998) grew during the first decade of the transition.

However, not everyone was impacted to the same degree by the new economic situation, since some individuals and households were better protected than others. Educational qualifications, which were previously not very well rewarded financially as centrally-administered wage schemes favored selected segments of the working class over white collar workers (Večerník 1999; 2009; Chase 1997), soon became a valued asset. Status consistency – the association between education, the socioeconomic standing of one's occupation, and earnings – began to rise, as did financial return on educational credentials (Chase 1997; Matějů, Kreidl 2001). Similarly, the association between higher education and the odds of unemployment, the effect of education on the probability of long-term unemployment, as well as the positive effect of educational attainment on the likelihood of getting out of unemployment, was strengthened (Hamplová, Kreidl 2006; Katrňák et al. 2011; Mareš, Sirovátka, Vyhlídal 2003; Večerník 1999). While women, particularly young mothers, were somewhat more impacted by unemployment (Katrňák et al. 2011), the gender wage gap was somewhat reduced in the early years of the post-socialist transition (Kozera 1997: 19).

The post-1989 governments also dismantled and reformed the socialist welfare system. These efforts had two manifest goals – to increase efficiency and reduce costs. The reforms, first embedded in social democratic and after 1992 in liberal rhetoric, included replacement of universal payments with means-tested benefits, and an overall reduction of support in many instances (Potůček 2001; Večerník 1998: 210-212). As a consequence the real value of social security spending dropped by 14 % between 1990 and 1991, and by 25 % between 1990 and 1993 (Večerník 1998: 215). Yet perhaps more important to people's lives and perceptions was the change in the political discourse surrounding these reforms. The explicit pro-natalist and family-strengthening emphasis of the late socialist rhetoric was abandoned. The old regime encouraged early marriage and childbearing through many policies, including for instance the distribution of public housing, which was almost exclusively available to married couples, and loans for young married couples (with partial reduction of loan re-payments after childbirth; Rabušic 1990). The

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[1] The rise of unemployment was somewhat mitigated by pro-employment policies (Vanhuysse 2006) as well as by some culturally embedded practices on the part of employers (see Možný 1994).

new welfare system somewhat paradoxically encouraged non-marriage and out-of-wedlock fertility, since unwed mothers could often claim higher welfare benefits than otherwise similar married women (Soukupová 2007). A survey of unwed mothers conducted in 2006 indicated that this pragmatic motivation to avoid marriage was more common among less-educated women (Chaloupková 2007).

The housing market underwent major changes that also complicated the transition to adulthood (see e.g. Lux 2009; Lux, Sunega 2010). The number of municipal and cooperative housing projects, which previously represented about two-thirds of all new apartments and houses (Možný, Rabušic 1999: 107), rapidly declined, as did individual investment into housing. The result was a deep housing shortage. While over 50,000 new dwelling units were completed in the country in 1989, only around 15,000 new residential units were completed in 1995 (Možný, Rabušic 1999: 107). Deregulated prices of housing or construction materials made it increasingly difficult to buy housing, and the rental housing sector was underdeveloped (with rents prohibitively high for most people). The housing market situation was a clear obstacle for young people to getting married and establishing new households.

*Theories of post-socialist population change*

There are two competing theoretical perspectives aimed at explaining the change in marital behavior and other aspects of population change during post-socialism: the so-called economic crisis theory and the second demographic transition view. The former theory proposes that new patterns of marital behavior were the result of poor economic performance, growing economic uncertainty, and the deteriorating situation on the housing market (e.g. Adler 1997; Frejka 2008; Eberstadt 1994; Možný, Rabušic 1999; Rychtaříková 1996, 2000; Sobotka et al. 2003). Furthermore, welfare state reform and the accompanying policy rhetoric also reduced incentives to enter marriage and increased the sense of uncertainty. Hence people increasingly tended to avoid long-term binding commitments such as marriage, which appear relatively unattractive vis-à-vis unpredictable economic environments (Adler 1997; Kohler et al. 2002). Young men and women, it is suggested, postponed establishing new households, remained single, or cohabited for longer periods of time, and marriage was frequently postponed or foregone as a result.

The second theory attributes the lowering of marriage rates to broader ideational changes. These are arguably similar to the sources of the second demographic transition (hereafter SDT), which began several decades earlier in advanced western democracies (van de Kaa 1987; Lesthaege 1995). SDT commences when societies reject traditional family-oriented altruism in favor of more individualistic orientations that emphasize "the rights and self-fulfillment of individuals" (van de Kaa 1987: 5). Many authors see the roots of the post-socialist transformation of marital behavior in the late arrival of the second demographic transition to the region (Gerber, Berman 2010; Sobotka et al. 2003; Thornton, Philipov 2009). These authors emphasize the growing real and perceived – often non-monetary – opportunity costs of early marriage vis-à-vis newly available alternatives for self-fulfillment such as quickly expanding educational opportunities, career advancement unrestricted by the Communist Party, and the opening up of the borders and new possibilities of traveling to previously forbidden destinations (Možný, Rabušic 1999; Rabušic 1996, 1997).

The economic crisis thesis is in line with theories that have been applied to investigate changes in the relationship between the socioeconomic standing of men and women and their marital behavior in several Western countries. These trends are typically theorized from the standpoint of Becker's

"specialization and trading" model of marriage (Becker 1981), its extensions or critiques (Oppenheimer 1988, 1994, 1997; Oppenheimer, Kalmijn, Lim 1997; Sweeney 2002). Becker (1981) explains the decline of marriage on the basis of the "reduced gains to marriage" thesis, which argues that growing female labor force participation and economic independence of women make the marital bargain less advantageous both for men and women.

Oppenheimer (1988) disagrees with the claim that all marriages are necessarily becoming more disadvantageous for both partners. Instead she suggests that the nature of the marital bargain is changing with growing female labor force participation. She further suggests that the status of men and women on the marriage market is becoming more symmetrical. As a result some types of marriages may have become less attractive, whereas some other marital matches may be considered more appealing. As the argument goes, potential wives are being evaluated more and more on the basis of their achieved status and earnings prospects rather than on the basis of the more traditional characteristics. Hence a women's good economic standing is increasingly positively associated with marriage (see e.g. Sweeney 2002). As women can be expected to make larger economic contributions to the household budget, men's socioeconomic standing may actually become less important for marriage (Oppenheimer, Lew 1995).

The economic crisis argument, as applied to the formerly socialist countries, suggests that the response to the crisis varies with the degree to which the crisis impacts individuals, households, and historical periods (Gerber, Berman 2010). Some individuals were – due to their individual characteristics such as the amount of human capital – better protected against the economic hardship. The strong version of the crisis argument predicts that individuals with better socioeconomic standing would not postpone marriage at all, whereas a weaker version of the theory suggests that they would postpone marriage to a lesser degree than others.

Moreover, the marital rates of the better-off should be recovering faster after the worst of the crisis has passed, since they would be the first ones to benefit from the economic upturn. By the same logic, the less educated were impacted more harshly by the crisis; therefore the reduction of the marriage rate in this group should have been deeper and perhaps more persistent once the economy has taken up again.

The second demographic transition theory – unlike the economic crisis argument – proposes that all individuals change their marital behavior to the same degree as they are all exposed to Western lifestyles and cultural patterns through the media, relatively unconstrained international travel, and other types of newly-burgeoning cross-border interaction. Thus the change in marital rates should be identical (or at least highly similar) across socioeconomically different segments of society defined, for instance, by educational attainment and employment status (Gerber, Berman 2010).

Obviously the two theories are not mutually exclusive, as both economic and ideational factors are likely to influence marital behavior. Yet their relative importance may differ across historical periods, and may also be of different relevance for individual segments of society at each stage of societal change. It is possible, for instance, that all individuals would avoid marriage during the early years of the transition due to the exposure to new values and life-styles, and that marital behavior would only become stratified at a later stage when the socioeconomic stratification of society peaks and deeply penetrates public awareness. The opposite scenario, however, is also possible: people's first reaction to the economic crisis may be strongly stratified by individual attributes such as education. Later, however, the postponement of marriage may occur at all levels

of education as individualistic values gain influence throughout society. We may also consider some more finely elaborated arguments. For example, the marital behavior of some groups may have been driven almost entirely by economic considerations, while some other groups may have responded mostly to new values.

Interestingly, these competing explanations of post-socialist population change have only been subjected to limited empirical scrutiny. Hamplová (2003) applied competing-risks event-history models to the Czech part of the 1997 Family and Fertility Survey (FSS) and found that school enrollment was a strong barrier to both marriage and cohabitation entry, and that once school enrollment was controlled in a multivariate model, educational attainment had no direct effect on entry into any type of co-residential partnership. Furthermore, she identified no statistically significant interaction between education and cohort in predicting marriage entry. This study has a number of limitations, however. First, it used cohorts to conceptualize social change, which seems to be an imperfect approach in cases where the change is so rapid and profound as it was in post-socialist countries. In this text I prefer to study change across historical periods, and I use historical periods as a time-varying covariate. Furthermore, the FSS data covered only the female part of the population, and therefore could not address the important issue of gender-related (a)symmetry in the effects of education on marriage entry rates and their (in)stability over time. Finally, my data cover a longer time period (up until 2002), so I can study both the retreat from marriage in the early years of post-socialism as well as marriage patterns in later years to see if some categories of men and women increased their marriage entry rates after the economic performance indices improved in the second half of the 1990s.

Gerber and Berman's recent paper (2010) used retrospective survey data to carry out event-history analysis of first union formation in Russia. They found a strong positive effect of education on marriage rates and identified no significant interaction of education with historical time. Furthermore, there was no negative association between men's unemployment and marriage entry after 1991. Women's unemployment, on the other hand, has a positive association with marriage entry among women. Overall, their findings do not support the notion that the retreat from marriage in Russia was driven primarily by the economic forces.

*Historical influences on the educational stratification of marriage*

Overall, our knowledge of the stability and change of the educational stratification of marital behavior during post-socialist demographic change in the Czech Republic is rather limited. This is rather unfortunate, since the Czech Republic represents a fascinating test case due to its unique historical heritage that led to very high female labor force participation, a normatively prescribed dual-earner household model, a relatively low gender wage gap, a growing female advantage in education, and rapidly rising inequality and economic returns on education.

Czech female labor force participation has been very high – in comparison to Western as well as other socialist countries – since the 1950s (Hašková, Klenner 2010; Kozera 1997). The share of the women in the labor force did not decline markedly after 1989. Whereas women represented 47.2 % of the entire labor force in the Czech Republic in 1980 and 47.1 % in 1985, their share declined only to 46.6 % by 1994 (Paukert 1995: 38) and 46.2 % by 1995 (Kozera 1997). Both men and women were leaving the labor market after 1989 to some extent, yet their rates of withdrawal were similar. While the labor force participation of working-age women dropped by 10 %, that of men

decreased by almost 7 % by 1996 (Kozera 1997: 16).[2] Nearly two thirds of the individuals leaving the labor market were past the official retirement age (Kozera 1997: 16; Matějů 1999: 159-160)[3], so labor force participation of individuals in the prime marriage age was not impacted very much: 87 % of all women aged 25-54 were economically active in 1995 (Kozera 1997). A two-earner household was established as the norm in the earlier decades of socialism and became considered a matter of economic necessity (e.g. Hašková, Klenner 2010). Both this norm and that of high employment among women persisted into the post-socialist period. Furthermore, educational expansion benefited females more than males in the 1990s and 2000s (OECD 2005; Simonová 2009), so women had increasing incentives to remain in the labor force and avoid the opportunity costs related to setting up new families and households. These incentives were further exacerbated by the prevailing traditional attitudes towards the division of domestic work in most post-socialist societies with the Czech citizens having the most-traditional values and attitudes (Klenner, Hašková 2010).

The traditionally very high and practically non-decreasing female labor force participation, combined with a normatively prescribed dual-earner model and other historically-inherited and culturally-embedded circumstances create a unique context in which to examine the individual responses to the new environment. Since both spouses had always been expected to make an economic contribution to the household budget, the marriage market situation was already more gender symmetric at the beginning of the post-socialist transition than in most other countries.[4] The marital bargain remained relatively gender symmetric in the post-socialist transition period as both genders had strong (and increasing) incentives to evaluate their potential spouses on the basis of their economic potential after 1989.[5] As a consequence, the association between educational attainment and the odds of marriage entry may have actually increased more among women than among men.

The Czech context is rather different from what we see in most other countries, and does not lend itself easily to the application of "standard" theories. The most notable difference concerns the gender symmetry of our hypotheses. I anticipate that both men and women valued economic potential in their prospective spouses to an equal extent even prior to 1989. I also predict that this tendency would have increased in both sexes after the end of communism. To formalize, I ask the following research questions:

Was marriage entry stratified by educational attainment before 1989?

Did all education categories retreat from marriage to the same degree after 1989?

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[2] Other sources confirm this development. For instance, Frýdmanová, Janáček, and Mareš (1999: 21) report that overall employment dropped by 10 % between 1989 and 1994.

[3] Frýdmanová, Janáček, and Mareš (1999: 21) document that the number of gainfully employed individuals who were recipients of the state provided pension dropped from 520,000 in 1989 to less than 300,000 in 1990 and 270,000 as of 1997.

[4] Educational attainment was a major factor in marital homogamy during socialism. However, education was not a matching criterion for its economic value exclusively (Katrňák, Kreidl, Fónadová 2006).

[5] This is not to say that the society was organized in a gender-symmetric way. On the contrary, for instance, an unequal division of domestic labor persisted with women spending about twice as many hours doing housework as men. The participation of men in domestic labor decreased after 1989 (Davis, Greenstein 2004; Křížková 1999).

Was the retreat from marriage permanent, or did some socioeconomic strata increase their marriage entry rate once the socioeconomic context improved?

If any change is identified in response to the questions outlined above, did the change concern men and women to the same degree?

**Data, methods, and analytic strategy**

I use data from a local appendix to the Czech 2002 ISSP survey on "Family and gender roles". The appendix contained (among other things) a detailed retrospective account of the respondent's marital history and labor market status. I was able to reconstruct from the survey questions in what year the respondent entered marriage for the first time. The survey also had questions regarding changes in economic activity (and their timing in calendar years[6]), which I was able to use to reconstruct respondents' history of school enrollment and (un)employment. I can utilize a total of 1,561 individuals who reported necessary variables in the survey.[7]

I analyze marriage entry data (my key dependent variable) using event-history techniques. I begin with a descriptive analysis of marriage entry with Kaplan-Meier survival graphs and I also estimate discrete-time event-history analysis as a form of multivariate analysis. I utilize a dichotomous dependent variable to indicate whether the selected respondent entered marriage in a given year or not. The model can be estimated on an appropriately modified data set of person-years using standard logistic regression procedures and general-purpose statistical software such as STATA or SAS.

Individuals come at risk of marrying at the age of 15, with the first marriages occurring at 16 (the lowest legal age of marriage). The 15 years of age category is retained in descriptive analyses (so that no individual "dies" at time 0), but multivariate models use 16 as the first age at risk (so that age 15, which predicts the outcome perfectly, does not distort the analysis). Observations are right-censored at age 36 or at the year of the interview, whichever comes first. Obviously, people leave the risk set at the time of marriage. The data set modified for the multivariate analysis, then, contains 14,286 person-years, of which 967 entered marriage.

The logistic regression model can be formally written as:

$$\ln\left(\frac{W}{1-W}\right) = a + \sum_{i=0}^{j} b_i X_i$$

where W is the probability of marriage entry, and Xi is the vector of j independent variables including time since the 15th birthday (measured in years), and possibly also some interaction between variables. The explanatory variables are both time-constant and time-varying. The only

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[6] In fact, the survey asked for the exact month of each status change. However, the number of missing values for month was so high that in my view it outweighed the potential benefits of measuring time with greater precision.
[7] The basic data set, which was representative of the adult population of the Czech Republic as of 2002, was supplemented by an oversample of individuals below age 36 (at the time of interview). I use both the oversample and the basic sample in the analysis. Both parts of the sample were selected using a stratified probability sampling procedure.

time-constant variable is gender (coded 1 for males and 0 for females). Time-varying explanatory variables include the respondent's education (with three categories: 1 - elementary education or less, 2 -vocational/lower secondary education, 3 - complete/higher secondary education or more; vocational education is used as reference category in the models), school enrollment (coded 1 if respondent attended school in the previous recorded person-year, 0 otherwise), unemployment (coded 1 if respondent was unemployed in the previous recorded person-year, 0 otherwise). Historical period is used as a time-varying covariate. I differentiate 5 historical periods (before 1970, 1970-1979, 1980-1989, 1990-1995, and 1996-2002). Finally, respondent's age is used as an explanatory time-varying variable; the exact specification of the age effect is discussed below. Some models also contain interaction effects among explanatory variables.

Figure 1: Kaplan-Meier survival curve of entry into first marriage in the Czech Republic. Number of individuals=1,561, number of events=967.
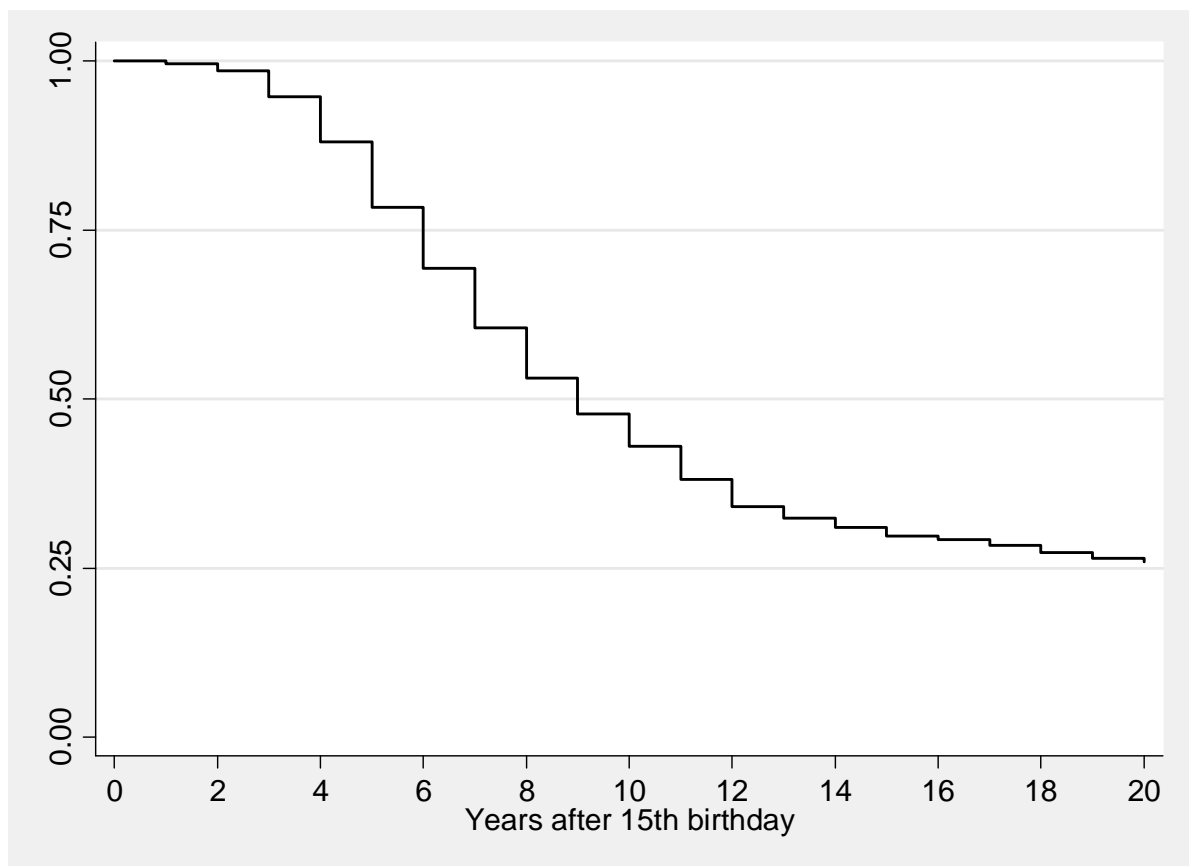


*Note: Marital history is reconstructed from retrospective questions administered in a survey in 2002. Respondents come at risk at age 15, first events occur at age 16, right-censoring occurs at age 36 (i.e. after a maximum of 20 years in the risk set) or at the interview (whichever occurs earlier).*

The analysis proceeds as follows. First, I use several descriptive Kaplan-Meier graphs to present the basic feature of the marriage entry process by gender, education, and period. Then I search for a parsimonious specification of the age effect, i.e. I search for a correct specification of the shape of the hazard, which I could use in the multivariate survival models. Then I estimate a benchmark additive model that contains the effects of all covariates on top of the age effects. Finally, I add interactions into the benchmark model to see if they improve the fit. These interactions include a two-way interaction between education and period, and a three-way interaction between education,

period, and gender. Model selection is guided by classical inference rules, but I also present BIC for interested investigators.

## Results of the analysis

*Descriptive results*

Figure 1 describes the basic features of the marriage entry process in the Czech Republic in recent decades by showing the Kaplan-Meier survival curve for first marriage entry. The figure depicts how many individuals have not entered into first marriage by a given time (as measured on the x-axis in years since respondent's 15th birthday). We can see that relatively very few individuals enter marriage before age 18, but marriage entry rates increase significantly thereafter; the increase is most pronounced after age 20. Overall, about one half of the individuals in our sample entered first marriage before their 24th birthday. Then the marriage rate slows down. About 75 % of individuals entered marriage in the window of observation. i.e. before they turned 36 (see Figure 1).

Figure 2: Kaplan-Meier survival curves of entry into first marriage by gender in the Czech Republic. Number of individuals=1,561, number of events=967.
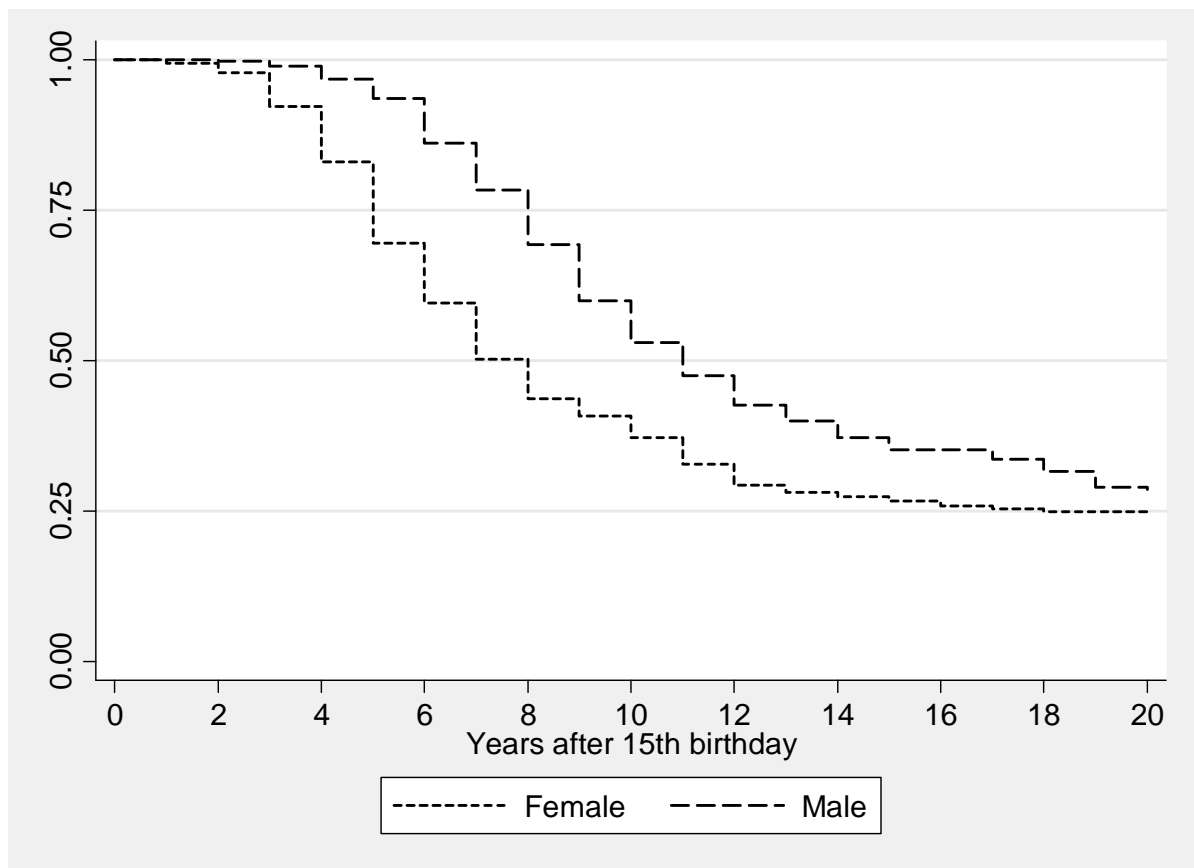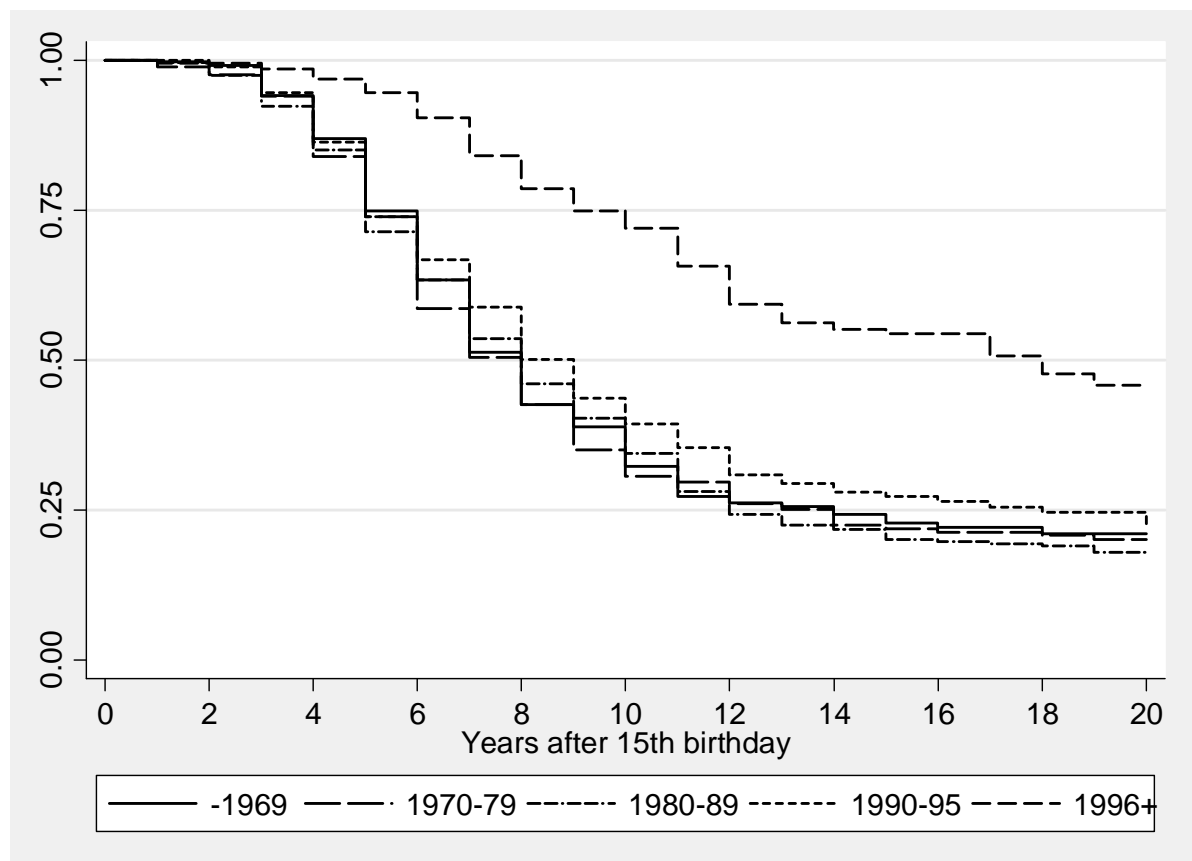


*Note: Marital history is reconstructed from retrospective questions administered in a survey in 2002. Respondents come at risk at age 15, first events occur at age 16, right-censoring occurs at age 36 (i.e. after a maximum of 20 years in the risk set) or at the interview (whichever occurs earlier).*

Figure 2 documents gender differences in the marriage entry process: women enter marriage with increasing intensity from their 18th birthday on. For instance, one half of our female respondents entered marriage by age 22, while men pass the 50 % mark by age 26. Women seem not to be entering marriage after age 30 almost at all. Some men, however, enter marriage even after 30. This tendency closes the gender gap in the cumulative entry rates. Yet more men than women survive until age 35 without first marriage (see Figure 2); this indicates that some men never marry, while some other men re-marry (and become partners in a marriage that is a first marriage for their new wives).

Figure 3 documents trends in marital behavior after 1989. While I use two periods to capture the post-1989 developments, the figure shows that the change was gradual. The 1990-1995 period shows only relatively minor deviations from the marital entry patterns of previous periods. For instance, 50 % of cases in the pre-1989 period entered marriage by age 22, while the 1990-1995 period reaches this threshold only one year later. The most recent period, however, is markedly different, with 50 % entering marriage only by age 33. Similarly, 18 % of the 1980-1989 cohort and 22 % of the 1990-1995 cohort had not entered marriage by age 35, while 46 % of the most recent cohort had not done so.

Figure 3: Kaplan-Meier survival curves of entry into first marriage by historical period in the Czech Republic. Number of individuals=1,561, number of events=967.



*Note: Marital history is reconstructed from retrospective questions administered in a survey in 2002. Respondents come at risk at age 15, first events occur at age 16, right-censoring occurs at age 36 (i.e. after a maximum of 20 years in the risk set) or at the interview (whichever occurs earlier).*

*Modeling the shape of the hazard curve*

The dashed line in Figure 4 represents the hazard of marriage entry by time in years. The estimates come from a discrete-time event-history analysis, in which time at risk was the only predictor. In order to capture the shape of the hazard with precision, the time enters the model as a set of dichotomous indicators (contrasts), i.e. it's the saturated effect of time. The hazard is very low until age 18, then it goes up very rapidly until age 20. Between ages 20-26 its remains rather high, then drops significantly between 26 and 28, slowing its decline somewhat thereafter. The shape of the hazard indicates that – when using a spline function to capture it – we might need one segment to describe the increasing risk between ages 16 and 20, and between one and three segments to describe the changes in rates of marriage entry between ages 20 and 35.

Figure 4: Hazard rate of entry into first marriage, estimates from selected discrete-time event-history models. Number of individuals=1,561, number of person-years=14,286, number of events=967.
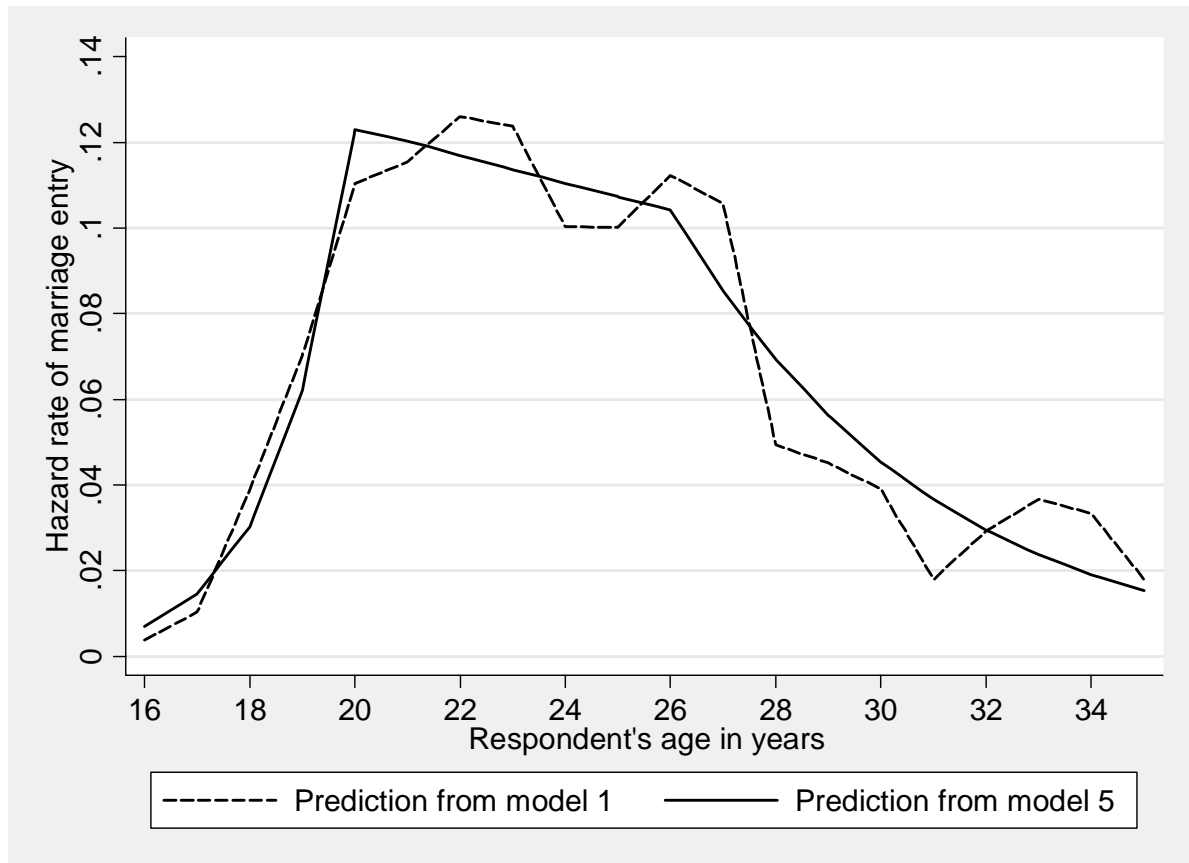


The goodness-of-fit statistics of Model 1 (the saturated model) are presented in Table 1. The table also contains goodness of fit indices of other models that I created in order to describe the hazard. Models 2-5 contain various spline functions of time, each with one or two knots placed at different ages. Model 2, for instance, uses one knot at age 21. This model achieves an unsatisfactory fit in comparison to Model 1 (a test of the null hypothesis that the restrictions implied by Model 2 are acceptable yields $L^2$=61.58 with 17 d.f., which implies p<0.00005). The fit does not improve if we move the knot to age 19 as in Model 3 on the expectation that after moving the peak of the spline function to an earlier age, the subsequently declining line – although still having one segment only

– would not deviate as much from the observed rates (Model 3, is, however, inferior in comparison to Model 1, $L^2$=91.38 with 17 d.f., p<0.00005).

Table 1: Goodness of fit statistics of selected discrete-time event-history models of first marriage entry in the Czech Republic. Number of individuals=1,561, number of person-years=14,286, number of events=967.

| Model | $L^2$ | df | p-value | BIC |
|---|---|---|---|---|
| M1: discrete time effects only | 542.37 | 19 | 0.0000 | -360.6 |
| M2: spline function of age, knot at 21 years | 480.79 | 2 | 0.0000 | -461.7 |
| M3: spline function of age, knot at 19 years | 450.99 | 2 | 0.0000 | -431.9 |
| M4: spline function of age, knots at 20 and 27 years | 514.48 | 3 | 0.0000 | -485.8 |
| M5: spline function of age, knots at 20 and 26 years | 516.53 | 3 | 0.0000 | -487.8 |
| M6: third polynomial of age | 512.34 | 3 | 0.0000 | -483.6 |
| M7: spline function of age, knots at 20, 26, and 30 years | 520.68 | 4 | 0.0000 | -482.4 |
| M8: M5 + additive effects of all other covariates (gender, education, school enrollment, unemployment, historical period) | 743.30 | 12 | 0.0000 | -628.5 |
| M9: M8+education*historical period | 755.66 | 16 | 0.0000 | -602.6 |
| M10: M9 + education*male + male*historical period + education*historical period*male | 779.39 | 24 | 0.0000 | -549.8 |
| **Contrasts** | | | | |
| M2-M1 | 61.58 | 17 | 0.0000 | 101.1 |
| M3-M1 | 91.38 | 17 | 0.0000 | 71.3 |
| M4-M1 | 27.89 | 16 | 0.0326 | 125.2 |
| M5-M1 | 25.84 | 16 | 0.0563 | 127.2 |
| M6-M1 | 30.03 | 16 | 0.0178 | 123.0 |
| M7-M1 | 21.69 | 15 | 0.1161 | 121.8 |
| M9-M8 | 12.36 | 4 | 0.0149 | -25.9 |
| M10-M8 | 36.09 | 12 | 0.0003 | -78.7 |
| M10-M9 | 23.73 | 8 | 0.0025 | -52.8 |

Model 4 uses a spline function with two knots – at ages 20 and 27. This model performs quite well in comparison to Model 1 (comparing the two using the $L^2$ yields 27.89 with 16 d.f., which leads to p=0.0326). While it is not, strictly speaking, an acceptable simplification of Model 1 by criteria of classical inference, Model 4 should be favored by BIC. We can achieve a small improvement in the model fit by moving the second knot to age 26. This produces Model 5, which performs well in

comparison to Model 1 even by the criteria of classical inference ($L^2$=25.84 with 16 d.f., which implies p=0.0563).

Table 2: Estimated parameters and Z-statistics (in parentheses) of selected discrete-time event-history models of entry into first marriage in the Czech Republic. Number of individuals=1,561, number of person-years=14,286, number of events=967.

| Variable | Model 5 | Model 8 | Model 9 |
|---|---|---|---|
| **Age effects** (spline function, knots at 20 and 26 years) | | | |
| Age 16-20 | 0.751 | 0.732 | 0.731 |
| | (15.91) | (13.98) | (13.96) |
| Age 20-26 | -0.032 | -0.016 | -0.017 |
| | (-1.71) | (-0.83) | (-0.88) |
| Age 26-35 | -0.224 | -0.250 | -0.249 |
| | (-7.17) | (-7.88) | (-7.88) |
| Male (1-male, 0-female) | | -0.569 | -0.567 |
| | | (-7.70) | (-7.67) |
| **Education** (vocational education is the reference category), time-varying variable | | | |
| Elementary or less | | -0.307 | -0.176 |
| | | (-3.13) | (-1.63) |
| Complete secondary or higher | | -0.181 | -0.136 |
| | | (-2.20) | (-1.31) |
| **Period** (1980-1989 is the reference category), , time-varying variable | | | |
| Before 1970 | | -0.018 | -0.035 |
| | | (-0.18) | (-0.34) |
| 1970-1979 | | 0.016 | 0.012 |
| | | (0.16) | (0.12) |
| 1990-1995 | | -0.153 | 0.120 |
| | | (-1.40) | (0.78) |
| 1996-2002 | | -1.016 | -0.983 |
| | | (-9.01) | (-5.69) |
| Still enrolled in school (1-enrolled, 0-otherwise), time-varying variable | | -0.295 | -0.275 |
| | | (-2.18) | (-2.03) |
| Unemployed (1-unemployed, 0-otherwise), time-varying variable | | -1.932 | -1.918 |
| | | (-1.92) | (-1.90) |
| **Interactions** | | | |
| Education*Period | | | |
| Elementary*(1990-1995) | | | -0.584 |
| | | | (-2.23) |
| Elementary*(1996-2002) | | | -0.689 |
| | | | (-1.95) |
| Complete secondary or higher*(1990-1995) | | | -0.397 |
| | | | (-1.88) |
| Complete secondary or higher*(1996-2002) | | | 0.093 |
| | | | (0.44) |
| **Intercept** | -16.977 | -15.998 | -16.020 |
| | (-18.59) | (-15.57) | (-15.61) |

Since this part of the analysis is entirely exploratory and the two models do not result in substantive differences in interpreting the process of marriage entry, I accept Model 5 as a better description of the underlying hazard function.[8] Parameters capturing the individual slopes of the spline function used in Model 5 are presented in Table 2 – the coefficients show the deviation of each segment of the spline function from zero (the effects are expressed in terms of the log odds, i.e. using the additive specification of the logit model).

Model 7 extends the spline function to four segments and three knots at ages 20, 26, and 30. This model does not deviate in any significant way from the saturated model (Model 1) as the formal test to compare these two models' returns $L^2$=25.84 with 16 degrees of freedom (p=0.1161, see Table 1). By the principle of parsimony, however, I shall prefer Model 5 over Model 7, since they achieve a comparable fit and Model 5 uses one parameter less. Also, BIC suggests that Model 5 is superior to Model 7 (BIC for Model 5 is -487.8 and for Model 7 it is -482.4). Model 7 is thus likely to be over-fitting the data.

I adopted Model 5 as an acceptable depiction of the hazard curve and the solid line in Figure 4 visualizes its shape. It appears to be a reasonable simplification of the saturated model, since it maintains all the substantively interesting features of the process of marriage entry, yet does it in a rather parsimonious way. We see that marriage entry rates go up steeply between ages 16 and 20, then they stay rather high (perhaps with a slight but statistically insignificant tendency to decline slightly) until 26. Later, the probability of marriage entry declines more rapidly on a curve that seems to be converging toward zero at later ages (see Figure 4).

*Event-history model with covariates and interactions*

I proceed in the analysis by adding all other covariates into to model to create Model 8. Its estimated parameters are presented in Table 2. The model shows the overall description of marital behavior in the Czech Republic over the second half of the 20th century. It mostly confirms the univariate results, which we have already seen. First, men are less likely to enter marriage than women. Second, the model also confirms that both school enrollment and unemployment (both utilized in the form of time-varying covariates) reduce the odds of marriage entry. Third, the effect of historical periods indicates some postponement of marriage entry in 1990-1995 (but the effect is not statistically significantly different from 0 at the 0.05 level) and a major postponement after 1996. Finally, the model somewhat surprisingly indicates a non-linear effect of education upon marriage rates, since the least and the best educated seem to be entering marriage somewhat less often than individuals in the middle of the education ladder (i.e. people with lower secondary education).

A key test of our hypothesis about the changing stratification of marital behavior is related to the interaction between education and historical period that can be added to Model 8 to create Model 9. We can see in Table 1 that this interaction is statistically significant at the 0.05 level. When

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[8] To make sure that the choice of spline specification stands as acceptable even in comparison to other strategies to describe the shape of the hazard function, I also checked the suitability of other functional forms. One of them – a model with third polynomial of age, perhaps the best of these alternatives – is also reported in Table 1 as Model 6. While it is almost as good as Model 1 by statistical criteria (but not as good as Model 5 as judged by BIC) and it reproduces the variation in marriage rates with reasonable accuracy, it has one substantive drawback. It implies that marital rates would start growing again after they declined

comparing both models using the likelihood ratio test, we obtain $L^2$ of 12.36 with 4 degrees of freedom (p-value= 0.0149). This implies that we cannot omit the interaction from Model 9 without producing an unacceptable deterioration of the quality of the model.

Estimated parameters of Model 9 are presented in Table 2. The main effect of period in this table describes the period effects for the reference category of education, which are individuals with vocational secondary education. Clearly, this group did not delay marriage between 1990 and 1995 at all, but did so between 1996 and 2002 to a significant degree (the contrast between 1980-1989 period and the 1996-2002 period is -0.983, which is a highly statistically significant effect, see Table 2).

The intensity of marital behavior developed somewhat differently for the other two education categories. People with elementary education began postponing marriage immediately after 1990 and this trend further intensified after 1996. The contrast between the 1980-1989 period and the 1990-1995 period in this group is quite large (from Table 2 we can compute its value, which is -0.464=0.120-0.584, Z-statistics to test if this contrast is different from zero is -2.02, p=0.043[9]), and it increased further to -1.672 (=-0.983-0.689) in the 1996-2002 period (Z-statistics=5.20, p<0.0005). Evidently, the least educated individuals began postponing marriage very early in the course of the transition, and this tendency only became more pronounced as society continued changing.

Young adults with complete secondary or university education also changed their patterns of marital behavior after 1989. The negative effect of time period 1990-1995 (in contrast with the 1980-1989 period) in this group is -0.277 (=0.120-0.397, Z-statistics to test difference from 0 is -1.72), which is only marginally statistically significant (p=0.086). The negative impact of historical time, however, increased to an even higher level after 1995, when it was -0.890 (=-0.983+0.093, Z-statistics=-60.5, p<0.0005). So again we see evidence of postponing marriage in this group. Yet, because of the marginal statistical significance of the effect of the 1990-1995 period, we cannot quite decide whether the postponement began immediately after 1989, or whether it was delayed until the 1996-2002 period.

The effect of historical time on marital behavior depended on education. The least educated individuals experienced immediate, large, persistent and even accelerating postponement of marriage after 1989. This change was more pronounced than that of the other education categories. People with vocational education, on the other hand, did not change their marital behavior immediately after 1989, but only after 1995. Hence this group experienced a delayed postponement of marriage. Individuals with complete secondary or college education fall between these two extremes. There is some slight indication that they had already begun postponing marriage in the 1990-1995 period, but they certainly did so after 1995.

When looking at the interaction between education and period, we can also check the changes in the contrasts between education categories over time to see more directly whether the stratification of marital behavior was stable. Effects presented in Table 2 indicate that marital behavior became more strongly linked to educational attainment in the 1990s. For instance, the log odds of marriage

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between ages 26 and 30. These considerations speak in favor of Model 5 as the best depiction of the shape of the hazard function.

[9] Some Z-statistics and p-values cannot be seen in Table 2. These were obtained by re-parameterizing the model (changing the reference categories of explanatory variables) and re-estimating it.

entry among individuals with elementary education were lower by 0.176 in the pre-1989 periods in comparison to individuals with lower secondary education (this contrast is not significant at the 0.05 level, the exact p-value is 0.104). However, the difference increased to 0.760 (=0.176+0.584, see Table 2) between 1990 and 1995 and to 0.865 (=0.176+0.689) between 1996 and 2002. The rise in the difference is statistically significant at the 0.05 for the 1990-1995 period, and is significant at the 0.1 level for the 1996-2002 period (the last contrast has |Z-statistics|=1.95, which implies p=0.051). In both post-1989 periods, the effects of elementary education are statistically different from 0 (at the 0.05 level), and are greater than in the pre-1989 periods. The negative contrast between complete secondary/college education and vocational education first increased in absolute value (from 0.136 in 1980-1989 to 0.533 in 1990-1995), and then declined to about its initial level (see Table 2).

Overall, we observed from Model 8 that marriage entry was not stratified by education before 1989. The data documented that the effect of education on marriage entry grew after 1989. Most notably, the least educated individuals became much less likely to enter marriage than the other education groups. This gap seems to have accelerated in the second half of the 1990s. The better-educated individuals (i.e. people with at least completed high school education) also experienced a relative (in comparison to individuals with lower secondary degrees) decline in the marriage rate between 1990 and 1995; yet this was a temporary phenomenon. After 1995 they again became equally likely to enter marriage as the graduates of vocational lower secondary schools.

*Has the stratification of marital behavior developed differently among men and women?*

Some historical circumstances of Czech society, such as consistently very high levels of female labor force participation, a growing female advantage in education, and the normative dual-earner household model, suggest that the marital bargain has been traditionally more gender symmetric than in other countries. Both men and women were expected to make a significant financial contribution to the household budget. Thus there were incentives for both potential marriage partners to be evaluated on their economic potential. These incentives existed to some degree under socialism and persisted, or were even more accentuated, in post-socialism. In this section I proceed to test this basic proposition, comparing the educational stratification of marital behavior and its changes under socialism and post-socialism by gender.

Empirical evaluation of the gender specific trends in the association between respondent's education and period is based on a three-way interaction between gender, education, and period. This interaction (along with the lower-order terms required by the principle of marginality) is added to Model 9, which produces Model 10. Its goodness-of-fit statistics are presented in Table 1. Model 10 appears to be better by statistical criteria than Model 9. When testing if the three-way interaction can be omitted from the model (i.e. testing the null-hypothesis that the three-way interaction and the added two-way interactions are all collectively equal to zero), we obtain $L^2=23.73$ with 8 degrees of freedom, which leads to p=0.0025. Clearly, the interaction is significant and cannot be omitted from the model! Men and women, then, differed in their patterns of and trends in educational stratification of marital behavior.

Table 3: Estimated parameters and Z-statistics (in parentheses) of a selected discrete-time event-history model of entry into first marriage (Model 10) in the Czech Republic. Number of individuals=1,561, number of person-years=14,286, number of events=967.

| Variable | Model 10 | |
|---|---|---|
| | Men | Women |
| **Age effects** (spline function, knots at 20 and 26 years) | | |
| Age 16-20 | 0.734 (13.98) | |
| Age 20-26 | -0.018 (-0.94) | |
| Age 26-35 | -0.247 (-7.8) | |
| **Education** (vocational education is the reference category), time-varying variable | | |
| Elementary or less | -0.770 (-3.66) | 0.030 (0.23) |
| Complete secondary or higher | 0.031 (0.18) | -0.170 (-1.29) |
| **Period** (1980-1989 is the reference category), time-varying variable | | |
| Before 1970 | -0.042 (-0.41) | |
| 1970-1979 | 0.018 (0.17) | |
| 1990-1995 | 0.141 (0.65) | 0.107 (0.53) |
| 1996-2002 | -1.009 (-3.96) | -0.950 (-4.27) |
| Still enrolled in school (1-enrolled, 0-otherwise), time-varying variable | -0.269 (-1.98) | |
| Unemployed (1-unemployed, 0-otherwise), time-varying variable | -1.893 (-1.88) | |
| **Interactions** | | |
| Education*Period | | |
| Elementary*(1990-1995) | 0.336 (0.76) | -0.890 (-2.67) |
| Elementary*(1996-2002) | -1.294 (-1.23) | -0.616 (-1.56) |
| Complete secondary or higher*(1990-1995) | -0.838 (-2.26) | -0.223 (-0.84) |
| Complete secondary or higher*(1996-2002) | -0.275 (-0.75) | 0.215 (0.80) |
| **Intercept** | -16.567 (-16.02) | -16.146 (-15.66) |

*Note: presented estimates are from one model. Effects that vary for men and women are presented in two columns in order to fit the table in one page. All other parameters are by definition of the model identical for men and women. The model contains a three-way interaction between sex, education, and period along with all necessary lower order terms required by the marginality principle and it also contains some other additive effects of several control variables.*

We can judge the nature of the three-way interaction when inspecting the estimated coefficients of Model 10, which are presented in Table 3 (the main effects of other covariates do not differ from

Model 8, so I do not comment on them here). There are two important and unexpected differences between men and women. Most importantly, the effects of education in the pre-1989 periods differ by gender. Furthermore, the stratification of marital behavior changed somewhat differently among men than among women.

Men's odds of marriage entry were stratified by education even before 1989. In particular, men with elementary education were significantly less likely to enter marriage (the log odds of marriage entry were lower by 0.770 in this group in contrast to men with vocational education). Women's marriage entry rates, on the other hand, were not stratified by education during the socialist period. This finding goes against my initial theoretical expectations, since I anticipated that women's earnings potential was as important for women as for men during socialism.

Men and women with vocational training experienced the same change in their marital entry rates. Their odds of entering marriage did not change in the 1990-1995 period in comparison to the 1980-1989 period. They did, however, decrease in the 1996-2002 period to a significant degree. The log odds of marriage entry declined by 1.009 and 0.950 among men and women with vocational education, respectively (see Table 3).

We see no evidence that the already-low odds of marriage entry among men with elementary education (in contrast to men with vocational degrees) dropped any further after 1989. These uneducated males, while already disadvantaged in the marriage market under late socialism, did not experience any further significant relative deterioration during post-socialism. They were postponing marriage at about the same rate as their better-educated counterparts with vocational diplomas: they did not postpone marriage in the 1990-1995 period, but did so after 1996. Model 10 reveals a fairly large point estimate of the interaction between elementary education and 1996-2002 period, but it is not statistically significant at the usual 0.05 level (the interaction is -1.294, Z-statistics=-1.23, p=-0.217). However, this point estimate is based on a relatively limited number of cases, so it is quite possible that a larger data file would confirm that the odds of marriage entry further declined among uneducated men in the 1996-2002 period.

Men with complete secondary or college education began postponing marriage immediately after 1989. Their odds of marriage entry declined in this period significantly in comparison to the other two education categories. Later, however, as the other groups also started the process of marriage postponement, the relatively lower marriage rates of the best-educated men disappeared (see Table 3).

Women with elementary education were not disadvantaged in the marriage entry process in comparison to women with higher qualifications during socialism. These less educated women, however, experienced a growing disadvantage immediately after 1989, when they apparently became less marriageable (the contrast in the log odds of marriage entry between these women and women with vocational degrees dropped by 0.890 in the 1990-1995 period, see Table 3). This relative disadvantage persisted in the 1996-2002 period. The contrast between women with vocational education and women with complete secondary or tertiary education was not significant before 1989, and remained insignificant later (see Table 3).

**Conclusions**

Theory predicted that both men's and women's odds of marriage entry should have been stratified by socioeconomic status in socialist societies, including the Czech Republic, which was examined in this paper. Moreover, this stratification, as predicted by the economic crisis interpretation of post-socialist population change, should have persisted or even increased after the transition began in 1989 towards a democratic society and market economy. The empirical analysis presented here only partially confirmed these predictions.

The likelihood of first marriage for men was indeed stratified by their educational attainment under late socialism, as the least educated men were the least marriageable. However, women's chances to enter their first marriage did not depend on their educational qualifications, which is a finding not predicted by theoretical considerations. Perhaps the explanation is that marriage was an almost universal phenomenon in the Czech Republic during socialism, and that the very small fraction of women who never entered marriage were selected on characteristics other than education (such as health). Men's status, on the other hand, was perhaps more important on socialist marriage markets because men still made, on the average, a larger contribution to the family's budget. A possible explanation for the gender disparities may also reflect differing re-marriage rates of widowed and divorced individuals, but since we lack empirical evidence on these issues I offer this as a speculative assertion only.

We observed some intensification in the stratification of marriage entry rates, but these mostly concerned women. Whereas the effect of men's education on their odds of marriage entry persisted essentially unchanged between 1990 and 2002, the effect of education increased significantly among women. Since the analysis of men's marriage rates in some education groups and periods was based on relatively few cases, and the point estimates, while fairly large, were not significant, it is possible that some substantively important changes in the educational stratification of marriage also occurred among men, but remained undetected in our analysis. Overall, I interpret the trends in the educational stratification of marriage as a confirmation of the economic crisis interpretation of the post-socialist population change.

Apart from the general trend in the educational stratification of marriage, we may consider also the timing of these changes. While Czech women and men of all educational categories experienced marriage postponement after 1989, this occurred earlier or later depending on the level of educational attainment. The early changes occurred among uneducated women and among better-educated men. While the former change can be attributed to the worsening economic situation of these uneducated females, the latter appears to be a response to the increasing opportunity costs of marriage such as education or career.

Neither females nor males with vocational qualifications changed their marital behavior immediately after 1989, but did so only in the 1996-2002 period. This indicates that their changing marital patterns were not inspired by the economic consequences of the early reform such as declining GDP, inflation and decreasing real wages. Instead it appears to be a response to the harsh situation in the labor market and growing unemployment that really was not considered a serious problem until 1996. The earlier layoffs mostly impacted older individuals, who could collect state-provided pensions and for whom employment provided only supplementary incomes. The experience of individuals with vocational qualifications also appears to be in line with the economic crisis argument.

Women with complete secondary or tertiary degrees began postponing marriage only after the mid-1990s. Their delayed response to the new environment may have stemmed from two main circumstances. First, female advantage in tertiary education did not increase markedly until the second half of the 1990s. Moreover, career opportunities for female employees opened up to a significant degree only after major international companies established their businesses in the country. These firms paid greater attention to gender equality, and it perhaps took longer for the experience of their female employees to spread through society. Thus the opportunity costs of early marriage may not have been so clear immediately after 1989 to the better-educated females. The experience of better-educated males and females is hard to explain within the framework of the economic crisis argument. Instead these individuals appear to have reacted to opportunity costs of early marriage such as education and career. Thus their changing marital behavior is perhaps more consistent with the second demographic transition argument.

Overall, the picture of the educational stratification of marital behavior and its change in the post-socialist Czech Republic is complex and defies simple description, since the initial situation, the trends and the timing of changes differ in men and women. First, contrary to our anticipation, women's marriage entry patterns were not stratified by education under late socialism. Second, we have positive evidence of growing educational stratification of marriage only among women, as the least educated women became less likely to enter marriage after 1989. We have only weak (and statistically insignificant) evidence of a similar pattern among men. The growing effect of education on marriage entry rates confirms the expectations of the economic crisis explanation of post-socialist population change.

We can, however, also examine the timing of change in marital behavior. This perspective complicates things somewhat, since only some groups began postponing marriage at the moment when it was most likely according to the economic crisis argument. This is particularly true of individuals with elementary and vocational education. The former were most heavily hit by the early economic reforms and began altering their marriage behavior immediately after 1989. The latter only began postponing marriage after 1995, when unemployment grew to a significant degree and affected skilled manual labor as well. The tempo of change among other education groups, however, appears to be consistent with the second demographic transition theory. In particular, high school and college educated men and women changed their marriage entry rates in a manner that seems to reflect the opportunity costs of early marriage.

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