ECONOMICS OF ENTRY INTO MARRIAGE

Simon W. Bowmaker

A Thesis Submitted for the Degree of PhD
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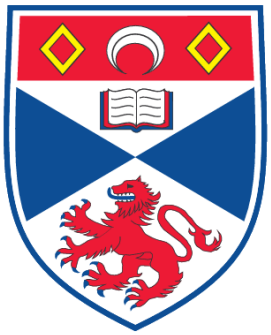
University of St. Andrews



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ECONOMICS OF ENTRY INTO MARRIAGE

A Dissertation Submitted in Partial Fulfilment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

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Simon W. Bowmaker

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Declarations

I, Simon Whitfield Bowmaker, hereby certify that this thesis, which is approximately 60,000 words in length, has been written by me, that it is the record of work carried out by me and that it has not been submitted in any previous application for a higher degree.

I was admitted as a research student in November, 2004 and as a candidate for the degree of Ph.D. in Economics in November, 2008; the higher study for which this is a record was carried out in the University of St Andrews between 2004 and 2008.

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Abstract

This thesis contains three studies on the economics of entry into marriage; a life event that has been shown to have significant implications for the well-being (economic and otherwise) of men, women and their children.

The first study examines the effect of family background on the timing of first marriage of 7,853 individuals born in 1970 in Great Britain. Hazard model analysis reveals that high levels of parental resources serve to delay entry into marriage for both males and females, although this effect fades as a young adult ages. Consistent with theories of "resource dilution", a greater number of siblings present in the household during adolescence is associated with early marriage for both sexes. It is also found that the presence of a younger sibling in the household hastens marriage for males, while the presence of a younger brother is associated with early marriage for both sexes.

The second study investigates how changes in abortion policy in Eastern Europe during the late-eighties and early-nineties may have affected female first-marriage rates. Previous studies have suggested that more liberal abortion laws should lead to a decrease in marriage rates among young women as 'shotgun weddings' are no longer necessary. Empirical evidence from the United States lends support to that hypothesis. This study presents an alternative theory of abortion access and marriage based on the cost of search that suggests that more liberal abortion laws may actually promote young marriage. An empirical examination of marriage data from Eastern Europe shows that countries that liberalized their abortion laws during the late-eighties and early-nineties saw an increase in marriage rates among non-teenage women.

The third study uses a unique and comprehensive panel of 2441 U.S. counties spanning from 1970 to 1999 to examine the relationship between the cost of owner-occupied housing and entry

into marriage. It is found that the burden of housing costs negatively affects the marriage rate. Further, it is reported that the greater the difference between the annual cost of owning a house and the annual cost of renting, the lower the marriage rate. These are important findings since they imply that government policies designed to reduce the cost of housing (such as tax advantages to owner-occupiers) have the potential to encourage entry into marriage.

1.

Introduction

1.1 Introduction

One of the most private and potentially critical decisions one makes in life is whether, when, and whom to marry. Since the last third of the twentieth century, an increasing proportion of people in developed countries have been opting to defer marriage or choosing not to marry at all. In England and Wales, for example, 22.8 men per 1000 unmarried men aged 16 and over and 20.5 per 1000 unmarried women aged 16 and over married in 2006, producing the lowest marriage rates in 144 years. In the same year, first marriage rates fell by more than one-third compared to 1981 and the mean age at which men and women married for the first time rose to 31.8 years and 29.7 years respectively, which represents more than a four-year increase in just fifteen years. Similar trends can be observed in other developed countries such as the United States [see Stevenson and Wolfers, 2007].

The decision to bear and raise children is also being increasingly decoupled from the decision to marry, resulting in a dramatic escalation in the number of children being born out of wedlock, while cohabitation has also been emerging as an important institution, either as a prelude to, or as a substitute for marriage. In the United States, among those marrying for the first time in the early 2000s, 59 per cent had cohabited with their future spouse prior to marriage (Stevenson and Wolfers, 2007). More than one-fifth of those cohabiting in 2002 had been doing so for at least five years, indicating that some couples are viewing cohabitation as a permanent rather than transitory state (Stevenson and Wolfers, 2007).

This apparent decline in marriage has prompted considerable public debate and stimulated policymakers to both advocate and execute new initiatives aimed at promoting marriage. This recognizes the importance of the institution in myriad aspects. For example, in many developed countries, the first marriage rate is an indicator that tends to reflect the welfare of adults and

children since married individuals and their children are on average wealthier than unmarried individuals and children raised with single parents (McLanahan and Sandefur, 1984; Waite, 1995). Further, marriage rates influence fertility since married fertility remains greater than unmarried fertility (Goldstein, 2002). Mean age at first marriage will also affect the mean number of children born, the timing and spacing of births (Heckman et al., 1985), and therefore the mean interval between successive generations (Lutz et al., 2003). Add the potential implications for savings and labour force attachment and it is clear that marriage has far reaching macroeconomic consequences as well.

In the United States, the Personal Responsibility and Work Opportunity Act (PRWORA) of 1996 placed the issue of marriage on the nation's legislative agenda and President Bush's "Healthy Marriage Initiative" of 2004 proposed to spend around $300 million every year for the next five years to encourage "healthy" marriages. Several economic and non-economic policies to promote marriage across the country have been introduced.[1] In the United Kingdom in 2007, the Social Justice Commission published a much-cited and controversial report recommending that the tax and benefits system should be changed to provide incentives for couples to marry and stay married.

The response of economists has been to re-examine several dimensions of the economics of marriage, such as the study of search frictions (Burdett and Coles, 1997; Seitz, 1999; Aiyagari et al., 2000; Shimer and Smith, 2000; Fernandez et al., 2001), intra-household bargaining and the allocation of resources (Lundberg and Pollak, 1996; Lundberg et al., 1997; Chiappori et al., 2002), as well as the determinants of marriage. The latter has included studies investigating the role of birth control technologies (Akerlof et al., 1996; Goldin and Katz, 2002; Choo and Siow,

2006), divorce laws (Rasul, 2003), gender wage structures (Gould and Paserman, 2003) and advances in household technology (Greenwood et al., 2005).[2]

This thesis extends the literature by providing three new studies on the economic determinants of marriage. Chapter 2 examines the relationship between family background and timing of first marriage in Great Britain using longitudinal data from the *British Cohort Study* (BCS). Chapter 3 investigates the extent to which a period of rapid change in abortion laws in Eastern Europe during the late-eighties and early-nineties affected female first marriage rates. Chapter 4 uses a unique and comprehensive dataset to examine the relationship between the burden of housing costs and marriage rates in the United States.

A detailed description of the nature, scope and contribution of the three studies is provided later in this introduction. To motivate the analysis that follows, it is necessary to outline the economic significance of entry into marriage. First, what are the gains enjoyed by a couple who marry? Second, how does marriage differ from cohabitation from an economic standpoint? Third, what is the relationship between marriage and labour market outcomes as well as indicators of adult and child well-being? The answers to these questions provide strong justification for further exploring the economic determinants of marriage in this thesis.

1.1.1 The gains from marriage

According to Gary Becker's seminal work (1973; 1974), a couple will enter marriage when there is a positive surplus generated from the union relative to the two individuals remaining single. The first gain from marriage that is expected to follow is that it allows division of labour within the household, whereby one spouse works in the job market while the other spouse focuses on household production (Becker, 1991). In so doing, each individual exploits his or her human

capital to a greater extent, magnifying small, innate differences in ability and strengthening the incentives to specialize further (Browning et al., 2005).

Becker's views on specialization have been questioned on several grounds. For example, Oppenheimer et al. (1997) note that it is possible for a married household to maximize its living standards by having both spouses work and buying housework or childcare services. Further, the decline in job market discrimination against women and the introduction of new and improved capital goods (such as washing machines and vacuum cleaners), which allow household production be undertaken using less labour, have both reduced the benefits from specialization of spouses in home and market production (Greenwood et al., 2005; Matouschek and Rasul, 2008).

A second potential gain from marriage is that the sharing of certain economic and social resources, such as housing and heating, yields economies of scale (Friedberg and Stern, 2005). Third, in two-income households, marriage allows individuals to share risk against unexpected events (Oppenheimer, 2000). Fourth, marriage can help to co-ordinate investment activities when credit markets are not operative (Weiss, 1997). For example, one spouse may invest in education, while the other spouse supports the education both directly (paying tuition fees) and indirectly (providing or paying for household activities). Evidence of such implicit credit arrangements often arises in divorce proceedings, when a wife who has supported her husband through college seeks a share of his earnings (Borenstein and Courant, 1989).

Finally, marriage is often modeled by economists as an optimal arrangement for child rearing (Willis, 1999; Weiss and Willis, 1985, 1993). Underpinning this approach is the belief that children are a public good within marriage in the sense that both parents simultaneously obtain utility from a child whilst sharing the cost of raising the child. Therefore, both parents have an incentive to co-operate to ensure an optimal allocation of resources in which each parent takes

into account his or her spouse's interest in child welfare (Smith, 2004). Any incentive for one spouse to free ride on the provision of childcare by the other is mitigated since marriage is associated with mutual interactions and relatively easy monitoring of resource allocation (Smith, 2004).

1.1.2 Marriage versus cohabitation

A problem with these theories outlining the gains from marriage is that they could be just as applicable to cohabiting relationships. There is nothing in Becker's pioneering model that makes it particular to marriage. Indeed, Becker himself (1973, p. 815) wrote that, "...'marriage' simply means that they share the same household."

One common approach in the law and economics literature is to model marriage as a contract that, in contrast to informal unions, provides legal protection for spouses. The early literature in this field focused on the benefits of legal protection for women who make costly marriage-specific investments such as bearing and raising children. By punishing a husband who leaves his family, the contractual nature of marriage is a means by which male opportunism is discouraged and optimal marriage-specific investment is supported (Landes, 1978; Pollak, 1985; Williamson, 1989). However, this theory understates the importance of male investment incentives and female adultery penalties (Smith, 2004). To address the imbalance, Edlund (2002) and Edlund and Korn (2002) suggest that the marriage contract allows a husband to share his resources in exchange for custodial rights to children, the latter being generally absent in unions formed outside marriage. Further, Smith (2004) argues that males value biological paternity more highly since there is a considerable opportunity cost associated with involuntarily investing

in another man's child. In other words, marriage represents an efficient vehicle through which paternity can be protected.

A second function of the marriage contract is that it serves as a signaling device that allows spouses to convey information to each other or to the world about the nature of their relationship. Trebilcock (1999) notes that marriage's role as a signaling device can foster improvements in the search and sorting process in the market for partners. If marriage is well-defined in contrast to cohabitating or other informal relationships, then a willingness or unwillingness to marry signals efficiently to potential spouses the relationship preferences of the signaler.

Rowthorn (2002) focuses on the broader signaling functions of marriage. He points out that being married signals to others that he or she is part of a committed (and perhaps stable) relationship and, as such, is not sexually available to outsiders. It may also be a further indication to potential employers or the government about certain characteristics of the individual such as health, reliability and ambition.

A third function of the marriage contract is that it may allow couples to obtain extra utility from following social custom (Cohen, 1987, 2002) and perhaps receive the symbolic sanction, or blessing, of the state (Bailey, 2004).[3]

1.1.3 The labour market, adult well-being and child outcomes

Marriage not only provides benefits that are more difficult to extract from a cohabiting relationship, but it also interacts with other aspects of economic and social life. The consensus view among economists is that there are significant differences between the behaviour and outcomes of the married versus the single and some of these differences may also be causal.

First, there is evidence to indicate that the behaviour of married and single men is quite different. For example, even allowing for selection bias, Akerlof (1998) reports that across a broad range of social indicators, married men in the United States are simply 'better behaved'; they commit less crime, engage in less substance abuse, drink less alcohol, and are less accident prone. Further, married men are also more attached to the labour force in various respects; they are more likely to be in the labour force, less likely to be unemployed because they quit their job, have lower unemployment rates, are more likely to be full-time-workers, and have higher earnings.

Akerlof (1998) also provides some evidence to suggest that some of these findings are causal. Most of the wage premium, for example, might be due to the differential accumulation of human capital that is prompted by marriage. Similar findings relating to higher male wages are reported by Reed and Harford (1989), Loh (1996) and Gray (1997), while Kenny (1983) and Korenman and Neumark (1991) report that married men experience higher growth of wages rather than higher levels of earnings. In summary, research seems to indicate that men develop different behaviour because of marriage.

Second, marriage has also been shown to be positively associated with adult well-being. Researchers in psychology, sociology and epidemiology have reported that, relative to singletons, married individuals have better physical and mental health (Hahn, 1993; Lillard and Panis, 1996; Horwitz et al., 1996; Simon and Marcussen, 1999) and live longer (Ross et al., 1990; Rogers, 1995; Brockmann and Klein, 2004). Moreover, formal marriage (relative to cohabitation) appears to be necessary in order to reap these benefits (Horwitz and White, 1998; Simon and Marcussen, 1999; Brown, 2000).

Research in the economics literature has focused on the effects of marriage on happiness. In a large number of countries, married individuals report higher levels of subjective well-being relative to those who have never been married, or have been divorced, separated or widowed [see Di Tella et al., 2001, for evidence relating to the United States and countries of the European Union; Graham and Pettinato, 2002, for Russia and countries of Latin America; Winkelmann and Winkelmann, 1998, Frey and Stutzer, 2006, both for Germany]. Blanchflower and Oswald (2004) have also translated the effect of marriage on subjective well-being into a monetary equivalent. Compared to being widowed or divorced, a lasting marriage is, on average, worth $100,000 per year.

Most of these economic studies are able to identify a causal effect of marriage on happiness and various theories have been proposed. For example, in addition to the traditional view that marriage increases self-esteem and reduces loneliness, Blanchflower and Oswald (2004) report that married individuals have greater levels of sex than other groups and find that sexual activity is strongly and monotonically correlated with happiness. Therefore, they suggest that married individuals may be happier than the non-married because they engage in more sex. In summary, marriage appears to exert a positive influence on the well-being of adults in terms of greater happiness as well as better physical and mental health.

Finally, research indicates that on balance children born and raised with married parents fare better on a range of outcomes compared to those from other living arrangements.[4] In particular, most studies report a benefit of marriage over most other living arrangements for children's educational and cognitive outcomes. For example, Manning and Lamb (2003) and Brown (2004) both report that teens in the United States show lower levels of school engagement if they live with their two unmarried parents than their two married parents. Hansen et al. (1997) find that

children aged 5 to 18 who live with their two married parents perform better in school than children in never-married, single-mother families and children in cohabiting step-parent families. Further, children living with divorced mothers or with cohabiting parents achieve lower school grades than those living with married parents. Similar findings are reported by Elliott and Richards (1991), McLanahan and Sandefur (1994), Haveman and Wolfe (1995), Cooksey (1997), Conger et al. (1997), Gregg and Machin (1998), and Ermisch and Francesconi (2001).

In conclusion, it would appear that entry into marriage can presage a positive change in men's behaviour in many different ways. Further, it can improve the health and well-being of both men and women, as well as enhance the ability of children to grow into productive and well-functioning adults. Having motivated the importance of further investigating the economic determinants of marriage, the remainder of the introduction is concerned with outlining the nature, scope and contribution of each study in this thesis.

1.2 Synopsis of Chapter 2: You Can't Hurry Love? An Analysis of the Effect of Family Background on Timing of First Marriage in Great Britain

A major implication of the research findings described above is that there may be significant, and potentially negative, consequences associated with the decision to delay marriage. With this in mind, Chapter 2 investigates the effect of family background characteristics on the timing of first marriage decision of 7,853 individuals born in Great Britain in 1970. The study makes an important contribution to the literature. Although previous studies using western data have investigated the effects of family size on marital timing, this study is the first to extend the analysis to include the respective impacts of sibling gender composition and birth order.

The data used in the analysis combine family background characteristics from the British Cohort Study's 1986 wave (when the cohorts were sixteen years-old) with marital history information from the survey's 1999/2000 wave (when the cohorts were thirty-years old). An advantage of using a single birth cohort is that all individuals have faced virtually the same policy and economic environment over the course of their lifetimes. Moreover, for the purpose of this study, the British Cohort Study is a particularly useful dataset in that it contains information directly relating to whether or not siblings are present in the individual's household at the age of sixteen. One disadvantage of analyzing data from only two points in time in this study is that it is not possible to examine the impact of 'intervening mechanisms' such as educational attainment on marital timing or to investigate the joint or simultaneous causal structures among several variables. However, by excluding these intervening mechanisms from the analysis, it is possible to identify the *overall* effect of family background on marital timing.

The analysis uses a Cox proportional hazards model, which does not assume a specific probability distribution for the time until an event occurs. This is appropriate for modeling the timing of first marriage since theory does not guide us to specify precisely *a priori* the distribution that ought to be used. Several important findings emerge from the study in relation to the effect of family size, sibling gender composition and birth order on timing of first marriage. The results confirm findings from previous research that indicate that greater numbers of siblings present in the household during adolescence is associated with early marriage for both sexes. In addition, for the first time using western data, it is found that for males, the presence of a younger sibling is associated with early entry into first marriage, while the presence of a younger brother hastens marriage for both sexes. These findings are consistent with theories of resource dilution.

1.3 Synopsis of Chapter 3: Abortion Laws and Marriage in Eastern Europe

As noted earlier, a number of studies in recent years have examined the extent to which birth control technology affects entry into marriage. Much of this work has focused on the respective effects of the introduction of the pill and the liberalization of abortion in the United States in the late-sixties and early-seventies. Although there have been similar changes to birth control technology in other countries, research into its effect on entry into marriage has been very much neglected. The third chapter of the thesis is the first study to investigate how changes in abortion policy in Eastern Europe during the late-eighties and early-nineties may have affected female first-marriage rates. It is primarily motivated by the work of Levine and Staiger (2004) who found that over the 1980 to 1997 period in Eastern Europe, liberalization of abortion laws was associated with an increase in the number of pregnancies in the region. A natural extension to their analysis is to examine whether the switch in abortion laws may have also induced changes in the propensity to marry.

The first contribution of the chapter is to present a theoretical model that shows how, contrary to conventional wisdom, liberal abortion laws have the potential to speed up entry into marriage. It is argued that a woman can learn about the suitability of a potential spouse (that is, separate the 'Dads' from the 'Cads') through one of two channels: either slowly through time obtain information relating to the man's attitude toward parenthood and marriage or choose to become pregnant and quickly learn this information. The adoption of liberal abortion laws may lower the cost of the second strategy and raise the number of pregnancies among women. As a result, some of these pregnancies may lead to marriage.

The aggregate data used in the analysis cover the period 1980 to 1997 and focus on twelve Eastern European countries. Much of the data are taken from international compilations such as

the Council of Europe, United Nations, and World Health Organization. One advantage of studying this particular region is that it experienced major and diverse changes in abortion laws over the two decades in question. Further, some of these changes took place at a time of significant turmoil in the region and this represents a good opportunity to examine whether an economic crisis increases the gains from marriage. One disadvantage of using data from the region over this time period is that it is not possible to obtain all relevant information that might help explain changes in marriage patterns, including figures relating to cohabitation and the use of contraceptive technology such as the pill.

The principal focus in the analysis is on examining the extent to which changes in abortion laws affect first marriage rates of females within different age groups. This is appropriate since the study's theoretical framework emphasizes that a female's propensity to adopt either a 'learning through time' or 'learning through pregnancy' strategy will depend on her age. Across several model specifications, fixed effects estimation reveals that the status of abortion laws has a significant impact on the female first-marriage rate. The marked variation in abortion law changes across the region allows the analysis to distinguish between highly restrictive, moderately restrictive and largely unrestrictive regimes. It is found that the switch from an abortion law regime with only moderate restrictions to one in which abortion is available upon request (largely unrestrictive) is associated with an increase in first-marriage rates among non-teenage females. This is a unique finding and one that is particularly robust for women in the 25-29 year-old age group. It also offers support for the theory that females may use pregnancy as a mechanism to screen 'Dads' from 'Cads', provided they can abort if the information received is negative.

1.4 Synopsis of Chapter 4: Bricks, Mortar and Wedding Bells: Does the Cost of Housing Affect the Marriage Rate?

The relationship between the state of the housing market and the propensity to marry has been neglected in the economics of the family literature. This is somewhat surprising in light of anecdotal evidence that suggests that prospective couples consider housing factors when making the decisions of whether and when to marry. Chapter 4 fills a gap in the literature by examining whether the cost of owner-occupied housing affects the marriage rate in the United States.

To motivate the analysis, a simple theoretical model is presented that argues that the decision to marry is intertwined with the decision to buy housing that is suitable for married life. The prediction from the model is that when the costs of being married (that include the cost of housing) increase relative to being single, individuals will be less likely to marry.

The empirical analysis uses data on a panel of 2441 U.S. counties spanning from 1970 to 1999 and a major contribution of this study is that it is the first time that county-level marriage rates have been collected and examined over this time period. The marriage rate data were obtained from the *National Vital Statistics System* of the *National Center for Health Statistics* (NCHS) and collected directly from Vital Statistics units on a state-by-state basis since the NCHS ended its publication of marriage data in 1988. The advantages of using these data over survey data such as the *Current Population Survey* are three-fold. First, they are more useful than stock data from surveys for examining the determinants of marriage flows. Second, they represent a “near universe” of new marriages. Third, they are less subject to measurement error compared to survey data. One disadvantage is that it is not possible to compare effects across different age, race and occupational groups. Further, the data are collected by county of marriage

occurrence, not by county of residence, and so this could potentially bias the results from the study.

The bulk of the economic and demographic data are taken from the U.S. Census, which results in extensive use of interpolated values for the intercensal years. The principal variable of interest is the housing cost burden that is constructed as the ratio of the flow value of owner-occupied housing units (that is, the median value of housing in a county multiplied by the mortgage interest rate) to per capita income. This measure represents a reasonable approximation of the annual cost of servicing the payments on a home.

The analysis uses fixed effects estimation and the findings indicate that a higher cost of owner-occupied housing is associated with a lower marriage rate. Moreover, it is also reported that the greater the difference between the annual cost of owning a house and the annual cost of renting, the lower the marriage rate. Clearly, housing circumstances have real effects on marriage rates and these results have potentially major implications for government policy. As noted at the beginning of this introduction, policy-makers have expressed concern at the decline in the propensity to marry in recent years and this study's findings suggest that initiatives aimed at reducing the cost of housing have the potential to encourage marriage.

The final chapter of the thesis summarizes the contribution of each study, draws attention to significant weaknesses in the economics of marriage literature, and identifies important questions for future research.

Notes

[1] For example, since 1996 a $100 cash incentive per month has been offered to married couples in West Virginia. In 1997, Louisiana became the first state to pass a covenant marriage law (in which marrying couples agree to obtain pre-marital counseling and accept more limited grounds for divorce) and Arizona and Arkansas followed suit in 1998 and 2003 respectively. Seven states (Arizona, Louisiana, Michigan,

New Mexico, Oklahoma, Utah, and Virginia) also spend a significant proportion of Temporary Assistance for Needy Families (TANF) funds on actions specifically aimed at strengthening marriage and parental relationships. In addition, in the Jobs and Growth Tax Relief Reconciliation Act of 2003, the federal "marriage penalty" was substantially reduced.

[2] It is beyond the scope of this introduction to provide a comprehensive survey of the economics of marriage literature or even the entry into marriage literature. The individual chapters that follow the introduction will discuss previous studies of specific relevance.

[3] There are also greater costs attached to exiting a marriage relative to those associated with exiting a cohabitating relationship. This view emphasizes the myriad transaction costs that accompany most, if not all, divorce negotiations. Such costs may arise because of the presence of liquidity constraints or asymmetric information relating to the value that each spouse places on maintaining the marriage (Matouschek and Rasul, 2008). The fees that are paid to divorce lawyers as well as certain legally imposed restrictions, such as mandatory separation requirements, are additional examples of transaction costs that are faced by couples in the process of divorce; costs that tend to be less relevant for those exiting a cohabiting relationship.

[4] It is acknowledged that couples who have children out of wedlock tend to be selectively different from those who marry before having children. In particular, unmarried parents are usually of lower socio-economic standing (Brown, 2004; Osborne and McLanahan, 2004), face relatively poor prospects in the marriage market (Rosenzweig, 1999), and are likely to be less assortatively matched (Jaffe and Chacon-Puignau, 1995; Garfinkel et al., 2002). Therefore, there are potential difficulties involved in interpreting differences in child outcomes between children born to married versus unmarried parents since any observed variation may reflect these advantages of married parents rather than any intrinsic gain from marriage itself (Heiland and Liu, 2004).

2.

You Can’t Hurry Love? An Analysis of the Effect of Family Background on Timing of First Marriage in Great Britain

2.1 Introduction

Despite the emergence of a burgeoning literature in the field of the economics of marriage, the determinants of an individual's marriage timing decision are yet to be fully understood. This chapter identifies family background characteristics that might be expected to influence the timing decision, and estimates the magnitude of their effects. As noted in the introduction to the thesis, economic models of marriage tend to posit that an individual will wed when the benefits generated from marriage exceed those associated with remaining single (Becker, 1973; 1974). In the timing of the marriage decision, it is not these benefits that are crucial, but the advantages attached to marrying sooner rather than later, and there are strong theoretical reasons to expect that family background may affect this decision. For example, high levels of parental resources may raise a young adult's consumption aspirations such that marriage is postponed until he or she has attained a relatively comfortable standard of living. On the other hand, an individual with a large number of siblings in the family home will face greater competition for parental resources, and this may spur early entry into marriage.

The chapter uses longitudinal data from the *British Cohort Study* (BCS) to estimate a hazard model of the time to first marriage for 7,853 individuals born in 1970. The dependent variable (days from birth until date of first marriage) is constructed using marital history reported in the 1999/2000 wave of the BCS when the cohorts were 30 years-old, and the covariates relating to family background are constructed from the 1986 wave of the survey when the cohorts were 16 years-old. Previous studies using western data have examined the effects of family size on timing of first marriage, but this is the first study to extend the analysis to include the respective effects of sibling gender composition and birth order. The main finding is that the presence of

one or more younger siblings in the household is associated with early first marriage for males, while the presence of one or more younger brothers hastens marriage for both sexes.

The chapter proceeds as follows: Section 2.2 provides a brief review of the existing literature that explores the relationship between family background and marital timing. Section 2.3 shows how a traditional economic model of the process by which a person finds a spouse can be modified to develop predictions about the influence of family background on marital timing. Section 2.4 describes the study's dataset and econometric approach. Section 2.5 discusses the results. Section 2.6 offers some concluding thoughts.

2.2 Previous studies

Family background in the context of this chapter consists of three principal dimensions: parental resources, parental marital status, and family composition. The purpose of this section is to provide a review of the existing literature that examines how these aspects affect timing of first marriage. From the outset, it should be noted that much of this research is found in the sociology and demography literature. However, the findings from these studies provide a useful backdrop to help capture the influence of family background in the economic model of marital timing presented in Section 2.3.

2.2.1 Parental resources

Economic models of the family tend to view the household as a productive entity in which parents make decisions about allocating resources to their children. In general terms, the more resources available to the parents, the more will be expended on a child, in terms of both money

and time. Similarly, the greater the competing demands for parental resources, the less will be allocated to a child (Rosenzweig and Schultz, 1983; Lazear and Michael, 1988; Becker 1991).

It follows that high levels of parental resources tend to be associated with a more advantageous and comfortable environment in which a young adult is raised. For example, it is often hypothesized that high parental income represents the most obvious way in which parents can provide children with material necessities and luxuries (Axinn and Thornton, 1992). Further, being raised in a prosperous home environment may also foster high consumption aspirations of children. One consequence will be that a young adult delays marriage until he or she has reached a certain standard of living. Easterlin (1987) argues that the latter translates into a young adult's meeting or exceeding the economic circumstances in which his or her parents established a family.

High levels of parental income are also a means by which parents can provide better schooling for their children. For instance, greater access to financial resources can allow parents to move to areas where there are good schools and it may also provide funding for higher education (Axinn and Thornton, 1992).

Similarly, high levels of parental education can enhance parents' ability to provide an attractive home environment in a number of non-material ways (Axinn and Thornton, 1992). Therefore, a young adult who enjoys these home comforts will be reluctant to leave the family home at an early age through marriage or other paths (Avery et al. 1992).

Axinn and Thornton (1992) argue that the more education, income, and assets that parents possess, the greater is the likelihood that they believe that their children should delay marriage. Indeed, parents with these levels of resources may be able to prevent premature marriages for the sake of more ambitious socio-economic aspirations for their children. Waite and Spitze (1981)

argue that parents can decide to employ their resources to postpone the marriages of their younger, unmarried children, and attempt to accelerate marriage among their older, unmarried children. In a sense, therefore, parental resources can be used to achieve an appropriate 'structuring' in the marriage order of children.

Empirical support for this latter argument is found in Avery et al. (1992) who report, using U.S. data, that the impact of parental income on marriage differs by the age of the young adult. For example, levels of parental income are reported to have a strong, negative effect upon marriage for teenagers. The effect of parental income on marriage for those aged between 25 and 29 is positive, although small and not statistically significant. In light of their findings for teenagers, the authors conclude that parents do use their resources to deter premature marriage for their children.

The effects of parental resources on marital timing may be expected to weaken with the child's age. Resources provide children with opportunities that may conflict with early marriage such as school enrolment, but once children complete their education, the impact of parental resources on marital timing is likely to fade (South, 2001). Using birth records from Detroit, Michigan, Axinn and Thornton (1992) find empirical support for this theory; high levels of parental education reduce the probability of early marriage for children, but this effect becomes weaker as children age. Similarly, using data from the U.S. *Panel Study of Income Dynamics*, South (2001) reports that high levels of maternal education serve to delay marriage for a young adult, but again this effect dissipates at older ages.

There are two theories that predict that the greater is the level of parental resources, the *earlier* will children leave home to marry. First, Goldscheider and DaVanzo (1989) argue that if parents have a demand for privacy, then the price at which they will be willing to subsidise the

purchase of a house will increase with income. In other words, parental income will be negatively correlated with the age at which a young adult leaves home to marry. Second, Aassve et al. (2002) suggest that high parental resources (particularly income) may increase the desirability of young adults in the marriage market. This is known as the 'good catch' effect.

In terms of empirical findings, Goldscheider and DaVanzo (1989) examine data from the *National Longitudinal Survey of the High School Class* (*NLS*) of 1972 and report that high levels of parental income unambiguously increase the probability of early marriage for young adults, although high levels of parental education decrease the probability of leaving home for marriage. Examining U.S. data from the *National Longitudinal Survey of Youth* (NLSY) over the period between 1979 and 1992, Aassve et al. (2002) find that high parental income is associated with delayed entry into marriage.

In summary, therefore, there appears to be no consensus, either theoretically or empirically, about the direction in which parental resources affect the timing of first marriage.

2.2.2 Parental marital status

A common finding in the family background literature is that children who have experienced parental divorce are more likely to divorce themselves (Bumpass and Sweet, 1972; Pope and Mueller, 1976; Glenn and Shelton, 1983; Kiernan, 1986; Keith and Finlay, 1988; McLanahan and Bumpass, 1988; Amato and Keith, 1991; Kiernan and Hobcraft, 1997; Feng et al., 1999; Kiernan and Cherlin, 1999). Further, a large body of work also reports that children who have experienced parental divorce (and particularly those with stepfamilies) are more likely than children raised by both parents to leave home at an early age (see, for example, Goldscheider and

Goldscheider, 1989, 1993 on the United States; Kiernan, 1992 on Great Britain; Mitchell et al., 1989 on Canada; Young, 1987 on Australia).

However, there is no agreement among researchers about the impact of parental divorce on entry into first marriage. One argument is that if a child wishes to leave home at an early age, then marriage represents one potential 'escape route'. Indeed, there is some empirical support for the theory that parental divorce will be associated with early entry into first marriage (see McLanahan and Bumpass, 1988; Keith and Findlay, 1988; Bumpass et al., 1991; Thornton, 1991; Bracher et al., 1993, Axinn and Thornton, 1993; Goldscheider and Goldscheider, 1998; Gruber, 2004).

On the other hand, an alternative theory argues that children from disrupted families will tend to marry at a *later* age (or not all) compared to children from intact families, even if they leave home at an earlier age. The reason is that parental divorce fosters a negative attitude toward marriage (Thornton and Friedman, 1982; Thornton, 1985; South, 2001). In the words of Axinn and Thornton (1996, p.67), "…children's experiences of living through their parents' bad marriages, unpleasant divorces, and related negative experiences sour their own feelings about married life".

Empirical support for the theory that parental divorce is associated with late entry into first marriage has been found by Goldscheider and Waite (1986) and Lichter et al. (1992). Meanwhile, Thornton (1991), Kiernan (1992), and Cherlin et al. (1995) find that children with divorced parents are not any more likely to marry at younger or older ages than children from intact families. Earlier research by Kobrin and Waite (1984) found a 3 to 6 percentage point reduction in the probability of marriage occurring at each age associated with childhood family disruption and little evidence to suggest that these deficits are made up by increases in the

likelihood of marrying at later ages. They conclude that the net impact of parental divorce is increased 'non-marriage'.

In summary, there appears to be agreement in the literature that parental divorce is associated with early nest-leaving, but there is much disagreement about how this affects the timing of first marriage, or even the probability of marriage ever taking place.

2.2.3 Family composition

The presence of a large number of siblings in the family home is likely to be associated with greater competition for resources (including space and parental attention), a lack of privacy and the possibility for sibling conflict (Mitchell et al., 1989; Avery et al., 1992). Therefore, these "crowding" or "resource dilution" effects within the household may lead a young adult to leave the nest at an early age and, in turn, this raises the probability of early entry into marriage.

There is considerable empirical support for this theory. Using the *NLS*, Goldscheider and DaVanzo (1989) report that a greater number of siblings, whether in the household or not, is associated with early nest leaving for males, but not for females. Using the NLSY, Michael and Tuma (1985) find that additional siblings in the household increase the probability of early marriage for white and Hispanic females.

Another dimension of family composition relates to the effects of birth order and sibling sex composition on marital timing. Angrist et al. (2005) construct data from a matched dataset linking the 1983 and 1995 Israeli censuses with information on the demographic structure of families from a population registry. They find that first-born girls from large families marry sooner. Having a second-born sister imposes pressure on the oldest to marry and this is consistent with traditional Jewish values. It is also suggested that older sisters in Israel who wish

to establish an independent household may have an incentive to marry sooner when "crowded" by younger sisters.

In summary, the literature reviewed above seems to provide fairly conclusive evidence that large family size is associated with early entry into marriage. Table 2.1 provides a summary of the results of the principal studies examined in this section. Note that there is a vast literature on this subject and so the studies in the table are limited to those published in economics and demography journals.

2.3 The theoretical model

The purpose of this section is to show how the three dimensions of family background (parental resources, parental marital status, and family composition) can be modelled within an economic framework to derive theoretical predictions of an individual's timing of first marriage.

Economists typically model the process of looking for a spouse using a search-theoretic framework, whereby individuals seek prospective marriage partners among a "distribution" of potential partners. This distribution may be thought of as a "marriage market" (Becker, 1973) that is defined both geographically and demographically (Loughan and Zissimopoulos, 2004).

Keeley (1979) argues that the search for a partner is a two-stage decision process. First, an unmarried individual has to decide whether or not to enter the marriage market and expend resources, including time and effort, on looking for a spouse. Second, if the individual does enter the market, he or she has to decide whether or not to follow an "optimal sequential search" strategy. Age at first marriage will, therefore, be a function of age at entry into the marriage market and search duration. In turn, both determinants will depend upon the gains from marriage and the costs attached to the search process.

Table 2.1 Summary of empirical studies examining relationship between family background and age at first marriage

Study	Principal dimension of interest	Data	Results
Goldscheider and DaVanzo (1989)	Parental resources	National Longitudinal Survey of the High School Class of 1972, U.S.	High levels of parental income increase probability of early marriage
Axinn and Thornton (1992)	Parental resources	Birth records from Detroit, U.S.	High levels of parental education reduce probability of early marriage for children; effect weakens as children age.
Avery et al. (1992)	Parental resources	U.S Panel Survey of Income and Program Participation of 1984	High levels of parental income have a strong, negative impact on probability of teenage marriage taking place
Aassve et al. (2002)	Parental resources	National Longitudinal Survey of the High School Class of 1972, U.S.	High levels of parental income associated with delayed entry into marriage
Kiernan (1992)	Parental marital status	National Child Development Study (Britain)	No statistically significant relationship between parental divorce and age at first marriage
Cherlin et al. (1995)	Parental marital status	National Child Development Study (Britain)	Young adults whose parents divorced no more or less likely to marry or have a child in marriage
Gruber (2004)	Parental martial status	1960, 1970, 1980, 1990 U.S. Census	Parental divorce associated with early entry into first marriage
Michael and Tuma (1985)	Family composition	National Longitudinal Survey of the High School Class of 1972, U.S.	Greater numbers of siblings associated with early marriage for white and Hispanic females
Angrist et al. (2005)	Family composition	Israeli 1983 and 1995 Census Data	First-born girls from large families marry sooner.

In describing the search for a partner, Keeley (1979) draws an analogy to the process by which an individual searches for a job in the labour market. He suggests that an unmarried individual enters the marriage market to search for a partner as long as the expected benefits from search are greater than the costs. If this condition holds, then the searcher sets a minimum 'reservation wage' or 'payoff', i.e. the share of the total home-produced output the individual would receive when married. This is determined by equating the marginal expected benefits from search to its marginal expected costs. The searcher will be willing to accept an offer of marriage when it equals or exceeds his or her reservation payoff. Should the costs or benefits of search alter during the search process such that the expected benefits are less than the costs, then the searcher withdraws from the search process.

It follows that an increase in the benefits from search raises the reservation payoff, and so increases both the probability that the individual will enter the marriage market and the expected duration of search. Likewise, an increase in the cost of search lowers the reservation wage, shortens the expected duration of search, and decreases the probability of entering the marriage market.[5]

The remainder of this section presents a stylised model that is based upon the work of Ermisch (2003). First, it is assumed that contacts with persons of the opposite sex occur according to a "Poisson process" with parameter α. These contacts are interpreted as marriage offers, where α_i is the rate at which individual i receives these offers. It is further assumed that individual i is able to calculate instantaneously the utility obtained from marrying this person, and this is denoted as x per unit of time. The likelihood of receiving such an offer represents the probability that individual i receives an offer less than x (that is, the distribution function for offers to individual i) and is denoted by $F_i(x)$. For instance, imagine that the maximum and

minimum marriage offers the individual can receive are x_i^* and $\underline{x}_i$ respectively and offers between these limits are equally likely. Since $F_i(x) = (x - \underline{x}_i)/(x_i^* - \underline{x}_i)$, it follows that x has a uniform distribution.

The optimal search strategy for individual i involves accepting marriage offers when the utility obtained from marriage (x) is greater than or equal to the individual's "reservation payoff". The latter is denoted by R_i and is assumed to be a function of utility when single (b_i), the rate at which offers of marriage are received (α_i), a discount rate (r_i), the risk of divorce (δ_i), maximum marriage offer (x_i^*), and minimum marriage offer ($\underline{x}_i$). The reservation payoff equation can be written as[6]:

$$R_i = b_i + \frac{\alpha_i (x_i^* - R_i)^2}{2(r_i + \delta_i)(x_i^* - \underline{x}_i)} \qquad (1.1)$$

Differentiation of (1.1) shows that higher values of b_i, α_i, x_i^* and $\underline{x}_i$ all raise the reservation payoff. In other words, greater utility when single, faster arrival of marriage offers, and a higher maximum or minimum marriage offer all increase the benefits of setting a higher standard of offer, above which the individual accepts. In doing so, the individual can be more choosy in the marriage market. On the other hand, a greater discount rate, r_i, reduces the reservation payoff because an individual wishes to receive the gains from marriage as early as possible and so is less selective in his or her choice of spouse. A greater divorce risk, δ_i, reduces the expected gains from waiting for a better match as it raises the probability of an individual's returning to the single state. Again, therefore, the individual will be less choosy about whom he or she marries.

The 'hazard rate' of marriage (the probability that the individual will marry in a small interval) is given by:

$$\theta_i = \alpha_i[1 - F_i(R_i)] \quad (1.2)$$

The mean waiting time to marriage is represented by $1/\theta_i$. Greater utility in the single state, a greater cost of divorce, a greater minimum or maximum marriage offer, a smaller discount rate, and a lower divorce risk all reduce the hazard rate of marriage and raise the time spent searching for a spouse in the marriage market. This follows since each factor increases the reservation payoff. Meanwhile, the effects of a faster arrival of marriage offers (that is, a greater α_i) on the hazard rate work in two opposite directions. The direct effect is partly offset by its positive effect on the reservation payoff. The net effect of receiving faster offers is to raise the hazard rate and reduce an individual's search time in the marriage market.

An examination of the mechanisms through which family background characteristics have the potential to affect timing of first marriage in the model will now be presented.

2.3.1 Parental resources and parental marital status

As noted in Section 2.2.1, greater levels of parental resources, as measured by family income and parental educational attainment, tend to be associated with an advantageous environment in which young adults are raised. It follows that for a given family size, greater levels of parental resources will raise utility when single, b_i, thereby increasing the reservation payoff, lowering the hazard rate, and in turn delaying marriage.

Becker and Mulligan (1997) note that parents devote resources to teaching children to plan better for the future, and these resources can affect a person's discount rate in the model. They also argue that richer people who are richer because they have more assets tend to be more patient than people with fewer assets. Taken together, these arguments would seem to suggest that individuals whose parents possess high levels of resources are likely to develop smaller discount rates at a relatively young age compared to those from resource-poor households. A smaller discount rate, r_i, in the model will be associated with delayed marriage.

On the other hand, a greater divorce risk, δ_i in the model reduces the reservation payoff, R_i. Since a higher divorce risk increases the probability that an individual will return to the single state, he or she will be less choosy about whom he or she marries. In turn, this will raise the hazard rate and reduce the individual's waiting time to marriage.

2.3.2 Residential location, ethnic origin and religion

Other aspects of family background that fit easily into the model are family residential location, ethnic origin and religion. Beginning with residential location, one might argue that lower population density in rural areas implies a lower rate of "contacts" due to a thin marriage market. Although this direct effect will be partially offset by its negative effect on the reservation payoff, the net effect of a lower rate of marriage offers (that is, a smaller α_i in the model) will be to lower the hazard rate and increase the waiting time to marriage.

A somewhat similar argument may be applied to ethnic origin. A young adult whose cultural background is difficult to match in the marriage market (for example, someone who is foreign-born or whose parents are foreign-born) may experience a longer search for a spouse. As with rural location, the net effect of this characteristic in the model will be a smaller rate of marriage

offers, α_i, and, consequently, a delayed entry into first marriage. On the other hand, those from certain ethnic origins may choose to live close to one another and this will be associated with a faster rate of marriage offers and an early entry into marriage. Overall, therefore, the net effect of ethnic origin on the timing of marriage is ambiguous.

Another contextual variable that has similarly ambiguous effects is religion. Since it does not condone divorce, Catholicism, for example, will lower the risk of divorce. In other words, by raising the cost of a mistake in choosing a spouse, Catholics will likely search longer in the marriage market to minimize the likelihood of selecting the "wrong partner". Therefore, Catholicism will be associated with an increased reservation payoff, a reduced hazard rate, and a longer waiting time to first marriage. However, one could also argue that Catholicism's opposition to sex outside of marriage will be associated with lower utility when single, b_i, and hence early entry into marriage.

2.3.3 Family composition

The effects of resource dilution on timing of first marriage depend upon the number of siblings present within the household during adolescence. Older siblings may live elsewhere and be less likely to dilute parental resources. Therefore, an examination of the effects of family composition in this study relates primarily to those siblings present in the family home at the age of sixteen.

In the model, for a given family income, greater family size within the household will be associated with lower utility when single, b_i, due to the resource dilution effects discussed in Section 2.2.1. This lowers the reservation payoff, raises the hazard rate, and reduces the waiting time to marriage.

The theoretical effects of birth order and sibling gender composition on the reservation payoff are less easy to predict. For example, Becker and Tomes (1976) develop a model in which parents allocate more monetary resources to children with lower natural ability. If, as proposed by Behrman and Taubman (1986) and Kessler (1991), genetic endowments are greater for earlier-born children, this model would predict that parents will make compensating monetary investments in later-borns. Further, Lindert (1977) provides empirical evidence from the U.S. that later-born children receive greater parental time inputs. On the other hand, Birdsall (1991) notes that early-borns do not initially face competition from siblings for parental resources. In the model, therefore, the effects of birth order on utility when single, b_i , and its subsequent impact on the waiting time to marriage are ambiguous.

The potential effects of sibling gender composition on timing of first marriage are similarly unclear. Butcher and Case (1994) report evidence from the U.S. indicating that females raised with brothers achieve higher levels of education, on average, than females raised with at least one sister. Although this finding is not easily explained, it would seem to suggest partly that girls are more “expensive” than boys. However, Lundberg et al. (2006) provide evidence from the U.S. that suggests that there are greater investments in young sons than young daughters, especially in terms of parental time. In light of these findings, it is difficult to predict how an individual’s utility will be affected by the presence of a younger brother or sister in the household. Table 2.2 summarises all the predictions of the model discussed in this section.

Table 2.2 Theoretical predictions of family background and composition on martial timing

Variable	Parameter Affected	Direction of Effect	Effect on Reservation Payoff	Effect on Hazard Rate	Effect on Waiting Time to Marriage
Parental Divorce	δ	+	-	+	-
Rural Residence	α	-	-	-	+
Non-European Origin	α	- or +	?	?	?
Catholic Religion	δ	+	+	-	+
Catholic Religion	α	-	-	+	-
High Parental Resources	b	+	+	-	+
High Parental Resources	r	-	+	-	+
Large Family Size	b	-	-	+	-
Younger sibling(s) in household	b	- or +	?	?	?
Younger brother(s) in household	b	- or +	?	?	?

Notes: (i) The effect of parental resources is for a given family size
(ii) The effect of large family size is for given parental resources
(iii) It is assumed that the direct effect of a faster rate of marriage offers (α) will outweigh the effect of a higher reservation payoff.

2.4 Empirical strategy

2.4.1 Data description

The data for the analysis that follows come from the *British Cohort Study* (*BCS*), a longitudinal study of children born in Great Britain during the second week of April 1970. The survey was initially designed to study perinatal mortality and ante- and post-natal service provision, but its scope has broadened through time to include myriad socio-economic, demographic, health, and attitudinal measures (Despotiduou and Shepherd, 1998; Sigle-Rushton, 2004).

During the first wave of the survey, interviews were conducted with 17,197 mothers, who represented 98 per cent of all births in the second week of April 1970. Follow-up interviews were conducted with parents and teachers at ages 5 and 10, and at ages 16, 26, and 30 the birth cohort members themselves were interviewed and are the subjects of this study.[7] The age 5, 10, and 16 follow-ups include, in addition to the initial birth cohort, any children born abroad during the reference week but who could be identified from school registers at later ages (Sigle-Rushton, 2004). The age 26 survey was undertaken via a short postal survey and, as a result, the content, response rates, and data quality were inferior compared to the data collected by face-to-face interviews (Sigle-Rushton, 2004). In response to these concerns, the age 30 survey was administrated on a face-to-face basis and the response rate was 69.9 per cent (Collins et al., 2001).[8]

Slightly more than 40 per cent of the original sample was interviewed in all of the childhood follow-ups up to age 16 and at age 30. Furthermore, even when interviews were conducted, there was often a large amount of missing information. Therefore, the proportion of the initial birth cohort with complete information is even lower than 40 per cent (Sigle-Rushton, 2004). Comparisons reveal that the obtained samples do not differ significantly from other survey samples of the British population, although there is some evidence of under-representation of the most disadvantaged groups (Shepherd, 1997).

The analysis in the study is restricted to the 9,513 cohort members (4,702 males and 4,811 females) for whom information at ages 16 and 30 is available. One problem is that a teachers strike took place in Great Britain during the administration of the 1986 (age 16) survey and many cohort members did not receive their questionnaires (Goodman and Butler, 1991). As a result, the actual sample for analysis is 7,853 cohort members (3,400 males and 3,853 females).

2.4.2 Constructing marriage and family background variables

The dependent variable in the main part of the analysis that follows is the duration in days between an individual's birth date and date of first marriage. This was constructed using data from the 1986 and 1999/2000 BCS surveys. Question 3 from the 1986 survey asks for the '*date of birth of cohort member*'. Question 622 from the 1999/2000 survey enquires about the individual's '*current, legal marital status*'. A series of questions (632-639) are then asked about the individual's relationship with '*ex-partners*', that includes information relating to whether or not he or she married an ex-partner, the date of any first marriage, plus the date of a first cohabiting relationship. From the responses to these questions from both surveys, it was possible to calculate the number of days from an individual's birth date to his or her date of first marriage or first co-residential relationship.[9]

By the age of 30, of the 3,400 males for whom marital history could be identified, 43.2 per cent had entered into a first marriage, while the respective figure for the 3,853 females was 57.5 per cent. As Table 2.3 shows, the mean duration of time between birth date and date of first marriage for males and females was 10,047 days and 9,623 days respectively. The mean age for first marriage is lower for females (26.3 years) than for males (27.5 years). This is in line with expectations and the traditional explanation proposed by economists is that marriage is a waiting game in which older and richer men outbid their younger and poorer rivals for the affections of young, fecund, and choosy women (see, for example, Bergstrom and Schoeni, 1996).[10]

From the age 16 survey conducted in 1986, variables were constructed to identify family structure and measure parental resources at the time of the interview. As discussed earlier, the principal interest in family structure in this study relates to the marital status of the respondent's parents. There were two types of questions that allowed this marital status to be identified.

Question 629 asks, *'Who does teen live with as parent?'* The most common living arrangement for a sixteen year-old in the sample was 'residing with both natural parents' (83 per cent of males and 80 per cent of females).

Questions 2670 to 2672 asked for the *'Reason for change in (living) situation'*, of the child between birth and five years-old, five years-old and ten years-old, and ten years-old to sixteen years-old. The responses were coded to construct six binary indicators: (1) *death of mother*, (2) *death of father*, (3) *death of both parents*, (4) *separation of parents*, (5) *divorce of parents*, and (6) *another situation*. Parental divorce was the most common reason for an individual not to be living with his or her natural parents at the age of sixteen and four binary indicators of parental divorce at different age ranges were constructed: between birth and sixteen years-old, between birth and five years-old, between five years-old and 10 years-old and between ten years-old and sixteen years-old. Table 2.3 shows that 16 per cent of the male and female sample experienced parental divorce between birth and the age of sixteen.

The main interest in parental resources relates to income and education. Question 3015 asks the respondent for the '*Combined income of parents per wk/mth*'. Three indicators were constructed to measure parental income: low income (between less than £7799 per annum), medium income (between £7800 and £18199 per annum), and high income (between £18200 and £26000 and over per annum). As Table 2.3 shows, at the time of the interview, around 50 per cent of the female sample were from households with parents earning 'medium' income, whilst the respective figure for males was just under 40 per cent.

The second measure of parental resources is parental education. Questions 4663 to 4671 ask the respondent about his or his parents' specific qualifications. The categories in the survey are*:* (1) *trade apprenticeship'*, (2) *'O-levels/CSE/C&G etc.'*, (3) *'A-level/OND/ONC/C&G'*, (4)

'nurse (SEN or SRN)', (5) *'teacher'*, (6) *'degree/diploma/professional membership'*, (7) *'other qualifications'*, (8) *'no qualifications'*, (9) *'qualifications unknown'*. Categories (3), (4), (5), and (6) were combined for each parent to indicate a higher level of education. Table 2.3 shows that around 10 per cent of the males and female sample reported having parents with a higher level of education.

In terms of family composition, both continuous and binary indicators of family size were constructed from the age 16 survey. Table 2.3 shows that the average number of (blood) siblings reported by male and female respondents at the time of interview was 1.3, i.e. they are from a 2.3 child family. It was also possible to ascertain whether these siblings were living at home at the time of interview or had already left 'the nest'.

Next, indicators of sibling sex composition for respondents whose siblings were still living at home at the time of the interview and for those who had already left home were constructed. Table 2.3 shows that almost 50 per cent of the male and female sample had an older sibling in the household at the time of interview and more than 60 per cent had a younger sibling.[11] Approximately 27 per cent of males and females had an older brother in the household, while around 20 per cent had an older sister at home. Around 30 per cent of the sample had a younger brother or a younger sister living at home at the time of interview.

In terms of the contextual variables, four indicators of race from the age 16 survey were constructed: '*Asian*', '*West Indian*', '*European*', and '*Other Race*'. As Table 2.3 shows, 96 per cent of the male and female respondents in the sample are European. To provide another measure of the 'pool' of potential spouses for individuals to choose from, two indicators of the respondent's family location at the age of 16 were constructed: '*rura*l' and '*urban*'. The latter was the most common location (26 per cent for males and 35 per cent for females). Three

indicators of religion were also constructed ('*Protestant*', '*Catholic*' and '*Other Religion*'). The most common religion was Protestant (28 per cent of males and 35 per cent of females).

From the outset, it should be noted that using a single birth cohort has advantages in that all individuals have faced, with the exception of some regional variation, the same policy and economic environment over the life course. Further, for the analysis of the effects of family composition on marital timing, the *BCS* is a very useful dataset in that it is possible to distinguish between the number of siblings present in the household at the time of interview from those who have already left home.

Brief descriptions of the variables used in the analysis are provided in Table 2.4[12].

2.4.3 A note on education

There are drawbacks as well as strengths associated with having data from only two points in time (1986 and 1999/2000). In particular, it will not be possible to examine the impact of certain 'intervening mechanisms' in explaining marital timing or to investigate the joint or simultaneous causal structures among several variables. It is acknowledged that children from lower income and less educated families are more likely to obtain lower levels of education than those from higher income and more educated families. For example, using British data, Ermisch and Francesconi (2001) report that young adults with parents in the bottom income quartile have much lower educational attainments, while higher levels of mother's and father's educational attainments are associated with higher levels of educational attainment of their children.[13] To the extent that educational attainment is not completely explained by family background characteristics, the timing of first marriage may be explained by both the independent effect of education as well as the effect of these family background characteristics. By excluding a potentially endogenous education variable, the reduced form model

Table 2.3 Descriptive statistics

	Males	**Females**
	Mean	**Mean**
Dependent Variable		
Duration from birth date to first marriage date (in days)	10047	9623
Duration from birth date to first co-residential relationship (in days)	9578	9076
Covariates		
Ethnic origin		
Asian	0.02	0.02
West Indian	0.01	0.01
Other ethnic origin	0.01	0.01
European	0.96	0.96
Missing race	0.02	0.01
Parental education		
Mother has higher education	0.08	0.09
Father has higher education	0.11	0.12
Missing parental education	0.38	0.29
Parental income		
Low	0.27	0.37
Medium	0.37	0.48
High	0.10	0.14
Missing income	0.24	0.25
Family size	1.30	1.32
Siblings	1.30	1.32
Siblings (in household)	0.21	0.22
Siblings (out of household)	0.19	0.21
Sibling composition in household		
Older sibling	0.49	0.47
Younger sibling	0.61	0.64
Older brother	0.27	0.27
Older sister	0.21	0.20
Younger brother	0.30	0.31
Younger sister	0.30	0.32
Family location		
Urban	0.26	0.35
Rural	0.12	0.19
Missing location	0.60	0.45
Religion		
Protestant	28.5	38.7
Catholic	5.5	8.5
Other religion	9.8	13.5
Missing religion	56.0	39.2
Parental marital status		
Divorced (between birth and 16 years-old)	0.16	0.16
Divorced (0-5)	0.02	0.03
Divorced (5-10)	0.06	0.05
Divorced (10-16)	0.08	0.08

Table 2.4 Brief descriptions of variables

Dependent variable	
First marriage	Number of days from birth date until first marriage date
First cohabitation or marriage	Number of days from birth date until date of first co-habiting relationship or marriage
Covariates (family background characteristics)	
Asian	1 if Asian, Chinese, or mixture of Asian and Chinese, 0 otherwise
West Indian	1 if West Indian
Other ethnic origin	1 if other ethnic origin
Mother has higher education	1 if mother has university degree or diploma, or membership of professional organization, 0 otherwise
Father has higher education	1 if father has university degree or diploma, or membership of professional organization, 0 otherwise
Medium parental income	1 if parental income between £7800 and £18199 per annum
High parental income	1 if parental income greater than £18200 per annum
Siblings	Total number of siblings at age 16
Siblings (in household)	Total number of siblings in the household at age 16
Siblings (out of household)	Total number of siblings out of household at age 16
Older sibling (in household)	1 if an older sibling present in the household at age 16, 0 otherwise
Younger sibling (in household)	1 if a younger sibling present in the household at age 16, 0 otherwise
Older brother (in household)	1 if an older brother present in the household at age 16, 0 otherwise
Older sister (in household)	1 if an older sister present in the household at age 16, 0 otherwise
Younger brother (in household)	1 if a younger brother present in the household at age 16, 0 otherwise
Younger sister (in household)	1 if a younger sister present in the household at age 16, 0 otherwise
Rural	1 if raised in village or country, 0 otherwise
Catholic	1 if Catholic, 0 otherwise
Other religion	1 if Other Christian or Muslim/Islam or Hindu or Buddhist or Sikh or Jewish or Other Culture or None, 0 otherwise
Divorced (birth-16)	1 if parents divorced between birth and 16 years-old, 0 otherwise
Divorced (birth-5)	1 if parents divorced between birth and 5 years-old, 0 otherwise
Divorced (5-10)	1 if parents divorced between 5 years-old and 10 years-old, 0 otherwise
Divorced (10-16)	1 if parents divorced between 10 years-old and 16 years-old, 0 otherwise

estimated in the study is therefore measuring the *overall* effect of family background characteristics on marital timing.[14]

2.4.4 Methods

Multivariate analysis of the determinants of age at first marriage was undertaken using a hazard model approach. Hazard models are appropriate when the outcome variable is the duration of time until an event takes place (in this case, entry into marriage) and when there is censoring, i.e. when the event in question has not yet occurred for everyone at the time of the survey interview.

The model used in the analysis is an extension of the proportional hazards model developed by British statistician David Cox in 1972. An important characteristic of this model is that it does not assume a specific probability distribution for the time until an event occurs. The absence of a requirement to parameterise time dependency is a particular advantage for the topic of marital timing since theories do not allow a precise specification *a priori* of what distribution should be used.

The hazard rate for the proportional hazards model is:

$$h(t \mid x) = h_0(t)e^{B_K^1 x_I)} \qquad (1.3)$$

where $h_0(t)$ represents the (unspecified) baseline hazard functions and X_i are covariates representing family background characteristics for individual i.

While Cox's model does not specify the underlying hazard function, it does nevertheless assume that the hazard functions of any two individuals with different values on one or more covariates differ only by a factor of proportionality. The baseline hazard rate varies with time but

not across individuals, which implies that the ratio of hazards for individuals i and j are independent of t and are constant for all t:

$$\frac{h_i(t)}{h_j(t)} = e^{\beta(x_j - x_i)} \tag{1.4}$$

Estimation of Cox's model in the presence of hazards that do not satisfy the proportionality assumption may lead to biased and inefficient estimates of all parameters. Prior to the analysis, it was therefore crucial to check this assumption.

Tests for non-proportionality can be viewed as variations on a more generalized Cox model that allows hazard ratios to vary over time:

$$h(t) = h_0(t)e^{[\beta_k X_i + \gamma_k x_i g(t)]} \tag{1.5}$$

In Equation (1.5) above, the effects of individual covariates are allowed to vary according to some function $g(\cdot)$ of time. The specific test used in this study involved what are known as the Schoenfeld residuals, or the difference between the actual effect of a covariate and the expected value. Box-Steffensmeier and Zorn (2001) note that if the proportionality assumption holds, the Schoenfeld residuals should be a random walk over the range of survival times, i.e. no relationship should exist between an observation's residual for that covariate and the length of its survival time. On the other hand, if the proportionality assumption is violated, the fitted model will tend to underestimate the hazard during those periods where the hazards are divergent and overestimate it when they are convergent.

The Grambsch-Therneau test (1994) extends this argument to show that a smoothed plot of the scaled Schoenfeld residuals (the residuals plus the value of the estimated coefficient) should reveal a zero slope if the assumption of proportionality holds. Therefore, if a linear regression model if fitted to the values of the scaled Schoenfeld residuals through time, the slope of the regression line should be zero, if the proportionality assumption holds. Thus, the Grambsch-Therneau test generates a direct estimate of γ in Equation (1.5).

Grambsch-Therneau tests were performed on various models of marital timing for males and females separately (given the tendency noted earlier for females to marry younger than males). Tables A1 and A2 in the Appendix show the respective results of the Grambsch-Therneau tests for five models of male and female marital timing (the model specifications are described in detail at the beginning of Section 2.5.1).

For males, strong evidence of non-proportionality was found for the parental income covariates (‘medium’ and ‘high’) based upon tests for a non-zero slope in a generalized linear regression of the scaled Schoenfeld residuals on time. However, it is also important to examine the plots of the regression residuals as certain types of non-proportionality will not be detected by the tests of non-zero slopes alone but may become obvious when examining the plots of the residuals (Gramsbch and Therneau, 2000). This includes the presence of a non-linear relationship between the residuals and time as well as the undue influence of outliers.

These plots for male parental income are shown in Figures A1 and A2 in the Appendix and suggest evidence of non-proportionality. It should also be noted that there are strong theoretical reasons to expect non-proportionality in these covariates. In Section 2.2.1, it was argued that the effects of parental income on marital timing may have less effect as an individual ages.

For females, evidence of non-proportionality was also found with respect to parental income (Figures A3 and A4). In addition, and in contrast to males, the effect of number of siblings (including those within the household only) on marital timing appears to fade with time (see Figure A5).

Schemper (1992) surveys a number of estimation techniques one can adopt when faced with non-proportional hazards in the Cox model. One approach he favours is to adapt the Cox model so that an interaction effect between the 'problem' covariate and some function of time is included. This represents an explicit operationalization of Equation (1.5) and, consequently, it is a very general means of dealing with non-proportionality. Further, it has the, "…added advantage of explicitly modeling the nature of the non-proportionality, resulting in a more accurately-specified model and greater validity in one's overall results" (Box-Steffensmeier and Zorn, 2001).

There are a number of forms of interaction between the covariate (e.g. X_1) and time one could use, including X_1 * TIME or X_1 * $(TIME)^2$. Most researchers, however, tend to prefer ln (TIME) (e.g. Kalbfleisch and Prentice, 1980; Collett, 1994) and this approach is adopted in the empirical strategy that follows.

2.5 Results and discussion

2.5.1 Main results

The effects of family background on timing of first marriage were estimated separately for males and females using five model specifications. Model 1 includes the following characteristics of family background: ethnic origin, religion, family residential location, parental education, parental income, total number of siblings, and an indicator of whether or not the individual's

parents divorced between birth and 16 years of age. Model 2 replaces the parental marital status covariate with three further indicators of the age at which parental divorce occurred (between birth and 5 years-old, 5 to 10 years-old, and 10 to 16 years-old). Model 3 replaces the 'total number of siblings' covariate with two covariates that separately model the effects of siblings living *in* and *out* of the household at the time of interview. Model 4 adds two covariates to capture the effects of a younger sibling(s) or older sibling(s) in the household, whilst controlling for total family size. Model 5 replaces these covariates with four covariates that examine the effects of sibling composition within the household: older brother, older sister, younger brother, and younger sister. Again, total family size is used as a control.

Beginning with the effects of parental resources, the results in Tables 2.5 and 2.6 reveal that 'high' and 'medium' parental income (compared to 'low' income) are strongly associated with delayed marriage for both males and females, although this effect is seen to fade through time. The interactive model assumes that the coefficient on parental income changes as a function of *ln*(t). In Models 1 and 2, for example, the direct effect of high parental income for males as shown in Table 2.5 is 39.0/4.27 = 9.13. Multiplied by the size of the interaction, the point at which they "cancel each other out" takes place at T = exp (9.13). This is equal to 9,228 days from birth or 27.1 years-old. In other words, once a male reaches this age, the effect of high parental income makes virtually no difference to his hazard rate of marriage.

Using the same approach for females, Table 2.6 shows that in Model 1, a high level of parental income has a strong delaying effect on first marriage up to the age of 25.4 years-old. These results are robust across the different model specifications for males and females and are consistent with expectations that a high level of parental income can be deployed to the extent

Table 2.5 Cox Regression Model Results for Timing of First Marriage for Males (N= 3400, Models 1-3)

	Model 1		**Model 2**		**Model 3**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[a]						
Medium	-15.0 (5.22)***	N/A	-15.0 (5.22)***	N/A	-14.9 (5.22)***	N/A
Medium * ln(t)	1.65 (0.57)***	N/A	1.66 (0.57)***	N/A	1.64 (0.57)***	N/A
High	-39.0 (8.52)***	N/A	-39.1 (8.52)***	N/A	-39.0 (8.52)***	N/A
High * ln(t)	4.27 (0.93)***	N/A	4.28 (0.93)***	N/A	4.26 (0.93)***	N/A
Parental Education[b]						
Mother	-0.11 (0.10)	0.89	-0.11 (0.10)	0.88	-0.11 (0.10)	0.89
Father	-0.06 (0.09)	0.93	-0.06 (0.09)	0.93	-0.05 (0.09)	0.94
Parental Marital Status						
Divorced (birth-16)	-0.04 (0.06)	0.95			-0.04 (0.06)	0.95
Divorced (birth-5)			-0.15 (0.20)	0.85		
Divorced (5-10)			-0.18 (0.13)	0.83		
Divorced (10-16)			0.10 (0.10)	1.11		
Family Location[c]						
Rural	-0.15 (0.08)*	0.85	-0.15 (0.08)*	0.85	-0.16 (0.08)*	0.85
Religion[d]						
Catholic	-0.09 (0.12)	0.90	-0.09 (0.12)	0.90	-0.09 (0.12)	0.90
Other religion	0.02 (0.09)	1.02	0.02 (0.09)	1.02	0.02 (0.09)	1.02
Ethnic Origin[e]						
Asian	0.53 (0.16)***	1.70	0.52 (0.16)***	1.69	0.49 (0.16)***	1.64
West Indian	-1.39 (0.57)***	0.24	-1.39 (0.57)***	0.24	-1.39 (0.57)***	0.24
Other ethnic origin	-0.87 (0.50)*	0.41	-0.87 (0.50)*	0.41	-0.88 (0.50)*	0.41
Family Size						
Siblings	0.03 (0.02)	1.03	0.03 (0.02)	1.03		
Siblings in household					0.05 (0.02)**	1.05
Siblings out of household					-0.03 (0.05)	0.96
Likelihood ratio	95.07***		97.68***		97.53***	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$) H.R. = hazard ratio

Table 2.5 (cont.) Cox Regression Model Results for Timing of First Marriage for Males (N= 3400, Models 4-5)

	Model 4		**Model 5**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[a]				
Medium	-14.6 (5.22)***	N/A	-14.6 (5.22)***	N/A
Medium * ln(t)	1.61 (0.57)***	N/A	1.61 (0.57)***	N/A
High	-38.9 (8.52)***	N/A	-38.9 (8.52)***	N/A
High * ln(t)	4.26 (0.93)***	N/A	4.26 (0.93)***	N/A
Parental Education[b]				
Mother	-0.11 (0.10)	0.89	-0.11 (0.10)	0.88
Father	-0.06 (0.09)	0.94	-0.06 (0.09)	0.94
Parental Marital Status				
Divorced (birth-16)	-0.04 (0.06)	0.97	-0.04 (0.06)	0.95
Family Location[c]				
Rural	-0.15 (0.08)**	0.85	-0.16 (0.08)**	0.84
Religion[d]				
Catholic	-0.10 (0.12)	0.90	-0.10 (0.12)	0.90
Other religion	0.01 (0.09)	1.01	0.02 (0.09)	1.02
Ethnic Origin[e]				
Asian	0.51 (0.16)***	1.67	0.52 (0.16)***	1.69
West Indian	-1.37 (0.57)***	0.25	-1.37 (0.57)***	0.25
Other ethnic origin	-0.89 (0.50)*	0.40	-0.89 (0.50)*	0.41
Family Size				
Siblings	-0.02 (0.05)	0.97	-0.02 (0.05)	0.97
Sibling composition (in HH)				
Older sibling	0.006 (0.06)	1.00		
Younger sibling	0.12 (0.05)**	1.12		
Older brother			0.07 (0.07)	1.08
Older sister			-0.07 (0.07)	0.93
Younger brother			0.14 (0.06)**	1.15
Younger sister			0.10 (0.06)	1.10
Likelihood ratio	103.81***		108.23***	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$) H.R. = hazard ratio

Table 2.6 Cox Regression Model Results for Timing of First Marriage for Females (N= 3853, Models 1-3)

	Model 1		**Model 2**		**Model 3**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[a]						
Medium	-11.8 (3.71)***	N/A	-11.8 (3.72)***	N/A	-12.6 (3.70)***	N/A
Medium * ln(t)	1.30 (0.41)***	N/A	1.30 (0.41)***	N/A	1.40 (0.40)***	N/A
High	-21.9 (5.59)***	N/A	-21.9 (5.59)***	N/A	-22.4 (5.58)***	N/A
High * ln(t)	2.41 (0.61)***	N/A	2.41 (0.61)***	N/A	2.46 (0.61)***	N/A
Parental Education[b]						
Mother	-0.38 (0.08)***	0.97	-0.38 (0.08)***	0.67	-0.38 (0.08)***	0.67
Father	-0.11 (0.07)	0.89	-0.11 (0.07)***	0.89	-0.10 (0.07)	0.89
Parental Marital Status						
Divorced (birth-16)	-0.02 (0.04)	0.97			-0.02 (0.04)	0.97
Divorced (birth-5)			0.001 (0.14)	1.00		
Divorced (5-10)			-0.03 (0.11)	0.96		
Divorced (10-16)			-0.03 (0.09)	0.96		
Family Location[c]						
Rural	0.15 (0.05)***	1.16	0.14 (0.05)***	1.15	0.15 (0.05)***	1.16
Religion[d]						
Catholic	-0.32 (0.08)***	0.72	-0.32 (0.08)***	0.72	-0.32 (0.08)***	0.72
Other religion	-0.02 (0.06)	0.97	-0.02 (0.06)	0.97	-0.01 (0.06)	0.97
Ethnic Origin[e]						
Asian	0.46 (0.15)***	1.58	0.46 (0.15)***	1.58	0.46 (0.15)***	1.58
West Indian	-1.06 (0.37)***	0.34	-1.06 (0.37)***	0.34	-1.08 (0.37)***	0.33
Other ethnic origin	-0.65 (0.33)**	0.51	-0.65 (0.33)**	0.51	-0.66 (0.33)**	0.51
Family Size						
Siblings	3.09 (1.26)***	N/A	3.09 (1.26)***	N/A		
Siblings * ln(t)	-0.34 (0.13)***	N/A	-0.34 (0.13)***	N/A		
Siblings in household					-0.009 (0.02)	0.99
Siblings out of household					-0.05 (0.03)	0.94
Likelihood ratio						

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'.
*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$) H.R. = hazard ratio

Table 2.6 (cont.) Cox Regression Model Results for Timing of First Marriage for Females (N= 3853, Models 4-5)

	Model 4		**Model 5**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[a]				
Medium	-11.7 (3.72)***	N/A	-11.8 (3.72)***	N/A
Medium * ln(t)	1.30 (0.41)***	N/A	1.31 (0.41)***	N/A
High	-21.9 (5.59)***	N/A	-22.47 (5.59)***	N/A
High * ln(t)	2.42 (0.61)***	N/A	2.44 (0.61)***	N/A
Parental Education[b]				
Mother	-0.38 (0.08)***	0.68	-0.38 (0.08)***	0.68
Father	-0.11 (0.07)	0.89	-0.11 (0.07)	0.89
Parental Marital Status				
Divorced (birth-16)	-0.02 (0.04)	0.97	-0.03 (0.04)	0.97
Family Location[c]				
Rural	0.14 (0.05)***	1.15	0.14 (0.05)***	1.15
Religion[d]				
Catholic	-0.32 (0.08)***	0.72	-0.32 (0.08)***	0.72
Other religion	-0.02 (0.06)	0.97	-0.01 (0.06)	0.97
Ethnic Origin[e]				
Asian	0.45 (0.15)***	1.57	0.46 (0.15)***	1.58
West Indian	-1.06 (0.37)***	0.34	-1.05 (0.37)***	0.34
Other ethnic origin	-0.64 (0.33)**	0.52	-0.65 (0.33)**	0.51
Family Size				
Siblings	3.07 (1.27)***	N/A	3.06 (1.27)***	N/A
Siblings * ln(t)	-0.34 (0.14)***	N/A	-0.34 (0.14)***	N/A
Sibling composition (in HH)				
Older sibling	0.009 (0.05)	1.00		
Younger sibling	0.07 (0.04)	1.07		
Older brother			0.06 (0.05)	1.06
Older sister			-0.05 (0.06)	0.94
Younger brother			0.11 (0.05)**	1.11
Younger sister			0.14 (0.05)	1.04
Likelihood ratio	149.22***		154.80***	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'.
*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$) H.R. = hazard ratio

that entry into first marriage is delayed for young adults. They also lend support to the theory that this effect may weaken with time.

In terms of education levels, the other measure of parental resources, Table 2.6 shows that, for females, a high level of parental education is also strongly associated with delayed entry into marriage. For example, a hazard ratio of 0.69 is reported in Model 2, indicating a 31 per cent lower risk of first marriage taking place at all ages between 16 and 30 for those whose mothers have high levels of education. In Models 1 and 2, a high level of *paternal* education is associated with an 18 per cent lower risk of first marriage occurring over this age range. For males, meanwhile, the results suggest that a high level of paternal education is associated with delayed entry into marriage, although this is only statistically significant in Model 2 in Table 2.5.

Another family background covariate of interest relates to the effect of parental divorce (that occurred at any age between birth and 16 years-old) on marital timing. For males and females, Tables 2.5 and 2.6 show that the impact is negative, suggesting that parental divorce makes children more wary of marriage, although neither coefficient is statistically significant. To examine whether it matters at what point in time in a young person's life parental divorce takes place, Model 2 includes three binary indicators of parental divorce: birth to 5 years-old, 5 to 10 years-old, and 10 to 16 years-old. Again, the results are not statistically significant.

Compared to the reference category (Europeans), being a male or female Asian is associated with earlier marriage, while being West Indian implies delayed marriage. For example, the results for Model 1 in Table 2.5 indicate a hazard ratio for Asian males of 1.72 times their European counterparts, implying a 72 per cent higher 'risk' of Asians marrying for the first time at all ages between 16 and 30 compared to Europeans.

On the other hand, the hazard ratio for male West Indians is 0.25 times their European counterparts, implying a 75 per cent lower risk of West Indians marrying compared to Europeans. These results may be explained by the fact that certain ethnic origins tend to live close to one another in Great Britain. In the theoretical model, this is associated with a faster rate of marriage offers and early entry into marriage. Alternatively, it could simply reflect differences in cultural values. Berthoud (2005) argues that Asians living in Britain adhere to 'old fashioned values' (particularly Indians and Pakistanis who engage in arranged and negotiated marriages) and this implies early marriage, whereas the Caribbean approach is one of 'modern individualism', which is associated with delayed marriage.[15]

With respect to religion, Models 1-3 in Table 2.6 reveal a hazard ratio of 0.72 for females, which indicates a 28 per cent lower risk of Catholic females marrying at all ages between 16 and 30. The sign on the coefficient for male Catholics is also negative, although it is not statistically significant. These results are consistent with the findings of Michael and Tuma (1985) who report, using U.S. data from the 1979 NLSY, that being a white female Catholic is associated with delayed entry into marriage.

It was noted in Section 2.2.2 that Catholicism is associated with a lower risk of divorce as the religion raises the cost of a mistake in choosing a spouse. These results seem to suggest that *female* Catholics in particular search for longer in the marriage market, which lends support to Lloyd Cohen's 1987 theory that the risks and costs of divorce are asymmetrically distributed for men and women. According to this theory, females need to minimize the probability of choosing the "wrong" partner because they tend to be worth less on the remarriage market than a male of similar age. Taken together, therefore, female Catholics face a cost premium in making a mistake

in spouse selection compared to their male counterparts and subsequently have a greater tendency to delay marriage.

There are also significant gender differences in relation to the effects of family residential location on marital timing. For example, Table 2.5 shows that being raised in a rural area is associated with delayed entry into marriage for males. The hazard ratio in Model 1 is 0.85 times that for urban males, implying a 15 per cent lower risk of first marriage taking place for rural males at any age between 16 and 30. However, for females a rural upbringing is associated with *early* entry into first marriage and this result is statistically significant at the 1 per cent level across all model specifications.

These results are in line with the empirical findings of Buck and Scott (1993), who use U.S. data from the *Panel Study of Income Dynamics* covering the period 1968 to 1987. They report that being from a large city has a pronounced effect of reducing the likelihood of leaving home to marry for both sexes, whereas a rural background increases the probability of early marriage, but only for females.

One explanation for these results is that there tends to be greater sexual division of labour in rural households relative to urban households. In other words, rural wives tend to specialize more in household work and less in market work than do their urban counterparts. This should increase the gains from marriage for the former, to the extent that specialization appreciably affects these benefits. Therefore, for females raised in traditional rural households, one might expect early entry into marriage. For rural males, meanwhile, traditional sexual division of labour may involve an expectation that property has to be accumulated (or even inherited) prior to first marriage. Delayed entry into marriage for rural males will be one consequence of this expectation.

An alternative hypothesis relates to Edlund's (2004) claim that young women outnumber young men in urban areas. The argument is that urban areas offer skilled workers better labour market opportunities. The presence of males with high incomes may attract not only skilled females but also unskilled females from rural areas. Thus, a surplus of females in urban areas results from the combination of better labour and marriage markets. It follows that the rural depopulation of young females in relative terms may explain why the women who remain are "snapped up" early for marriage, while the surplus bachelors must engage in a longer search for a wife.

Finally, the effects of family composition on marital timing were investigated. Models 1 and 2 for females in Table 2.6 show that the greater the number of total siblings (both in and out of the household), the earlier first marriage takes place, although this effect is non-constant through time. For males, the results for Models 1 and 2 in Table 2.5 reveal that while the effect of total family size is in the expected direction, it is not statistically significant.

In Model 3 for both sexes, the family size covariate is split into two separate variables that capture the effects of siblings being present within the individual's household at 16 years-old as well as the effects of those siblings who have already 'left the nest'. For males, it was found that the greater the number of siblings present, the earlier first marriage occurs. This is consistent with expectations that large numbers of siblings within the family home may be associated with crowding and greater competition for resources, thereby providing an incentive to marry earlier. For females, it appears that it is family size *per se* that matters most for marital timing. One potential explanation for this finding is that females with a large number of siblings may develop a preference for large families and marry at an early age because they wish to have more children than average.

Models 4 and 5 for males and females examine the effects of household family composition on marital timing in greater detail. Turning first to Model 4 for males, Table 2.5 shows that the presence of a younger sibling in the household is associated with earlier marriage. The hazard ratio indicates a 12 per cent increase in the risk of first marriage at all ages between 16 and 30. For females in Table 2.6, the sign on the coefficient for the presence of a younger sibling(s) in the household in Model 4 also suggests earlier marriage, but the result does not quite reach conventional levels of significance. The results for Model 5 show that for males and females the presence of a younger brother in the household is associated with 14 per cent and 11 per cent respective increases in the likelihood of first marriage taking place at any age between 16 and 30. Both results are statistically significant at the 5 per cent level. These findings relating to birth order and sibling gender composition indicate that the presence of a younger sibling in the household may dilute resources for older siblings, and there is some evidence to suggest that that this is also true for those with a younger brother in the household. In both cases, there is an incentive to experience the gains from early marriage.

2.5.2 Results for split samples (only children and those with siblings)

The second stage of the analysis involved splitting the sample in order to examine whether the effects of parental resources, family background and family composition vary across different family sizes (for example, only-children versus those with siblings). The advantage of this approach is that it implicitly allows the sub-samples to have different baseline hazards, including potentially allowing only-children to ‘vary’ over time. By looking at these respective hazards, one is able to get a sense of whether the different groups have different baselines.

The analysis begins with a comparison of the results for only-children (who accounted for 25 per cent of the sample) versus those with siblings. The principal findings reported in Tables 2.7 and 2.8 for males show that high levels of parental income are associated with delayed marital entry for both only-children and for those with siblings, although these effects are non-constant through time. On the other hand, while high levels of parental education are associated with delayed marital entry for those with siblings, the results for only-children are not statistically significant.

The results for female only-children are rather puzzling. While high levels of maternal education serve to delay marriage (a result in line with expectations), Table 2.9 shows that high levels of parental income are associated with early marital entry at all ages between 16 and 30. Although this result is only statistically significant at the 10 per cent level in Model 3, it still warrants further explanation and investigation. One approach was to examine whether its significance was at least partially due to the positive relationship between parental income and parental education. A model was estimated that excluded parental education from the specification and the statistical significance of the high parental income covariate disappeared. Meanwhile, Table 2.10 shows that high levels of parental resources (income levels and education levels) tend to be associated with delayed entry into marriage for those with siblings.

In addition, the effect of a rural upbringing on the hazard rate was both positive and statistically significant at the 5 per cent level. Although the effect was in the same direction for female only-children, it was not statistically significant. One possible explanation for these results is that female only-children raised in rural areas are not necessarily expected to conform to traditional roles in the household.

Table 2.7 Cox Regression Model Results for Timing of First Marriage for Male Only-Children (N= 811, Models 1 – 2)

	Model 1		**Model 2**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[a]				
Medium	-22.1 (11.2)**	0.00	-22.3 (11.2)**	0.00
Medium * ln(t)	2.45 (1.23)**	11.6	2.47 (1.23)**	11.8
High	-50.3 (18.7)***	0.00	-50.7 (18.7)***	0.00
High * ln(t)	5.53 (2.05)***	254.5	5.57 (2.05)***	264.3
Parental Education[b]				
Mother	0.005 (0.32)	1.00	-0.02 (0.32)	0.97
Father	-0.12 (0.20)	0.88	-0.13 (0.20)	0.87
Parental marital status				
Divorced (0-16)	-0.05 (0.12)	0.94		
Divorced (0-5)			0.03 (0.32)	1.02
Divorced (5-10)			-0.51 (0.30)**	0.59
Divorced (10-16)			0.25 (0.21)	1.29
Family Location[c]				
Rural	-0.25 (0.19)	0.77	-0.26 (0.19)	0.77
Religion[d]				
Catholic	-0.10 (0.18)	0.83	-0.11 (0.17)	0.84
Other religion	0.04 (0.08)	1.06	0.03 (0.07)	1.09
Ethnic Origin[e]				
Asian	0.42 (0.41)	1.52	0.38 (0.41)	1.46
West Indian	-11.9 (237.6)	0.00	-11.9 (238.0)	0.00
Other	-1.03 (1.00)	0.35	-1.09 (1.00)*	0.33
-2 log-likelihood				
Without covariates	4341.00		4341.00	
With covariates	4313.04		4309.71	
Likelihood ratio	27.95		31.28	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

Table 2.8 Cox Regression Model Results for Timing of First Marriage for Males with Sibling(s) (N= 2915, Models 1 – 3)

	Model 1		**Model 2**		**Model 3**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[a]						
Medium	-0.02 (0.07)	0.97	-0.02 (0.07)	0.97	-0.03 (0.07)	0.96
High	-26.5 (8.93)***	N/A	-26.5 (8.93)***	N/A	-24.7 (8.78)***	N/A
High * ln(t)	2.89 (0.97)***	N/A	2.89 (0.97)***	N/A	2.70 (0.95)***	N/A
Parental Education[b]						
Mother	-0.10 (0.17)**	0.90	-0.10 (0.17)**	0.90	-0.14 (0.12)	0.86
Father	-0.16 (0.10)**	0.85	-0.16 (0.10)**	0.84	-0.06 (0.10)	0.93
Parental marital status						
Divorced (0-16)	-0.04 (0.07)	0.95			-0.04 (0.07)	0.95
Divorced (0-5)			-0.26 (0.25)	0.76		
Divorced (5-10)			-0.08 (0.15)	0.91		
Divorced (10-16)			0.05 (0.12)	1.06		
Family Location[c]						
Rural	-0.12 (0.09)	0.88	-0.12 (0.09)	0.88	-0.13 (0.08)	0.90
Religion[d]						
Catholic	-0.13 (0.21)	0.83	-0.11 (0.17)	0.84	-0.14 (0.19)	0.88
Other religion	0.04 (0.08)	1.06	0.03 (0.07)	1.09	0.04 (0.10)	1.08
Ethnic Origin[e]						
Asian	0.53 (0.17)***	1.70	0.52 (0.17)***	1.69	0.48 (0.17)***	1.62
West Indian	-1.05 (0.57)**	0.34	-1.04 (0.57)**	0.35	-1.04 (0.57)*	0.35
Other	-0.75 (0.58)	0.47	-0.75 (0.58)	0.46	-0.76 (0.58)	0.46
Family size						
Total siblings	8.51 (2.19)***	N/A	8.53 (2.19)***	N/A		
Total siblings * ln(t)	-0.93 (0.24)***	N/A	-0.93 (0.24)***	N/A		
Total sibs. in household					8.20 (2.37)***	N/A
Total sibs. in household * ln(t)					-0.89 (0.26)***	N/A
Total sibs. out of household					-0.04 (0.05)	0.95
-2 log-likelihood						
Without covariates	16916.56		16916.56		16916.56	
With covariates	16832.94		16871.57		16836.12	
Likelihood ratio	83.61		84.98		80.43	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

Table 2.8 (cont.) Cox Regression Model Results for Timing of First Marriage for Males with Sibling(s) (N= 2915, Models 4 – 5)

	Model 4		**Model 5**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[a]				
Medium	-0.04 (0.07)	0.95	-0.04 (0.07)	0.95
High	-30.4 (8.85)***	N/A	-30.4 (8.85)***	N/A
High * ln(t)	3.32 (0.96)***	N/A	3.31 (0.96)***	N/A
Parental Education[b]				
Mother	-0.13 (0.12)	0.87	-0.14 (0.12)	0.86
Father	-0.06 (0.10)	0.93	-0.06 (0.10)	0.93
Parental Marital Status				
Divorced (0-16)	-0.05 (0.07)	0.94	-0.04 (0.07)	0.87
Family Location[c]				
Rural	-0.12 (0.09)	0.88	-0.13 (0.09)	0.93
Religion[d]				
Catholic	-0.18 (0.25)	0.87	-0.19 (0.22)	0.88
Other religion	0.09 (0.09)	1.07	0.04 (0.07)	1.06
Ethnic Origin[e]				
Asian	0.49 (0.17)***	1.63	0.55 (0.17)***	1.73
West Indian	-1.04 (0.57)*	0.35	-1.03 (0.57)*	0.35
Other	-0.75 (0.58)	0.46	-0.79 (0.58)	0.45
Family Size				
Total siblings	-0.02 (0.05)	0.97	-0.03 (0.05)	0.96
Sibling composition (in HH)				
Older sibling(s)	0.008 (0.06)	1.00		
Younger sibling(s)	0.12 (0.05)**	1.13		
Older brother(s)			0.07 (0.07)	1.08
Older sister(s)			-0.07 (0.07)	0.93
Younger brother(s)			0.14 (0.06)**	1.15
Younger sister(s)			0.10 (0.06)*	1.11
-2 log-likelihood				
Without covariates	16916.56		16916.56	
With covariates	1854.54		16861.52	
Log-likelihood ratio	62.01		55.04	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

Table 2.9 Cox Regression Model Results for Timing of First Marriage for Female Only-Children (N= 938, Models 1 – 3)

	Model 1		**Model 2**		**Model 3**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[a]						
Medium	-0.03 (0.10)	0.96	-0.04 (0.10)	0.95	-0.009 (0.11)	0.99
High	0.25 (0.16)	1.28	0.24 (0.16)	1.28	0.29 (0.17)*	1.33
Parental Education[b]						
Mother	-0.30 (0.18)*	0.61	-0.30 (0.18)*	0.73	-0.29 (0.18)	0.74
Father	-0.17 (0.15)	0.83	-0.17 (0.15)	0.84	-0.18 (0.15)	0.83
Parental marital status						
Divorced (0-16)	-0.02 (0.07)	0.97			-0.01 (0.08)	0.98
Divorced (0-5)			0.22 (0.23)	1.25		
Divorced (5-10)			0.08 (0.19)	1.08		
Divorced (10-16)			-0.23 (0.17)	0.79		
Family Location[c]						
Rural	0.14 (0.11)	1.15	0.14 (0.11)	1.15	0.13 (0.11)	1.14
Religion[d]						
Catholic	-0.40 (0.10)***	0.80	-0.41 (0.08)***	0.80	-0.42 (0.008)***	0.80
Other religion	-0.04 (0.08)	0.98	-0.05 (0.07)	0.97	-0.06 (0.05)	0.98
Ethnic Origin[a]						
Asian	0.26 (0.36)	1.31	0.26 (0.36)	1.30	0.31 (0.37)	1.37
West Indian	-1.54 (1.00)	0.21	-1.55 (1.00)	0.21	-1.55 (1.00)	0.21
Other	-0.83 (0.57)	0.43	-0.81 (0.58)	0.44	-0.80 (0.58)	0.44
-2 log-likelihood						
Without covariates	7150.01		7150.01		7150.01	
With covariates	7123.11		7120.75		7120.76	
Likelihood ratio	26.90		26.26		29.25	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$) H.R. = hazard ratio

Table 2.10 Cox Regression Model Results for Timing of First Marriage for Females with Sibling(s) (N= 2915, Models 1 –3)

	Model 1		**Model 2**		**Model 3**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[a]						
Medium	-14.35 (4.39)***	N/A	-14.38 (4.39)***	N/A	-16.09 (4.32)***	N/A
Medium * ln(t)	1.59 (0.48)***	N/A	1.59 (0.48)***	N/A	1.78 (0.47)***	N/A
High	-23.60 (6.49)***	N/A	-23.64 (6.49)***	N/A	-25.51 (6.44)***	N/A
High * ln(t)	2.59 (0.71)***	N/A	2.59 (0.71)***	N/A	2.80 (0.70)***	N/A
Parental Education[b]						
Mother	-0.33 (0.14)**	0.71	-0.33 (0.14)**	0.71	-0.40 (0.09)***	0.66
Father	-0.17 (0.08)**	0.83	-0.17 (0.08)**	0.83	-0.07 (0.08)	0.93
Parental marital status						
Divorced (0-16)	-0.04 (0.05)	0.96			-0.03 (0.05)	0.96
Divorced (0-5)			-0.10 (0.17)	0.90		
Divorced (5-10)			-0.09 (0.13)	0.90		
Divorced (10-16)			0.02 (0.10)	1.02		
Family Location[c]						
Rural	0.15 (0.06)**	1.17	0.15 (0.06)**	1.17	0.15 (0.06)**	1.16
Religion[d]						
Catholic	-0.40 (0.09)***	0.76	-0.41 (0.09)***	0.78	-0.41 (0.10)***	0.78
Other religion	-0.06 (0.07)	0.95	-0.03 (0.04)	0.94	-0.04 (0.04)	0.94
Ethnic Origin[a]						
Asian	24.93 (10.37)***	N/A	24.92 (10.37)***	N/A	26.27 (10.37)***	N/A
Asian * ln(t)	-2.70 (1.15)***	N/A	-2.70 (1.15)***	N/A	-2.85 (1.15)***	N/A
West Indian	-0.96 (0.41)***	0.38	-0.96 (0.41)***	0.38	-1.00 (0.41)***	0.36
Other	-0.64 (0.40)	0.52	-0.63 (0.41)	0.52	-0.67 (0.40)	0.50
Family size						
Total siblings	3.08 (1.66)**	13.6	3.08 (1.66)**	13.4		
Total siblings * ln(t)	-0.34 (0.18)**	21.9	-0.34 (0.18)**	21.9		
Total sibs. in household					0.01 (0.02)	1.01
Total sibs. out of household					-0.04 (0.04)	0.95
-2 log-likelihood						
Without covariates	24950.14		24950.14		24950.14	
With covariates	24842.01		24841.45		24832.13	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10
H.R. = hazard ratio

Table 2.10 (cont.) Cox Regression Model Results for Timing of First Marriage for Females with Sibling(s) (N= 2915, Models 4 – 5)

	Model 4		**Model 5**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[a]				
Medium	15.8 (4.32)***	N/A	-15.9 (4.32)***	N/A
Medium *ln(t)	1.76 (0.47)***	N/A	1.76 (0.47)***	N/A
High	-25.0 (6.45)***	N/A	-25.3 (6.45)***	N/A
High * ln(t)	2.75 (0.70)***	N/A	2.79 (0.70)***	N/A
Parental Education[b]				
Mother	-0.40 (0.09)***	0.66	-0.39 (0.09)***	0.67
Father	-0.07 (0.08)	0.92	-0.08 (0.08)	0.92
Parental Marital Status				
Divorced (0-16)	-0.03 (0.05)	0.96	-0.04 (0.05)	0.96
Religion[c]				
Catholic	-0.41 (0.09)***	0.78	-0.42 (0.10)***	0.79
Other religion	-0.03 (0.04)	0.94	-0.04 (0.04)	0.94
Ethnic Origin[d]				
Asian	26.6 (10.3)***	N/A	26.0 (10.3)***	N/A
Asian *ln(t)	-2.88 (10.3)***	N/A	-2.82 (1.14)***	N/A
West Indian	-1.00 (0.41)***	0.05	-0.99 (0.41)***	0.37
Other	-0.65 (0.41)	0.52	-0.66 (0.41)*	0.51
Family Size				
Total siblings	-0.03 (0.04)	0.96	-0.04 (0.04)	0.96
Total sibs. in household				
Total sibs. out of household				
Sibling composition (in HH)				
Older sibling(s)	0.01 (0.05)	1.01		
Younger sibling(s)	0.07 (0.04)	1.07		
Older brother(s)			0.06 (0.05)	0.95
Older sister(s)			-0.04 (0.06)	0.95
Younger brother(s)			0.11 (0.05)**	1.12
Younger sister(s)			0.04 (0.05)	1.04
-2 log-likelihood				
Without covariates	24950.14		24950.14	
With covariates	24831.68		24826.66	
Log-likelihood ratio	118.46		123.47	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European', *** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

The findings reported above are broadly consistent with the results obtained if a comparison is made between the effects of parental resources and family background on marital timing for only-children versus those with one sibling (results for this latter sub-sample appear in Tables 2.11 and 2.13 for males and females respectively). A comparison was also made between those with one sibling versus those with two or more siblings (Tables 2.12 and 2.14). Again, the results relating to the effects of parental resources are in line with expectations and the findings are fairly similar for both sexes. For example, high levels of parental income are associated with delayed marriage. For males with two or more siblings, parental divorce occurring at any age between birth and sixteen is associated with earlier entry into first marriage, although this effect is seen to fade through time (specifically, by 23.8 years of age).

In terms of birth order and sibling sex composition, the presence of one sibling in the household is associated with early entry into marriage for females. Meanwhile, for females with two or more siblings, the presence of a younger brother(s) in the household is also associated with a higher risk of first marriage occurring at any age between 16 and 30, although this result is not quite significant at the 10 per cent level.

For males with one sibling, no statistically significant results are found. However, for males with two or more siblings, almost all of the family background covariates are statistically significant and in line with expectations. For example, the presence of younger siblings within the household (of either sex) is associated with early entry into first marriage, while ‘absent’ siblings are associated with a 12 per cent lower risk of marriage taking place at any age between 16 and 30. The most likely explanation for this latter result is that a male with at least one sibling who has already left the nest is able to enjoy the benefits of less competition for scarce resources. According to the theoretical model, one would expect delayed entry into first marriage for these individuals.[16]

Table 2.11 Cox Regression Model Results for Timing of First Marriage for Males with One Sibling (N= 1384, Models 1 – 4)

	Model 1		**Model 2**		**Model 3**		**Model 4**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[a]								
Medium	0.10 (0.11)	1.11	0.10 (0.11)	1.11	0.10 (0.11)	1.11	0.10 (0.11)	1.11
High	-30. 3 (12.1)***	N/A	-30.3 (12.1)***	N/A	-26.8 (11.9)***	N/A	-26.8 (11.9)***	N/A
High * ln(t)	3.31 (1.32)***	N/A	3.30 (1.32)***	N/A	2.92 (1.30)***	N/A	2.92 (1.30)***	N/A
Parental Education[b]								
Mother	-0.19 (0.16)	0.82	-0.19 (0.16)	0.82	-0.19 (0.16)	0.81	-0.20 (0.16)	0.81
Father	-0.07 (0.13)	0.92	-0.07 (0.13)	0.92	-0.07 (0.13)	0.93	-0.07 (0.13)	0.92
Parental marital status								
Divorced (0-16)	-0.02 (0.09)	0.97			-0.03 (0.09)	0.97	-0.02 (0.09)	0.97
Divorced (0-5)			0.01 (0.29)	1.01				
Divorced (5-10)			-0.09 (0.20)	0.91				
Divorced (10-16)			0.007 (0.17)	1.00				
Family Location[c]								
Rural	-0.07 (0.12)	0.92	-0.07 (0.12)	0.92	-0.07 (0.12)	0.92	-0.08 (0.12)	0.91
Religion[d]								
Catholic	-0.19 (0.27)	0.88	-0.21 (0.21)	0.88	-0.21 (0.23)	0.87	-0.22 (0.24)	0.88
Other religion	0.10 (0.09)	1.07	0.08 (0.08)	1.05	0.09 (0.09)	1.06	0.05 (0.07)	1.07
Ethnic Origin[e]								
Asian	0.64 (0.38)*	1.91	0.64 (0.38)*	1.91	0.66 (0.38)*	1.93	0.66 (0.38)*	1.94
West Indian	-10.9 (171.6)	0.00	-10.9 (171.7)	0.00	-10.9 (171.0)	0.00	-10.9 (171.0)	0.00
Other	0.34 (0.71)	1.41	0.34 (0.71)	1.41	0.33 (0.71)	1.40	0.33 (0.71)	1.40
Family size								
Total sibs. In household	-0.04 (0.12)	0.95	-0.04 (0.12)	0.95	-0.06 (0.13)	0.93	-0.06 (0.13)	0.93
Sibling composition (in HH)								
Younger sibling(s)					0.04 (0.08)	1.04		
Younger brother(s)							0.10 (0.10)	1.11
Younger sister(s)							-0.01 (0.10)	0.98
-2 log-likelihood								
Without covariates	8070.35		8070.35		8070.35		8070.35	
With covariates	8070.93		8034.80		8037.43		8036.44	
Likelihood ratio	35.42		35.55		32.92		33.90	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'.
*** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

Table 2.12 Cox Regression Model Results for Timing of First Marriage for Males with Two+ Siblings (N= 1205, Models 1 – 3)

	Model 1		**Model 2**		**Model 3**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[c]						
Medium	-0.19 (0.11)*	0.82	-0.18 (0.11)*	0.82	-0.20 (0.11)*	0.81
High	-22.6 (13.3)*	N/A	-23.7 (13.2)*	N/A	-24.4 (13.2)*	N/A
High * ln(t)	2.47 (1.45)*	N/A	2.58 (1.45)*	N/A	2.66 (1.44)*	N/A
Parental Education[b]						
Mother	-0.10 (0.18)	0.89	-0.11 (0.18)	0.89	-0.10 (0.18)	0.90
Father	-0.05 (0.16)	0.95	-0.05 (0.16)	0.94	-0.03 (0.16)	0.96
Parental marital status						
Divorced (0-16)	15.34 (6.74)**	N/A			16.3 (6.75)***	N/A
Divorced (0-16) * ln(t)	-1.69 (0.74)**	N/A			-1.80 (0.74)***	N/A
Divorced (0-5)			-0.83 (0.51)	0.43		
Divorced (5-10)			-0.08 (0.24)	0.92		
Divorced (10-16)			0.11 (0.19)	1.12		
Family Location[d]						
Rural	-0.16 (0.14)	0.84	-0.16 (0.14)	0.84	-0.17 (0.14)	0.84
Religion[d]						
Catholic	-0.20 (0.27)	0.89	-0.21 (0.21)	0.88	-0.21 (0.23)	0.87
Other religion	0.11 (0.09)	1.07	0.08 (0.08)	1.05	0.09 (0.09)	1.06
Ethnic Origin[a]						
Asian	0.50 (0.19)***	1.66	0.49 (0.19)***	1.64	0.44 (0.20)**	1.55
West Indian	-0.77 (0.58)	0.46	-0.72 (0.58)	0.48	-0.76 (0.58)	0.46
Other	-1.66 (1.00)	0.46	-1.67 (1.00)*	0.18	-1.69 (1.00)*	0.18
Family size						
Total siblings	8.13 (3.45)***	N/A	7.77 (3.39)**	N/A		
Total siblings * ln(t)	-0.89 (0.38)***	N/A	-0.85 (0.37)**	N/A		
Total sibs. in household					6.39 (3.39)*	N/A
Total sibs. in household * ln(t)					-0.70 (0.37)*	N/A
Total sibs. out of household					-0.11 (0.06)*	0.88
-2 log-likelihood						
Without covariates	7285.53		7285.53		7285.53	
With covariates	7236.97		7238.14		7244.39	
Likelihood ratio	48.55		47.38		41.13	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'.

*** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

Table 2.12 (cont.) Cox Regression Model Results for Timing of First Marriage for Males with Two+ Siblings (N= 1205, Models 4 – 5)

	Model 4		**Model 5**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[c]				
Medium	-0.20 (0.11)*	0.81	-0.20 (0.11)*	0.81
High	-24.3 (13.4)***	N/A	-24.4 (13.4)***	N/A
High * ln(t)	2.65 (1.47)***	N/A	2.66 (1.47)***	N/A
Parental Education[b]				
Mother	-0.09 (0.18)	0.90	-0.10 (0.18)	0.90
Father	-0.06 (0.16)	0.93	-0.06 (0.16)	0.94
Parental marital status				
Divorced (0-16)	15.2 (6.81)**	N/A	15.1 (6.79)**	N/A
Divorced (0-16) * ln(t)	-1.68 (0.18)**	N/A	-1.67 (0.74)**	N/A
Family Location[d]				
Rural	-0.17 (0.14)	0.83	-0.17 (0.10)	0.83
Religion[d]				
Catholic	-0.20 (0.27)	0.89	-0.21 (0.21)	0.88
Other religion	0.11 (0.09)	1.07	0.08 (0.08)	1.05
Ethnic Origin[a]				
Asian	0.47 (0.20)***	1.60	0.49 (0.20)***	1.63
West Indian	-0.74 (0.58)	0.47	-0.73 (0.58)	0.48
Other	-1.71 (1.00)*	0.90	-1.70 (1.00)*	0.18
Family size				
Total siblings	7.61 (3.51)**	2037	7.58 (3.50)**	1968
Total siblings * ln(t)	-0.84 (0.38)**	0.42	-0.84 (0.38)**	0.43
Sibling composition (in HH)				
Older sibling(s)	0.01 (0.07)	1.01		
Younger sibling(s)	0.14 (0.06)**	1.15		
Older brother(s)			0.06 (0.08)	1.06
Older sister(s)			-0.04 (0.09)	0.95
Younger brother(s)			0.14 (0.07)**	1.15
Younger sister(s)			0.14 (0.07)	1.16
-2 log-likelihood				
Without covariates	7285.53		7285.53	
With covariates	7227.62		7226.17	
Log-likelihood ratio	57.90		59.35	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'.
*** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

Table 2.13 Cox Regression Model Results for Timing of First Marriage for Females with One Sibling (N= 1572, Models 1 – 4)

	Model 1		**Model 2**		**Model 3**		**Model 4**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est. (S.E.)**	**H.R.**	**Est. (S.E.)**	**H.R.**
Parental Income[a]								
Medium	13.0 (6.46)**	N/A	-13.0 (6.46)**	N/A	-12.5 (6.46)**	N/A	-12.6 (6.46)**	N/A
Medium * ln(t)	1.45 (0.71)**	N/A	1.45 (0.71)**	N/A	1.40 (0.71)**	N/A	1.40 (0.71)**	N/A
High	-23.6 (9.49)***	N/A	-23.6 (9.49)***	N/A	-22.4 (9.51)***	N/A	-22.4 (1.04)***	N/A
High * ln(t)	2.60 (1.04)***	N/A	2.60 (1.04)***	N/A	2.47 (1.04)***	N/A	2.47 (1.04)***	N/A
Parental Education[b]								
Mother	-0.38 (0.12)***	0.68	-0.38 (0.12)***	0.68	-0.38 (0.12)***	0.67	-0.39 (0.12)***	0.67
Father	-17.1 (7.42)**	N/A	-17.1 (7.42)**	N/A	-14.4 (7.48)***	N/A	-14.4 (7.47)**	N/A
Father * ln(t)	1.86 (0.81)**	N/A	1.87 (0.81)**	N/A	1.57 (0.82)**	N/A	1.57 (0.82)**	N/A
Parental marital status								
Divorced (0-16)	-0.08 (0.07)	0.92			-0.08 (0.07)	0.92	-0.08 (0.07)	0.92
Divorced (0-5)			-0.03 (0.22)	0.96				
Divorced (5-10)			-0.04 (0.18)	0.95				
Divorced (10-16)			-0.13 (0.15)	0.87				
Family Location[c]								
Rural	0.18 (0.08)**	1.20	0.18 (0.08)**	1.22	0.18 (0.08)**	1.20	0.18 (0.08)**	1.20
Religion[d]								
Catholic	-0.41 (0.11)***	0.78	-0.41 (0.10)***	0.78	-0.42 (0.11)***	0.79	-0.43 (0.11)***	0.79
Other religion	-0.05 (0.07)	0.96	-0.04 (0.05)	0.95	-0.04 (0.04)	0.94	-0.04 (0.10)	0.94
Ethnic Origin[e]								
Asian	0.09 (0.38)	1.01	0.09 (0.38)	1.09	0.06 (0.38)	1.06	0.07 (0.38)	1.08
West Indian	0.06 (0.58)	1.06	0.04 (0.58)	1.04	0.07 (0.58)	1.07	0.04 (0.58)	1.04
Other	-0.40 (0.58)	0.66	-0.40 (0.58)	0.65	-0.40 (0.58)	0.66	-0.35 (0.58)	0.70
Family size								
Total sibs. in household	-0.20 (0.12)*	1.22	0.20 (0.12)*	1.22	0.14 (0.12)	1.15	0.14 (0.12)	1.15
Sibling composition (in HH)								
Younger sibling(s)					0.09 (0.07)	1.10		
Younger brother(s)							0.08 (0.08)	1.08
Younger sister(s)							0.18 (0.08)	1.12
-2 log-likelihood								
Without covariates	12359.77		12359.77		12359.77		12359.77	
With covariates	12310.06		12309.91		12298.32		12298.18	
Likelihood ratio	49.70		49.86		61.44		61.58	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'.
*** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

Table 2.14 Cox Regression Model Results for Timing of First Marriage for Females with Two+ Siblings (N= 1343, Models 1 – 3)

	Model 1		**Model 2**		**Model 3**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[c]						
Medium	-17.6 (6.05)***	7.06	-17.7 (6.05)***	0.00	-17.6 (6.05)***	0.00
Medium * ln(t)	1.95 (0.66)***	0.00	1.97 (0.66)***	7.17	1.95 (0.66)***	7.05
High	-19.5 (9.35)**	0.00	-19.6 (9.34)**	0.00	-19.5 (9.35)***	0.00
High * ln(t)	2.14 (1.02)**	8.50	2.15 (1.02)**	8.59	2.13 (1.02)***	7.05
Parental Education[b]						
Mother	-0.46 (0.16)***	0.62	-0.46 (0.16)***	0.62	-0.46 (0.16)***	0.62
Father	0.01 (0.13)	1.01	0.01 (0.13)	1.01	0.01 (0.13)	1.01
Parental marital status						
Divorced (0-16)	0.01 (0.08)	1.01			0.01 (0.08)	1.01
Divorced (0-5)			-0.22 (0.30)	0.79		
Divorced (5-10)			-0.14 (0.20)	0.86		
Divorced (10-16)			0.18 (0.15)	1.20		
Family Location[d]						
Rural	0.11 (0.10)	1.11	0.11 (0.10)	1.12	0.11 (0.10)	1.11
Religion[d]						
Catholic	-0.41 (0.11)***	0.78	-0.41 (0.10)***	0.78	-0.42 (0.11)***	0.79
Other religion	-0.05 (0.07)	0.96	-0.04 (0.05)	0.95	-0.04 (0.04)	0.94
Ethnic Origin[a]						
Asian	31.7 (11.2)***	6E13	31.7 (11.2)***	6E13	31.7 (11.2)***	5.8E13
Asian * ln(t)	-3.44 (1.25)***	0.03	-3.44 (1.25)***	0.03	-3.43 (1.25)***	0.03
West Indian	-1.51 (0.58)***	0.22	-1.53 (0.58)***	0.21	-1.51 (0.58)***	0.22
Other	-0.84 (0.58)	0.42	-0.81 (0.58)	0.44	-0.85 (0.58)	0.42
Family size						
Total siblings	-0.02 (0.04)	0.97	-0.01 (0.04)	0.98		
Total siblings * ln(t)						
Total sibs. in household					-0.01 (0.04)	0.98
Total sibs. out of household					-0.03 (0.05)	0.96
-2 log-likelihood						
Without covariates	10307.53		10307.53		10307.53	
With covariates	10231.91		10229.84		10231.71	
Likelihood ratio	75.61		77.69		75.81	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

Table 2.14 (cont.) Cox Regression Model Results for Timing of First Marriage for Females with Two+ Siblings (N= 1205, Models 4– 5)

	Model 4		**Model 5**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[c]				
Medium	-17.6 (6.05)***	0.00	-17.7 (6.05)***	0.00
Medium *ln(t)	1.95 (0.66)***	7.07	1.96 (0.66)***	7.11
High	-19.5 (9.34)***	0.00	-19.6 (9.35)***	0.00
High * ln(t)	2.14 (1.02)***	8.50	2.15 (1.02)***	8.64
Parental Education[b]				
Mother	-0.45 (0.16)	0.63	-0.44 (0.16)	0.64
Father	0.004 (0.13)	1.00	-0.001 (0.13)	0.99
Parental marital status				
Divorced (0-16)	0.01 (0.08)	1.01	0.01 (0.08)	1.01
Family Location[d]				
Rural	0.11 (0.10)	1.12	0.11 (0.10)	1.11
Religion[d]				
Catholic	-0.41 (0.11)***	0.78	-0.41 (0.11)***	0.80
Other religion	-0.05 (0.07)	0.96	-0.03 (0.07)	0.95
Ethnic Origin[a]				
Asian	31.5 (11.2)***	4E13	30.9 (11.2)***	2E13
Asian *ln(t)	-3.41 (1.25)***	0.03	-3.35 (1.25)***	0.03
West Indian	-1.50 (0.58)***	0.22	-1.48 (0.58)***	0.22
Other	-0.83 (0.58)	0.43	-0.85 (0.58)	0.42
Family size				
Total siblings	-0.02 (0.05)	0.97	-0.02 (0.05)	0.97
Sibling composition (in HH)				
Older sibling(s)	-0.006 (0.05)	0.99		
Younger sibling(s)	0.03 (0.04)	1.03		
Older brother(s)			0.02 (0.06)	1.02
Older sister(s)			-0.04 (0.07)	0.95
Younger brother(s)			0.09 (0.06)	1.10
Younger sister(s)			-0.01 (0.05)	0.98
-2 log-likelihood				
Without covariates	10307.53		10307.53	
With covariates	10230.97		10226.98	
Log-likelihood ratio	76.55		80.54	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

2.5.3 Results for timing of first co-residential relationship

The final part of the analysis involved estimation of models where the dependent variable is the number of days from birth date to date of first co-residential relationship. That is, first cohabiting union and first marriage were combined into one state.

Tables 2.15 and 2.16 show the results of the co-residential relationship analysis for males and females respectively using the full sample. Overall, they are broadly in line with the results obtained when the analysis is restricted to timing of first marriage only. For example, for both sexes, high levels of parental income are associated with delayed entry into first co-residential relationship, whilst for females, high levels of parental education also serve to postpone first co-residential relationship.

In terms of family composition, the greater the number of siblings, both in and out of the household, the earlier a first co-residential relationship takes place for females, although this effect is non-constant through time. The principal difference between the co-residential relationship and first marriage results for females relating to family composition is that greater numbers of siblings present in the household at the age of 16 is also associated with earlier entry into first co-residential relationship, although this effect does wane through time. For males, greater numbers of siblings in the household also serves to speed up first co-residential relationship, whilst the presence of a younger sibling in the household is associated with a 9 per cent higher risk of first co-residential relationship taking place at all ages between 16 and 30. For males and females, the presence of a younger brother in the household is associated with early entry into first co-residential relationship, although both results are not quite significant at the 10 per cent level.

Table 2.15 Cox Regression Model Results for Timing of First Co-residential relationship for Males (Full Sample (N= 3400), Models 1-3)

	Model 1		**Model 2**		**Model 3**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[c]						
Medium	-6.99 (3.73)*	0.00	-6.96 (3.73)*	0.00	-6.93 (3.73)*	0.00
Medium * ln(t)	0.77 (0.41)*	2.16	0.77 (0.41)*	2.16	0.76 (0.41)*	2.58
High	-22.8 (5.64)***	0.00	-22.8 (5.64)***	0.00	-22.8 (5.64)***	0.00
High * ln(t)	2.53 (0.62)***	12.5	2.52 (0.62)***	12.4	2.52 (0.62)***	12.5
Parental Education[b]						
Mother	-0.05 (0.08)	0.94	-0.06 (0.08)	0.94	-0.05 (0.08)	0.94
Father	-0.09 (0.07)	0.90	-0.10 (0.07)	0.90	-0.09 (0.07)	0.90
Parental Marital Status						
Divorced (0-16)	0.11 (0.04)***	1.12			0.11 (0.04)***	1.12
Divorced (0-5)			0.16 (0.15)	1.17		
Divorced (5-10)			-0.03 (0.11)	0.96		
Divorced (10-16)			0.21 (0.09)***	1.24		
Family Location[d]						
Rural	-0.10 (0.7)	0.90	-0.10 (0.07)	0.90	-0.10 (0.07)	0.90
Religion[d]						
Catholic	-0.11 (0.13)	0.91	-0.10 (0.14)	0.90	-0.09 (0.13)	0.91
Other religion	0.03 (0.10)	1.03	0.02 (0.10)	1.04	0.02 (0.10)	1.03
Family Size						
Total siblings	0.03 (0.01)	1.03	0.03 (0.01)	1.03		
Total siblings * ln(t)					0.04 (0.02)*	1.04
Total sibs. in household					-0.008 (0.04)	0.99
Total sis. out of household						
-2 log-likelihood						
Without covariates	32261.09		32261.09		32261.09	
With covariates	32190.97		32188.57		32189.75	
Likelihood ratio	70.11		72.51		71.33	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

Table 2.15 (cont.) Cox Regression Model Results for Timing of First Co-residential relationship for Males (Full Sample (N= 3400), Models 4-5)

	Model 4		**Model 5**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[c]				
Medium	-6.70 (3.73)*	0.00	-6.72 (3.73)*	0.00
Medium * ln(t)	0.74 (0.41)*	2.54	0.74 (0.41)*	2.10
High	-22.7 (5.64)***	0.00	-22.8 (5.64)***	0.00
High * ln(t)	2.51 (0.62)***	12.3	2.52 (0.62)***	12.4
Parental Education[b]				
Mother	-0.05 (0.08)	0.94	-0.05 (0.08)	0.94
Father	-0.10 (0.07)	0.90	-0.10 (0.07)	0.90
Parental Marital Status				
Divorced (0-16)	0.10 (0.04)***	1.11	0.11 (0.04)***	1.11
Family Location[d]				
Rural	-0.10 (0.07)	0.90	-0.10 (0.07)	0.89
Religion[d]				
Catholic	-0.11 (0.14)	0.91	-0.12 (0.13)	0.93
Other religion	0.01 (0.10)	1.02	0.02 (0.09)	1.02
Family Size				
Total siblings	0.005 (0.04)	1.00	0.002 (0.04)	1.00
Sibling composition (in HH)				
Older sibling(s)	-0.03 (0.05)	0.96		
Younger sibling(s)	0.08 (0.04)*	1.09		
Older brother(s)			0.003 (0.06)	1.00
Older sister(s)			-0.07 (0.06)	1.08
Younger brother(s)			0.08 (0.05)	1.09
Younger sister(s)			0.09 (0.05)*	1.09
-2 log-likelihood				
Without covariates	32261.09		32261.09	
With covariates	32179.51		32177.84	
Likelihood ratio	81.57		83.24	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

Table 2.16 Cox Regression Model Results for Timing of First Co-residential relationship for Females (Full Sample (N= 3853), Models 1-3)

	Model 1		**Model 2**		**Model 3**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[c]						
Medium	-14.8 (3.01)***	0.00	-14.8 (3.01)***	0.00	-15.0 (3.01)***	0.00
Medium * ln(t)	1.64 (0.33)***	5.17	1.64 (0.33)***	5.17	1.66 (0.33)***	5.30
High	-24.6 (4.54)***	0.00	-24.6 (4.54)***	0.00	-24.6 (4.54)***	0.00
High * ln(t)	2.71 (0.50)***	15.1	2.72 (0.50)***	15.1	2.71 (0.50)***	15.1
Parental Education[b]						
Mother	-0.23 (0.07)***	0.78	-0.23 (0.07)***	0.78	-0.23 (0.07)***	0.78
Father	-0.14 (0.06)**	0.86	-0.14 (0.06)**	0.86	-0.14 (0.06)**	0.86
Parental Marital Status						
Divorced (0-16)	0.12 (0.03)***	1.13			0.12 (0.03)***	1.13
Divorced (0-5)			0.10 (0.11)	1.10		
Divorced (5-10)			0.13 (0.09)	1.14		
Divorced (10-16)			0.12 (0.07)*	1.13		
Family Location[d]						
Rural	-10.5 (3.05)***	0.00	-10.1 (3.05)***	0.00	-10.2 (3.05)***	0.00
Rural * ln(t)	1.13 (0.33)***	3.10	1.13 (0.33)***	3.10	1.13 (0.33)***	3.12
Religion[d]						
Catholic	-0.32 (0.08)***	0.72	-0.33 (0.08)***	0.72	-0.32 (0.08)***	0.72
Other religion	-0.02 (0.06)	0.97	-0.02 (0.06)	0.97	-0.01 (0.06)	0.97
Family Size						
Total siblings	2.37 (0.99)***	10.7	2.37 (0.99)***	10.8		
Total siblings * ln(t)	-0.26 (0.11)***	0.76	-0.26 (0.11)***	0.76		
Total sibs. in household					1.96 (1.12)*	7.12
Total sibs. in household *ln(t)					-0.21 (0.12)*	0.80
Total sibs. out of household					-0.007 (0.03)	0.99
-2 log-likelihood						
Without covariates	44055.24		44055.24		44055.24	
With covariates	43895.43		43895.39		43897.88	
Likelihood ratio	159.81		159.85		157.36	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

Table 2.16 (cont.) Cox Regression Model Results for Timing of First Co-residential relationship for Females (Full Sample (N= 3853), Models 4-5)

	Model 4		**Model 5**	
	Est.(S.E.)	**H.R.**	**Est.(S.E.)**	**H.R.**
Parental Income[c]				
Medium	-14.7 (3.01)***	0.00	-14.8 (3.01)***	0.00
Medium * ln(t)	1.63 (0.33)***	5.13	1.64 (0.33)***	5.16
High	-24.5 (4.54)***	0.00	-24.7 (4.54)***	0.00
High * ln(t)	2.70 (0.50)***	15.0	2.73 (0.50)***	15.3
Parental Education[b]				
Mother	-0.23 (0.07)***	0.78	-0.23 (0.07)***	0.79
Father	-0.15 (0.06)***	0.86	-0.15 (0.06)***	0.85
Parental Marital Status				
Divorced (0-16)	0.12 (0.03)***	1.13	0.12 (0.03)***	1.13
Family Location[d]				
Rural	-10.2 (3.05)***	0.00	-10.3 (3.05)***	0.00
Rural *ln(t)	1.14 (0.33)***	3.14	1.14 (0.33)***	3.15
Religion[d]				
Catholic	-0.34 (0.06)***	0.74	-0.35 (0.07)***	0.74
Other religion	-0.03 (0.05)	0.97	-0.02 (0.07)	0.98
Family size				
Total siblings	2.37 (1.00)***	10.7	2.35 (1.00)***	10.5
Total siblings * ln(t)	-0.26 (0.11)***	0.76	-0.26 (0.11)***	0.77
Sibling composition (in HH)				
Older sibling(s)	-0.03 (0.03)	0.96		
Younger sibling(s)	0.03 (0.03)	1.03		
Older brother(s)			0.008 (0.05)	1.00
Older sister(s)			-0.09 (0.05)*	0.90
Younger brother(s)			0.07 (0.04)	1.07
Younger sister(s)			0.01 (0.04)	1.01
-2 log-likelihood				
Without covariates	44055.24		44055.24	
With covariates	43890.18		43884.79	
Likelihood ratio	165.05		170.44	

[a] – omitted category (o.c.) is 'low income', [b] o.c. is 'those without higher education', [c] o.c. is 'urban', [d] o.c. is 'Protestant', [e] o.c. is 'European'. *** p<0.01 ** p<0.05 *p<0.10 H.R. = hazard ratio

There are some notable differences between the first co-residential relationship and first marriage results in relation to family location and parental marital status. First, rural females were at higher risk of first marriage taking place at any between 16 and 30. However, the results in Table 2.16 show that such females are also at a *lower* risk of entering into a co-residential relationship, although this effect fades through time. Within the traditional rural community, there may be a greater social stigma associated with a co-residential relationship that does not involve marriage, particularly for females at relatively young ages.

The most striking result in relation to family background is that both males and females whose parents divorced during childhood are more likely to begin a co-residential relationship for the first time at a younger age than their contemporaries raised by both parents. For example, the results for Model 1 show that parental divorce occurring between birth and the age of the sixteen is associated with 12 per cent and 13 per cent higher risks of first co-residential relationship taking place at any age between 16 and 30 for males and females respectively. These results are robust across all model specifications.

Further, Model 2 also allows an examination of whether of timing of parental divorce affects the timing of first co-residential relationship. For both sexes, parental divorce between the ages of 10 and 16 is associated with earlier entry into first co-residential relationship. The results may be explained by the fact that parental divorce tends to be associated with early home-leaving (see Kiernan, 1992, using British data). Therefore, early home-leaving raises the likelihood of an early first co-residential relationship and, given the earlier results in this study, one that involves cohabitation rather than marriage.[17]

2.6 Conclusion

This chapter deals with an important question: Does family background affect children's outcomes, in particular, the timing of first marriage. Investigation of timing of marriage is important, not only to see whether the data support the predictions of human behaviour based on economic models, but also because age at first marriage has implications about a variety of individual and family outcomes over the life cycle, ranging from fertility to labour-force participation.

Of course, a young adult's transition to marriage involves a complicated set of relationships among a very large number of factors. For example, the economic model presented in this study, together with the findings of previous research, led to the expectation that high levels of parental resources would be associated with delayed entry into first marriage. Strong statistical evidence was found in support of this theory and there are several possible explanations for this finding; an advantageous family environment fostering negative attitudes toward marriage, parents with high income and education levels preventing premature marriages for the sake of more ambitious socio-economic aspirations for their children, and the mere reluctance of a young adult enjoying these home comforts and parental support to leave the family home through marriage.

Although the findings of this chapter indicate that young adults who have experienced parental divorce are not any more likely to marry at younger or older ages than those from intact families, three contextual factors (ethnic origin, religion, and family residential location) were found to affect timing of first marriage. First, compared to Europeans, being Asian is associated with early entry into first marriage, while being West Indian implies delayed marriage. Both findings were consistent with previous research that had suggested that Asians living in Britain adhere to "old-fashioned values" and the Caribbean approach is one of "modern individualism".

Second, being Catholic is associated with delayed marriage for females, a finding that supports the idea that since Catholicism attaches a higher cost to divorce, a longer search time in the marriage market is necessary to find the "right partner". Third, females raised in rural areas are associated with early entry into first marriage, while their male counterparts tend to delay marriage. One explanation for this result centres on the observation that there tends to be greater sexual division of labour in rural households relative to urban households.

In terms of family composition, theory had suggested that for a given level of parental resources, a larger number of siblings within the household would be associated with early marriage. Greater competition for these resources was the principal reason to expect this relationship. For males, the negative effects of "crowding" within the household appear to make the continuation of the current life pattern less attractive and early marriage represents one escape route. For females, the results suggest that it is the number of siblings both in and out of the household that is associated with early marriage. One explanation for this finding is that females with a large number of siblings may develop a preference for large families and marry at an early age because they wish to have more children than average.

Whilst previous studies using western data have examined the effects of family size on marital timing, this study is the first to investigate the effects of birth order and sibling sex composition. The results indicate that the presence of a younger sibling in the household at 16 years-old is associated with early entry into first marriage for males, while the presence of a younger brother serves to speed up marriage for both sexes. These results seem to suggest that parents may transfer resources toward younger siblings (particularly younger brothers), thereby diluting resources for older siblings and providing an incentive to experience the gains from marriage at an early age. Given the robustness of these results, it is clear that there is a need for

comparative research to be undertaken using data from other European countries as well as from North America.

Notes

[5] This type of model assumes that there is no so-called 'matching problem', i.e. all individuals and all relationships are the same and so individuals either accept all marriage offers or reject them all (see also Mortenson, 1982).

[6] The full derivation of this reservation payoff equation is found in Ermisch (2003, Chapter 7, pp. 137-140).

[7] The most recent follow-up interview was conducted in 2004/05 when the birth cohort members were aged 33. At the time when the bulk of this study was undertaken, the data were not available from this survey.

[8] By the age 30 interview in 1999/2000, 1.6 per cent of birth cohort members were treated as permanent or proxy refusals, 1.2 per cent had moved abroad so were not contacted for interview, and 0.6 per cent had died. These persons (in addition to a small number who had a birthday outside of the survey reference week) are not included as part of the original sample in the calculation of the response rate (Collins et al., 2001).

[9] Marriage dates for 305 respondents who reported two marriage dates were recoded and for five respondents who reported only one marriage date but did not indicate that they married that partner. There were 104 people who indicated that their current marital status is married/divorced/widowed etc. but they reported no marriage date. These were coded as missing all marriage information.

[10] More recently, Dias-Gimenez and Giolito (2008) argue that women's shorter biological clocks means that marriage is in fact a 'rushing game' in which young women marry older men since delaying marriage involves a high cost for women.

[11] It is unclear from the questions reported in the survey whether a twin would consider his or her twin as an older sibling. There are 94 twins in the dataset, 6 of whom report that he or she has no older siblings and no younger siblings. This suggests that these individuals do not consider their twin to be older or younger than themselves. In order to ensure that an older sibling in the model is not a twin born, say, a few hours earlier, 94 twins were deleted from the sample.

[12] As the table shows, many of the covariates have missing data. To maximize the sample size, for each variable that has missing data, a corresponding dummy variable was created, and included in the regressions, that indicated which cases were missing (1 = missing, 0 = observed).

[13] Recent British studies such as Booth and Kee (2006) also report that larger family size can have a negative impact on education.

[14] In addition, marriage and fertility decisions are almost certainly intertwined and therefore the estimates for martial timing that follow later in this chapter may also be capturing fertility timing preferences.

[15] Berthoud (2005) reports that South Asians living in Britain have very high rates of marriage. For example, around three-quarters of Pakistani and Bangladeshi women are in partnerships by the age of 25, compared with about two-thirds of Indian women and a little over half of African Asian and white women. Virtually all South Asians (97%) with a partner are in a formal marriage compared to three-quarters for whites. By contrast, Berthoud notes that blacks (predominantly from the Caribbean) have very low rates of marriage. This is true across all age groups, but is particularly so for those in their late-20s. Two-thirds of white men and women in this age group are reported to have lived with a partner, while just over a third of blacks had done so. Among those with a partner, three-quarters of whites, but only one-half of blacks, were in a formal marriage.

[16] For good measure, indicators of birth spacing (measured in days) ranging from 'furthest older brother in the household' (1676 for males and 1409 for females) to 'furthest younger sister in the household' (1361

for males and 1669 for females) were also constructed. The only statistically significant result that was found related to the effect of birth spacing between a female and her furthest younger sister. Greater birth spacing in this case was associated with earlier entry into first marriage. One potential explanation for this result is that perhaps having very young sisters (relative to slightly younger ones) decreases utility in the single state because one is expected to help care for these siblings.

[17] Research by Thornton (1991), Cherlin et al. (1995) from the U.S. and Kiernan (1992) from the U.K reports that parental divorce is associated with early first cohabitation.

Appendix

Table A1 Results of Grambsch-Therneau Test for Non-Proportionality (Males) for full sample

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
	p-value	p-value	p-value	p-value	p-value
Race					
Asian	0.76	0.78	0.73	0.64	0.65
West Indian	0.74	0.76	0.76	0.72	0.74
Other	0.81	0.80	0.80	0.79	0.81
Parental Education					
Mother	0.66	0.68	0.68	0.67	0.41
Father	0.80	0.65	0.56	0.60	0.35
Parental Income					
Medium	0.01	0.01	0.01	0.01	0.01
High	0.01	0.01	0.01	0.01	0.01
Family Size					
Total siblings	0.17	0.18		0.19	0.02
Total sibs (in HH)			0.23		
Total sibs (out of HH)			0.34		
Sibling composition					
Older sibling				0.21	
Younger sibling				0.26	
Older brother					0.14
Older sister					0.16
Younger brother					0.20
Younger sister					0.62
Religion					
Catholic	0.69	0.68	0.69	0.68	0.70
Other religion	0.66	0.65	0.66	0.66	0.69
Family location					
Rural	0.64	0.64	0.64	0.64	0.63
Parental marital status					
Divorced (0-16)	0.81		0.81	0.80	0.80
Divorced (0-5)		0.45			
Divorced (5-10)		0.51			
Divorced (10-16)		0.94			

Table A2 Results of Grambsch-Therneau Test for Non-Proportionality (Females) for full sample

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
	p-value	p-value	p-value	p-value	p-value
Race					
Asian	0.02	0.02	0.02	0.02	0.02
West Indian	0.09	0.09	0.10	0.09	0.09
Other	0.30	0.29	0.29	0.30	0.29
Parental Education					
Mother	0.54	0.54	0.54	0.53	0.54
Father	0.61	0.61	0.63	0.65	0.67
Parental Income					
Medium	0.02	0.02	0.02	0.02	0.03
High	0.01	0.01	0.01	0.01	0.01
Family Size					
Total siblings	0.02	0.02		0.04	0.02
Total sibs (in HH)			0.08		
Total sibs (out of HH)			0.10		
Sibling composition					
Older sibling				0.46	
Younger sibling				0.50	
Older brother					0.96
Older sister					0.15
Younger brother					0.46
Younger sister					0.40
Religion					
Catholic	0.69	0.68	0.69	0.68	0.70
Other religion	0.66	0.65	0.66	0.66	0.69
Family location					
Rural	0.48	0.49	0.47	0.48	0.49
Parental marital status					
Divorced (0-16)	0.17		0.19	0.17	0.18
Divorced (0-5)		0.31			
Divorced (5-10)		0.98			
Divorced (10-16)		0.36			

Figure A1 Plots of the scaled Schoenfeld residuals for the effect of 'medium' parental income on male marital timing (Model 1)

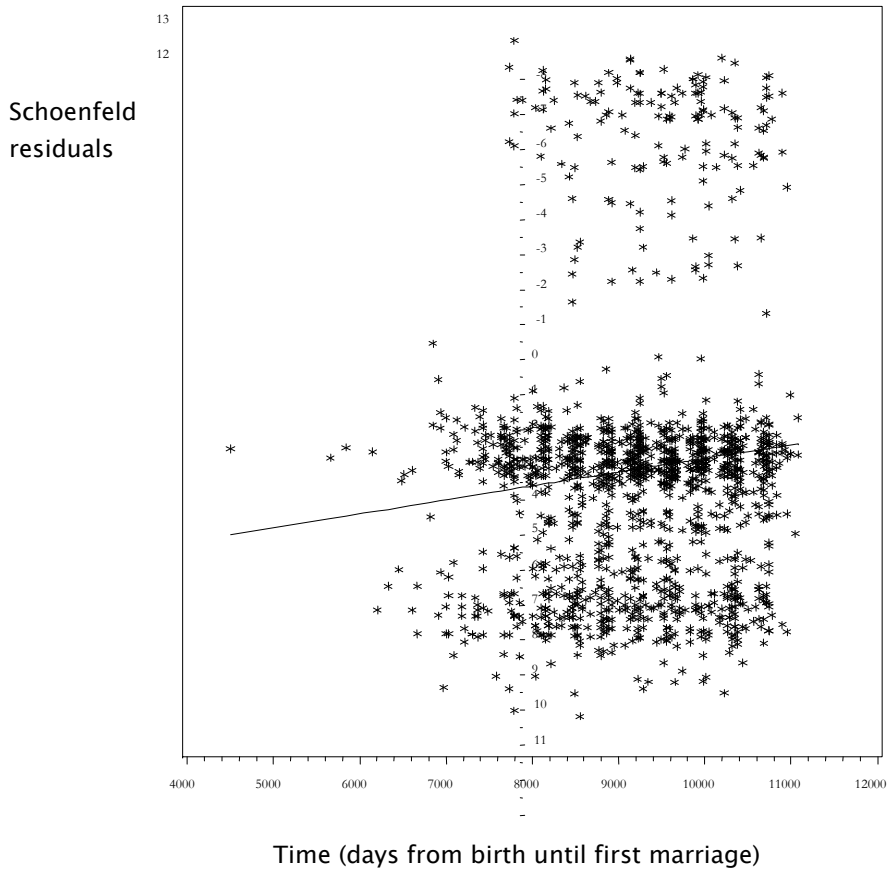


Figure A2 Plots of the scaled Schoenfeld residuals for the effect of 'high' parental income on male marital timing (Model 1)

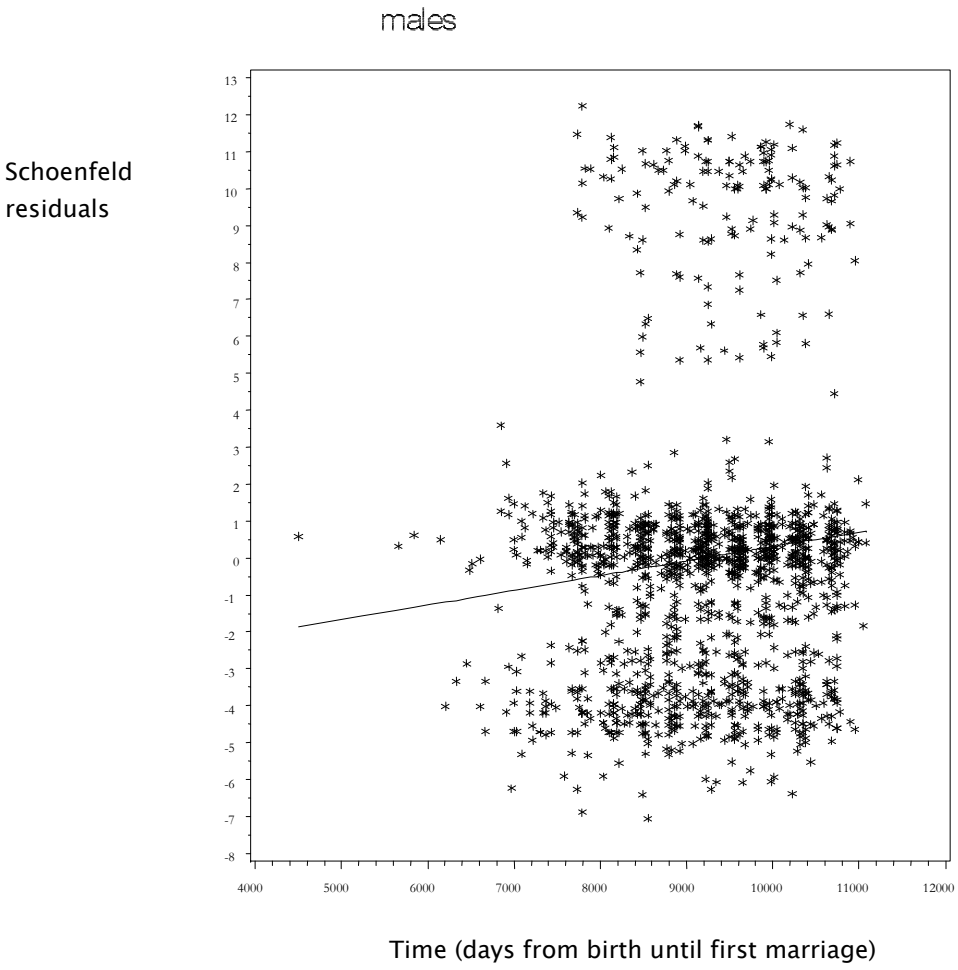


Figure A3 Plots of the scaled Schoenfeld residuals for the effect of 'medium' parental income on marital timing for females (Model 1)

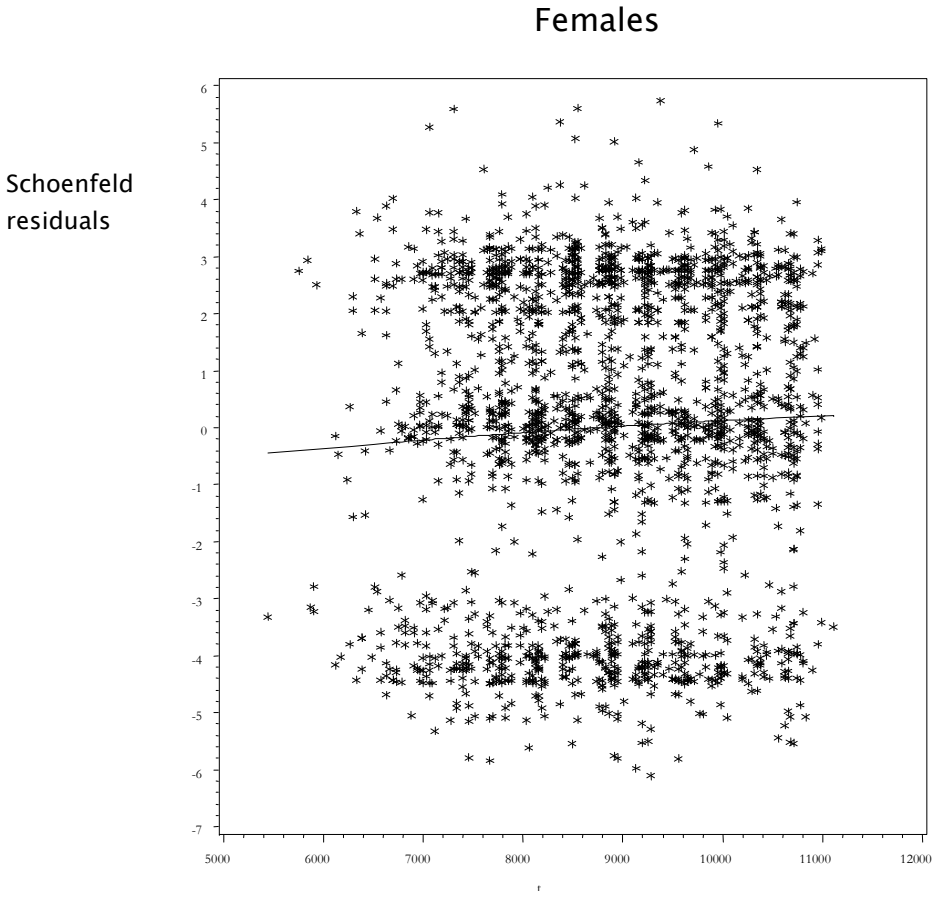


Figure A4 Plots of the scaled Schoenfeld residuals for the effect of 'high' parental income on female marital timing (Model 1)

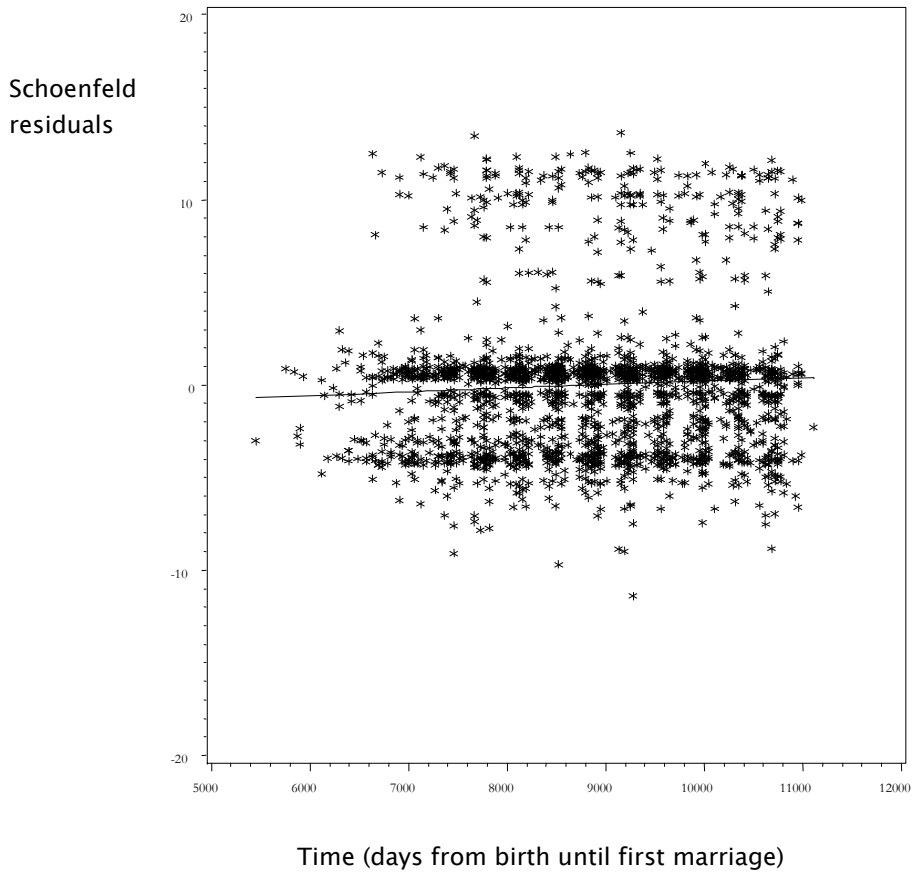
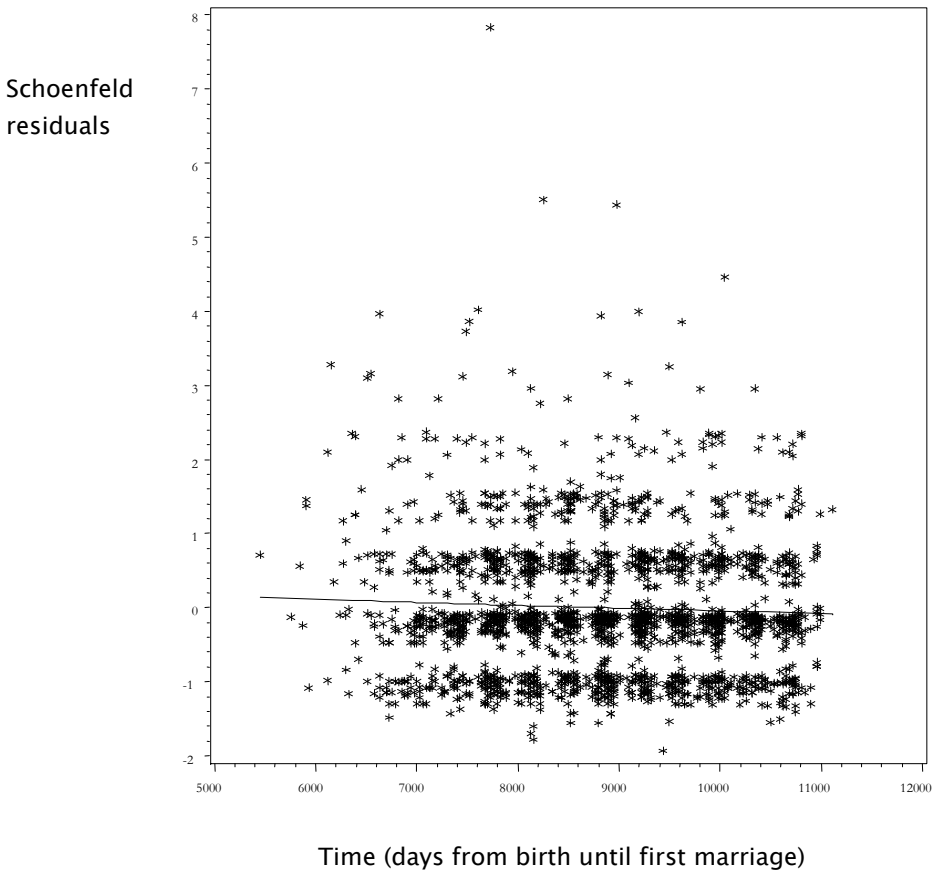


Figure A5 Plots of the scaled Schoenfeld residuals for the effect of family size on female marital timing (Model 1)



3.

Abortion Laws and Marriage in Eastern Europe

"Some girls can deliberately set out to get pregnant or threaten to have abortions to give guys ultimatums, which is awful."

Haley Hann, 21, student (*The Times* online)

"For us women, it's really a limited window. We know that boys who grow up to become men don't necessarily want to be men. They like to be boys. And so women say, 'You know what? He's gonna just have to snap out of it - and my pregnancy will be the thing to do it.'

Vicki Iovine, author of *The Girlfriends' Guide to Pregnancy*.

3.1 Introduction

Economists have long understood how changes in social policy can alter the incentives of individual and group actions leading to behavioural responses. One such social policy is the restrictions that a society places on a person's ability to terminate a pregnancy. Changes in such restrictions can alter both male and female incentives to engage in premarital sex, to seek premarital commitments and to enter marriage itself.

This study examines a period of rapid change in abortion restrictions in Eastern Europe and the effect that these changes had on the marriage rates of women. It is found that, contrary to what many have assumed, more liberal abortion laws have been associated with increases in female marriage rates for non-teenage women. A reasonable theoretical model is presented to suggest that these results are not perverse, that in fact in a world of uncertainty about a potential spouse's attitude toward parenthood, liberal abortion laws can speed up the search process leading to earlier marriages.

The economic and political transition in Eastern Europe of the late 1980s and early 1990s was associated with a drastic transformation in family life. The data show considerable changes in trends affecting families, such as an abrupt fall in total fertility rates but a corresponding steep rise in the proportion of extra-marital births. Single-person families increased relative to all

families, and the average size of families and households dropped significantly. Further, there were major changes in patterns of union formation, as marriage rates declined to very low levels and individuals postponed marriage to a later age. These trends took place against the backdrop of radical changes in social policy in Eastern Europe. For example, over the transitional period of the late 1980s and early 1990s, several countries made amendments to laws relating to access to abortion. For most countries in the region, this took the form of eliminating varying degrees of restrictions that existed under the former communist regime, although one country (Poland) tightened abortion laws even further. Those countries, mainly from the former Soviet Republics, that already had in place fairly liberal abortion laws prior to the transitional period, did not significantly change their policies relating to abortion.

Several previous economic studies investigate the relationship between abortion access and marriage in the United States. Akerlof et al. (1996), for instance, examine whether legalization of abortion may be partly responsible for a decline in shotgun weddings (that is, marriage taking place after pregnancy begins, but before the birth of the child). They note that comparing the periods 1965 to 1969 and 1980 to 1984, the percentage of out-of-wedlock births rose by 154 per cent for whites and by 64 per cent for blacks. At the same time, the number of shotgun weddings occurring dropped by 25 per cent for white women and by 48 per cent for blacks. Akerlof et al. (1996) argue that the availability of abortion may be driving these trends, noting that the number of abortions among unmarried women aged 15 to 44 increased from 88 000 during the 1965-1969 period to 1.27 million in the 1980-1984 period. Increased availability of abortion is theorized to lead to a decline in marriage rates among females for two reasons. First, since abortion now acts as a form of ‘insurance policy’, women no longer need to insist upon a marriage promise, in the event of pregnancy, as a precondition for premarital sex. Second, with

increased access to abortion, males may feel less responsibility to marry their partners in the event of an unplanned pregnancy since fertility is now a decision on their part. For both reasons, increased access to abortion should lead to lower incidence of 'shotgun weddings,' or weddings that occur due to an unplanned pregnancy. This theory states then that a decrease in forced marriages due to unplanned pregnancies should lead to more delays in first marriage as abortion laws are liberalized, and lower first marriage rates among women across the entire fertility age range (15 to 44 years-old).

The present study proposes a competing theory of abortion access and marriage that extends the work of Kane and Staiger (1996). It is suggested that a woman considering the suitability of a potential mate for marriage can learn through two channels: slowly gathering information through time, or becoming pregnant and therefore learning quickly, provided she can terminate the pregnancy if the information is negative. A switch to a liberal abortion regime might make the pregnancy route less costly, speed up the learning process on average, and, in contrast to the Akerlof et al. (1996) theory, raise first-marriage rates among women. It would appear, therefore, that the precise effect of abortion laws on marriage outcomes is an empirical question.

The study proceeds as follows: Section 3.2 provides a more detailed comparison of the theories exploring the relationship between abortion access and marriage. Section 3.3 discusses previous empirical work that examines the relationship between abortion laws and marriage. Section 3.4 contains a descriptive overview of the data used in the chapter's empirical analysis. Section 3.5 presents the study's methodology and results. Finally, Section 3.6 outlines the conclusions of the chapter.

3.2 Abortion laws and entry into marriage: the theoretical framework

To understand how abortion access affects entry into marriage, the decision to engage in sexual intercourse by unmarried women is first examined. In a traditional economic framework, an unmarried woman is assumed to evaluate the costs and benefits of sexual activities before engaging in sexual intercourse with a man (Posner, 1992; Levine, 2000; Klick and Stratman, 2003, 2008). One of the most obvious drawbacks is the possibility of an unplanned pregnancy occurring, which is associated with considerable costs. On the one hand, there are several direct costs, including the monetary costs attached to giving birth to and raising a child. On the other hand, there are also indirect costs to consider. For example, an unplanned pregnancy may result in a woman having to forgo opportunities in education and in the labour market (Angrist and Evans, 1996) and may also generate social or familial opprobrium. This raises the possibility that a woman (and her partner) may be 'forced' into a shotgun wedding. Access to abortion can eliminate these costs by eliminating their source (although replacing them with the actual financial and possibly emotional cost of the abortion itself).

From this theoretical basis, two theories extend this analysis to marriage directly and relate to the effect of abortion access on entry into marriage. In the Akerlof et al. (1996) theory noted earlier, two types of women are assumed to exist. A Type I woman attaches high costs to pregnancy and would terminate a pregnancy using abortion were it legally available. She is willing to engage in premarital sex with a man but only with a marriage promise. A Type II woman attaches low costs to pregnancy (as she would like to have a baby) and would not terminate a pregnancy using abortion even if it were legal. Whilst she would be willing to proceed without one, the Type II woman also demands a marriage promise as she knows that a man will have to accept her demand. Further, she prefers marriage and birth to just a birth. For

both women, a man has to provide a marriage promise simply because he has no better alternative. Taking these preferences together, when premarital sex takes place under strict abortion laws, shotgun marriages will increase.

A switch to liberal abortion laws reverses this outcome. A Type I woman no longer needs to insist on a marriage promise, since she can terminate a pregnancy using abortion rather than giving birth (the man is no longer obliged to provide a marriage promise since there is no birth to legitimize in the first place). Similarly, a Type II woman can no longer insist on a marriage promise, as she is aware that a man can find a Type I woman who will not demand such a promise (and who would not have a birth in any case). Therefore, this switch in behaviour following liberalization of abortion laws leads to a decline in shotgun weddings.[18]

A competing theory of abortion access and marriages is derived from Kane and Staiger (1996), who argue that pregnancy reveals information about the attractiveness of parenthood and abortion provides insurance in case that information is negative. Adapting this to a marriage market, it is easy to argue that one type of information revealed only after pregnancy is the father's willingness to marry her and raise the child.

To fix ideas, consider a simple model. A woman who wishes to start a family needs to find a spouse.[19] Denote the benefit to a woman from successfully starting a family as B. Potential spouses are drawn from a population of men, a proportion of whom are not interested in marrying and having children ('cads') and the rest are men who are interested in marriage and family ('dads'). Women do not know a man's type when they meet them; they know only that the proportion Φ of all men are 'dads' and the proportion 1- Φ are 'cads.'

Information can be revealed in two ways: a woman can wait for a period of time for the information to be revealed or she can get pregnant and force the revelation of this information

immediately. Waiting is costless in the sense that there are no explicit costs to be paid (only implicit ones such as the costs of marriage market depopulation), but the expected benefits are discounted by the extra time involved in undertaking this strategy. This discounting becomes more severe as the woman approaches the end of her fertile years. Thus, the future benefit to waiting if the information is positive (her potential mate is a 'dad') is $\beta^{\alpha} B$, where $\beta \in (0,1)$ and α is the age of the woman minus the age at the beginning of fertile years. Therefore, when the woman first becomes fertile $\alpha = 0$ and there is no discounting; and as the woman gets older from there, the discounting is exponential. The benefit to the woman if the information is negative (her potential mate is a 'cad') is zero.

The second strategy is to get pregnant and force the immediate revelation of a man's type. If the information is positive, there is no cost to this strategy, and the woman receives the full benefit, B. If the information revealed is negative, the cost to this strategy depends on the cost to the woman of obtaining an abortion to terminate the pregnancy. If abortion laws are 'liberal' the cost of this strategy is C_L, and if abortion laws are strict, the cost of this strategy is C_R, where $C_L < C_R$.[20] Also, it follows that $B > C_R > C_L$.

We can consider this a type of game where a random draw from the population of potential spouses is made and then a woman makes her strategy choice. The woman's decision tree is illustrated in Figure 3.1:

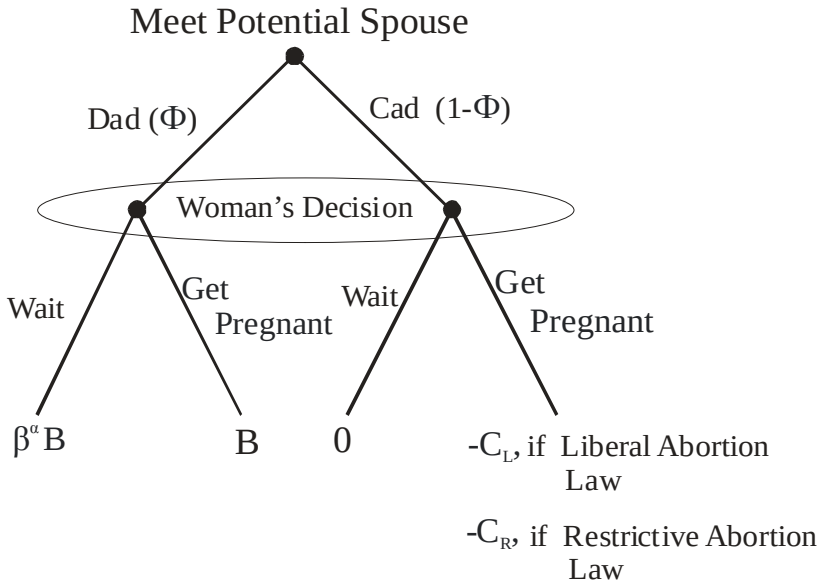


Figure 3.1 The Marriage Information Game

expected payoff from waiting is: $\Phi \beta^{\alpha} B + (1- \Phi)0$, or $\Phi \beta^{\alpha} B$. The expected payoff from getting pregnant is: $\Phi B + (1- \Phi)(-C_L)$. Thus, a risk-neutral woman should get pregnant if:

$$(1) \qquad \Phi B + (1- \Phi)(-C_L) > \Phi \beta^{\alpha} B$$

For a woman facing restrictive abortion laws, the expected payoff from waiting is the same, $\Phi \beta^{\alpha} B$, and the expected payoff from getting pregnant is: $\Phi B + (1- \Phi)(-C_R)$. Thus, a risk-neutral woman should get pregnant if:

$$(2) \qquad \Phi B + (1- \Phi)(-C_R) > \Phi \beta^{\alpha} B.$$

Note that it is always the case that $\Phi B + (1- \Phi)(-C_L) > \Phi B + (1- \Phi)(-C_R)$, so the expected payoff to getting pregnant is higher in a country with liberal abortion laws. Therefore, depending on the distribution of types in the male population, the restrictiveness of the abortion law, and the age of the woman, three cases are possible:

Case 1: $\Phi \beta^{\alpha} B > \Phi B + (1- \Phi)(-C_L) > \Phi B + (1- \Phi)(-C_R)$

Case 2: $\Phi B + (1- \Phi)(-C_L) > \Phi \beta^{\alpha} B > \Phi B + (1- \Phi)(-C_R)$

Case 3: $\Phi B + (1- \Phi)(-C_L) > \Phi B + (1- \Phi)(-C_R) > \Phi \beta^{\alpha} B$

Proposition 1: For a given distribution of types in the population of men, women are more likely to choose the 'getting pregnant' strategy if abortion laws are liberal.

Proof: Since it is always the case that $\Phi B + (1- \Phi)(-C_L) > \Phi B + (1- \Phi)(-C_R)$, the result follows.

Proposition 2: For a given distribution of types in the population of men, and under either type of abortion law, as women get older they are more likely to choose the 'getting pregnant' strategy.

Proof: $\Phi \beta^{\alpha} B$ is monotonically decreasing in α, therefore as α increases from the situation in Case 1, first Case 2 will obtain and then Case 3 (see Figure 3.2).

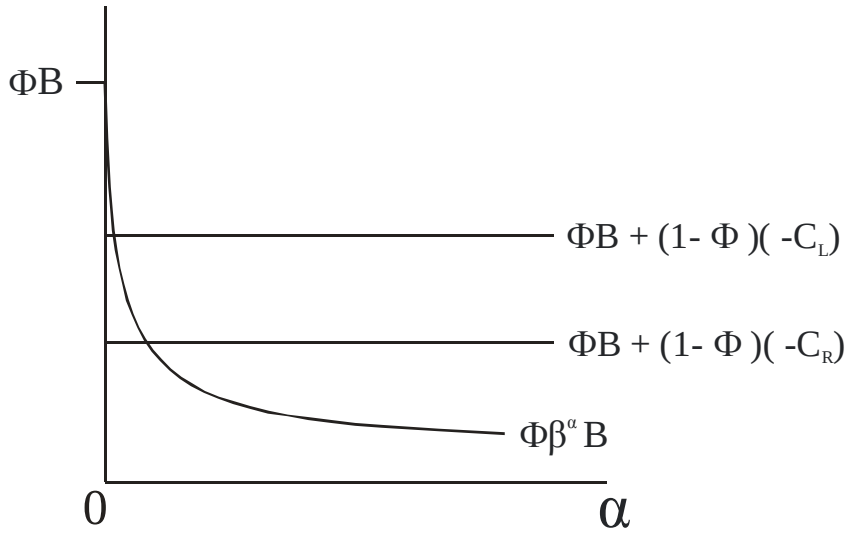


Figure 3.2 Proof of the Marriage Information Game

In summary, a switch to a more liberal abortion law in the model can affect marriage rates because pregnancies will be affected. Specifically, every non-marital pregnancy will be associated with a probability that the man will turn out to be a 'Dad' and therefore marry the woman before the child is born. Since more pregnancies are likely to take place, some of these will lead to marriage. Further, the response time of women to the policy shift is likely to be fairly rapid in this model since their behaviour reflects changes in the woman's own actions with little or no regard to the broader social environment. By contrast, in the Akerlof et al. (1996) model, social norms are required to change in response to the switch in abortion policy, since we observe effects on competition among women and bargaining power between men and women.

The presence of competing theories of access to abortion and marriage suggests that the net effect of a more liberal abortion law on entry into marriage is an empirical issue.

3.3 Previous empirical studies

There are a few additional previous empirical studies that address similar questions as the present study. Goldin and Katz (2002) argue that liberalizing access to abortion in the U.S. in the early 1970s may have lowered the marriage market cost to young women who delayed marriage in order to pursue a career. The data in their study are drawn from the 1 percent sample of the 1980 Census of Population from the Integrated Public Use Microdata Service (PUMS), and the authors employ a standard difference-in-difference specification that includes controls for both state of birth and year of birth fixed effects, and a basic estimating equation that includes dummy variables for state laws regarding pill access and abortion availability in each woman's state of birth, when she was 18 years-old, and her age at college education. They report that the legalization of abortion was associated with a small but statistically significant decline in the likelihood that a female college graduate would marry before the age of 23.

Their analysis is also extended to examine whether changes in long-run marital status outcomes (from ages 30 to 49 years-old) for successive cohorts of college women in the U.S. are related to access to abortion when these individuals were under 21 and unmarried. Consistent with their within-state results, they report that legalization of abortion had a positive effect on the share of women who never married. In summary, Goldin and Katz (2002) report that legalization of abortion in the U.S. was associated with a delay in marriage for women, although the effect was not as strong as that of the pill.[21]

Two other studies exploit the cross-state variation in abortion access in U.S. states in the early 1970s to examine the effects on marriage rates. Evans and Angrist (1999) note that whilst five states adopted laws that imposed non-restrictive access to abortion in 1970, a further ten states had also made abortion 'significantly easier to obtain' by this date. Using the 1980 Census

of Population, they examine teen marriage rates over the 1967 to 1973 period for men and women born between 1949 and 1954. Their OLS regressions suggest that there is a statistically significant negative effect of abortion liberalization on the probability that a white woman married by the age of 20. For example, three years of exposure to the new laws is associated with a 0.029 unit reduction in the probability of teen marriage, which amounts to a 5.2 per cent decline in teen marriage rates.

Choo and Siow (2006) also employ Census data to estimate the effect of partial liberalization of abortion in twelve U.S. states between 1967 and 1973 on marital behaviour in 1971/72 and 1981/82. Consistent with the results of Evans and Angrist (1999), they report a negative effect of partial liberalization of abortion on marriage rates for both young men and women and argue that the change in policy may explain up to 20 per cent of the decline in the gains to marriage for young adults in the 1970s, particularly for same-age spouses between the ages of 19 and 26. A small increase in the gains to marriage is reported for same-age spouses between the ages of 27 and 40. The authors argue that these gains arise because individuals in this age group would have been forced to marry at a young age had abortion not been legalized.

The studies discussed above focus directly on the effect of liberalization of abortion laws in the U.S. on entry into marriage. Two studies by Rasul (2003) and Alesina and Giuliano (2007) examine the impact of adoption of unilateral divorce laws in the U.S. on marriage rates, but appear to be the only papers in this growing body of literature in recent years that also control for the liberalization of abortion laws. Rasul (2003) uses state-level data from Vital Statistics between 1968 and 1995 and finds that legalized abortion has a statistically significant negative effect on marriage rates. Alesina and Giuliano (2007) use state-level Vital Statistics data over the period 1956 to 1995 and report a negative relationship between abortion legalization and

marriage rates, but the result is not statistically significant. Table 3.1 provides a summary of the results of the principal studies examined in this section.

Having discussed the effect of abortion liberalization in the U.S., the remainder of this study is concerned with an empirical investigation of abortion law liberalization in Eastern Europe.

3.4 Data description and methodology

The analysis that follows uses data from twelve Eastern European countries over the 1980 to 1997 period to estimate the empirical relationship between changes in different types of abortion policies and female entry into marriage.[22] Eastern Europe is a very useful area to study in this respect since, as noted earlier, the region experienced sweeping and diverse changes in abortion laws over those two decades. Further, the issue of whether these changes affected the propensity to marry has not been addressed in the literature and the decision to explore this area of research was also motivated by the fact that access to robust coding of the abortion laws was made available by Doug Staiger and Phillip Levine who, in a 2004 study, had examined the effect of these laws on a range of fertility outcomes in Eastern Europe[23].

To examine the impact of changes in abortion policy on entry into marriage, OLS regression models were estimated with each outcome considered as a function of the legal status of abortion, macroeconomic conditions (GDP and inflation), economic and social development (female university enrolment and urbanization) and marriage market conditions (female-to-male population ratios and divorce laws). The outcomes considered are the total female first marriage rates per 1000 females for women aged less than 50, those in the 15-19, 20-24, 25-29, 30-34, 35-39, and 40-44 age groups, as well as the mean age at first marriage for females.

Table 3.1 Summary of empirical studies examining relationship between abortion laws and entry into marriage

Study	Principal interest	Data	Results
Evans and Angrist (1999)	Effect of legalization of abortion on teenage marriage rates between 1967 and 1973 for men and women born between 1949 and 1954	1980 U.S. Census	Teen marriage rates lower in early legalizing states relative to later legalizing states. Three years of exposure to new laws associated with a 0.029 unit reduction in probability of teenage marriage that amounts to a 5.2% decline in teen marriage rates.
Goldin and Katz (2002)	Effect of introduction of pill and legalization of abortion on marital status outcomes of U.S. college women	1980 U.S. Census	Legalization of abortion associated with small but statistically significant decline in likelihood that female college graduate would marry before age 23. Also, policy had a positive effect on share of women never married.
Rasul (2003)	Effect of adoption of unilateral divorce laws on marriage rates (abortion legalization used as control)	1968 to 1995 Vital Statistics	Legalization of abortion associated with a statistically significant negative effect on marriage rates.
Choo and Siow (2006)	Effect of legalization of abortion on marital behaviour in 1971/72 and 1981/82	1970 and 1980 U.S. Census and 1971/72 and 1981/82 Vital Statistics	Partial liberalization of abortion in 12 U.S. states between 1967 and 1973 may explain up to 20% of decline in gains to marriage for young adults in the 1970s, particularly for same-age spouses between ages of 19 and 26. Small increase in gains to marriage for same-age spouses aged between 27 and 40.
Alesina and Guiliano (2007)	Effect of adoption of unilateral divorce laws on marriage rates and fertility rates (abortion legalization used as control)	1960, 1970, 1980 and 1990 U.S. Census and 1956 to 1995 Vital Statistics	Legalized abortion associated with negative effect on marriage rates, but the result is not statistically significant.

The total female first marriage rate is the probability of first marriage for a woman if she has passed through the ages 15 to 49 conforming to the age-specific first marriage rates of a given year. It is calculated by summing the age-specific first-marriage rates observed in a given year. Note that since the period total female first-marriage rate sums over age groups that are born in different years, the rate can exceed one.[24] The age-specific marriage rates are calculated as the total number of first marriages divided by the number of unmarried women in each age group. The mean age at first marriage is the weighted average of the different ages, using as weights the age-specific marriage rates of first marriage only.

The data for the dependent variables are taken from various issues of the Council of Europe's Demographic Yearbook.

3.4.1 Descriptive analysis of outcome measures

Over the time period under examination, traditional patterns of early and universal entry into marriage for females were broken in Eastern Europe, a process that continues today. Table 3.2 presents mean values of this study's outcome measures in Eastern Europe weighted by the relevant population measure in each country in 1980 and 1995. For comparative purposes, statistics are also reported for Western Europe.

The first row of the table provides estimates of the total female marriage rate that are broadly similar in both regions. In 1980, the total female marriage rate was 0.76 and 0.73 for Eastern and Western Europe respectively. By 1995, both regions had experienced a decline in the female marriage rate, although the magnitude of the decline was considerably greater in Western Europe at 25 per cent compared to a 10 per cent fall in Eastern Europe.

Table 3.2 Weighted average values of outcome measures, by region

	Eastern Europe		Western Europe	
	1980	**1995**	**1980**	**1995**
Female marriage rate	0.76	0.69	0.73	0.58
Female marriage rate (per 1000 women):				
Aged 15-19	334.5	261.8	153.2	33.3
Aged 20-24	398.7	338.5	382.8	196.7
Aged 25-29	101.7	90.7	137.3	228.1
Aged 30-34	30.9	23.8	34.1	82.4
Aged 35-39	27.9	9.2	12.1	25.1
Aged 40-44	5.1	4.3	6.1	7.8
Female mean age at first marriage	22.2	22.4	23.3	26.6

Source: Council of Europe

Figures 3.3 to 3.6 present the complete time series in total female marriage rates over the 1980 to 1995 period for the Eastern European countries included in the sample. They show that female marriage rates during the 1980s were particularly high in two Baltic States (Latvia and Lithuania) and in two countries of the CIS (Moldova and Russia), where values close to or higher than 1 can be observed. It was above or around 0.9 in Poland, the Czech and Slovak Republics, Bulgaria, Romania, and Hungary. The latter two countries experienced considerable and persistent falls in the female marriage rate during the 1980s. The lowest marriage rates during this decade were observed in the ex-GDR.

At the beginning of the 1990s, the figures show that there was a small increase in the female marriage rate, particularly in the Czech and Slovak Republics. The timing of this behavioural shift closely coincides with the political and economic turmoil brought about by the decline and eventual collapse of the Soviet Union. This emphasises the need to address the issue of variation through time of the key variables in the econometric analysis, something that is discussed in

Figure 3.3 Female marriage rates in Bulgaria, Czech Republic and Estonia, 1980-1995

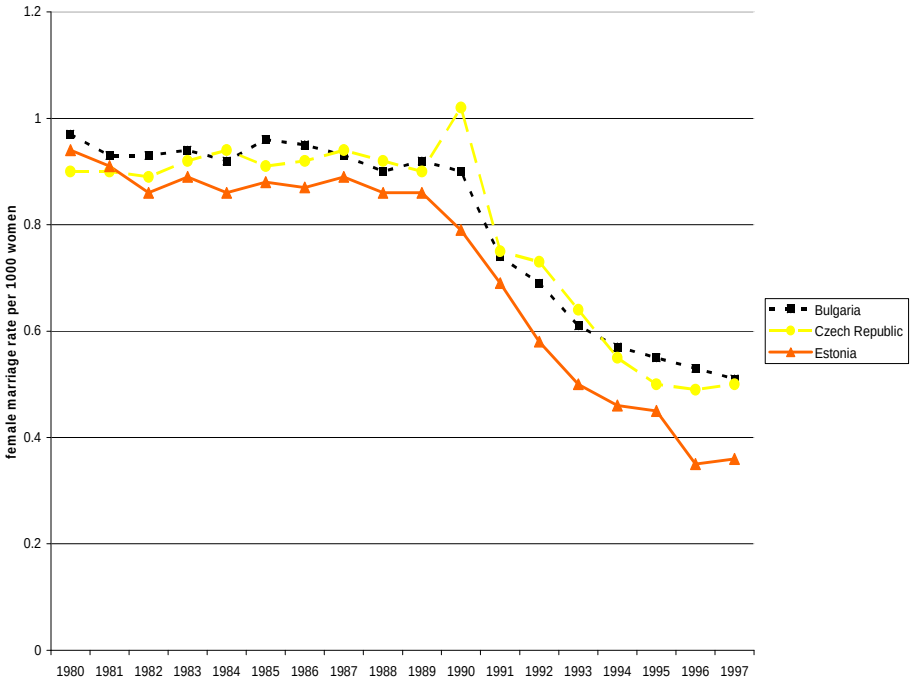


Figure 3.4 Female marriage rates in GDR, Hungary and Latvia, 1980-1995

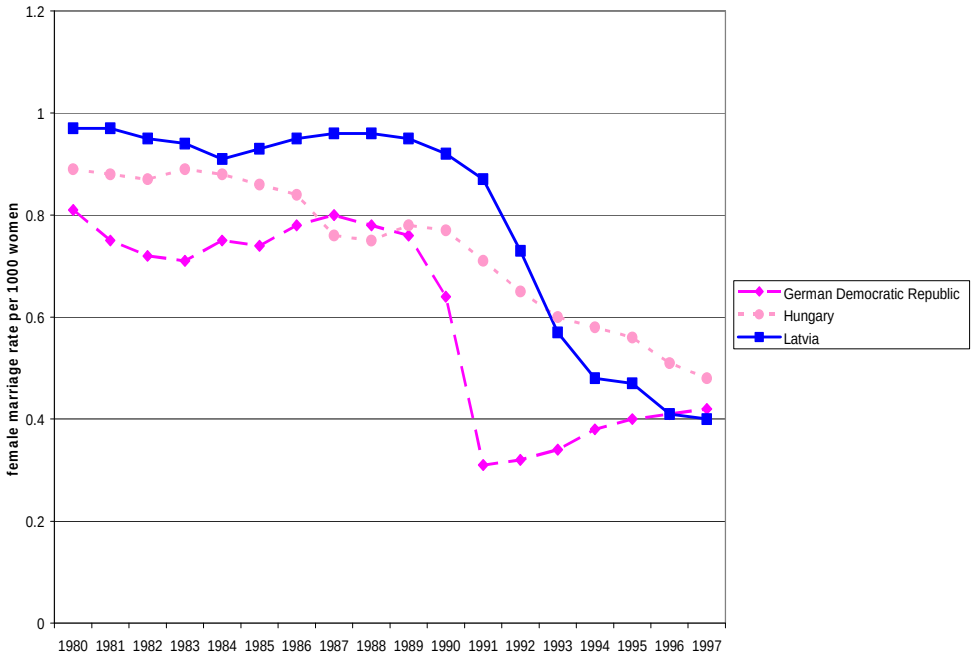


Figure 3.5 Female marriage rates in Lithuania, Moldova and Poland, 1980-1995

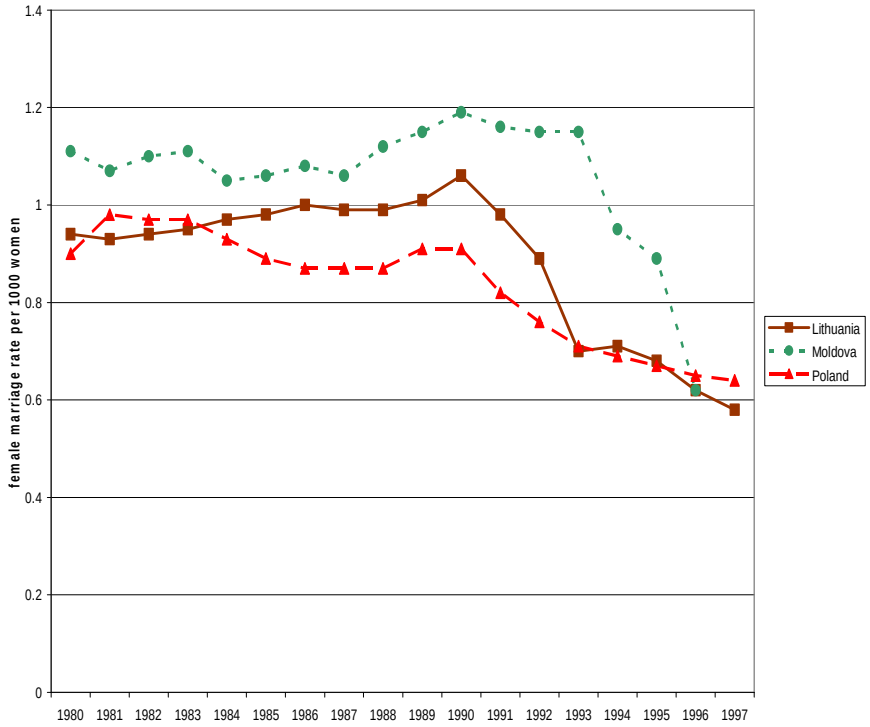
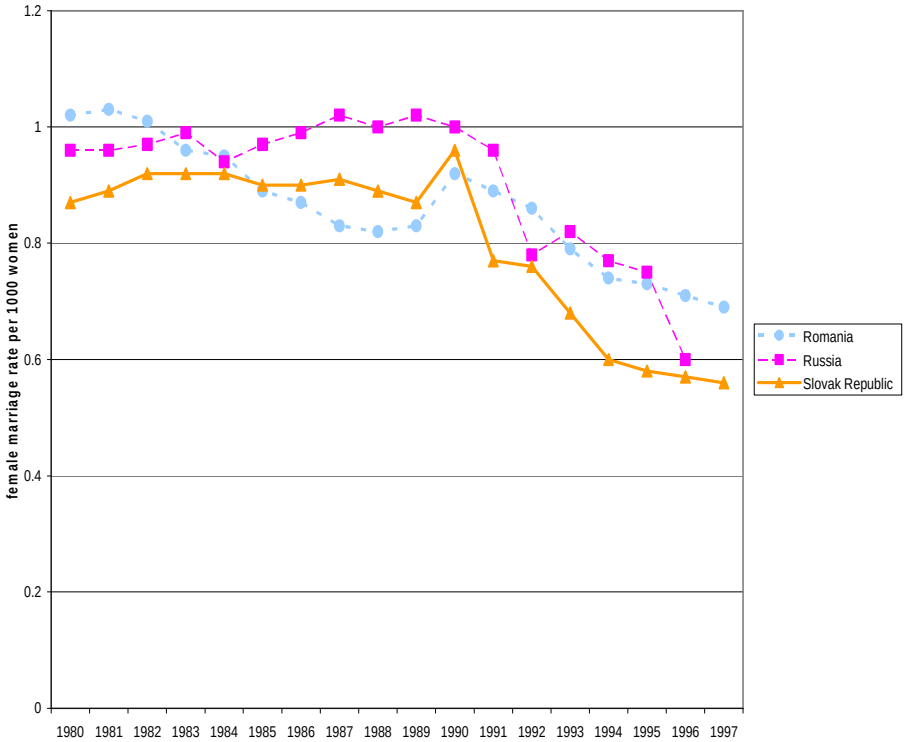


Figure 3.6 Female marriage rates in Romania, Russia, and Slovak Republic, 1980-1995



Section 3.5. A dramatic initial decrease in the female marriage rate was observed in the ex-GDR, where the female marriage rate fell from 0.64 in 1990 to 0.31 in 1991.

Table 3.2 also reports female marriage rates in Eastern and Western Europe by age group in 1980 and 1995. Across the entire age spectrum in Eastern Europe, the figures show that there was a fall in marriage rates over the period, with the largest decline (67 per cent) occurring in the 35-39 age group. As Table 3.3 shows, considerable falls in the female marriage rate among this age group were experienced by Latvia, Lithuania, and Moldova.

The picture for Western Europe is rather more mixed. In the 15-19 and 20-24 age groups, female marriage rates declined between 1980 and 1995, by 78 per cent and 48 per cent respectively. However, in the 25-29, 30-34 and 35-39 age groups, large *increases* in the marriage rate were observed. For example, the 30-34 age group experienced a 141 per cent rise in the female marriage rate between 1980 and 1995.

Figures 3.7 to 3.10 present the complete time series for mean age at female marriage for the Eastern European countries. They show that the mean ages at female first marriage remained relatively constant during the 1980s in most of the Eastern European countries, with the exception of the ex-GDR and Moldova. The former experienced a 1.6 year increase in the mean age between 1980 and 1989, whilst a 3.1 year decrease was observed in Moldova. Moving into the transitional period of the 1990s, small increases in the mean age at female first marriage were observed in most of the Eastern European countries in the sample. The highest rise between 1990 and 1995 was observed in the ex-GDR (one year).

Table 3.3 First female marriage rates per 1000 women in Eastern Europe (1980 and 1995)

Country	**Aged 15-19**		**Aged 20-24**		**Aged 25-29**		**Aged 30-34**		**Aged 35-39**		**Aged 40-44**	
	1980	**1995**	**1980**	**1995**	**1980**	**1995**	**1980**	**1995**	**1980**	**1995**	**1980**	**1995**
Bulgaria	404	153	441	274	82	82	21	33	7	8	3	3
Czech Republic	337	116	448	285	76	76	18	16	6	5	3	3
Estonia	273	113	489	216	114	80	36	26	15	11	8	6
Germany (GDR)	257	20	465	203	64	133	15	31	5	9	3	4
Hungary	391	124	383	303	82	102	21	20	7	6	3	2
Latvia	286	116	493	252	121	70	37	18	16	7	8	3
Lithuania	221	215	526	332	127	88	36	25	16	10	9	3
Moldova	379	434	542	340	101	74	36	20	19	9	15	6
Poland	202	116	530	402	122	115	30	25	10	8	5	3
Romania	451	211	409	353	98	114	30	31	13	11	8	6
Russia	415	360	475	346	105	79	35	23	14	10	9	5
Slovak Republic	279	155	459	311	95	82	22	20	7	6	3	3

Source: Council of Europe

Figure 3.7 Female mean age at marriage in Bulgaria, Czech Republic and Estonia, 1980-1995

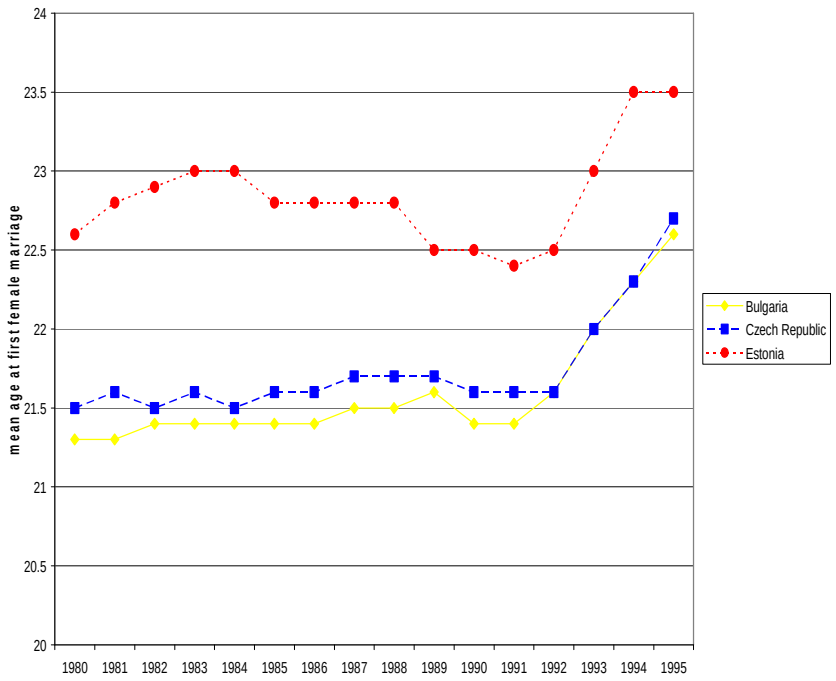


Figure 3.8 Female mean age at marriage in GDR, Hungary and Latvia, 1980-1995

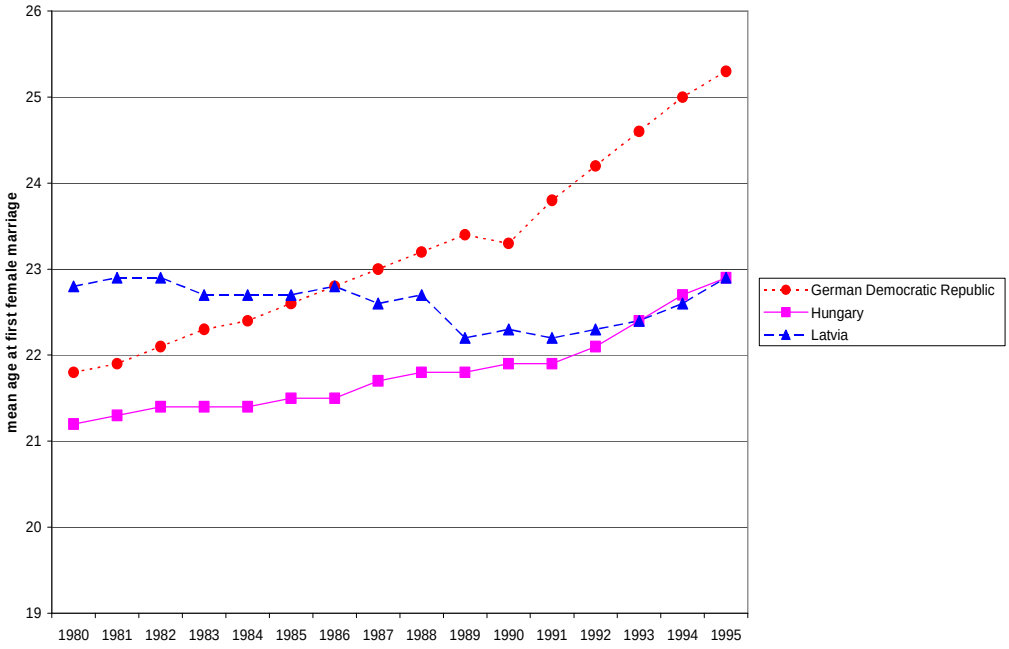


Figure 3.9 Female mean age at marriage in Lithuania, Moldova and Poland, 1980-1995

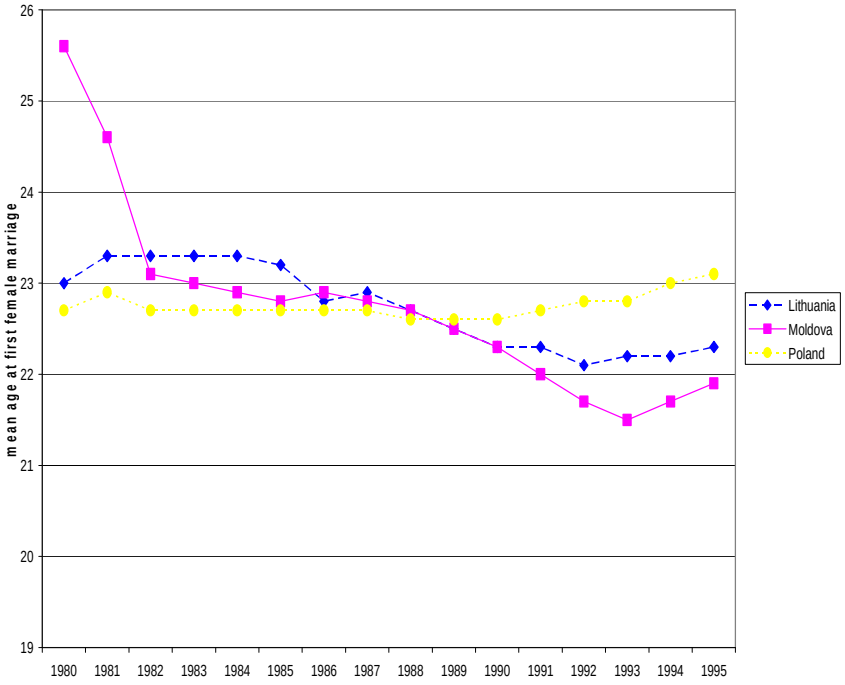
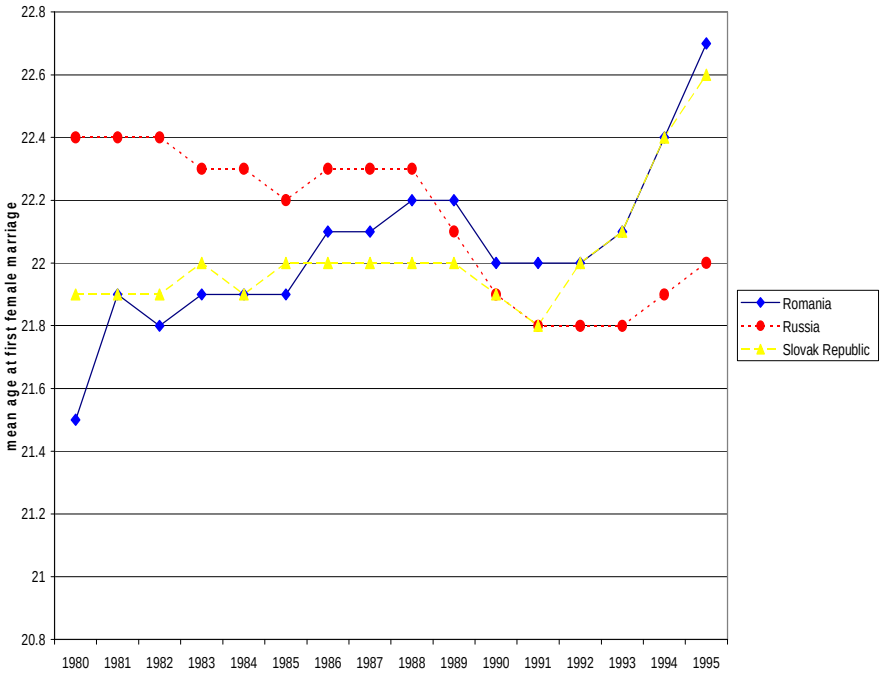


Figure 3.10 Female mean age at marriage in Romania, Russia, and Slovakia, 1980-1995



3.4.2 Description of Abortion Laws

Abortion laws in the countries of Eastern Europe are currently among the most liberal in the world. In the 1950s, the republics of the former Soviet Union made abortion available on request during the first 12 weeks of pregnancy. In the more recent past, several other Eastern European countries, with the exception of Poland, continued to liberalise their abortion laws, although several restrictive aspects of these laws remain in place. Table A1 of the Appendix presents an overview of these laws in Eastern Europe and highlights the changes that have been implemented since 1980.

The legal status of abortion in each country at a given point in time is placed into one of three categories:

(1) "life/medical" – abortion is only granted in order to save the life of the woman or if she suffers from 'specific, narrow medical' conditions;

(2) "medical/social" – abortion is available if the woman suffers from a broader range of medical problems, including mental health issues, or if it is deemed that hardship would follow from the birth of the child; and

(3) "on request" – abortion is available to a woman if she asks for one.

Over the eighteen-year period examined in this study, there have been a number of changes made to the fundamental legal status of abortion in the Eastern European countries featured in Table A1, particularly by those who were not part of the former Soviet Union. Some of these changes coincided with the movement from communism and democracy in the regions and the abandonment of pro-natalist policies. For example, following the overthrow of dictator, Nicolae Ceausescu in late 1989, Romania repealed the 1966 and 1986 decrees restricting access to abortion. Similarly, in early 1990, Bulgaria made abortion available on request to all women in

the first 12 weeks of pregnancy, thereby overturning laws passed in 1968 and 1973 that restricted eligibility for abortion to unmarried women and married women with children.

However, there are countries in Eastern Europe that liberalized abortion laws prior to the transitional period of the 1990s. For example, in 1987, six years prior to its split into two republics, Czechoslovakia made abortion available upon request, ending a 30 year-old law that permitted abortion only on medical or social grounds. Not long after the country divided into the Czech and Slovak republics, considerable fees for abortions were introduced. Similar changes were made to Hungarian abortion law in 1993.

The former GDR has been subject to changes in abortion law since German unification. In 1995, several new procedural requirements were introduced, including a three-day waiting period and mandatory counselling to dissuade the woman from having an abortion. Further, most abortions in the ex-GDR are no longer covered by national health insurance.[25]

Poland represents the only country in the sample to have significantly tightened access to abortion in the transitional period of the 1990s. Restrictions on funding of abortion began in the spring of 1990, and by 1993, the Polish government, backed by the Catholic Church, had succeeded in overturning the country's liberal abortion law that had been in place since 1956. The new law limited abortion to cases of threat to the mother's life or health, cases of rape and incest, and serious and irreversible damage to the foetus.

As noted at the beginning of this section, abortion in the republics of the former Soviet Union has been available on request both before and after the transition from communism to democracy. The first major change occurred two years after the death of Joseph Stalin in 1953, when abortion prohibition that had been in force since 1936 was abandoned. In 1988, abortion

laws were further liberalized, with an extension of the termination period and consideration of a broader range of non-medical issues in the decision.

3.4.3 Macroeconomic conditions

Macroeconomic conditions in Eastern Europe are important controls to include in the analysis. First, they are likely to be correlated with political developments that led to changes in abortion laws in Eastern Europe over the 1980 to 1997 period. Second, there are several mechanisms through which an economic crisis (as experienced by almost all the Eastern European countries included in the study period) could either hasten or postpone marriage. To begin with, it has the potential to increase the gains from marriage. For example, the uncertainty associated with an economic crisis enhances the attractiveness of the resource pooling and insurance functions of marriage. In other words, married individuals can reap the benefits of economies of scale, and relationships formed through marriage can extend family networks and facilitate income and consumption smoothing.[26] On the other hand, an economic crisis may be associated with delayed marriage. The search for a spouse may be longer and more costly in a period of uncertainty since wage declines and reduced economic prospects make partners less marriageable. Further, females may delay marriage so that childbearing can be postponed, particularly in societies found in Eastern Europe where first births follow soon after marriage.[27]

To capture the extent of the crisis (and subsequent recovery), the specific measures of macroeconomic conditions included in the analysis are the natural log of per capita gross domestic product (GDP) and a set of dummy variables representing varying levels of inflation (less than 5 per cent, between 5 and 25 per cent, between 25 and 100 per cent, and greater than 100 per cent). The figures that cover the transitional period of the 1990s were obtained from the

World Bank[28], whilst those relating to the communist period of the 1980s were taken from estimates made by the Central Intelligence Agency (CIA).[29]

As Table A2 shows, during the transitional period of the late 1980s and early 1990s, virtually all of the Eastern European countries included in the sample experienced huge declines in real GDP per capita. Further, eight of the twelve countries featured in Table A3 were subject to inflation of greater than 100 per cent in several years during the 1990s.

3.4.4 Economic and social development

Female enrolment in higher education is included as a control since the opportunity cost of completing studies in a marital setting may be high. Further, once education is completed, the opportunity cost of marriage and related child bearing is higher for more educated female workers. Including education as a control raises less concern about the issue of endogeneity compared to Chapter 2 since aggregate data are being used. In Chapter 2, the education decision is made by the same individual, whereas with aggregate data, reported education is not necessarily referring to the same individual.

A huge expansion of female enrolment in higher education in Eastern Europe took place following the collapse of communism. Table A4 shows the percentage of females aged 20-24 who were enrolled in university education in 1980 and 1995 (UNESCO). Although there is a fairly large amount of missing data for this variable, the table does highlight the rapid growth in female participation in university education in the regions. For example, Bulgaria, Hungary, and Poland have all experienced more than 100 per cent increases in female enrolment at universities. The only country in the sample that has observed a decline is Lithuania; between 1985 and 1995, female enrolment at universities declined by more than 25 per cent.

A measure of urbanization (the proportion of people living in urban areas) was also included as a control in the analysis. Economic development may be expected to change the benefits and costs of marriage. For example, urbanization may generate new economic opportunities that provide an attractive alternative to early marriage. On the other hand, urbanization may also lower search costs leading to an increase in early marriage.

Table A5 shows that most of the Eastern European countries experienced increased urbanization over the 1982 to 1997 period. The greatest increases in urbanization were experienced by Romania (13.4 per cent) and Hungary (11.3 per cent). Three countries in the sample (Estonia, ex-GDR, and Moldova) observed small declines in urbanization.

3.4.5 Marriage market conditions

To capture the demographic availability of potential male spouses, the female-to-male population ratio in each country is included as a control. Theory would suggest that the probability of a female being married increases directly with the demographic supply of men to wed. Therefore, one should expect that the higher the female-to-male population ratio, the *lower* the female marriage rate. Table A6 shows the respective ratios between 1980 and 1996 for each Eastern European country included in the sample. Although there appears to be little variation across countries and through time, it is noticeable that in virtually all countries the older age groups (35 to 39 and 40 to 44) have female-to-male population ratios greater than one, indicating that there is an excess supply of women. Of course, this female-to-male population ratio represents only a crude approximation on two grounds. First, females typically marry older men and second, it is the eligible sex ratio (in terms of bachelors and spinsters) that matters most for the marriage

market and is the theoretically correct measure, adjusted for differences in age at marriage. Unfortunately, it is not possible to obtain data on the latter.

Divorce laws were controlled for in the analysis since they too might be expected to affect entry into marriage. On the one hand, liberal divorce laws might encourage marriage since the law acts as a cheap form of 'insurance policy' should a marriage prove to an unhappy one. In other words, liberal divorce laws reduce the cost of exiting an unhappy marriage, so individuals may be encouraged to enter marriage more easily, particularly those who plan to have children (Alesina and Giuliano, 2007). On the other hand, liberal divorce laws may reduce the incentives for spouses to undertake marriage-specific investment, such as buying a house together (Stevenson, 2007). In turn, this will reduce the *ex ante* value of marriage and reduce marriage rates, all else equal. [30]

In this study, the following two-fold categorisation of divorce laws is adopted:

(1) Strict, institutionalised divorce laws - divorce permitted on the grounds of fault or other major disruption of marital life. Institutionalisation of marriage remains the leading principle, and the divorce process is hard and lengthy;

(2) Less strict, more individual-based divorce laws - divorce permitted on grounds of less restrictive legislation. Shows more understanding for the will of the spouses.

Data on divorce laws of each country were obtained from Martiny and Schwab (2003), Todorova (2003), Antokolskaia (2003), Weiss and Szeibert (2003), Maczynski and Sokolowski (2003), Harkonen and Dronkers (2006), the Max Planck Institute for Demographic Research, and through direct correspondence with legal experts in Eastern Europe. Table A7 shows that throughout the period under study, the majority of the Eastern European countries included in the sample have operated under Category (2) divorce laws. However, Bulgaria, the former GDR, and

Romania experienced switches in divorce laws over the study period. In Bulgaria, the 1985 Family Code restored fault as a ground for divorce that represents a shift to Category (1) in the divorce coding. Meanwhile, in Romania, the 1993 Family Code introduced no-fault divorce, that represents a movement into Category (2).

The case of the former GDR is less straightforward. Between 1949 and 1990, the former GDR and West Germany followed widely differing approaches to divorce laws. Engelhardt et al. (2002) note that the combination of low costs, shorter waiting times, and greater simplicity of the procedure meant that divorce in East Germany was less stigmatizing and stress-producing compared to West Germany. Following unification, however, all divorce laws in the West were made applicable in the territory of the East. Whilst it would be incorrect to argue that this uniform divorce law is strict and institutionalised *per se,* for the purpose of this analysis it is reasonable to assume that the ex-GDR's adoption of West German divorce law in 1990 represented a shift toward a more restrictive divorce law regime.

Descriptive statistics for the variables used in the analysis that follows are found in Table 3.4. Several important econometric issues will now be addressed.

3.5 Econometric methodology

The data used in the analysis are a panel of 208 observations that include twelve Eastern European countries for the years 1980 through 1997. Given that the data have time series and cross-section components, the analysis relies on changes in the legal status of abortion laws on marriage rates in these twelve countries. In light of the panel nature of the data, the analysis naturally employs panel data techniques.[31] The two traditional approaches for estimating panel data are the fixed-effects and random-effects methods. In this study's case, if the individual

Table 3.4 Descriptive Statistics

Variable	Variable Description	Mean	S.E.	Min.	Max.
Female first marriage rate (<50 years-old)	Female first marriage rate for those women less than 50 years-old	0.8	0.1	0.3	1.2
Female first marriage rate (15-19 year-olds)	Female first marriage rate for those women between 15 and 19 years-old	266.5	116.6	17.0	580.0
Female first marriage rate (20-24 year-olds)	Female first marriage rate for those women between 20 and 24 years-old	412.9	95.9	176.0	577.0
Female first marriage rate (25-29 year-olds)	Female first marriage rate for those women between 25 and 29 years-old	97.1	21.4	61.0	163.0
Female first marriage rate (30-34 year-olds)	Female first marriage rate for those women between 30 and 34 years-old	26.4	7.1	15.0	45.0
Female first marriage rate (35-39 year-olds)	Female first marriage rate for those women between 35 and 39 years-old	10.1	3.6	5.0	21.0
Female first marriage rate (40-44 year-olds)	Female first marriage rate for those women between 40 and 44 years-old	4.9	2.4	2.0	15.0
Mean age at first marriage	Mean age at first marriage for those women less than 50 years-old	22.4	0.8	21.2	26.0
Non-marital birth rate	Number of unmarried births per 100 live births	15.5	10.2	2.7	51.5
Legal to save mother's life or for other specific medical reasons	1 if abortion is only granted in order to save the life of the woman or if she suffers from 'specific, narrow medical' conditions; 0 otherwise	0.06	0.2	0	1
Available upon request	1 if abortion is available to a women if she asks for one; 0 otherwise	0.7	0.4	0	1
Parental consent	Parental consent required for a minor to have an abortion	0.1	0.3	0	1
Log GDP per capita	Log of Gross Domestic Product per capita	10.3	1.3	7.9	13.2

Table 3.4 (cont.) Descriptive Statistics

Variable	Variable Description	Mean	S.E.	Min.	Max.
Inflation between 5% and 25%	1 if inflation rate between 5% and 25%; 0 otherwise	0.3	0.4	0	1
Inflation between 25% and 100%	1 if Inflation rate between 25% and 100%; 0 otherwise	0.1	0.3	0	1
Female enrolment in university education	Percentage of females between 20 and 24 years-old enrolled in university education	14.7	15.0	0	52.8
Urbanization	Percentage of population residing in an urban area	64.1	9.1	41.7	79.0
Female to male population ratio (15-44 years-old)	Number of females 15 to 44 years-old per males 15 to 44 years-old	0.98	0.02	0.91	1.16
Female to male population ratio (15-19 years-old)	Number of females between 15 and 19 years-old per males between 15 and 19 years-old	0.95	0.01	0.90	1.00
Female to male population ratio (20-24 years-old)	Number of females between 20 and 24 years-old per males between 20 and 24 years-old	0.95	0.02	0.87	1.07
Female to male population ratio (25-29 years-old)	Number of females between 25 and 29 years-old per males between 25 and 29 years-old	0.97	0.02	0.91	1.07
Female to male population ratio (30-34 years-old)	Number of females between 30 and 34 years-old per males between 30 and 34 years-old	1.03	0.61	0.93	9.73
Female to male population ratio (35-39 years-old)	Number of females between 35 and 39 years-old per males between 35 to 39 years-old	1.01	0.03	0.93	1.12
Female to male population ratio (40-44 years-old)	Number of females between 40 and 44 years-old per males between 40 to 44 years-old	1.04	0.04	0.94	1.14
Restrictive divorce laws	1 if divorce permitted on the grounds of fault or other major disruption of marital life; 0 otherwise	0.15	0.36	0	1

country-fixed effects are correlated with other exogenous variables, then the random-effects estimation procedure will generate inconsistent estimates. Hausman specification tests were performed that showed that the fixed-country effects are correlated with other exogenous variables in most of the regressions, which indicates that the fixed-effects estimation procedure is more appropriate for this analysis.[32] Further, on a theoretical basis, a fixed-effects technique is more suitable because the data are a panel of nearly all major countries in Eastern Europe and not a specifically chosen sample of countries.[33]

In the model specifications employed in the analysis, country fixed-effects are included to control for time-invariant differences in marriage rates across countries. These differences may relate, for example, to history, culture and other institutional arrangements. Time fixed-effects are also included to control for year-over-year changes common to each country. For instance, the timing of the decline and collapse of the Soviet Union undoubtedly had an impact on the twelve countries included in the study's sample.

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To capture unobservable factors that may be evolving over time at different paces in different countries, country-specific trends are included in two model specifications. One potential criticism of this approach, however, is that such models might "overfit" the data, thereby reducing the power of the analysis (Blank, 2001). The results are presented both with and

without these trends to examine the sensitivity of their inclusion. In models without these trends, identification is provided by those countries that changed their abortion laws over the period under study. In models with the trends, identification is based on the discrete nature of the change in abortion laws and the change in marital outcomes right around the time of the change in abortion laws. The following model was estimated using OLS:

:

$$mrate_{i,t} = \alpha + \beta_1 restrict_{i,t} + \beta_2 onreq_{i,t} + \gamma_1 GDP_{i,t} + \gamma_2 \inf lation_{i,t} + \gamma_3 femenroll_{i,t} + \gamma_4 urban_{i,t} + \gamma_5 year_t + \gamma_6 country_i + \gamma_7 trend_i + \varepsilon$$

where *mrate* is the female first-marriage rate for the different age categories for country i in year t; *restrict* and *onreq* are indicator variables that equal one if the country had a restrictive abortion law or abortion available on request respectively for country i and year t; *GDP, inflation, femenroll,* and *urban* are the GDP per capita, the inflation rate categorical dummy variables, the female university enrolment rate and the percentage of the population living in urban areas, respectively, for country i in year t. Finally, *year, country* and *trend* are the year dummies, the country dummies and the country-specific trends (either linear or quadratic).

The estimation of each model assumes that any switch in abortion laws was exogenous to the differences across countries in social problems that were occurring at the same time and that may also have been associated with changes in marriage rates. It is possible that these social problems that were largely borne out of the economic transition process partly drove countries with restrictive abortion laws to change them in response to, for example, greater fertility control. However, the timing of the changes in abortion laws provides some variation in policies across countries that are not directly related to the period of the most dramatic social turmoil.

In all specifications, the omitted abortion law dummy is ‘medical and social conditions’, so the results are interpreted as the effect of imposing severe or liberal abortion restrictions relative to having a more moderate regime in place.

3.6 Results

3.6.1 Main findings

Table 3.5 presents estimates from models where the dependent variable is the marriage rate of females aged 14 to 49 in Eastern Europe. The specification shown in Column 1 includes two abortion law dummies (representing ‘strict’ and ‘liberal’ laws), macroeconomic conditions, and country and year fixed effects. Columns 2 and 3 add linear and quadratic trends respectively, thus accounting for time-varying country-specific factors that may be related to both marriage rates and abortion law reforms. Column 4 adds controls that capture measures of economic and social development as well as marriage market conditions.

The estimates show that the coefficient on ‘available upon request’ is positive and strongly significant in the first three specifications, indicating that Eastern European countries that switched to liberal abortion laws between 1980 and 1997 experienced increases in the marriage rate for females aged 14 to 49. However, the sizes of the coefficients are very small; indicating that liberal abortion laws increase marriage rates by about 0.05 marriages per 1000 females aged 14 to 49. Indeed, once additional controls are added in the last specification, the sign on the coefficient turns negative and becomes statistically insignificant. Across all four specifications, the estimates for the strict abortion law dummy are not statistically significant.

Table 3.6 presents estimates from models where the dependent variable is the mean age at first marriage for females. Theory would seem to suggest that liberalization of abortion laws

might be associated with an increase in the mean age at first marriage for females, since it allows women to postpone marriage (see Akerlof et al., 1996; Evans and Angrist, 1999; Goldin and Katz, 2002; and Choo and Siow, 2006). The ‘marriage information’ theory proposed in this study does not provide a clear prediction of the impact of abortion laws on the mean age at first marriage for women, since it is attempting to explain the effect on the behaviour of women within certain age groups (i.e. 20-24, 25-29 years-old and so on) rather than across the entire marriageable age range (i.e. 15-49 years-old), which is the measure used to construct the dependent variable in Table 3.5.

Table 3.5 OLS estimates of the effect of abortion laws on first marriage rates of females aged 15-49 in Eastern Europe

	(1)	(2)	(3)	(4)
Abortion laws				
Legal to save mother's life or for other specific medical reasons [a]	0.01 (0.02)	-0.006 (0.03)	-0.004 (0.90)	-0.02 (0.02)
Available upon request [a]	0.05 (0.01)***	0.05 (0.02)***	0.06 (0.23)***	-0.02 (0.02)
Macroeconomic conditions				
Log GDP per capita	1E-05 (6E-06)***	4E-05 (1E-05)***	3E-05 (9E-06)***	8E-05 (1E-05)***
Inflation between 5% and 25% [b]	-0.01 (0.01)	0.01 (0.01)	-0.001 (0.01)	0.02 (0.01)*
Inflation between 25% and 100% [b]	0.03 (0.02)	0.03 (0.02)***	0.03 (0.02)	0.02 (0.01)
Inflation greater than 100% [b]	0.03 (0.02)***	0.08 (0.02)***	0.02 (0.02)***	0.06 (0.02)***
Economic and social development				
Female enrolment in university education				-7E-04 (4E-04)*
Urbanization				0.01 (0.004)***
Marriage market conditions				
Female to male population ratio (15-49)				-0.30 (0.20)
Restrictive divorce laws [c]				-0.03 (0.01)
Country-specific linear trends	No	Yes	No	No
Country-specific quadratic trends	No	No	Yes	No
R^2	0.90	0.94	0.93	0.93
Sample size	208	208	208	172

The dependent variable is the first female marriage rate per 1000 women aged 15-49. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons', [b] omitted category is 'inflation less than 5%', [c] omitted category is unrestrictive divorce laws.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

As the table shows, the results are inconsistent across the four specifications. In Column 1, the adoption of liberal abortion laws is associated with an increase in the mean age at first marriage for females. However, when country-specific linear trends are introduced in Column 2, the result remains statistically significant, but the sign of the liberal abortion law coefficient turns negative. In Column 3, with country-specific quadratic trends, the coefficient is positive but not statistically significant. Finally, in Column 4, when additional controls are included, the coefficient is positive and statistically significant, and the size of the coefficient and standard error are very similar to that obtained in Column 1. However, the inconsistency and ambiguity of the findings across the four specifications indicate that it is not possible to draw firm conclusions about the impact of abortion laws on female mean age at first marriage.

Given that the theory of the relationship between marital timing and availability of abortion presented in this chapter emphasises the importance of the age of the female, the effect of abortion's legal status on marriage rates of females for different age groups was examined. Tables 3.7 to 3.12 present the results. In the teenage category (Table 3.7), Columns 1 and 4 indicate that the marriage rate is lower in countries where abortion is available upon request compared to countries in which abortion is only available for medical and social conditions. Estimates from both specifications indicate that liberal abortion laws decrease marriage rates among teenagers by around 50 marriages per 1000 women. This seems to lend support to the Akerlof et al. (1996) theory discussed earlier, which suggests that a switch to more liberal abortion laws will lead to a decline in shotgun weddings. However, the introduction of country-specific trends in Columns 2 and 3 results in a change in the sign of the coefficient, and remains statistically significant in the specification with linear trends.

Table 3.6 OLS estimates of the effect of abortion laws on female mean age at first marriage in Eastern Europe

	(1)	(2)	(3)	(4)
Abortion laws				
Legal to save mother's life or for other specific medical reasons [a]	-0.14 (0.11)	-0.08 (0.10)	-0.09 (0.11)	-0.16 (0.11)
Available upon request [a]	0.51 (0.13)***	-0.11 (0.05)**	0.01 (0.06)	0.45 (0.11)***
Macroeconomic conditions				
Log GDP per capita	3E-04 (4E-05)***	1E-05 (2E-05)	1E-04 (2E-05)***	1E-04 (9E-05)
Inflation between 5% and 25% [b]	-0.20 (0.07)***	-0.01 (0.04)	0.02 (0.05)	-0.02 (0.12)***
Inflation between 25% and 100% [b]	-0.27 (0.12)**	-0.01 (0.05)	0.008 (0.07)	-0.31 (0.12)***
Inflation greater than 100% [b]	-0.52 (0.15)***	-0.11 (0.06)*	-0.09 (0.09)	-0.60 (0.12)***
Economic and social development				
Female enrolment in university education				-0.005 (0.002)**
Urbanization				-0.06 (0.02)***
Marriage market conditions				
Female to male population ratio (15-49)				2.35 (1.18)**
Restrictive divorce laws [c]				0.11 (0.09)
Country-specific linear trends	No	Yes	No	No
Country-specific quadratic trends	No	No	Yes	No
R^2	0.75	0.95	0.94	0.84
Sample size	208	208	208	172

The dependent variable is the female mean age at first marriage. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons', [b] omitted category is 'inflation less than 5%', [c] omitted category is unrestrictive divorce laws.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Meanwhile, the results reported in Tables 3.8 and 3.9 for the 'twenty-somethings' reveal a remarkably consistent story. Across all specifications, the coefficient on the liberal abortion law dummy is positive and strongly statistically significant. For females aged 20 to 24, the effect of imposing a liberal abortion law is estimated at 17.5 to 62.2 additional marriages per 1000 women, whilst for those aged 25 to 29, the impact is estimated at 9.5 to 27.7 additional marriages.

Table 3.10 shows that for females aged 30 to 34, the adoption of liberal abortion laws in which abortion is available upon request also increases marriage rates relative to a regime where it is available for medical and social reasons only. However, the size of the coefficient is fairly small across all specifications and the introduction of country-specific linear trends (Column 2) lowers the estimate to the point where it is no longer statistically significant. The coefficients on the abortion law dummies for those females aged 35 to 39 and 40 to 44 (shown in Tables 3.11 and 3.12 respectively) are positive and statistically significant in Columns 1 and 4, but are sensitive to the inclusion of both country-specific linear and quadratic trends.

Table 3.11 also shows that, for females aged 35 to 39, the coefficient on the strict abortion dummy is positive and statistically significant in Columns 1 to 3, indicating that marriage rates for this age group increase following the adoption of laws where abortion is only available to save the mother's life or for other specific medical reasons. This may be consistent with expectations that shotgun weddings become more prevalent when abortion laws are tightened in a country. Lack of precision of these estimates may be due to the fact that overall marriage rates are quite low for females over thirty leaving less variation to identify from.

Table 3.7 OLS estimates of the effect of abortion laws on first marriage rates of females aged 15-19 in Eastern Europe

	(1)	(2)	(3)	(4)
Abortion laws				
Legal to save mother's life or for other specific medical reasons [a]	17.6 (14.8)	12.2 (19.1)	0.71 (17.2)	11.2 (17.4)
Available upon request [a]	-53.7 (13.5)***	21.5 (11.0)**	4.27 (11.7)	-51.8 (16.7)***
Macroeconomic conditions				
Log GDP per capita	0.005 (0.003)	0.03 (0.004)***	0.02 (0.003)***	0.02 (0.01)**
Inflation between 5% and 25% [b]	29.4 (10.1)***	10.4 (6.63)	2.08 (5.88)	35.7 (11.2)***
Inflation between 25% and 100% [b]	33.1 (16.0)**	19.6 (11.4)*	11.5 (10.5)	32.3 (15.2)***
Inflation greater than 100% [b]	70.1 (19.3)***	46.8 (13.1)***	34.5 (11.6)***	69.1 (17.7)***
Economic and social development				
Female enrolment in university education				0.15 (0.34)
Urbanization				7.64 (3.53)**
Marriage market conditions				
Female to male population ratio (15-19)				829.3 (367.8)**
Restrictive divorce laws [c]				-20.8 (15.5)
Country-specific linear trends	No	Yes	No	No
Country-specific quadratic trends	No	No	Yes	No
R^2	0.87	0.96	0.96	0.91
Sample size	208	208	208	172

The dependent variable is the first female marriage rate per 1000 women aged 15-19. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons', [b] omitted category is 'inflation less than 5%', [c] omitted category is unrestrictive divorce laws.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 3.8 OLS estimates of the effect of abortion laws on first marriage rates of females aged 20-24 in Eastern Europe

	(1)	(2)	(3)	(4)
Abortion laws				
Legal to save mother's life or for other specific medical reasons [a]	-0.19 (15.3)	-22.6 (16.9)	-6.33 (17.2)	-34.5 (12.6)***
Available upon request [a]	62.2 (9.48)***	22.4 (10.7)***	41.5 (11.5)***	17.5 (9.24)*
Macroeconomic conditions				
Log GDP per capita	-0.003 (0.003)	0.01 (0.01)	3E-04 (0.005)	0 .04 (0.007)***
Inflation between 5% and 25% [b]	-20.8 (8.55)***	0.64 (8.27)	-0.94 (8.81)	-4.61 (6.60)
Inflation between 25% and 100% [b]	-1.23 (13.4)	9.38 (11.5)	11.2 (12.2)	-9.29 (8.27)
Inflation greater than 100% [b]	14.6 (14.4)	28.1 (12.7)**	33.2 (13.1)***	0.84 (11.2)
Economic and social development				
Female enrolment in university education				-0.47 (0.22)**
Urbanization				6.95 (1.73)***
Marriage market conditions				
Female to male population ratio (20-24)				-304.2 (151.4)**
Restrictive divorce laws [c]				-13.5 (10.3)
Country-specific linear trends	No	Yes	No	No
Country-specific quadratic trends	No	No	Yes	No
R^2	0.90	0.94	0.93	0.94
Sample size	208	208	208	172

The dependent variable is the first female marriage rate per 1000 women aged 20-24. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons', [b] omitted category is 'inflation less than 5%', [c] omitted category is unrestrictive divorce laws.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 3.9 OLS estimates of the effect of abortion laws on first marriage rates of females aged 25-29 in Eastern Europe

	(1)	(2)	(3)	(4)
Abortion laws				
Legal to save mother's life or for other specific medical reasons [a]	-0.06 (3.65)	0.14 (5.13)	-0.93 (4.56)	-8.88 (4.18)**
Available upon request [a]	27.7 (3.69)***	9.46 (3.40)***	16.8 (4.08)***	15.0 (3.80)***
Macroeconomic conditions				
Log GDP per capita	0.008 (0.001)***	0.002 (0.002)	0.005 (0.001)***	0.01 (0.003)***
Inflation between 5% and 25% [b]	-8.36 (2.92)***	-1.94 (2.79)	-2.63 (2.89)	-7.32 (2.78)***
Inflation between 25% and 100% [b]	-3.44 (4.04)	4.29 (3.60)	4.35 (3.74)	-7.61 (3.63)**
Inflation greater than 100% [b]	-4.97 (4.34)	5.08 (3.67)	5.28 (3.89)	-9.48 (3.86)***
Economic and social development				
Female enrolment in university education				-0.28 (5.34)***
Urbanization				-1.51 (0.84)**
Marriage market conditions				
Female to male population ratio (25-29)				309.6 (82.3)***
Restrictive divorce laws [c]				1.15 (3.07)
Country-specific linear trends	No	Yes	No	No
Country-specific quadratic trends	No	No	Yes	No
R^2	0.79	0.89	0.87	0.85
Sample size	208	208	208	172

The dependent variable is the first female marriage rate per 1000 women aged 25-29. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons', [b] omitted category is 'inflation less than 5%', [c] omitted category is unrestrictive divorce laws.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: β =

Table 3.10 OLS estimates of the effect of abortion laws on first marriage rates of females aged 30-34 in Eastern Europe

	(1)	(2)	(3)	(4)
Abortion laws				
Legal to save mother's life or for other specific medical reasons [a]	1.39 (0.95)	1.85 (1.22)	0.83 (1.07)	-2.38 (1.25)**
Available upon request [a]	6.53 (0.92)***	0.89 (0.88)	2.73 (1.07)***	3.15 (0.90)***
Macroeconomic conditions				
Log GDP per capita	0.003 (4E-04)***	0.001 (5E-04)***	0.002 (4E-04)***	0.006 (8E-04)***
Inflation between 5% and 25% [b]	-0.47 (0.66)	0.16 (0.65)	0.19 (0.69)	-0.25 (0.64)
Inflation between 25% and 100% [b]	0.35 (1.02)	1.44 (0.96)*	1.74 (1.04)*	-0.76 (1.10)
Inflation greater than 100% [b]	0.12 (1.09)	1.64 (0.98)*	1.94 (1.07)*	-1.67 (1.13)
Economic and social development				
Female enrolment in university education				-0.07 (0.02)***
Urbanization				-0.42 (0.18)**
Marriage market conditions				
Female to male population ratio (30-34)				0.26 (0.12)**
Restrictive divorce laws [c]				1.76 (1.00)*
Country-specific linear trends	No	Yes	No	No
Country-specific quadratic trends	No	No	Yes	No
R^2	0.87	0.92	0.90	0.91
Sample size	208	208	208	172

The dependent variable is the first female marriage rate per 1000 women aged 30-34. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons', [b] omitted category is 'inflation less than 5%', [c] omitted category is unrestrictive divorce laws.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 3.11 OLS estimates of the effect of abortion laws on first marriage rates of females aged 35-39 in Eastern Europe

	(1)	(2)	(3)	(4)
Abortion laws				
Legal to save mother's life or for other specific medical reasons [a]	1.09 (0.38)***	0.92 (0.46)**	0.70 (0.42)*	-0.80 (0.57)
Available upon request [a]	2.57 (0.42)***	-0.14 (0.33)	0.42 (0.42)	1.04 (0.43)***
Macroeconomic conditions				
Log GDP per capita	9E-04 (1E-04)***	4E-04 (1E-04)	7E-04(1E-05)***	0.002 (4-E04)***
Inflation between 5% and 25% [b]	0.02 (0.31)	0.17 (0.32)	0.29 (0.35)	-0.12 (0.35)
Inflation between 25% and 100% [b]	0.07 (0.51)	0.35 (0.50)	0.58 (0.54)	-0.32 (0.55)
Inflation greater than 100% [b]	0.70 (0.86)	0.57 (0.52)	0.81 (0.57)	-0.71 (0.62)
Economic and social development				
Female enrolment in university education				-0.02 (0.008)***
Urbanization				-0.13 (0.08)
Marriage market conditions				
Female to male population ratio (35-39)				-9.65 (16.1)
Restrictive divorce laws [c]				1.24 (0.48)***
Country-specific linear trends	No	Yes	No	No
Country-specific quadratic trends	No	No	Yes	No
R^2	0.91	0.93	0.92	0.92
Sample size	208	208	208	172

The dependent variable is the first female marriage rate per 1000 women aged 35-39. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons', [b] omitted category is 'inflation less than 5%', [c] omitted category is unrestrictive divorce laws.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 3.12 OLS estimates of the effect of abortion laws on first marriage rates of females aged 40-44 in Eastern Europe

	(1)	(2)	(3)	(4)
Abortion laws				
Legal to save mother's life or for other specific medical reasons [a]	0.65 (0.26)***	-0.17 (0.35)	-0.09 (0.31)	-0.64 (0.35)*
Available upon request [a]	1.71 (0.29)***	-0.28 (0.21)	0.15 (0.25)	0.81 (0.26)***
Macroeconomic conditions				
Log GDP per capita	5E-04 (1E-04)***	2E-04 (1E-04)**	4E-04 (1E-04)***	0.001 (2E-04)***
Inflation between 5% and 25% [b]	0.25 (0.20)	0.39 (0.18)**	0.49 (0.19)***	0.23 (0.22)
Inflation between 25% and 100% [b]	0.28 (0.31)	0.54 (0.28)**	0.72 (0.29)***	0.18 (0.33)
Inflation greater than 100% [b]	0.20 (0.37)	0.74 (0.30)***	0.94 (0.32)***	-0.14 (0.37)
Economic and social development				
Female enrolment in university education				-0.01 (0.006)**
Urbanization				-0.16 (0.06)***
Marriage market conditions				
Female to male population ratio (40-44)				-7.61 (6.42)
Restrictive divorce laws [c]				0.69 (0.25)***
Country-specific linear trends	No	Yes	No	No
Country-specific quadratic trends	No	No	Yes	No
R^2	0.87	0.93	0.93	0.91
Sample size	208	208	208	172

The dependent variable is the first female marriage rate per 1000 women aged 40-44. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons', [b] omitted category is 'inflation less than 5%', [c] omitted category is unrestrictive divorce laws.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Turning to the findings for the controls used in the analysis, a number of broadly consistent results emerge. In terms of the macroeconomic conditions, greater levels of GDP per capita are generally associated with higher female marriage rates. Economic growth is likely to be accompanied by employment creation and may therefore imply some improvement in the pool of economically attractive men for women to marry. In addition, high rates of inflation (in particular, greater than 100 per cent) tend to be associated with higher female marriage rates compared to low rates of inflation (less than 5 per cent). Hyperinflation may be a reflection of an economic crisis that may, as noted earlier, increase the attractiveness of marriage as a means of pooling resources and insuring against loss.

As for the measures of economic and social development, higher levels of female enrolment in university education are, as expected, associated with lower marriage rates. However, there are asymmetrical effects observed across age groups relating to the impact of urbanization on marriage rates. A greater rate of urbanization is associated with higher marriage rates for females aged between 15 and 24, but lower marriage rates for those aged between 25 and 44. One possible explanation is that greater urbanization implies a larger potential supply of male spouses in the marriage market, thus resulting in females marrying at an earlier age.

Finally, turning to marriage market conditions, the findings suggest that restrictive divorce laws are associated with higher marriage rates for females aged between 30 and 44. The implication here is that an older woman in particular may feel more secure about entering marriage if the divorce law regime reduces the probability of her being an unwilling party to divorce. This is also related to the more general idea that a woman tends to be valued less in the remarriage market than a male of similar age (Cohen, 1987).

Less easily explained are the results relating to the study's other measure of marriage market conditions, namely, female-to-male population ratios. Across several age groups, statistically significant coefficients are reported, but the signs are not all in the same direction. For example, for females aged 20-24, a higher ratio is associated with lower female marriage rates, which is in line with expectations. On the other hand, for those aged 15-19, 20-24 and 30-34, a higher ratio is associated with *higher* marriage rates, which goes against economic theory. However, given that this control is only a very crude approximation of the female-to-male population ratio, it is perhaps not surprising that it is not a strongly performing variable due to the measurement issues noted earlier.

In summary, the results presented in this section provide strong evidence that the status of abortion laws has a large impact on the female marriage rate. In particular, the estimates reported for 'twenty-something' females indicate that making abortion available upon request is associated with an increase in the marriage rate. This lends some support to the theory that suggests that, under a liberal abortion regime, females may adopt a strategy of 'learning through pregnancy' to separate 'Dads' from 'Cads'. These results would also appear to be consistent with the findings of Levine and Staiger (2004) who report that, over the same 1980 to 1997 period in Eastern Europe, a switch from moderate restrictions to abortion available upon request was associated with no change in births despite large increases in abortions, indicating that pregnancies increased following more liberal access to abortion. As argued earlier, if more pregnancies take place, some of these will turn into marriage.

3.6.2 Robustness checks

One concern with the model specifications adopted in the analysis thus far is that they do not explicitly capture the collapse of communism that was common across the twelve countries included in the study's sample. In an attempt to understand the extent to which this mattered for female marriage rates, all four specifications were modified to include either a level shift "political shock" dummy (set to 1 from 1990 onwards) or a time trend (set to 0 until 1990 and then incrementing onwards). Table 3.13 shows that the results were not overly sensitive to the inclusion of these dummy variables.

Another worry might be that only a few countries are driving most of the results. Therefore, the regressions were estimated dropping one a time each country that had liberalized its abortion laws over the study period, namely Bulgaria (adoption of liberal abortion laws in 1990), ex-GDR (1993), Czech Republic and Slovak Republic (both 1987) and Hungary (1993). Poland was also excluded from the estimation procedure, which is a country that had tightened its abortion laws in 1993. This experimentation did not change the results significantly (results are available on request from the author). For the teenage age group, however, the exclusion of Hungary from the sample resulted in the sign on the 'liberal' abortion dummy being negative across all model specifications, although conventional levels of statistical significance were not reached once country-specific trends were added.

Ideally, the models should also include some measure of religious adherence, but it was not possible to obtain time-varying data relating to such a variable. To make an attempt at addressing this issue (aside from differences in religiosity being captured by fixed effects in the models), following Sobotka (2002) each country was placed into one of four religious categories: (1) traditionally Roman Catholic countries with relatively strong religiosity (Lithuania, Poland and

Table 3.13 OLS estimates of the effect of abortion laws on first marriage rates of females (models include political shock and time trend dummies)

	14-49	14-49	14-49	14-49	15-19	15-19	15-19	15-19	20-24	20-24	20-24	20-24
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
"Political shock" dummy (set to 1 from 1990 onwards)												
Legal to save mother's life or for other specific medical reasons [a]	0.01 (0.28)	-0.006 (0.03)	-0.004 (0.03)	-0.02 (0.02)	17.6 (14.8)	12.2 (19.1)	0.71 (17.2)	11.2 (17.4)	-0.01 (15.3)	-22.6 (16.9)	-6.33 (17.2)	-34.5 (12.6)***
Available upon request [a]	0.05 (0.01)***	0.05 (0.02)***	0.06 (0.02)***	-0.02 (0.02)	-53.7 (13.5)***	21.5 (11.0)**	4.27 (11.7)	-51.8 (16.7)***	68.2 (9.48)***	22.4 (10.7)***	41.5 (11.5)***	17.5 (9.24)**
Country-specific linear trends	N	Y	N	N	N	Y	Y	N	N	Y	N	N
Country-specific quadratic trends	N	N	Y	N	N	N	N	N	N	N	Y	N
R^2	0.90	0.94	0.93	0.93	0.87	0.96	0.96	0.91	0.90	0.94	0.93	0.94
Sample size	208	208	208	172	208	208	208	208	208	208	208	208
Time trend (set to 0 until 1990 and then incrementing onwards).												
Legal to save mother's life or for other specific medical reasons [a]	0.01 (0.02)	-0.006 (0.03)	-0.004 (0.03)	-0.02 (0.02)	17.6 (14.8)	12.2 (19.1)	0.71 (17.2)	11.2 (17.4)	-0.01 (15.3)	-22.6 (16.9)	-6.33 (17.2)	-34.5 (12.6)***
Available upon request [a]	0.05 (0.01)***	0.05 (0.02)***	0.06 (0.02)***	-0.02 (0.02)	-53.7 (13.5)***	21.5 (11.0)**	4.27 (11.7)	-51.8 (16.7)***	68.2 (9.48)***	22.4 (10.7)***	41.5 (11.5)***	17.5 (9.24)**
Country-specific linear trends	N	Y	N	N	N	Y	Y	N	N	Y	N	N
Country-specific quadratic trends	N	N	Y	N	N	N	N	N	N	N	Y	N
R^2	0.90	0.94	0.93	0.93	0.87	0.96	0.96	0.91	0.90	0.94	0.93	0.94
Sample size	208	208	208	172	208	208	208	208	208	208	208	208

The dependent variable is the first female marriage rate per 1000 women by age group. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons'. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 3.13 (cont.) OLS estimates of the effect of abortion laws on first marriage rates of females (models include political shock and time trend dummies)

	25-29	25-29	25-29	25-29	30-34	30-34	30-34	30-34	35-39	35-39	35-39	35-39
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
"Political shock" dummy (set to 1 from 1990 onwards)												
Legal to save mother's life or for other specific medical reasons [a]	-0.06 (3.65)	0.14 (5.13)	-0.93 (4.56)	-8.88 (4.18)**	1.39 (0.95)	1.85 (1.22)	0.83 (1.07)	-2.38 (1.25)**	1.09 (0.38)***	0.92 (0.46)**	0.70 (0.42)*	-0.80 (0.57)
Available upon request [a]	27.7 (3.69)***	9.46 (3.40)***	16.8 (4.08)***	15.0 (3.80)***	6.53 (0.92)***	0.89 (0.88)	2.73 (1.07)***	3.15 (0.90)***	2.57 (0.42)***	-0.14 (0.33)	0.56 (0.42)	1.04 (0.43)***
Country-specific linear trends	N	Y	N	N	N	Y	N	N	N	Y	N	N
Country-specific quadratic trends	N	N	Y	N	N	N	Y	N	N	N	Y	N
R^2	0.79	0.89	0.87	0.85	0.87	0.92	0.90	0.91	0.89	0.93	0.92	0.92
Sample size	208	208	208	182	208	208	208	172	208	208	208	172
Time trend (set to 0 until 1990 and then incrementing onwards).												
Legal to save mother's life or for other specific medical reasons [a]	-0.06 (3.65)	0.14 (5.13)	-0.93 (4.56)	-8.88 (4.18)**	1.39 (0.95)	1.85 (1.22)	0.83 (1.07)	-2.38 (1.25)**	1.09 (0.38)***	0.92 (0.46)**	0.70 (0.42)*	-0.80 (0.57)
Available upon request [a]	27.7 (3.69)***	9.46 (3.40)***	16.8 (4.08)***	15.0 (3.80)***	6.53 (0.92)***	0.89 (0.88)	2.73 (1.07)***	3.15 (0.90)***	2.57 (0.42)***	-0.14 (0.33)	0.56 (0.42)	1.04 (0.43)***
Country-specific linear trends	N	Y	N	N	N	Y	N	N	N	Y	N	N
Country-specific quadratic trends	N	N	Y	N	N	N	Y	N	N	N	Y	N
R^2	0.79	0.89	0.93	0.85	0.87	0.92	0.90	0.91	0.89	0.93	0.92	0.92
Sample size	208	208	208	182	208	208	208	172	208	208	208	172

The dependent variable is the first female marriage rate per 1000 women by age group. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons'. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 3.13 (cont.) OLS estimates of the effect of abortion laws on first marriage rates of females (models include political shock and time trend dummies)

	40-44	**40-44**	**40-44**	**40-44**
	(1)	**(2)**	**(3)**	**(4)**
"Political shock" dummy (set to 1 from 1990 onwards)				
Legal to save mother's life or for other specific medical reasons [a]	0.65 (0.26)***	-0.17 (0.35)	-0.09 (0.31)	-0.64 (0.35)*
Available upon request [a]	1.71 (0.29)***	-0.28 (0.21)	0.15 (0.25)	0.81 (0.26)***
Country-specific linear trends	N	N	N	N
Country-specific quadratic trends	N	Y	Y	N
R^2	0.87	0.93	0.93	0.91
Sample size	208	208	208	172
Time trend (set to 0 until 1990 and then incrementing onwards).				
Legal to save mother's life or for other specific medical reasons [a]	0.65 (0.26)***	-0.17 (0.35)	-0.09 (0.31)	-0.64 (0.35)*
Available upon request [a]	1.71 (0.29)***	-0.28 (0.21)	0.15 (0.25)	0.81 (0.26)***
Country-specific linear trends	N	N	N	N
Country-specific quadratic trends	N	Y	Y	N
R^2	0.87	0.93	0.93	0.91
Sample size	208	208	208	172

The dependent variable is the first female marriage rate per 1000 women by age group. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons'. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

the Slovak Republic), (2) traditionally Roman Catholic countries with relatively high levels of secularisation (Czech Republic and Hungary), (3) traditionally Protestant countries that are also highly secular (Estonia, Latvia and former GDR), and (4) countries with a Christian Orthodox tradition (Bulgaria, Moldova, Roania and Russia). In theory, one might expect countries with relatively strong religiosity such as Lithuania, Poland and the Slovak Republic to have

consistently higher marriage rates than more secular countries such as Estonia, Latvia and the former GDR.

Then, the 25-29 year-old female marriage rates (the most robust result) of these countries between 1980 and 1995 were plotted according to category of religion in Figure 3.11. Three aspects of these figures are worth noting. First, marriage rates declined (or continued to decline in the case of the dominantly Christian orthodox countries) across all four categories at the turn of the transition period of the early-1990s and then picked up soon thereafter. Note that the dramatic fall in the marriage rate in the dominantly Protestant category is largely driven by the ex-GDR post-unification[34]. Second, as one might expect, the marriage rates of the Catholic Religious countries are considerably higher than those in the Catholic Secularised countries across the 1980 to 1995 period, although there is little variation observed in the latter. In summary, therefore, it is difficult to draw meaningful conclusions from this inspection of the raw data, but the trends in marriage rates according to religion in Figure 3.11 are broadly similar through time and it is reasonable to argue that the introduction of a time-varying variable for religion would not significantly change the principal findings of this study.[35]

An additional robust check included some estimates of the effect of abortion laws on the 25-29 age group based on alternative identification assumptions that are found in Columns 1 to 3 of Table 3.14. Column 1 excludes both country and year fixed effects, Column 2 includes only country fixed effects, while Column 3 includes only year fixed effects. In Column 1, the coefficient on 'available upon request' is positive but not statistically significant. The effect of excluding both country and year fixed effects is that the coefficient on the 'liberal' abortion law dummy is no longer statistically significant, indicating that the dummy is correlated with the omitted fixed effects. F-tests showed that the country and year fixed effects are strongly

significant both individually and as a group (results are available from the author). Once country and year fixed effects are included separately (Columns 2 and 3) and jointly (Columns 4 and 5), the coefficient on the 'liberal' abortion law dummy turns statistically significant. In Columns 2 and 3, for example, the coefficients indicate that a switch from a regime where abortion is only available for medical and social conditions to one where it is available upon request raises female marriage rates by around 15 marriages per 1000 women when country fixed effects are included and by around 16 marriages when year fixed effects are included. These results are broadly consistent with our previous findings for this age group that are shown in Columns 3 to 4 and include both country and year fixed effects.

Finally, it should be noted that the initial estimation strategy in this study only captures a discrete series break in abortion laws. One potential problem with this methodology is that it may confound pre-existing trends in female marriage rates with the dynamic response of a policy shock. To account for this response to the regime change, the four model specifications were modified to include dummies for the 'strict' abortion law having been effective for up to two years and the 'liberal' abortion law having been in place for up to three years. These dummies capture the dynamic response of marriage rates to abortion law changes while the country-specific trends identify pre-existing trends.

Table 3.14 reports the dynamics of abortion law changes where the reforms are allowed to have time-varying effects. As with the 'discrete jump approach' adopted in the initial analysis, the specifications all include year and country fixed effects, as well as country-specific linear and quadratic trends. The results are broadly similar to those obtained from the discrete jump approach with the strongest effects being observed for the 'liberal' abortion law dummies.

Yet, there are noticeable differences across the age groups under study. Table 3.14 shows that making abortion available upon request has a positive and statistically significant effect on marriage rates for females aged between 25 and 29 during the first year of reform, but the magnitude of the effect diminishes by the end of the first three years. The results for those aged between 30 and 44 from the discrete jump approach were not always robust to the inclusion of country-specific trends. However, the coefficient on the 'liberal' abortion law dummy is positive and statistically significant across all specifications during the three years following reform. For example, the effect of making abortion available on request for 35 to 39 year-olds is estimated at 3.48 to 6.00 female marriages per 1000 women and at 0.69 to 1.57 marriages for 40 to 44 year-olds

In summary, the robustness checks and dynamic specifications examined in this section appear to support the main findings of this study: a switch to a more liberal abortion law regime is associated with an increase in marriage rates for non-teenage females.[36]

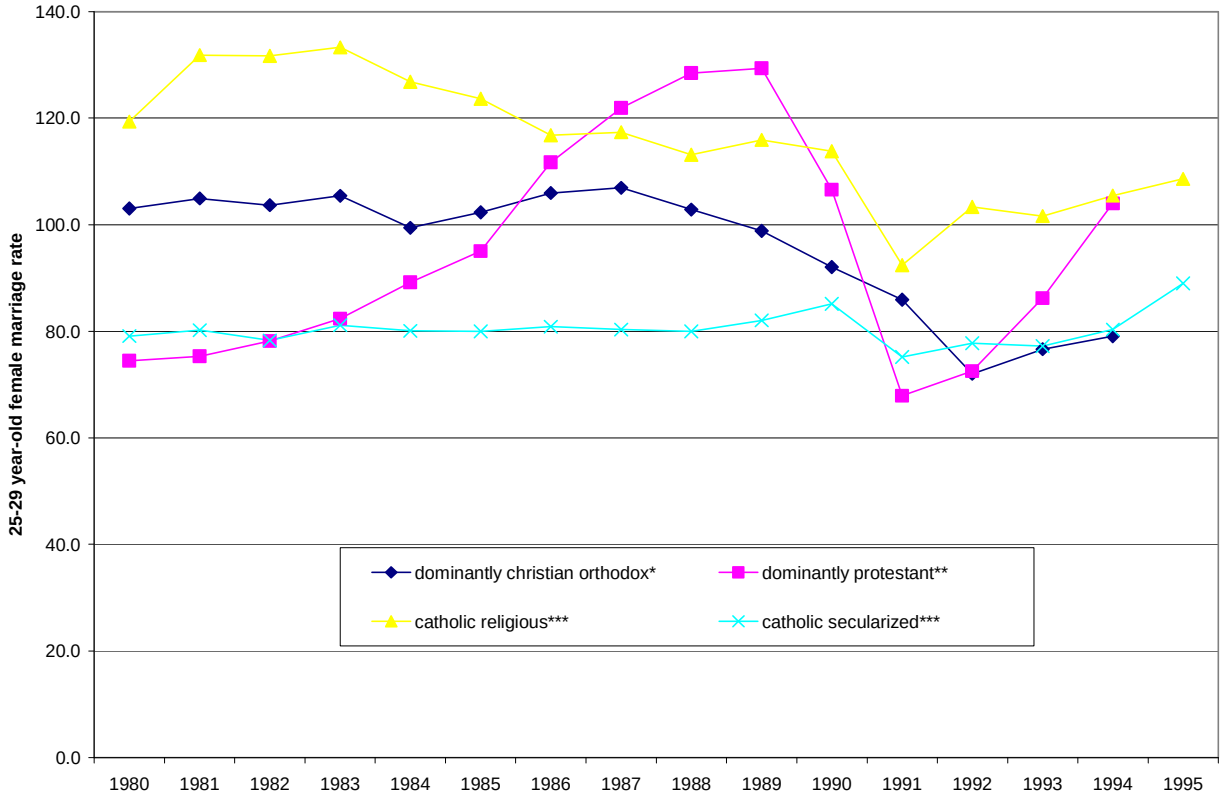
Table 3.14 OLS estimates of the effect of abortion laws on first marriage rates of females aged 25-29 in Eastern Europe (includes alternative specifications)

	(1)	(2)	(3)	(4)	(5)	(6)
Abortion laws						
Legal to save mother's life or for other specific medical reasons [a]	12.24 (4.84)***	-10.76 (3.78)***	21.09 (5.10)***	-0.06 (3.65)	0.14 (5.13)	-0.93 (4.56)
Available upon request [a]	4.35 (3.79)	15.28 (2.75)***	16.75 (3.83)***	27.7 (3.69)***	9.46 (3.40)***	16.8 (4.08)***
Macroeconomic conditions						
Log GDP per capita	6E4 (6E4)	0.007 (0.001)***	0.002 (7E4)***	0.008 (0.001)***	0.002 (0.002)	0.005 (0.001)***
Inflation between 5% and 25% [b]	-12.08 (3.35)***	-17.98 (2.92)***	2.02 (4.22)	-8.36 (2.92)***	-1.94 (2.79)	-2.63 (2.89)
Inflation between 25% and 100% [b]	-13.72 (4.65)***	-26.15 (3.02)***	19.55 (5.69)***	-3.44 (4.04)	4.29 (3.60)	4.35 (3.74)
Inflation greater than 100% [b]	-16.06 (4.89)***	-27.89 (5.00)***	18.18 (6.24)***	-4.97 (4.34)	5.08 (3.67)	5.28 (3.89)
Country fixed effects	No	Yes	No	Yes	Yes	No
Year fixed effects	No	No	Yes	Yes	Yes	No
Country-specific linear trends	No	No	No	No	Yes	No
Country-specific quadratic trends	No	No	No	No	No	Yes
R^2	0.13	0.68	0.36	0.79	0.89	0.87
Sample size	208	208	208	208	208	208

The dependent variable is the first female marriage rate per 1000 women aged 25-29. All models include dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons', [b] omitted category is 'inflation less than 5%', [c] omitted category is unrestrictive divorce laws.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Figure 3.11 Religion and Marriage Rates for Females Aged 25-29 in Eastern Europe (1980 to 1995)



* Bulgaria, Moldova, Romania and Russia ** Estonia, Latvia and ex-GDR ***Poland, Lithuania and the Slovak Republic
**** Czech Republic and Hungary

Source: religious categories from Sobotka (2002)

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Table 3.15 OLS estimates of the (dynamic) effect of abortion laws on first marriage rates of females in Eastern Europe

	14-49	**14-49**	**14-49**	**14-49**	**15-19**	**15-19**	**15-19**	**15-19**	**20-24**	**20-24**	**20-24**	**20-24**
	(1)	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
Strict abortion law effective for 1 yr	0.02 (0.02)	-0.01 (0.03)	-2E-04 (0.03)	-0.02 (0.02)	47.6 (21.3)**	14.3 (15.7)	14.6 (14.9)	30.3 (21.6)	-13.0 (23.1)	-26.0 (17.5)	-12.0 (19.2)	-42.7 (16.9)***
Strict abortion law effective for 2 yrs	-0.03 (0.03)	-0.02 (0.03)	-0.03 (0.03)	-0.01 (0.03)	-35.7 (23.7)	-6.07 (15.0)	-19.9 (16.0)	-17.1 (21.0)	-0.53 (27.4)	-10.7 (17.3)	-8.88 (18.9)	0.72 (20.5)
On request abortion law effective for 1 yr	0.03 (0.03)	0.03 (0.02)	0.04 (0.02)	-0.03 (0.02)	-40.7 (19.7)*	14.4 (11.4)	5.12 (11.6)	-41.8 (19.5)*	47.2 (16.1)***	1.31 (13.0)	21.6 (13.7)	5.09 (11.0)
On request abortion law effective for 2 yrs	-0.005 (0.03)	-0.001 (0.03)	-0.005 (0.03)	0.005 (0.02)	0.80 (24.2)	1.26 (12.8)	-7.19 (12.9)	4.02 (20.6)	-2.32 (24.5)	1.31 (16.4)	4.41 (17.7)	5.95 (15.2)
On request abortion law effective for 3 yrs	0.02 (0.02)	0.03 (0.02)	0.02 (0.02)	-0.003 (0.02)	-24.7 (18.4)	20.7 (11.6)*	-0.44 (11.4)	-15.0 (19.4)	23.6 (19.1)	2.41 (12.8)	10.6 (13.8)	4.97 (13.6)
Country-specific linear trends	N	Y	N	N	N	Y	N	N	N	N	Y	N
Country-specific quadratic trends	N	N	Y	N	N	N	Y	N	N	Y	N	N
R^2	0.90	0.94	0.96	0.93	0.88	0.96	0.96	0.90	0.90	0.94	0.93	0.94
F-statistic (strict)	0.01	0.51	0.52	1.67	0.41	0.12	0.06	0.44	0.47	3.81**	1.01	6.79***
F-statistic (on request)	6.76***	6.58***	6.32***	21.8	18.5***	6.64***	0.03	7.41***	50.8***	0.99	7.42***	2.42
Sample size	208	208	208		208	208	208	208	208	208	208	172

The dependent variables are first female marriage rate per 1000 women for each age group. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. The omitted abortion law category is 'legal for medical or social reasons'.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$

Table 3.15 (cont.) OLS estimates of the (dynamic) effect of abortion laws on first marriage rates of females in Eastern Europe

	25-29	**25-29**	**25-29**	**25-29**	**30-34**	**30-34**	**30-34**	**30-34**	**35-39**	**35-39**	**35-39**	**35-39**
	(1)	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**	**(1)**	**(2)**	**(3)**	**(4)**
Strict abortion law effective for 1 yr	-4.95 (5.84)	-1.25 (4.12)	-2.35 (4.76)	-14.5 (4.47)***	0.42 (1.26)	1.71 (1.09)	1.00 (1.13)	-1.93 (1.24)	-0.11 (0.50)	0.48 (0.50)	0.18 (0.57)	-1.16 (0.50)**
Strict abortion law effective for 2 yrs	2.61 (6.14)	-5.03 (3.58)	-2.84 (4.48)	2.05 (4.56)	0.86 (1.44)	-0.93 (1.04)	-0.58 (1.19)	-0.28 (1.47)	1.48 (0.74)**	0.49 (0.51)	0.72 (0.57)	0.76 (0.50)
On request abortion law effective for 1 yr	17.7 (5.36)***	5.54 (3.58)	10.3 (4.18)***	9.80 (4.09)***	3.75 (1.57)***	1.10 (1.38)	2.15 (1.55)	1.81 (1.34)	1.29 (0.53)***	-0.01 (0.51)	0.38 (0.57)	0.47 (0.42)
On request abortion law effective for 2 yrs	-0.83 (8.26)	-0.80 (4.49)	0.26 (5.26)	-0.42 (5.71)	-0.66 (2.04)	-0.99 (1.59)	-0.75 (1.75)	-0.80 (1.71)	0.13 (0.73)	-0.07 (0.59)	0.06 (0.66)	-1.66 (0.59)
On request abortion law effective for 3 yrs	15.8 (6.66)***	5.44 (3.39)	10.8 (4.09)***	4.59 (5.18)	6.00 (1.44)***	3.48 (0.97)***	4.86 (1.12)***	4.86 (1.28)***	2.25 (0.59)***	0.90 (0.43)***	1.56 (0.49)**	1.99 (0.55)***
Country-specific linear trends	N	Y	N	N	N	N	N	N	N	Y	N	N
Country-specific quadratic trends	N	N	Y	N	N	Y	Y	N	N	N	Y	N
R^2	0.80	0.89	0.87	0.85	0.90	0.92	0.92	0.93	0.93	0.92	0.93	0.93
F-statistic (strict)	0.36	1.49	1.18	7.31***	1.18	0.37	0.14	0.50	9.97***	3.52*	3.31*	0.50
F-statistic (on request)	93.1***	6.54***	27.2***	10.6***	27.2***	12.7***	35.9**	20.7***	75.0***	40.4***	16.3***	20.7***
Sample size	208	208	208	172	208	208	208	172	208	208	208	172

The dependent variables are first female marriage rate per 1000 women for each age group. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. The omitted abortion law category is 'legal for medical or social reasons'.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 3.15 (cont.) OLS estimates of the (dynamic) effect of abortion laws on first marriage rates of females in Eastern Europe

	40-44	**40-44**	**40-44**	**40-44**
	(1)	**(2)**	**(3)**	**(4)**
Strict abortion law effective for 1 yr	0.006 (0.31)	-0.06 (0.34)	-0.11 (0.31)	-0.48 (0.31)
Strict abortion law effective for 2 yrs	0.88 (0.39)	0.01 (0.37)	0.27 (0.35)	0.09 (0.30)
On request abortion law effective for 1 yr	0.95 (0.32)***	6E-04 (0.31)	0.21 (0.31)	0.58 (0.28)
On request abortion law effective for 2 yrs	0.02 (0.50)	-0.11 (0.40)	0.009 (0.43)	-0.19 (0.39)
On request abortion law effective for 3 yrs	1.57 (0.45)***	0.69 (0.32)**	1.06 (0.37)***	1.29 (0.33)***
Country-specific linear trends	N	Y	N	N
Country-specific quadratic trends	N	N	Y	N
R^2	0.93	0.93	0.93	0.92
F-statistic (strict)	8.49***	0.02	0.21	1.36
F-statistic (on request)	72.7***	4.27**	18.0***	34.1***
Sample size	208	208	208	172

The dependent variable is the first female marriage rate per 1000 women for those aged 40 to 44. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. The omitted abortion law category is 'legal for medical or social reasons'.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

3.7 Extensions to the analysis

The first extension to the analysis was to examine whether parental consent laws relating to abortion affect the teen female marriage rate in Eastern Europe. Empirical work from the United States has found that parental consent laws lower the abortion rate among teenagers, although there is little evidence to suggest that the number of births increase in response (see Cartoof and Klerman,1988; Ohsfeldt and Gohmann, 1994; Haas-Wilson, 1996; Lundberg and Plotnick, 1996; Joyce and Kaestner, 1996; Levine, 2003). In Eastern Europe, Table A1 shows that three countries (Czech Republic, Hungary, and Slovak Republic) introduced parental consent laws over the study period and given the evidence from outside of Eastern Europe, it is difficult to make clear predictions about the potential effect of these laws on the female teenage marriage rate. It is therefore an empirical exercise and Table 3.15 shows the results. The sign on the parental consent laws coefficient is positive in three of the four model specifications, but turns negative once country-specific quadratic trends are introduced. The results are not statistically significant across all four model specifications. In summary, the results do not provide any evidence to suggest that parental consent laws relating to abortion affect the teen female marriage rate.

Next, the early 1990s observed a considerable increase in the proportion of children born out of wedlock in Eastern Europe. Figures 3.12 to 3.15 show the number of extra-marital births per 100 live births in the sample of countries over the 1980 to 1997 period. It is clear that in several countries (such as Estonia and the ex-GDR) this trend appeared to begin in the 1980s, but the 1990s marked an upsurge in all the countries shown in Figures 3.12 to 3.15.[37] For example, by the late-1990s, Bulgaria had experienced an almost threefold increase in the non-marital birth rate compared to the late-1980s (see Figure 3.12).

Table 3.16 OLS estimates of effect of abortion laws (inc. parental consent laws) on first marriage rates of females aged 15-19 in Eastern Europe

	(1)	(2)	(3)	(4)
Abortion laws				
Legal to save mother's life or for other specific medical reasons [a]	19.6 (15.2)	14.1 (22.0)	-4.95 (17.1)	11.4 (17.6)
Available upon request [a]	-61.5 (17.5)***	17.7 (18.2)	12.2 (17.3)	-59.4 (22.9)***
Parental consent required [b]	12.7 (13.5)	6.22 (18.5)	-14.6 (15.5)	9.70 (14.7)
Macroeconomic conditions				
Log GDP per capita	0.005 (0.003)	0.03 (0.004)***	0.02 (0.003)***	0.03 (0.01)**
Inflation between 5% and 25% [c]	28.4 (10.2)***	10.7 (6.68)*	1.30 (5.75)	35.2 (11.4)***
Inflation between 25% and 100% [c]	34.6 (16.1)**	19.8 (11.4)*	10.2 (10.5)	33.9 (15.7)**
Inflation greater than 100% [c]	71.6 (19.3)***	47.0 (13.1)***	33.2 (11.7)***	70.3 (18.1)***
Economic and social development				
Female enrolment in university education				0.14 (0.35)
Urbanization				7.75 (3.60)**
Marriage market conditions				
Female to male population ratio (15-19)				772.3 (388.2)**
Restrictive divorce laws [d]				-20.3 (15.5)
Country-specific linear trends	No	Yes	No	No
Country-specific quadratic trends	No	No	Yes	No
R^2	0.87	0.96	0.96	0.91
Sample size	208	208	208	172

The dependent variable is the first female marriage rate per 1000 women aged 15-19. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons', [b] omitted category is parental consent not required, [c] omitted category is 'inflation less than 5%', [d] omitted category is unrestrictive divorce laws.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Figure 3.12 Non-marital birth rates in Bulgaria, Czech Republic and Estonia, 1980-1997

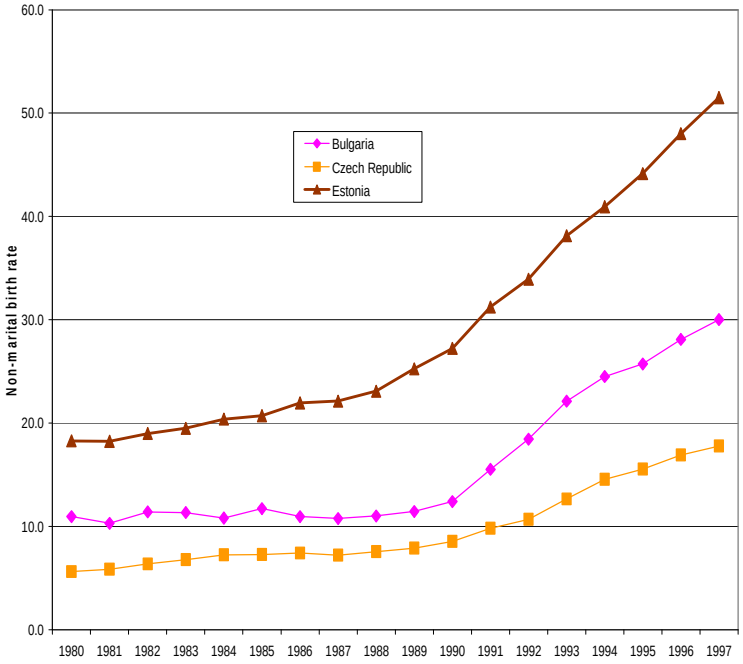


Figure 3.13 Non-marital birth rates in GDR, Hungary and Latvia, 1980-1997

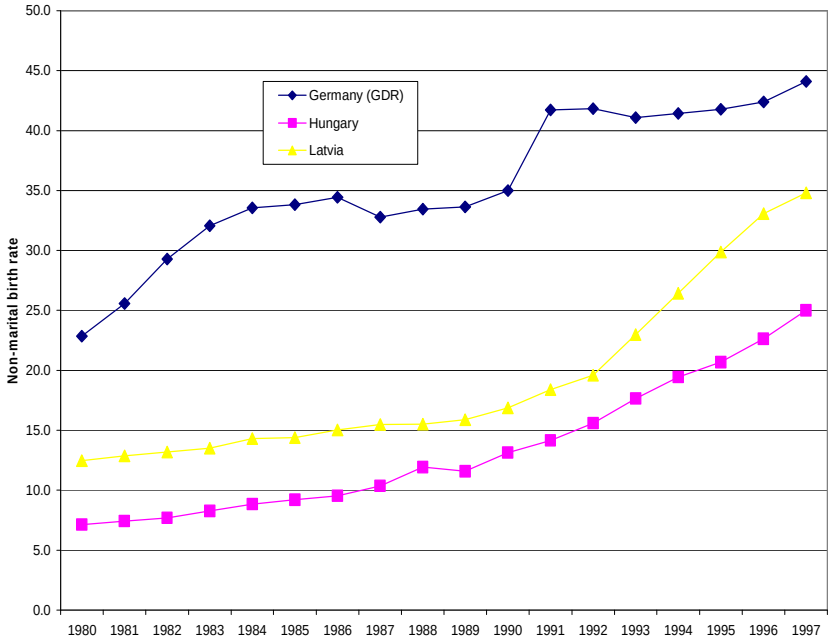


Figure 3.14 Non-marital birth rates in Lithuania, Moldova, and Poland, 1980-1997

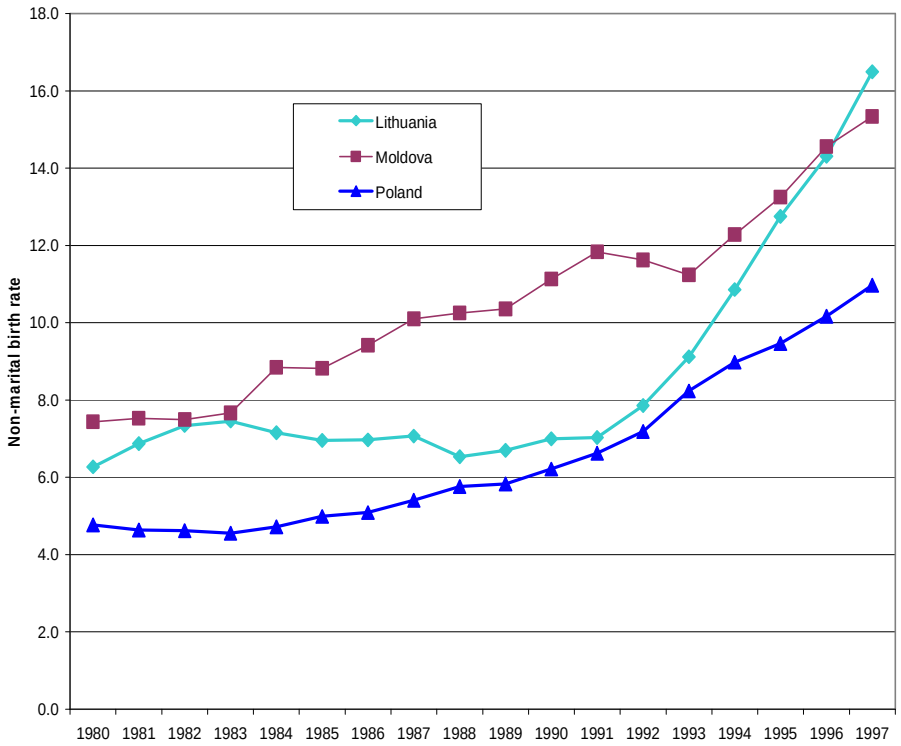
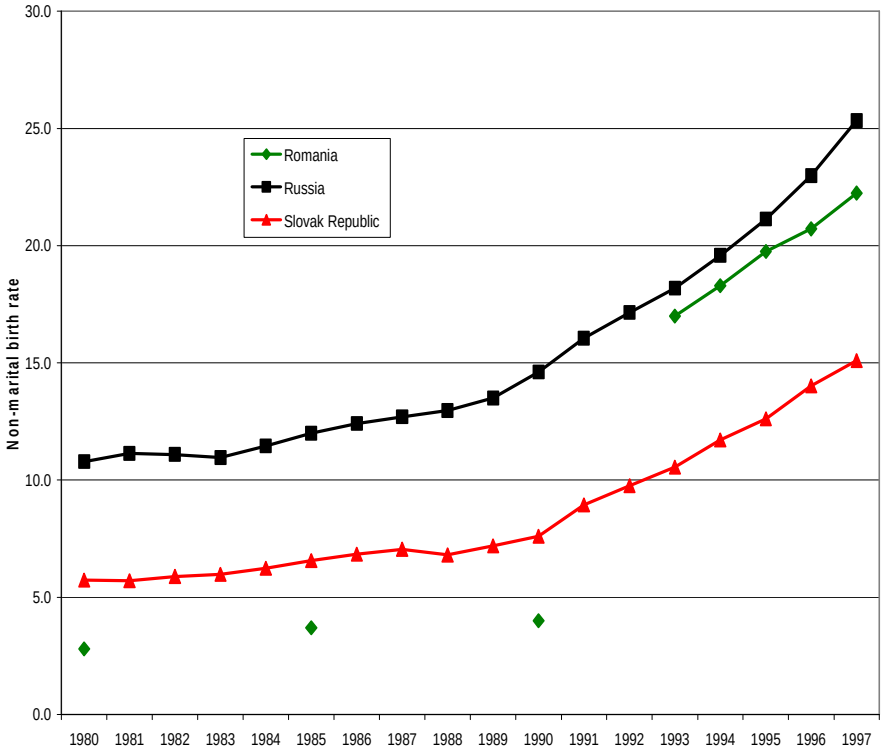


Figure 3.15 Non-marital birth rates in Romania, Russia and Slovak Republic, 1980-1997



Several hypotheses have been proposed by researchers to explain this shift in behaviour, including the suggestion that women may be first choosing to have a child and then entering into marriage, or that these non-marital births are taking place within a non-marital union or co-habiting relationship. As a final part of the analysis, the extent to which a switch in abortion laws may have contributed to the increases in the non-marital birth rate experienced by the sample of countries was investigated. As explained earlier, the Akerlof et al. (1996) theory argues that liberalization of abortion laws in the U.S. increases the number of out-of-wedlock births relative to all births since women can no longer insist upon a marriage promise in the event of pregnancy. However, the competing theory proposed in this chapter does not make any clear predictions about the relationship between a change in abortion laws and the non-marital birth rate. Nevertheless, it is a natural extension to the empirical analysis given the earlier findings. Further, it is an issue that is not addressed by Levine and Staiger (2004) who examine the impact of changes in abortion laws on a range of other fertility outcomes in Eastern Europe.

Table 3.16 presents estimates from models where the dependent variable is the number of non-marital births per 100 live births. As with the previous regressions, the specification in Column 1 includes two abortion law dummies (representing ‘strict’ and ‘liberal’ laws), macroeconomic conditions, and country and year fixed effects, whilst Columns 2 and 3 add linear and quadratic trends respectively, thus accounting for time-varying country-specific factors that may be related to both non-marital births and abortion law reforms. Following Levine and Staiger (2004), macroeconomic conditions are the only controls used in the analysis and again in all specifications, the omitted abortion law dummy is ‘medical and social conditions’.

Table 3.17 OLS estimates of the effect of abortion laws on non-marital birth rate in Eastern Europe

	(1)	(2)	(3)
Abortion laws			
Legal to save mother's life or for other specific medical reasons [a]	-5.16 (0.98)***	-1.25 (1.37)	-3.15 (1.02)***
Available upon request [a]	-1.17 (0.87)	0.78 (0.65)	1.16 (0.67)*
Macroeconomic conditions			
Log GDP per capita	4E-04 (2E-04)	-0.001 (3E-04)***	8E-04 (2E-04)***
Inflation between 5% and 25% [b]	-0.06 (0.60)	0.15 (0.41)	0.11 (0.50)
Inflation between 25% and 100% [b]	0.94 (1.07)	0.55 (0.58)	0.90 (0.78)
Inflation greater than 100% [b]	-0.01 (1.14)	-0.11 (0.65)	0.11 (0.86)
Country-specific linear trends	No	Yes	No
Country-specific quadratic trends	No	No	Yes
R^2	0.93	0.98	0.97
Sample size	200	200	200

The dependent variable is the non-marital birth rate. All models include country and year fixed effects and dummy variables indicating whether GDP and inflation data are missing. They are also weighted by the size of the relevant population. Standard errors are reported in parentheses and are corrected for heteroscedasticity. [a] omitted category is 'legal for medical or social reasons', [b] omitted category is 'inflation less than 5%'.

*** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

The results reported in Table 3.16 are fairly ambiguous. In Column 1, the model without country-specific trends, estimates indicate that the adoption of strict abortion laws decreases the number of non-marital births by around 5 per 100 live births relative to a regime in which abortion is available for medical and social reasons. When country-specific linear trends are added in Column 2, this lowers the estimate and increases the standard error to the point where it is no longer statistically significant, although the sign remains negative. On the other hand, the introduction of country-specific quadratic trends in Column 3 increases the estimate and lowers the standard error to the point where statistical significance is again obtained. The ambiguity of these findings suggests that it is not possible to draw strong conclusions about the impact of strict abortion laws on the non-marital birth rate. This is also the case with the estimates relating to the

effect of liberal abortion laws. The estimate in Column 1 is negative and not statistically significant, whilst the inclusion of country-specific trends in Columns 2 and 3 does not provide a clearer basis for interpretation. In Column 2 with linear country-specific trends, the estimate is positive but not statistically significant. Meanwhile, the estimate remains positive when quadratic country-specific trends are added in Column 3, but turns statistically significant.

3.8 Conclusion

In recent years, a growing number of studies have begun to examine the ways in which access to abortion might affect various social and economic phenomena. Whilst the study by Donohue and Levitt (2001) exploring the relationship between abortion legalization and crime rates in the United States is undoubtedly the most well-known and controversial, several studies have also indicated that the availability of abortion may change the sexual behaviour of women. In turn, this has ramifications for other related issues such as the prevalence of sexually transmitted diseases and incidence of 'shotgun weddings'. Much of this work focuses upon the United States, where a variety of policy changes affecting abortion access have occurred over the past four decades. However, there have also been significant changes in abortion policy in other parts of the world, most notably in Eastern Europe, and this study is the first of its kind to investigate how adoption of new abortion laws in the region may have affected female entry into marriage. Eastern Europe provides an extremely useful environment in which to undertake the analysis since the changes in abortion policy that took place in the late 1980s and early 1990s were both extensive and varied.

Previous studies from the United States had found that liberalization of abortion laws is associated with a decline in the marriage rate among females. Akerlof et al. (1996), for instance, theorized that, as a precondition for marital sex, a woman is no longer able to insist upon a

marriage promise in the event of pregnancy, while a man feels less obligated to marry his partner under these circumstances given that fertility is now a decision on her part. The study in this chapter proposes that the liberalization of abortion laws has the potential to raise female marriage rates since it lowers the cost to a woman of using pregnancy as a mechanism to screen 'Dads' from 'Cads'. The empirical analysis that follows reveals that the movement from an abortion regime with only moderate restrictions to one in which abortion is available upon request appears to raise marriage rates among non-teenage females in Eastern Europe. Although it would be bold to claim that the majority of women adopted this strategy across the region, the results for those aged 25 to 29 in particular were sufficiently robust to suggest that there is a possible role for this competing theory of abortion access and marriage.

A natural follow-up study would be to examine the effects of liberalization of abortion laws in Western Europe during the 1970s. Further, if it is true that women may use pregnancy as a means of "forcing the issue", another research question concerns whether this leads to an improvement in match quality.

Notes

[18] Chiappori and Oreffice (2008) argue that for Akerlof et al.'s theory to hold, it must be the case that a significant proportion of the male population in the U.S. chose to remain single over this time period, but would have decided (or been forced) to marry had legal abortion not been available. To examine empirically whether legalization of abortion significantly increased the probability of singlehood in the male population, they use data on males aged 15 to 50 from the Current Population Survey March Supplements 1968-1980 and regress a male singlehood dummy on age, education, race and fixed effects by year and state, as well as an abortion legalization dummy for the different states. They find that the abortion dummy is not statistically significant and the coefficient has a negative sign.

[19] It is assumed throughout that a woman wishes to raise a child within a formal marriage setting, not within an informal, co-habiting union.

[20] It is acknowledged that the costs of abortion (both economic and psychological) are different for different women, but the simplified model that follows does not consider these features.

[21] Chiappori and Oreffice (2008) argue that following the legalization of abortion in the U.S. all women (in the absence of a shortage of fathers) are strictly better off, including those who want a child and would not choose to use the option of abortion. The reason for this is that by raising the reservation utility of single women it also increases the "price" of all women. As a result, married women, for example, receive a greater share of household resources. On the other hand, men are "strict losers" from the reform.

[22] The twelve countries are Bulgaria, Czech Republic, Estonia, ex-GDR, Hungary, Latvia, Lithuania, Moldova, Poland, Romania, Russia, and Slovak Republic.
[23] Levine, P. and D. Staiger (2004), 'Abortion Policy and Fertility Outcomes: The Eastern European Experience', *Journal of Law and Economics*, 47, 1, 223-243.
[24] The age restriction of 50 years-old in first marriages is included because of its impact on reproduction.
[25] Rahman et al. (1998).
[26] See Rosenzweig (1988, 1993).
[27] See Nobles and Buttenheim (2006).
[28] Levine and Staiger (2004) note that it is difficult to obtain data for separate regions within a country, for example, the former German Demographic Republic and the former Czechoslovakia. Separate estimates for the German eastern regions of the level of GDP were able to be obtained, but for previous years, I follow Levine and Staiger (2004) and calculate the level of GDP using the more recent data combined with CIA estimates of GDP growth rates in earlier years. Inflation data for 1992 onwards were taken from the German Statistical Office and 1980 to 1989 data were obtained from CIA estimates. Data for 1990 and 1991 are missing. For the Czech and Slovak Republics, separate GDP figures over the 1984 to 1997 period were obtained from the World Bank, but for previous years, I again follow Levine and Staiger (2004) and assign the GDP growth rates from the combined Czechoslovakia to the 1984 levels of GDP to project backward. It is also assumed that inflation in the two republics were the same prior to their separation.
[29] Some countries and years have missing data for these macroeconomic variables, even using the CIA estimates. To include these countries in the analysis, I follow Levine and Staiger (2004) and add dummy variables for both GDP and inflation measures to indicate whether or not these data are missing.
[30] Empirical evidence from the United States suggests that the adoption of unilateral divorce laws by many states in the 1970s has led to a significant and permanent decline in marriage rates (see Brinig and Grafton, 1994; Rasul, 2003).
[31] A differences-in-differences estimation may seem a priori to be an appropriate estimation strategy as well. However, the problem is that it is not possible to find a valid control group for the estimation. Although the five former Soviet Republics did not significantly modify their abortion laws over the study period, they did change their laws *prior* to the study period. As noted earlier, the five former Soviet Republics liberalised their abortion laws in 1955.
[32] Hausman specification tests were performed on the 32 regressions that are part of the main analysis in this study. Results are available from the author.
[33] Baltagi (2001) notes that the random effects model is more appropriate when a random sample is chosen from a large population.
[34] The results from the ISSP (International Social Survey Program) indicate that in 1998, 69 per cent of individuals in the ex-GDR considered themselves to be non-religious (Sobotka, 2002).
[35] It would also have been interesting to examine whether changing levels of cohabitation in Eastern Europe has affected entry into marriage. Unfortunately, there appears to be only a very small amount of data available relating to this issue post-1990 and seemingly no data are available pre-1990. Philipov and Dorbritz (2003) report that there is some cohabitation information available from the European Values Survey carried out in Eastern Europe in 1990-1992 (wave 2) and in 1995–1997 (wave 3). The percentage of respondents aged 20-29 who stated that they were "living together like married" were 13% and 26% in Estonia in waves 2 and 3 respectively, 8% and 10% in Latvia, 1% and 4% in Poland grouped with Lithuania, as well as in Bulgaria separately, 8% in the Czech Republic in wave 2, and 5% in Hungary in wave 2. Philipov and Dorbritz (2003) note that the level of cohabitation in Eastern Europe remains quite low (compared to Western Europe, for example), although these numbers do suggest that there has been an increase in cohabitation levels from the beginning of the 1990s towards the middle of the decade.
[36] An additional concern was that if the observations were correlated across time, even after controlling for fixed effects, then the standard errors reported thus far were incorrect. So, a cluster estimator was used and resulted in an increase in standard errors in some model specifications to the point where

conventional levels of statistical significance were no longer reached. However, the results remained statistically significant across the four model specifications for the 25-29 year-old age group. (Results are available from the author on request).

[37] Philipov and Dorbritz (2003) note that the rise in non-marital births relative to all births was also a trend observed in Western European countries during the 1990s.

Appendix

Table A1 Abortion Laws in Eastern Europe (1980-1997)

Country	Years Legalized	Description	Legal Status of Abortion	Waiting Period/Counselling	Large Cost Subsidy	Parental Consent
Bulgaria	1973-1989 1990 -	Legal for medical reasons or on request in the first 10 weeks of pregnancy for certain categories of women, like those with 2 or more children Legal on request in the first 12 weeks of pregnancy	Medical/Social On request	Y Y	Y Y	N N
Czech Republic	1957-1986 1987 -	Legal for maternal health or social reasons in the first 12 weeks of pregnancy Legal in the first 12 weeks of pregnancy on request and physician approval	Medical/Social On request	Y N	Y Y	N Y
Estonia	1955 -	Legal on request in the first 12 weeks of pregnancy following consultation with doctor and notification of possible adverse consequences	On request	Y	Y	N
GDR	1972-1992 1993 -	Legal on request in the first 12 weeks of pregnancy Legal in the first 12 weeks of pregnancy after mandatory counselling and a 3-day waiting period; procedure is subsidised in majority of cases	On request On request	N Y	Y Y	N N
Hungary	1973-1992 1993 -	Legal for medical reasons or on request in first 12 weeks of pregnancy for certain categories of women, like those with 3 or more children Legal in the first 12 weeks of pregnancy after counselling and a 3-day waiting period	Medical/Social On request			
Latvia	1955-	Legal on request in the first 12 weeks of pregnancy following consultation with doctor and notification of possible adverse consequences	On request	Y	Y	N
Lithuania	1955-	Legal on request in the first 12 weeks of pregnancy following consultation with doctor and notification of possible adverse consequences	On request	Y	Y	N
Moldova	1955-	Legal on request in the first 12 weeks of pregnancy following consultation with doctor and notification of possible adverse consequences	On request	Y	Y	N
Poland	1956-1992 1993 -	Legal in the first 12 weeks of pregnancy for medical and social reasons Legal only when the pregnancy threatens the mother's life or health or in cases of rape/incest or foetal defects	Medical/Social Life/Medical	Y NA	Y NA	Y NA
Romania	1966-1989 1990 -	Legal in very limited circumstances (mother's life, rape, very large family, and the like) Legal on request in the first 12 weeks of pregnancy	Life/Medical On request	NA N	NA Y	NA N
Russia	1955-	Legal on request in the first 12 weeks of pregnancy following consultation with doctor and notification of possible adverse consequences	On request	Y	Y	N
Slovak Republic	1957-1986 1987 -	Legal for maternal health or social reasons in the first 12 weeks of pregnancy Legal in the first 12 weeks of pregnancy on request and physician approval	Medical/Social On request	Y N	Y Y	N Y

Source: Levine and Staiger (2004)

Table A2 Change in real GDP per capita in Eastern Europe (1980-1997)

Country	**1980-84 (% change)**	**1985-88 (% change)**	**1989-92 (% change)**	**1993 -97 (% change)**
Bulgaria	8.6	22.3	-19.8	-10.7
Czech Republic	5.8	4.6	-20.3	14.8
Estonia	10.4	5.4	-31.5	23.4
Germany (GDR)[1]		4.3	14.3	30.8
Hungary	7.1	6.9	-16.9	12.3
Latvia	11.9	9.5	-41.5	15.2
Lithuania[2]	5.1	14.1	-19.8	3.9
Moldova	17.1	8.3	-42.9	-36.1
Poland	3.3	8.7	-16.5	27.0
Romania	15.7	-4.6	-23.9	9.1
Russia	5.5	5.3	-21.8	-17.8
Slovak Republic[2]	4.2	6.9	-22.9	25.9

[1] missing data for 1980-84 and 1997 [2] missing data for 1980

Source: World Bank and CIA.

Table A3 Inflation rates in Eastern Europe (1980-1997)

Country	**less than 5%**	**between 5%-25%**	**between 25%-100%**	**greater than 100%**	**missing data**
Bulgaria	1980-88	1989	1992-95	1991, 1996-97	1980, 1990
Czech Republic	1981-89	1990, 1992-97	1991		1980
Estonia	1981-85, 1987-88	1986, 1989-90,1996-97	1993-95	1991-92	1980
Germany (GDR)	1981-89, 1994-97	1992-93			1980, 1990-91
Hungary	1981	1980, 1982-1989, 1992-94, 1996-97	1990-91, 1995		
Latvia	1981-85, 1987-88	1986, 1989-90, 1996-97	1994, 1995	1991-93	1980
Lithuania	1981-85	1986, 1989-90, 1996-97	1987-88, 1994-95	1991-93	1980
Moldova	1981-85, 1987-88	1986, 1989-90, 1996-97	1991, 1995	1992-94	1980
Poland		1980-81, 1984-86, 1996-97	1983, 1987-88, 1991-95	1982, 1989-90	
Romania	1984-88	1981-83, 1989-90	1995-96	1991-94, 1997	1980
Russia	1980-84, 1986-87	1985, 1988-90, 1997	1996	1991-95	
Slovak Republic	1981-89	1990, 1992-97	1991		1980

Source: World Bank and CIA.

Table A4 Percentage of Females Aged 20-24 Enrolled in University Education in Eastern Europe (1980 and 1995)

Country	**1980**	**1995**	**% change**
Bulgaria	18.5	51.9	180.9
Czech Republic	14.0	21.2	51.5
Estonia	25.5	40.4	58.6
Germany (GDR)[1]	36.1	-	-
Hungary	12.6	26.9	113.8
Latvia	28.1	29.8	6.1
Lithuania[2]	44.6	32.6	-26.7
Moldova[3]	-	35.6	-
Poland	20.1	29.3	45.9
Romania	9.5	23.9	150.9
Russia[4]	51.5	-	-
Slovak Republic[5]	-	21.1	-

[1] Data only available for 1980-1988, [2] 1980-1984 missing (1985 used), [3] Data only available for 1994-1996, [4] Data only available for 1980-1986, [5] Data only available for 1992-1996

Source: UNESCO (various years)

Table A5 Urbanization in Eastern Europe (1982 and 1997)

Country	**1982**	**1997**	**% change**
Bulgaria	63.9	67.7	+5.9
Czech Republic	73.7	74.7	1.4
Estonia	70.8	69.3	-2.1
Germany (GDR)[1]	76.5	76.3	-0.3
Hungary	57.3	63.8	+11.3
Latvia	69.9	69.1	-1.1
Lithuania	63.3	68.3	+7.9
Moldova[2]	42.8	41.7	-2.6
Poland	59.3	61.9	+4.4
Romania	48.5	55.0	+13.4
Russia[3]	71.6	72.9	+1.8
Slovak Republic[4]	53.0	57.0	+7.5

[1] 1991-97 missing (1990 used), [2] 1980-83 missing (1984 used), [3] 1980-83 missing (1984 used), [4] 1980-82 missing (1983 used)

Source: United Nations Demographic Yearbook (various years)

Table A6 Female-to-male population ratios in Eastern Europe (1980 and 1996)

	15-44		**15-19**		**20-24**		**25-29**		**30-34**		**35-39**		**40-44**	
	1980	1996	1980	1996	1980	1996	1980	1996	1980	1996	1980	1996	1980	1996
Bulgaria	0.97	0.98	0.94	0.94	0.95	0.96	0.98	0.96	0.98	0.98	0.99	1.00	1.00	1.02
Czech Republic	0.97	0.96	0.95	0.95	0.96	0.95	0.97	0.95	0.97	0.96	0.99	0.97	1.00	0.99
Estonia	0.98	0.99	0.90	0.96	0.92	0.97	0.96	0.91	1.02	0.99	1.04	1.04	1.08	1.08
Germany (GDR)*	0.96	0.91	0.95	0.92	0.94	0.87	0.94	0.91	0.96	0.93	0.99	0.93	0.99	0.94
Hungary	0.98	0.97	0.94	0.95	0.96	0.95	0.97	0.96	0.98	0.97	1.00	1.00	1.09	1.09
Latvia	1.00	0.99	0.93	0.97	0.94	0.96	0.99	0.93	1.02	0.99	1.05	1.04	1.09	1.09
Lithuania	1.00	0.99	0.92	0.97	0.95	0.97	0.99	0.95	1.04	0.98	1.06	1.03	1.11	1.07
Moldova*	1.06	1.03	0.98	0.97	1.07	0.99	1.06	1.02	1.08	1.07	1.11	1.06	1.14	1.08
Poland	0.97	0.97	0.94	0.95	0.95	0.96	0.97	0.95	0.98	0.97	1.00	0.99	1.02	1.00
Romania	0.98	0.97	0.95	0.95	0.96	0.95	0.97	0.97	0.98	0.97	1.00	0.99	1.01	1.00
Russia	0.99	0.98	0.94	0.97	0.96	0.94	0.94	0.97	0.98	0.98	1.04	1.01	1.06	1.03
Slovak Republic	0.98	0.97	0.96	0.94	0.94	0.96	0.96	0.96	0.96	0.98	1.03	0.97	1.06	0.99

* figures are 1994 for 1996.

Source: Council of Europe

Table A7 Divorce Laws in Eastern Europe

Country	**Divorce legislation**
Bulgaria	From 1968-1985: Breakdown or other less restrictive; Since 1985: Fault or other restrictive
Czech Republic	From 1950-1964: Fault or other restrictive; From 1964- 1998: Breakdown or other less restrictive
Estonia	Until 1966: Fault or other restrictive; Since 1966: Breakdown or other less restrictive
Germany (GDR)	From 1949-1990: Breakdown or other less restrictive; Since 1990, more restrictive
Hungary	Until 1964: Fault or other restrictive; Since 1964: Breakdown or other less restrictive
Latvia	Until 1966: Fault or other restrictive; Since 1966: Breakdown or other less restrictive
Lithuania	Until 1966: Fault or other restrictive; Since 1966: Breakdown or other less restrictive
Moldova	Until 1966: Fault or other restrictive; Since 1966: Breakdown or other less restrictive
Poland	Until 1964: Fault or other restrictive; Since 1964: Breakdown or other less restrictive
Romania	From 1966-1993: Fault or other restrictive; Since 1993: Breakdown or other less restrictive
Russia	Until 1966: Fault or other restrictive; Since 1966: Breakdown or other less restrictive
Slovak Republic	From 1950-1964: Fault or other restrictive; From 1964- 1998: Breakdown or other less restrictive

Sources: Martiny and Schwab (2003), Todorova (2003), Antokolskaia (2003), Weiss and Szeibert (2003), Maczynski and Sokolowski (2003), Harkonen and Dronkers (2006), the Max Planck Institute for Demographic Research, and direct correspondence with legal experts in Eastern Europe.

4.

Bricks, Mortar, and Wedding Bells:
Does the Cost of Housing Affect the Marriage Rate?

"We have already decided that we will not be able to get married for a long time yet due to buying a house at such inflated prices", Christine Knight, 22, 'The trials of becoming a first-time home buyer', *BBC online*, Thursday, September 19, 2002.

4.1 Introduction

In the era between 1200 and 1800, the British practised the sexual restraint that economist Thomas Malthus had belatedly suggested they follow in 1798's *An Essay on the Principle of Population*. In so doing, they postponed marriage until a man and woman were able to afford the lifestyle suitable for a married couple of their class. A half-century before Malthus's work, Benjamin Franklin noted in his 1751 essay, *Observations Concerning the Increase of Mankind*, that, "…People Increase in Proportion to the Number of Marriages, and that is greater in Proportion to the Ease and Convenience of supporting a Family. When Families can be easily supported, more Persons marry, and earlier in Life". Franklin discussed the virtuous relationships between limited population, low land prices, high wages, early marriage and abundant children: "Europe is generally full settled with Husbandmen, Manufacturers etc. and therefore cannot now much increase in People…Land being thus plenty in America, and so Cheap as that a labouring man, that understands Husbandry, can in short Time save Money enough to purchase a Piece of new Land sufficient for a Plantation, whereon he may subsist a Family; such are not afraid to Marry…". Franklin concluded that, "Hence, marriages in America are more general, and more generally early, than in Europe".

Although the Industrial Revolution helped to avoid the Malthusian trap relating to food, the supply of and demand for land in modern times undoubtedly influences the state of the housing market, which has the potential to influence the decision to marry. Anecdotal evidence and findings from surveys indicate that individuals consider housing market factors when weighing

the decision to marry. For example, a Ipsos MORI poll conducted in 2008 on behalf of the Civitas think-tank in the U.K. of people aged between 20 and 35, found that seven in ten wanted to marry, and a quarter of those surveyed stated that they had not yet married because of financial circumstances; lacking the funds required to buy a home was one factor cited.

Yet, only a small number of academic studies have examined the extent to which the state of the housing market (in particular, the cost of buying property) affects entry into marriage. This comparative neglect is somewhat puzzling, particularly in light of evidence that homeownership rates for married couples are much higher than those for cohabiting couples who, in turn, have higher ownership rates than single person households (Ineichen, 1979, 1981; Murphy and Sullivan, 1985; Haurin et al., 1988; Mulder and Wagner, 1998; Andrew and Meen, 2003). Further, newly-weds tend to purchase housing within a few years of marriage (Van Riper, 2006).[38] If homeownership is strongly associated with marriage, it is reasonable to argue that individuals may evaluate their willingness to marry with respect to their ability to purchase appropriate housing. In other words, marriage may be endogenous to homeownership and this raises the question of whether a high cost of housing has the potential to constrain marriage.

This chapter examines the relationship between the cost of housing and the rate of marriage in 2441 U.S. counties over the period 1970 to 1999. Data from the U.S. Census are used to construct a measure of the burden of housing costs (the ratio of the value of owner-occupied housing to per capita income), whilst the marriage rate figures are taken from the National Center for Health Statistics (NCHS) and privately obtained from Vital Statistics units on a state-by-state basis. This appears to be the most comprehensive dataset on marriages in the United States that has ever been collected and analysed at the U.S. county level.

Controlling for a number of economic and demographic variables, it is found that the burden of housing costs appears to play a role in the marriage decision. A higher ratio of the cost of owner-occupied housing to per capita income in a given county is associated with a lower marriage rate. The analysis is also extended to include a measure capturing the relationship between the cost of owning housing and the cost of renting and marriage. Evidence is reported that suggests that the greater the difference between the annual cost of owning housing and renting as a proportion of per capita income in a county, the lower the marriage rate.

The chapter proceeds as follows: In Section 4.2, the burden of housing costs is incorporated in a standard economic model of marriage. Section 4.3 provides a review of previous empirical studies that have examined the relationship between the housing market and marriage. In Section 4.4, the panel data and the study's estimation methods are described, and in Section 4.5 the study's main results are presented and the analysis extended. Summary and conclusions are provided in Section 4.6.

4.2 Theoretical framework

Standard economic models assume that an individual will marry if utility is greater when married than when single (Becker, 1973, 1974). The probability of marriage is then influenced by economic and other factors that change the returns to being married versus single. This framework can incorporate most theories that seek to explain differences in marriage rates through time or among individuals (Ellwood and Jencks, 2001).

The model developed in this section is a simple, stylised model that is intended to motivate the empirical analysis and assumes that the decision to marry also involves a decision to purchase appropriate housing. It is acknowledged that not all individuals who marry buy

property, but it may be the case that couples delay marriage until, for example, they have saved sufficient funds for a house that is large enough to raise children and includes amenities such as gardens and garages.[39]

Consider a forward-looking individual i who seeks to maximize the expected present value of the following additively separable, continuous, and concave utility functions in the single and married states respectively:

$$U_{i,s} + U(H_i, Y - P_i) \quad (1)$$

$$U_{i,m} + U(H_i, Y + Y^* - P_i) \quad (2)$$

where H represents the quantity of housing, Y is personal income, Y^* is spousal income, and P is the price of housing where $U_H>0$, $U_Y>0$, $U_{HH}<0$, and $U_{YY}<0$; we note that the utility derived from each marital status is independent of the utility derived from housing. Next, assume that a single individual chooses Type A housing that is appropriate for singles at a cost of P_A and a married individual purchases Type B housing that is appropriate for married life at a cost of P_B. Further, given that the quality of owner-occupied housing is on average higher than that of rental accommodation (Megbolugbe and Linneman, 1993), assume that $P_B > P_A$.[40]

Therefore, individual i who meets a potential mate will decide to marry if:

$$U_{i,m} + U(H_B, Y + Y^* - P_B) > U_{i,s} + U(H_A, Y - P_A) \quad (3)$$

or

$$U_{i,m} - U_{i,s} > U(H_A, Y - P_A) - U(H_B, Y + Y^* - P_B) \quad (4)$$

If the cost of single housing is static, then any increase in P_B decreases the likelihood that individual *i* will marry since $U_Y>0$. Further, if the cost of Type B housing (P_B) increases more than the cost of Type A housing (P_A), or if ($P_B - P_A$) increases, the likelihood that individual *i* will choose to marry also decreases.[41]

Suppose that there are *n* types, where type refers to the additional utility that a person receives from marriage. Abstract from reality by assuming a one-sided marriage model; thus, there is no sorting or matching. Label types such that type 1 has the lowest values of $U_{i,m} - U_{i,s}$ (which can be negative), type 2 the next lowest and so on. Therefore, type *n* has the highest value of $U_{i,m} - U_{i,s}$. From Equation (4), it follows that individuals will marry if and only if $U_{i,m} - U_{i,s} > U(H_A, Y - P_A) - U(H_b, Y + Y^* - P_B)$. So, as ($P_B - P_A$) increases, the subset of types that marry will decrease, thereby lowering the overall rate of marriage.

Having fixed the theoretical ideas behind the analysis, the remainder of the chapter is concerned with an empirical investigation of the relationship between the cost of housing and marriage rates in the United States.

4.3 Previous empirical studies

Numerous studies have investigated the empirical relationship between the state of the housing market and the broad process of household formation (for example, Ermisch, 1981; Markandya, 1982; Smith, 1984; Smith et al. 1984; Borsch-Supan, 1986; Kent, 1992; Ermisch and Di Salvo, 1997; Ermisch, 1999), but only a few researchers have been concerned with understanding the extent to which housing market factors play a role in the marriage decision itself.

Ermisch (1981) provides the only economic study that examines whether the *availability* of housing affects the decision to marry. He seeks to understand changes in the propensity to marry in England and Wales since post-World War II, a period which observed a general increase in marriage rates from 1950 until the mid-1960s, followed by significant fluctuations, and then a drastic decline from the early-1970s until the early-1980s. The analysis focuses on the first marriage rates of men aged 16-19, 20-24 and 25-29 and of women aged 16-19 and 20-24 and his model includes annual (aggregate) measures of real disposable income, the ratio of women's to men's hourly earnings, the sex ratio corresponding to marriage age groups, and the number of housing completions. The latter is lagged by one year to provide time for the addition of housing stock to impact on marriage behaviour.

Using GLS estimation, Ermisch reports that changes in the propensity to marry have been driven by changes in women's economic opportunities, real income, and the relative scarcity of the opposite sex. Housing market factors have only a small impact on the marriage decisions of men and women. Lagged housing completions do not have a noticeable effect on the marriage rates of teenagers, and even for those aged 20 and above the impact on marriage rates is weak, with an elasticity of only around 0.1. He notes that when housing market completions are at their post-war peak compared with their pre-war low, the difference between the marriage rates of those aged 20-24 is only about 5 per cent. For men aged 25-29, the effect is found to be statistically insignificant. Ermisch notes that the marked lack of influence of housing completions on teenage marriage rates may represent a behavioural difference. He suggests that this provides support for the idea that teenagers can choose the option of living with their parents at the beginning to marriage to a greater extent than other age groups.

Several studies from Europe examine the relationship between *home ownership* and entry into marriage. Research that relies upon descriptive analysis of survey responses has found that, in most cases, the average age at marriage of those couples who started off in an owner-occupied home is one or two years older compared to those who began married life in any other housing type (for example, Ineichen, 1979, 1981; Murphy and Sullivan, 1985). This lends support to the theory that couples might postpone marriage until they are in a position (financial or otherwise) to buy a home. Mulder and Wagner (1998) examine the connection between the transition to first home ownership and entry into marriage using large longitudinal West German and Dutch datasets. Controlling for socioeconomic status, number of years worked, employment and education, logistic regression analysis shows that there is a strong positive relationship between entry into marriage and home ownership. For example, never-married persons are 0.25 times less likely to become a home owner than married people without children in Germany, and 0.15 times lower in the Netherlands. Further, those marrying in a given year are by far the most likely category of people to become home owners in both countries.

Research seeking to uncover the effect of *housing affordability* on entry into marriage focuses on the United States. There appear to be two studies that examine the impact of rental prices on marriage and only one that investigates the relevant effect of owner-occupied housing. In the first category, Haurin et al. (1993), using a sample of 2,573 youths in their twenties from the National Longitudinal Survey of Youth (NLSY), measure the effect of spatial variations in rental costs on the probability of forming a household, including the decision of whether to marry or not. They expand a demographic model to include the following economic variables: an individual's potential real wage rate, the two-person maximum real AFDC (welfare) payment in the state of residence, and real rents in the locality of residence. Treating the probability of

marriage variable as endogenous, predicted from a reduced-form probit estimation, the study's results are presented for six groups: whites, blacks, and Hispanics, each by gender, with each group evaluated at its weighted sample mean. The results indicate that real housing rents are an important variable in explaining marital status for Hispanic females, in particular. The average probability of a Hispanic female being married is around 20 percentage points lower in high real housing cost (twice mean) than low (half mean) cost areas.

A similar study is carried out by Hughes (2003) who reports that individuals aged 18 to 30 in the U.S. are more likely to be married than to be living in four alternative arrangements (living alone, living with a partner, living with roommates, or living with parents) when housing costs are low. She uses a large sample of individuals (400,000 whites and 100,000 blacks) from the U.S. Census 1990 Public Use Microdata Samples (PUMS) with information about the individuals' metropolitan area of residence appended. Her model features variables that measure a broad set of economic and labour market conditions, including the average rent of a one-bedroom, three room apartment. Multinomial logistic regression analysis produces results that are broadly similar, but not identical, across gender and race. For white females and black males, higher housing costs are associated with higher probabilities of being married relative to cohabiting, living with roommates, or living with parents, but are not related to the contrast between living alone and being married. On the other hand, whilst higher housing costs are associated with higher probabilities of living in any of the four alternative arrangements for white males, they *reduce* the likelihood of living alone relative to being married for black females. An explanation is not provided for this latter finding, although it may reflect the fact that higher housing cost areas also have greater opportunities for black women in the labour

market. The overall results reported in this study, however, do suggest that high housing costs constrain marriage.

Hughes (2004) appears to provide the sole study of the relationship between the cost of owner-occupied housing and entry into marriage. She uses a sample of 9,385 individuals aged between 18 and 49, taken from the Panel Study of Income Dynamics (PSID), who were at "at risk" of first marriage over the 1968 to 1996 period. Her model's economic and labour market variables include the median value of owner-occupied housing in the county where the individual lived. Hazard model analysis shows that the relationship between the costs of owner-occupied housing and marriage is fairly strong and negative, and comparable to the effects of income. A $10,000 increase in income raises the probability of marriage by 15 per cent, whilst a $10,000 increase in the value of owner-occupied housing decreases the likelihood of marriage by 16 per cent. The effects are similar for blacks and whites and are more pronounced among those individuals without a college degree. Housing costs were also found to explain some, but not all, of the decline in marriage in the U.S over time. They were most relevant in explaining trends in marriage among those individuals without a college degree, mostly because the likelihood of marriage for college-educated persons remained stable. Finally, the study reports that the strength of the relationship between marriage and homeownership has not increased over time. In fact, it appeared to be stronger in the 1968 to 1973 period than in subsequent years. This may reflect a growing tendency for buying a home to be part of the "American Dream", independent of the decision to marry.

In summary, the state of the housing market is greatly overlooked in studies relating to entry into marriage, but it is often the focus of research seeking to understand the broader process of household formation. This review of the literature noted that several theories, though differing in

specific mechanisms, share the expectation that prospective couples will take into account housing factors when making the decisions of whether and when to marry. Indeed, the limited empirical research that does exist suggests that housing circumstances have real effects, with high costs in particular acting to constrain marriage. Table 4.1 provides a summary of the studies described in this section.

4.4. Data description

4.4.1 Dependent variable

A unique and comprehensive series of marriage data at the county level in the United States from 1970 to 1999 was constructed. The figures for the period 1970 to 1988 were obtained from the *National Vital Statistics System* of the *National Center for Health Statistics* (NCHS). In 1988, the NCHS ended its publication of marriage data; consequently, to gather data for the period 1989 to 1999, it was necessary to contact the Vital Statistics units on a state-by-state basis. Of the 48 states contacted, 42 were able to provide county-level marriage rates for this period; these data were subsequently hand-entered into spreadsheets. [42] The six states that were unable or unwilling to supply these data were California, Georgia, Maine, New Mexico, Oklahoma, and Tennessee. In addition, Virginia stopped collecting county-level data in 1995, whilst Pennsylvania could not provide figures for 1997 and 1999. In summary, it was possible to obtain complete marriage data for the 1970 to 1999 period for 2450 counties.

Specifically, the marriage rate data are crude marriage rates (that is, the total number of marriages in a county per 1000 population), and so they are a flow measure of entry into marriage that focuses on the incidence of marriage. This is in contrast to previous studies of the relationship between the cost of housing and marriage patterns that have used either individual-

level data to investigate the determinants that an individual is never married or single and state-level averages of the fractions of the population that are married, pooling data across states and years. These studies are measuring the prevalence of marriage.

There are several advantages to using Vital Statistics marriage data in this study as opposed to survey data such as the Current Population Survey (CPS). First, Vital Statistics figures are more useful than are stock data from the CPS in investigating flows into marriage (Bitler et al., 2004). Second, the Vital Statistics data are a "near universe" of new marriages compared to the CPS, which appears to under-report marriages (Goldstein, 1999). Third, survey data such as the CPS are subject to a greater degree of measurement error than are Vital Statistics data because survey respondents may report inaccurate or incomplete information about household members' marital status or history (Thornton and Rogers, 1987).

On the other hand, there are also disadvantages to using Vital Statistics data. This study uses county-level data that do not permit comparisons of effects across different age, racial, and educational groups. Further, much of the aggregate marriage data are by county of occurrence, not by county of residence. Therefore, if the likelihood of marrying outside the county of residence is systematically related to the cost of housing, then the results would be biased. It was possible to obtain some data from several states that provided information on county of residence and county of occurrence and later in the study some robustness checks are performed to deal with this issue.

Despite these drawbacks, the gains from using flow data from Vital Statistics that measure entries into marriage appear to outweigh the disadvantages and, further, this is the first time that such a comprehensive county-level marriage dataset has been constructed and analyzed over this time period.

Table 4.1 Summary of empirical studies examining relationship between housing and entry into marriage

Study	Principal dimension of interest	Data	Results
Ermisch (1981)	Availability of housing	Various aggregate British data	Availability of housing has only a small impact on the marriage decisions of men and women, e.g. elasticity of marriage for those aged 20 and above with respect to lagged housing completions is only 0.1
Mulder and Wagner (1998)	Home ownership	Longitudinal West German and Dutch data	Never-married persons 0.25 times less likely to become a homeowner than married people without children in Germany and 0.15 less likely in the Netherlands
Haurin et al. (1993)	Rental prices	National Longitudinal Survey of Youth, Class of 1972	Real housing rents an important variable in explaining marital status for Hispanic females. Average probability of a Hispanic female being married is 20 percentage points lower in high real housing costs areas than low cost areas
Hughes (2003)	Rental prices	U.S. Census (1990)	For white females and black males, higher rental costs associated with higher probabilities of being married relative to cohabiting, living with roommates, or living with parents. For black females, they reduce the likelihood of living alone relative to being married
Hughes (2004)	Cost of owner-occupied housing	U.S. Panel Study of Income Dynamics and U.S. Census (1970, 1980, 1990, 2000)	A $10,000 increase in the value of owner-occupied housing decreases the likelihood of marriage by 16%. Housing costs explain some of the decline in U.S. marriage through time. Strength of the relationship between marriage and homeownership has not increased through time

4.4.2 Explanatory variables

The study's primary explanatory variable of interest is "housing cost burden" that is constructed as the ratio of the flow value of owner-occupied housing units to per capita income in each county.[43] The flow value is constructed by multiplying the median value of housing by the mortgage interest rate in each year. The mortgage interest rate is the average annual U.S. contract rate on a 30-year, fixed-rate conventional first mortgage. The housing value data are drawn from the 1970-2000 Decennial Census Summary Tape Files, and the mortgage interest rate data are taken from the Federal Reserve. The per capita income data are drawn from the U.S. Census. Note that the U.S. Census reported per capita income figures for the year 1999, not 2000, and this explains why the period under study ends in the former year.

The housing cost burden measure provides a reasonable approximation of the annual cost of servicing the payments on a home. Three crucial components enter into the burden (housing value, mortgage interest payments and, as a proxy for a budget constraint, per capita income is also included). This is an effective measure as possible given data constraints. Of course, it is also acknowledged that it is only an approximation. Ideally, the specification must go beyond median measures of values and income to include other factors such as the relative ease of access to credit, the cost of credit, employment conditions and even life-cycle developments. However, it is not possible to obtain figures on these broader set of factors for this study.

Median housing values and per capita income (both expressed in 1989 U.S. dollars) are also included separately in the analysis; the value of housing as a proxy for the median level of wealth in a county (and in turn, perhaps the attractiveness of a county as a place to wed) and per capita income as a proxy for the potential gains from marriage. Whilst the former might be expected to be positively associated with the marriage rate, theory suggests that the impact of

income on the marriage rate is ambiguous (Fitzgerald and Ribar, 2004). Higher income might increase the attractiveness of remaining single and may discourage marriage. This is often referred to as the "independence effect" (Becker, 1973; Becker et al., 1977). However, higher income also enhances an individual's attractiveness as a potential spouse, which increases the likelihood of marriage.

Additional explanatory variables that capture economic and demographic conditions in labour and marriage markets are also included in the analysis, with data drawn from the U.S. Census. For example, a large literature has analyzed how changes in labour markets, particularly for women, have taken place in the U.S. over the past forty years. These include a fall in gender segregation in hiring and training by employers and changes in the composition of production and technology that increase demand for female labour relative to male labour. Female labour-force participation is included as a variable in this study to capture these improved labour market opportunities for women as well as the proportion of the county female population aged 25 and over who are high school graduates.[44] The expected signs on both variables are ambiguous. On the one hand, improved labour market opportunities for females indirectly increase the mean marriage offer distribution of women, which in turn raises the return to marriage for males and therefore increases the marriage rate. Further, in the study's theoretical model, improved labour market outcomes for women are likely to be associated with an increase in combined household income ($Y + Y^*$), thereby also increasing the marriage rate. Other theories suggest the opposite effect, however. For example, according to Becker (1991), the net utility of marriage is likely to decrease if we do not observe household specialization in which the male specializes in market activities and the female in non-market activities. Moreover, increased female labour force participation might also reduce the ability of a female to undertake certain forms of marriage-

specific investment such as bearing and raising a child. The effect of this will be to reduce the *ex ante* value of marriage and reduce marriage rates, all else equal. Of course, it is likely that there are unobserved factors that affect both female labour force participation and marriage flows across counties and time. As a result, the error term in the regression analysis will co-vary with labour force participation, hence potentially causing endogeneity bias. This issue will be addressed later in the study.

Demographic conditions in the marriage market are captured by several variables. First, the proportion of the population that live in an urban area is included, which might be expected to have ambiguous effects on the marriage rate. Whilst greater levels of urbanization might be associated with economic opportunities that provide an alternative to marriage, there is an alternative argument, drawn from theories of marital search, which argues that large and spatially concentrated marriage market areas will lower the search costs attached to finding a suitable spouse and thus will generate higher marriage rates.[45] Population size of the county is also included to capture the potential "thickness" (or returns to scale) of the marriage market and may be positively associated with the marriage rate (Botticini and Siow, 2008). Ideally, this variable should measure the stock of eligible individuals searching for a spouse. However, it is possible to control for the proportion of the population that is of 'marriageable' age (15-49 years-old) and the median age of the population. One should expect the former to be positively associated with the marriage rate and the latter to be negatively associated with the marriage rate.

The marriage rate in a county may also be affected by demographic shifts in the relative supply of males and females, as measured by our indicator of males per 100 females of marriageable age (Gutentag and Secord, 1983; Schoen and Kluegel, 1988; South and Lloyd, 1992; and McLaughlin et al., 1993). Sex-ratio imbalances shift the aggregate demand for

marriage or the supply of potential spouses (Grossbard-Schechtman, 1984). It follows that an increase in the number of males per 100 females might be expected to increase the demand for wives, thereby raising female marriage rates and transferring part of the marital surplus from men to women (Angrist, 2002). In other words, an increase in the number of males per 100 females raises women's bargaining power in the marriage market, which could lead men to make stronger emotional and financial commitments to women in the form of marriage (Angrist, 2002).

Variables are also included that indicate the proportion of the population that is white, the proportion that is black, and the proportion that is foreign born. Economic theory provides little guidance on the predicted effects of these variables but in terms of race, it is important to include these variables because black marriage rates are traditionally lower than those for non-blacks.[46]

One disadvantage of working with Census data is that interpolated values are used for the intercensal years. The demographic data included in this study uses intercensal estimates directly provided by the U.S. Census Bureau, while linear interpolation is employed to generate intercensal estimates for the economic data that are not available from the Census Bureau. However, the mortgage interest rate data are not interpolated since there is a complete series of figures available for this variable.

It is also worth addressing the question of whether using county-level data for an analysis of a "marriage market" is appropriate. It is arguably preferable to using state-level data as in Fitzgerald (1991) or national-level data as in Wilson and Neckerman (1986); these studies assume too large a geographical area in which individuals may search for spouses and also do not account for potential variation between areas within states. On the other hand, it is acknowledged that the best level of analysis is individual-specific given that individuals operate

within social networks that may not be limited to geographic boundaries (Brien, 1997). One might reasonably expect an individual's "true" marriage market to consist of members of the opposite sex within their community, church, profession, or other social or workplace setting (Brien, 1997). The scope of the marriage market may be determined by the availability of potential spouses within a specific group or by an individual's own characteristics rather than by, for example, sex ratios within a specific county. Further, individuals may respond to, for example, shortages of potential spouses in a county by broadening their field of search, implying that an individual's marriage market might be an endogenous choice (Brien, 1997). Nevertheless, the county data employed in this chapter do represent one of the most disaggregated geographical locations available in the Census sample and includes all locations in the United States.

4.4.3 Descriptive statistics

There are a total of 85695 observations in the sample, and descriptive statistics are presented in Table 4.2. The mean marriage rate over the 1970 to 1999 period for the sample of counties was 10.5, although note that the minimum and maximum values range from 1.0 marriage per 1000 population to 520.5. The latter will be addressed later in this chapter. Further, Figure 4.1 shows that there has been a steady decline (with the exception of the mid-1970s to mid-1980s) in the marriage rate over this period. Of the 2441 counties for which there is a complete series of data, 79.9 per cent of these counties experienced a fall in the marriage rate over this period. The mean decrease in the marriage rate for these counties was 28.4 per cent. The fifty counties that experienced the greatest decline in their marriage rates over the 1970 to 1999 period are shown

in Figure 4.2 and are led by Gallatin, Illinois, which observed a 94.8 per cent fall. (The abbreviations used for each U.S. state are provided in Table A1 in the Appendix to this chapter).

Numerous explanations for the general downward trend in the marriage rate in the U.S. have been proposed by researchers, and these include improvements in birth control technology (Akerlof et al., 1996, Goldin and Katz, 2002), greater generosity of welfare payments, (Murray, 1984; Moffitt, 1990), a fall in the availability of marriageable men (Lichter et al., 1992), advances in household technology (Greenwood et al., 2005), changes in gender wage structures (Gould and Paserman, 2003), and liberalization of divorce laws (Rasul, 2003).

The mean value of the housing cost burden was 0.44 between 1970 and 1999, and Figure 4.3 shows that the index has fallen slightly over this period from 0.35 in 1970 to 0.30 in 1999. The burden rose sharply between the mid-1970s and the early-1980s, a period that witnessed rapid house price inflation (see Figure 4.4) and sharply increasing mortgage interest rates (see Figure 4.5). Per capita income followed a general uptrend trend over this period (see Figure 4.6).

More than 85 per cent of counties in the sample underwent a decrease in the housing cost burden between 1970 and 1999. The fifty counties that experienced the greatest declines in the burden are shown in Figure 4.7 and are led by a 71.7 per cent fall in Stutsman, North Dakota. Twenty-one of the fifty counties in Figure 4.7 are located in North and South Dakota.

A comparison of the marriage rate (Figure 4.1) and housing cost burden (Figure 4.3) reveals quite a striking observation in that during the mid-1970s to early-1980s, the marriage rate rose slightly when the housing cost burden escalated most rapidly and thereafter the two variables declined together. This observation will be returned to later in the study when the estimation results are discussed.

Turning to the remaining economic and demographic variables, Table 4.2 shows that the mean values for the measures of female labour-force participation and percentage of females aged 25 and over who are high school graduates are 63.0 per cent and 46.6 per cent respectively. However, these figures mask the dramatic increase in their values over the study period that reflects the improved labour market opportunities available to women that were noted earlier. The demographic variable that has experienced the greatest change over the study period is the median age of the population. Although the mean median age in the sample is 32.6 years-old, this has increased fairly dramatically through time, rising from 29.8 in 1970 to 37.0 in 1999.

4.5 Econometric methodology

Because of the lack of individual level data, it is not possible to test the model directly. Instead, the implication of the hypothesized theoretical relationship between housing costs and marriage will be tested using the aggregate data described above. The following panel data regression of the crude marriage rate in county c at time t is estimated for the period 1970 to 1999 using ordinary least squares (OLS):

$$mrate_{c,t} = \alpha + \beta_1 burden_{c,t} + \chi_c + \gamma_t + \lambda X_{c,t} + \varepsilon_{c,t}$$

where *mrate* is the crude marriage rate for county c in time t; *burden* is a measure of housing cost burden (the ratio of median housing value to per capita income) for county c in time t; χ_c and γ_t refer to county or state and year fixed effects and $X_{c,t}$ is a set of economic and demographic controls that are potentially important for explaining the propensity to marry and include those relating to female educational and labour market outcomes.

Hausman specification tests were performed that indicated that a fixed-effects estimation procedure is appropriate for the analysis and on a theoretical basis there is good reason to use

this technique since the panel contains almost all counties in the United States; not a specific sample.[47] Each of the regressions includes either county, state, or county and state and year fixed effects to control for unobserved variables.[48]

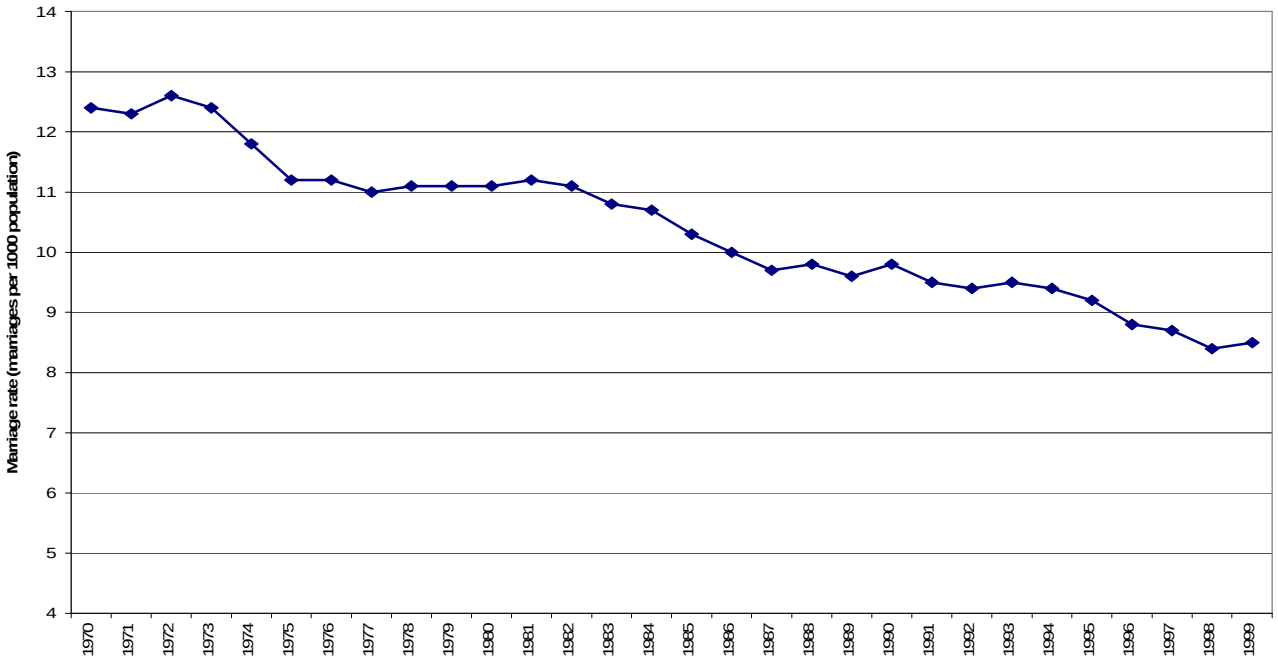
Each of the fixed-effects specifications controls for a different type of omitted variable. The county fixed effects model is more general in that it controls for both state- and county-specific factors that are time-invariant (i.e. state fixed-effects would be redundant in this model). The state fixed-effects model controls for state-specific factors that do not vary over time. The year fixed-effects control for changes in marriage rates in a given year that are common to all counties and states. When the year fixed effects are included in models with county fixed effects or state fixed effects, the model is identified from within county or state variation. Unobservable factors that influence flows into marriage are captured by $\varepsilon_{c,t}$ and the covariance matrix estimates are White/Huber corrected, which corrects for arbitrary heteroskedasticity.

The focus in this chapter is on the coefficient β_1, which is a measure of the sensitivity of flows into marriage to changes in the housing cost burden. The constructed measure of the latter variable is essentially a proxy for the term $Y + Y^* - P_B$ found in the theoretical model, and β_1 is expected to be a negative coefficient. In a separate set of estimations the burden variable is replaced by a variable that equals the median home value (expressed as a flow variable) minus rental rates divided by per capita income. This is a more direct test of the model if it is assumed that housing cost is representative of P_B and rental rates representative of P_A. Thus, this variable is a proxy for (P_B - P_A), which directly determines marriage rates in the model.

Table 4.2 Descriptive Statistics

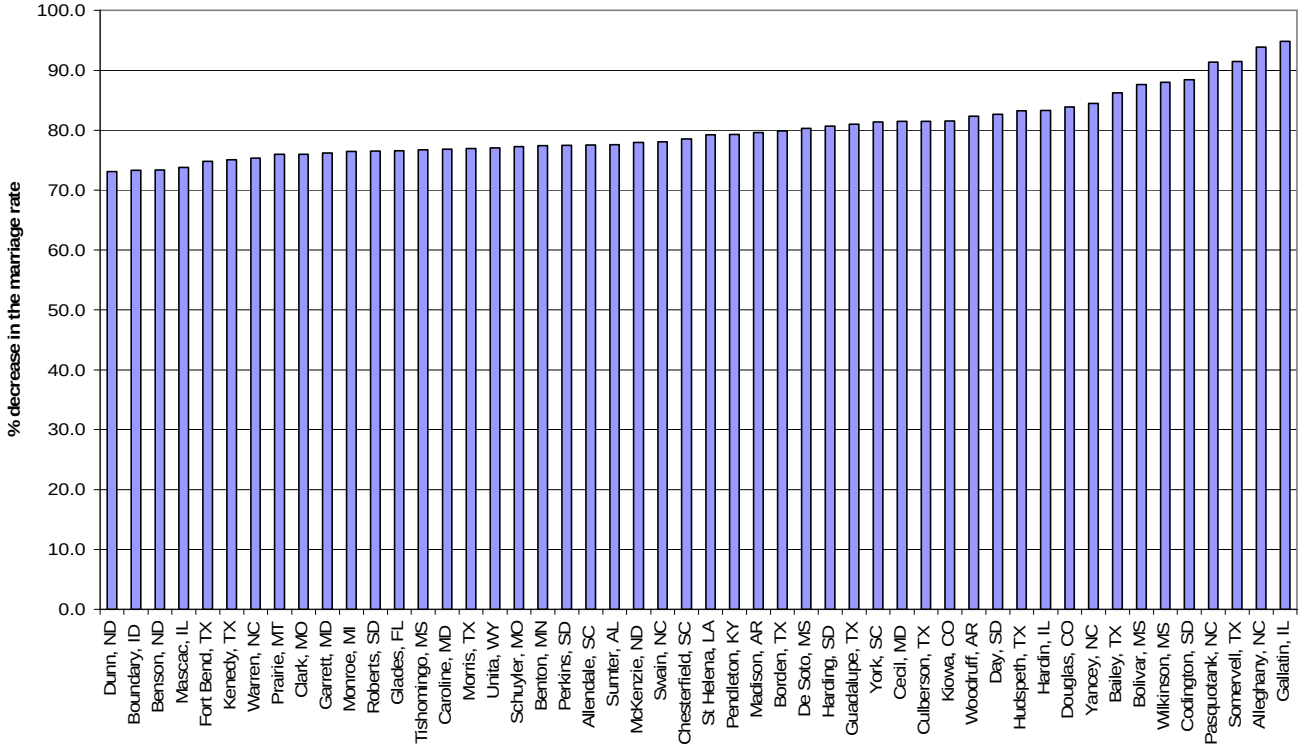
Variable name	Variable definition	Mean	S.E.	Min.	Max.
Crude marriage rate	Number of marriages per 1000 population	10.5	11.2	1.0	520.5
Housing value	Median value of owner-occupied housing (1989 US$)	49305.9	23886.4	15004.1	494079.7
Income	Per capita income (1989 US$)	10051.6	2680.0	3266.6	29016.1
Mortgage interest rate	Mortgage interest rate on a conventional 30-year loan	9.6	2.1	7.0	15.1
Housing cost burden	(Housing value*mortgage interest rate)/(per capita income) (1989 US$)	0.4	0.1	0.09	2.8
Annual rent	Annual rent for housing (1989 US$)	2680.9	920.8	1500.0	7949.6
Female labour-force participation	Percentage of female population 16+ in labour force	46.6	8.3	11.2	84.0
Female education	Percentage of female population 25+ who are high school graduates	63.0	14.7	10.3	96.5
White	Percentage of population that is white	88.7	15.1	4.5	100.0
Black	Percentage of population that is black	8.5	14.4	0.0	86.4
Foreign born	Percentage of population that is foreign born	2.1	3.0	0.0	45.1
Median age	Median age of population	32.6	4.5	19.0	58.3
Population	Total population	73566.9	230798.8	723.7	8566813.0
15-49 population	Number of 15-49 year-olds in population	37504.8	121118.1	400.0	4793755.0
Males per 100 females	Number of males per 100 females	96.7	7.0	60.9	247.4
Urbanization	Percentage of population that lives in an urban area	36.7	29.4	0.0	100.0

Figure 4.1 Crude Marriage Rate in the U.S. (1970 – 1999)



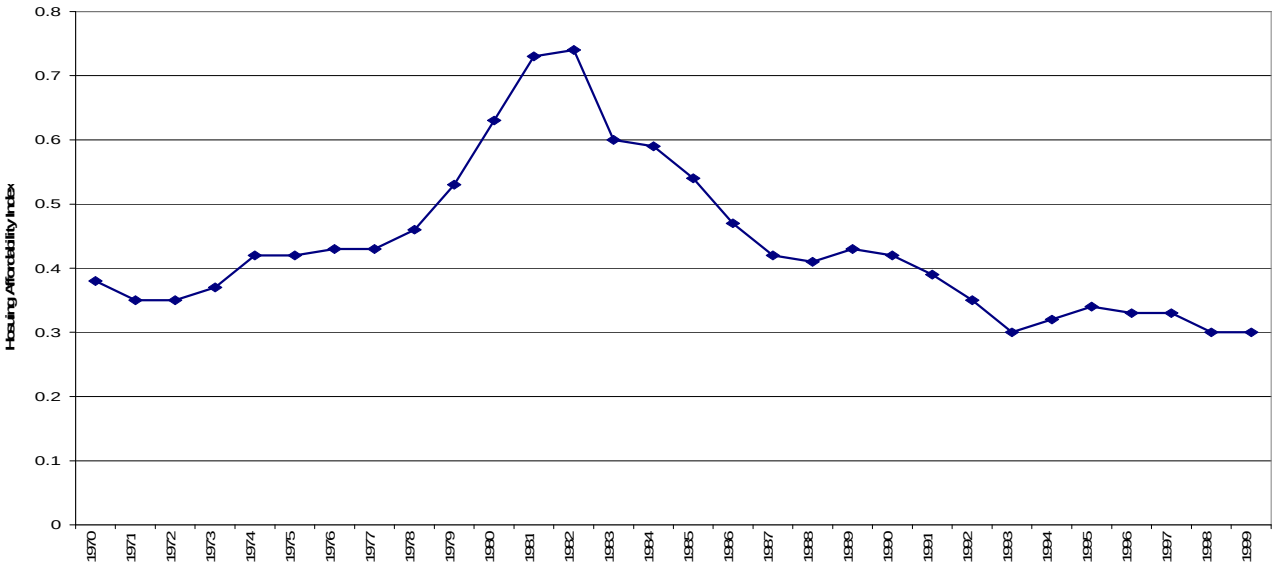
Source: Vital Statistics

Figure 4.2 Fifty counties with the greatest percentage decline in their marriage rates (1970 – 1999)



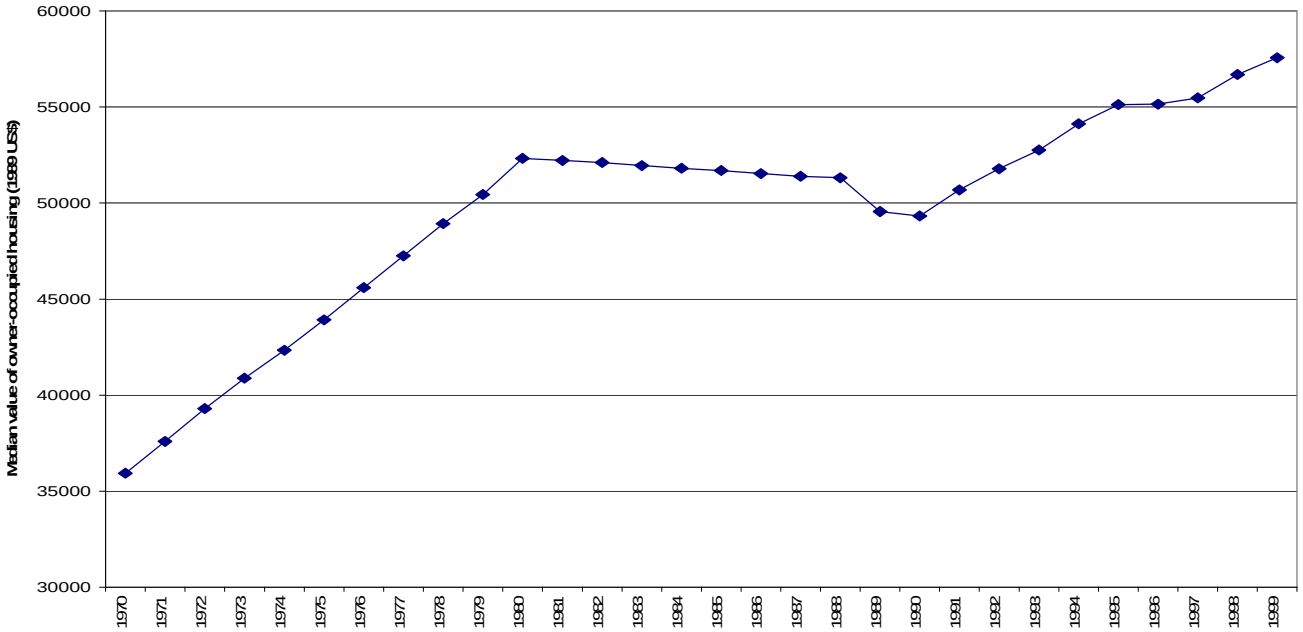
Source: U.S. Census

Figure 4.3 Housing Cost Burden in the U.S. (1970-1999)



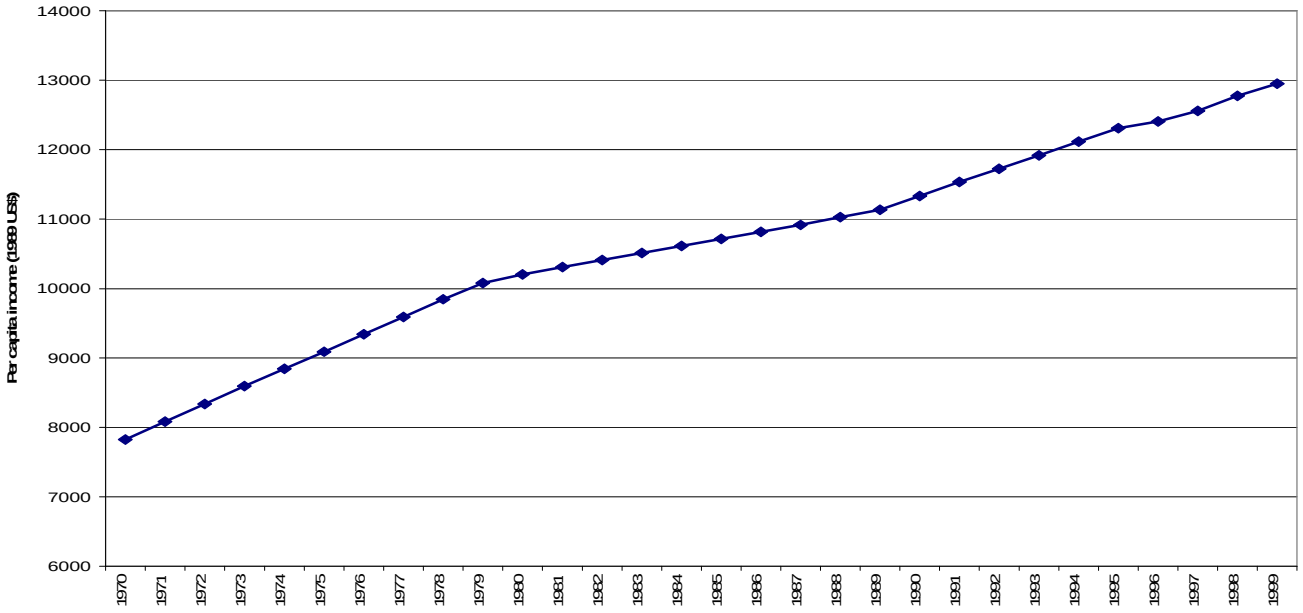
Source: U.S. Census Bureau and Federal Reserve Board of Governors.

Figure 4.4 Median Value of Owner-Occupied Housing in the U.S. (1989 US$, 1970 – 1999)



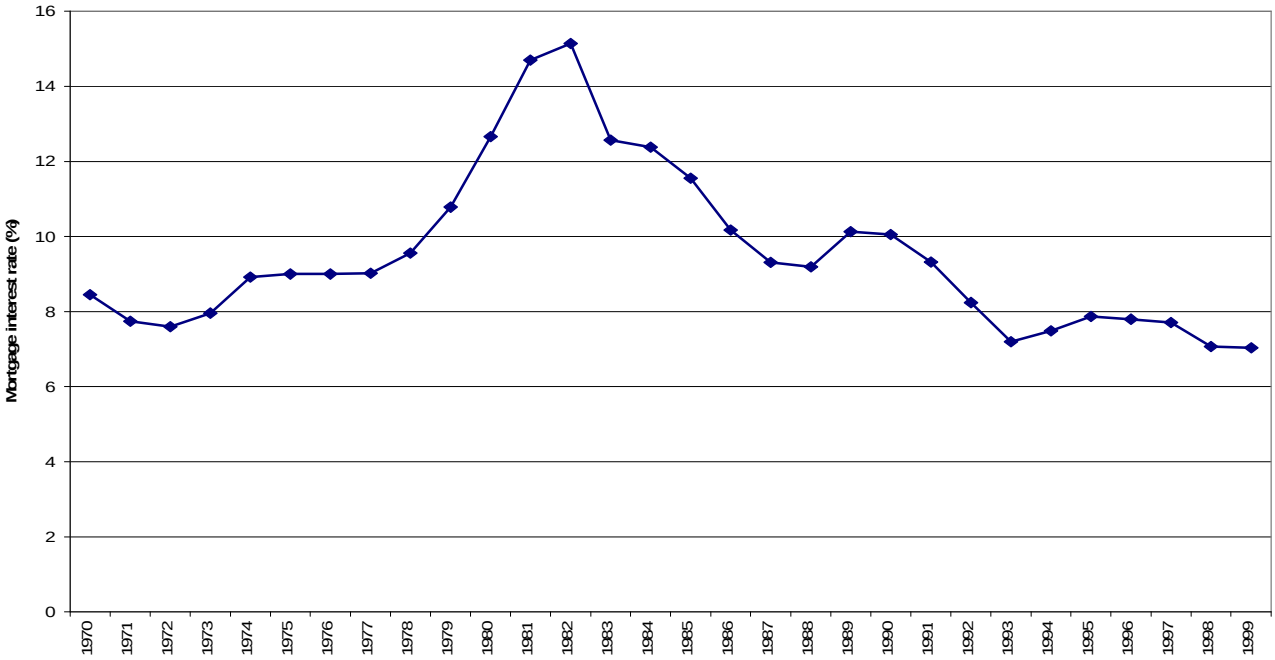
Source: U.S. Census Bureau

Figure 4.5 Per Capita Income in the U.S. (1989 US$, 1970 - 1999)



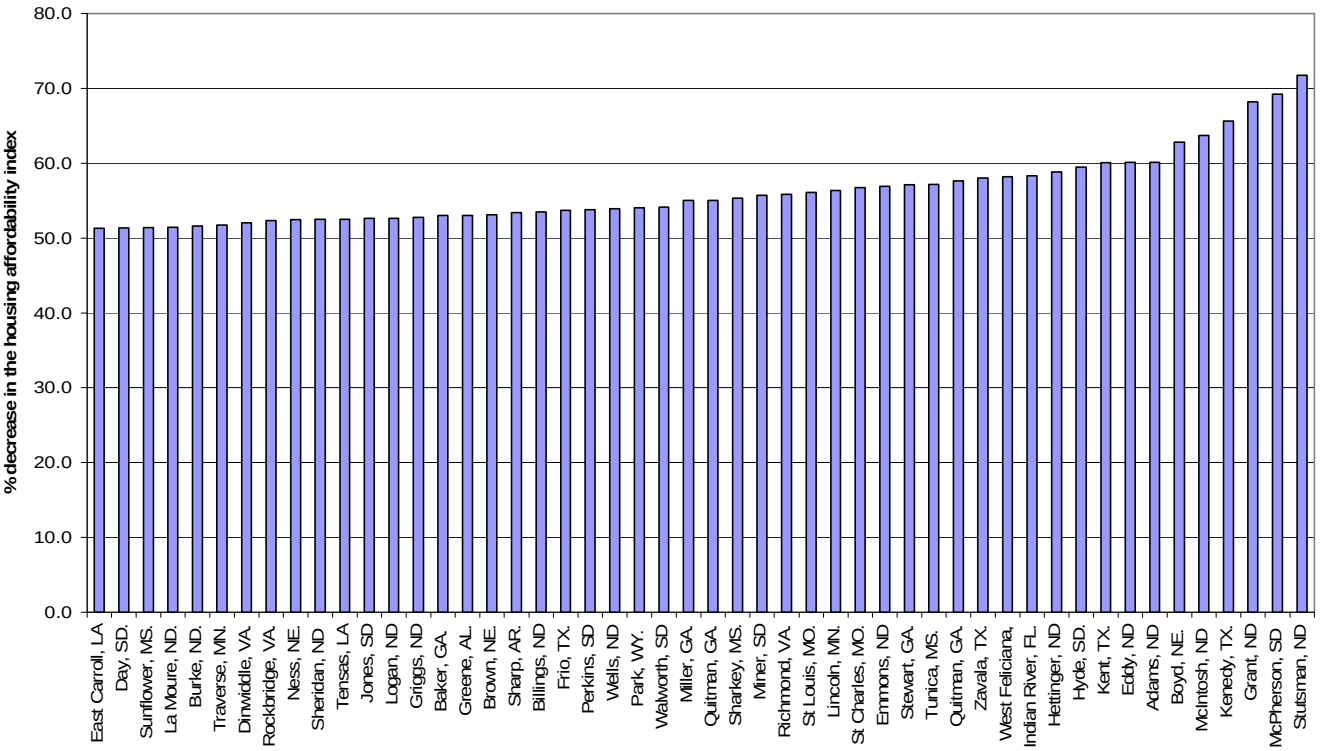
Source: U.S. Census Bureau

Figure 4.6 Mortgage Interest Rates in the U.S. (1970 - 1999)



Source: Federal Reserve Board of Governors

Figure 4.7 Fifty counties with the greatest percentage decrease in the housing cost burden (1970-1999)



Source: U.S. Census

4.6. Results

4.6.1 Main findings

Results are reported from several models of the determinants of the marriage rate, having examined the effects of various economic and demographic variables on the county marriage rate, adjusting for either county or state fixed effects and incorporating year fixed effects. These alternative approaches are helpful in establishing how well the estimates take into account the biases resulting from different types of omitted variables.

OLS estimation results relating to the U.S. county marriage rate over the period 1970 to 1999 are presented in Table 4.3. Column 1 reports the results from models with county fixed effects. The model in Column 2 adds year fixed effects to the county fixed effects. In Column 3, a model

with state fixed effects only is estimated and in Column 4 the model adds year fixed effects to the state fixed effects. Columns 5 and 6 report the results of models that include interaction terms between various economic and demographic variables and the measure of the housing cost burden in a given county. Column 5 includes county and year fixed effects, whilst Column 6 includes state and year fixed effects.

Consider first the impact of the housing cost burden on marriage rates in Columns 1 to 4. The coefficients are negative and statistically significant in models that include county fixed effects, state fixed effects and state and year fixed effects, indicating that a higher housing cost burden in a county is associated with a lower marriage rate. These results are consistent with the predictions of the economic model of marriage; that is, when the costs of being married (that include the burden of housing costs) increase relative to being single, individuals are less likely to marry. The magnitude of the coefficient varies across models, ranging from 0.21 in the model with county fixed effects to 3.70 in the model with state and year fixed effects. This means that a one unit increase in the housing cost burden is associated with a 0.21 to 3.70 unit decrease in the marriage rate. Note that in the model in Column 2, the sign on the coefficient is in the expected direction, but it is not statistically significant. The principal explanation for this is that with both sets of county and year dummies included in the model, almost all of the variation has been swept out from the data.

The results in Columns 5 and 6 that include interaction terms indicate that there is a fair degree of heterogeneity in terms of how individuals respond to the housing cost burden. In both models, the housing cost burden coefficient increases in size compared to the first four models. Further, it is statistically significant when county and year fixed effects are included in Column 5.[49]

In terms of the interactions terms themselves, consider first the interaction term between the indicator of the proportion of white persons in a county and the housing cost burden. Over much of the period under examination in this study, high levels of residential segregation are likely to have existed, meaning that whites and blacks, for example, faced somewhat different housing markets. Further, homeownership rates are likely to have been lower on average for blacks due to socio-economic disadvantage and housing discrimination (Hughes, 2003). One might argue that these factors raise expectations among whites that they should be homeowners. In Column 6 with state and year fixed effects, although the combined effect is quite small, the interaction term is statistically significant and suggests that the housing cost burden is a greater constraint on marriage rates in counties with a greater proportion of whites.

In the models from Columns 5 and 6, it is also possible to identify statistically significant differences between the effects of the housing cost burden on county marriage rates when the former is interacted with measures of per capita income and female education. The results indicate that the housing cost burden is less of a constraint on marriage rates in counties with higher levels of per capita income and female education. These differences are in line with expectations. Individuals living in counties with these characteristics are less likely to be "priced out" of marriage. For example, all else equal, those with higher levels of income and education should find it easier to obtain a mortgage. In the model with state and year fixed effects, the results also indicate that the housing cost burden is less of a constraint on marriage rates in counties with a higher median age of the population and a similar explanation to the above can be offered for this finding.

As for the control variables included in the models in Columns 1 and 6, an increase in the median value of owner-occupied housing is associated with an increase in the marriage rate. For example, the results from the model in Column 1 indicate that a $10 000 increase in the value of

housing is associated with a 0.30 increase in the marriage rate. Recall that this variable was included separately to proxy for the median level of wealth in a county and, in turn, the potential attractiveness of a county as a place to wed. The results for the effect of per capita income on the marriage rate are only statistically significant in the models from Columns 3, 4 and 6 (i.e. those with state fixed effects and/or year fixed effects). They indicate that higher levels of per capita income in a county are associated with a lower marriage rate, suggesting that the "independence effect" of income dominates the "stabilizing effect". This is consistent with the findings of Schultz (1994), Alm and Whittington (1995), and Bitler et al. (2004). However, it is contrary to the results of Keeley (1979), Avery et al. (1992) and Hughes (2003). Rasul (2003) finds that per capita income has a positive effect on the marriage rate, although this result is not statistically significant.

In terms of race, the results in Table 4.3 further indicate that blacks and whites in the U.S. exhibit differences in marriage behaviour. Across all model specifications, a greater proportion of whites in a county is associated with a higher marriage rate. The results for blacks, however, are very sensitive to whether county or state fixed effects are employed. For example, in Columns 1 and 2, the coefficient is negative and statistically significant, but positive and statistically significant in Column 4 when state and year fixed effects are included.

Early empirical work by Preston and Richards (1975) and Keeley (1979) had found that race is not a significant determinant of the marriage rate itself in the U.S. However, more recent work has sought to explain the observed decline in black marriage rates in recent decades. The traditional explanations for this phenomenon focus on relatively poor marriage market conditions, in both quantity and quality terms, for black women relative to white women, in particular. On the quantity side, the sex ratio has been consistently lower for blacks throughout

recent decades and the reasons include racial differences in the sex ratio at birth and variations in homicide, accident and infant mortality rates and a disproportionate number of black men entering the armed forces (Guttentag and Secord, 1983; Espenshade, 1985). Consequently, the quantity of potential spouses for black women is smaller than for white women, thereby reducing the marriage rates of black women.

On the quality side, Wilson and Neckerman (1986) argue that the poor quality of potential black husbands in the marriage market results in black women being more likely to choose single status than marry a man with poor socio-economic characteristics (see Wood, 1995 and Brien, 1997 for empirical work relating to this issue). The narrower gender gap in earnings for blacks relative to whites, as well as the availability of support programmes for single women with children, have also been proposed as explanations for the differences in marriage rates across race (Espenshade, 1985). Unfortunately, the results for the black variable in Table 4.7 are too ambiguous to contribute to the debate on this topic.

Like the black variable, the results relating to the percentage of foreign born individuals in a county, urbanization, median age of county population, population of county and population of county aged 15 to 49 are sensitive to whether county or state fixed effects are included in the model specifications. In almost every case, the coefficient is statistically significant when state fixed effects or state and year fixed effects are included. These variables change slowly through time and so most of their variation is between counties rather than within counties. Hence, including county fixed effects does wash out their impact, as there is little within variation from which they can be identified.

For example, the results in Columns 3, 4, and 6 show that there is a statistically significant negative relationship between the percentage of foreign born individuals in a county and the

marriage rate. Although the sign of the urbanization coefficient is positive across all model specifications, again it is only statistically significant in Columns 3, 4, and 6. These results tentatively suggest that higher levels of urbanization are associated with a higher marriage rate, implying that the lower costs of searching for a mate in an urban area dominate any potential effect from improved economic alternatives to marriage. In the same columns, a higher median age in a county is associated with a lower marriage rate, whilst a greater proportion of the population of marriageable age is associated with a higher marriage rate. Population size appears to negatively affect the marriage rate.

An increase in the number of males per 100 females of marriageable age is associated with a decrease in the marriage rate across all three models in Table 4.3, although this is contrary to theoretical expectations. However, it should be acknowledged that it was not possible to control for the *quality* of males per 100 females and also for the proportion of these males who were already married.

The results for the female education and labour market controls provide broad support for Gary Becker's theory that increased economic independence of women erodes the fundamental basis of marriage. Estimates for the effect of higher levels of female education on marriage rates are negative and statistically significant across all model specifications in Table 4.3 and this is consistent with the previous empirical findings of Blau et al. (2000), Elwood and Jencks (2001) and Bitler et al. (2004). As expected, the sign on the female labour-force participation is negative across all models, but again like several of the other control variables, it is sensitive to whether county or state fixed effects are employed. In the models with state fixed effects (Columns 3, 4, and 6), the coefficient is statistically significant.

As noted earlier, one worry might be that the direction of causality runs from marriage to labour market outcomes. For example, it may be the case that married women are less likely to

join the labour force or graduate from high school. If so, then the estimated coefficients are subject to endogeneity bias. Therefore, models were estimated with and without these female labour market controls and the coefficient on the housing cost burden remained negative and statistically significant in both cases.

In summary, the main results presented in this section provide empirical support for the theoretical conclusion that the burden of housing costs can influence the marriage rate. The models presented demonstrate that there is a negative relationship between these variables, controlling for a broad range of economic and demographic indicators.

4.6.2 Robustness checks

As noted earlier, one concern with the dependent variable is that it only measures the number of marriages occurring within a county in a given year but does not capture whether or not the bride and groom are *resident* in that same county. This has the potential to bias the results if marriage patterns are systematically related to the cost of housing.

In the data collection process, several states were able to provide official marriage figures that differentiated between resident and non-resident couples, indicating that around 75 to 80 per cent of couples wed in their county of residence. Most of the other state Vital Statistics units contacted also suggested that this is a fairly accurate (unofficial) estimate for their particular state. In light of this, therefore, one should not expect the movement of marrying couples across counties to significantly bias the main results. However, as a robustness check, a model was included that omitted 'high marriage counties' from the analysis. In total, 95 counties were identified that had considerably higher than average marriage rates (evaluated at two standard deviations from the mean) and, via correspondence with state Vital Statistics units, these counties were confirmed as 'popular' places to marry (See Table 4.4 for a list of these counties

and their average marriage rates over the study period). The estimation results when these counties are excluded are reported in Table 4.5 and show that the housing cost burden coefficient is very robust to this model specification.[50]

An additional concern with this study centres on the simultaneous structure of the decision process relating to marriage and homeownership. Specifically, it has been implicitly assumed throughout the analysis that the price of housing (or even the housing market) determines entry into marriage, whereas it might be the case that marriage is a strong predictor of the demand for housing. This causality in the other direction (marriage increasing the demand for owner-occupied housing) results from couples' enhanced economic ability to maintain an independent household and possibly due to newly-weds seeking more privacy than singles.[51] The issue was addressed by lagging the housing cost burden variable and this also has the advantage of taking into account the idea that couples plan a wedding in advance and local housing market conditions may enter into the decision of when to marry. The results in Table 4.6 show that the coefficient on the housing cost burden is very robust to the introduction of a lagged structure.

As noted at the beginning of this chapter, a relatively large amount of the data for the intercensal years are imputed and so measurement error becomes an additional concern. Therefore, an additional robustness check involved estimating the relationship between the housing cost burden and the marriage rate using only the Census year data (1999 is also included since that was the year that per capita income was reported). Table 4.7 shows the results when the models are estimated at each Census year, using state fixed effects. The most striking result relates to the results using the 1970 data that are reported in Column 1. The size of the coefficient is quite large, negative and statistically significant. It indicates that a one-unit increase in the housing cost burden is associated with 22.5 unit decrease in the county marriage rate.

Table 4.8 shows the results when the Census data are pooled giving a sample size of 10710 observations. Across the four model specifications, the sign on the housing cost burden variable is in the expected direction and the coefficient is statistically significant in the models in Columns 1 and 3 that include county fixed effects and state fixed effects respectively. Model 1 indicates that a one-unit increase in the housing cost burden is associated with a 1.61 unit decrease in the county marriage rate, whilst Model 2 suggests that there is a 2.62 unit decrease. The housing cost burden coefficient is not statistically significant once year fixed effects are added to the models in Columns 2 and 4.

Tables 4.9 and 4.10 present the pooled results when two alternative model specifications are considered. First, in Table 4.9 the model excludes per capita income and median housing value as separate controls. The results show that the housing cost burden is very sensitive to the exclusion of these variables. In each of the four models, the sign on the coefficient is positive, which is contrary to expectations and not easily explained by economic theory, although it is only statistically significant when county and year fixed effects are employed in Column 2. The coefficient indicates that a one-unit increase in the housing cost burden is associated with a 2.52 increase in the county marriage rate.

To further examine whether the study's initial results are sensitive to an alternative model specification, Table 4.10 shows the results when the housing cost burden is composed of the median housing value multiplied by the mortgage interest rate, that is, per capita income is omitted from this measure. Further, median housing value is not included as an independent explanatory variable in this specification. In Columns 1 and 2, where county and county and year fixed effects respectively are employed, the coefficient on the housing cost burden is positive and statistically significant, although the size of the coefficient is much smaller compared to our initial estimates. Although the two results in Columns 1 and 2 contradict our earlier results and

are not easily explained by economic theory, the coefficients are not statistically significant when state and state and year fixed effects are included respectively in Columns 3 and 4, and the sign on the housing cost burden coefficient in Column 3 is in the expected direction.

A convincing case can be made for suggesting that the two alternative specifications are inappropriate for the analysis in this chapter. Both income and wealth can be expected to affect marriage rates. Therefore, in order to measure the true effect of the effect of housing costs, it is important to control for income and wealth (median housing value being the only proxy available for wealth). Excluding income and housing value as independent controls in the first specification makes it difficult to interpret the housing cost burden coefficient since it is contaminated by the effects of income and housing value on marriage rates. In the second alternative specification, the housing cost burden measure itself does not include per capita income. One can argue that for the housing cost measure to be appropriate, it needs to capture how the difference between the annual cost of servicing the payments on a home and per capita income affects the marriage rate. In the alternative specification, the housing cost burden is only referring to the cost of the servicing the payments on a home and therefore does not include even a crude proxy for an income constraint. Further, this specification does not include median housing value as an independent control, which is necessary to capture the effect of wealth on the marriage rate.

In summary, the robustness checks described in this section broadly support the main findings of this study; that is, over the 1970 to 1999 period in the United States, a higher housing cost burden (appropriately constructed) was associated with a lower rate of marriage.

4.7 Extensions to the analysis

4.7.1 Housing cost burden and marriage by decade

The analysis was also extended to examine the effects of the housing cost burden on marriage rates by decade. Tables 4.11 to 4.13 present the results. The most consistent results are for the 1970 to 1979 decade. Table 4.11 shows that the coefficient on the housing cost burden is negative and statistically significant across all four model specifications. The size of the coefficient ranges from 4.32 (including county fixed effects) to 11.4 (including state and year fixed effects). The 1970s was the decade that experienced the most dramatic increase in the housing cost burden during the study period and the negative sign on the coefficient may reflect the decline in marriage rates in the earlier part of the decade (see Figure 4.1).

More generally, it is reasonable to argue that the 1970s observed a fairly rapid change in family behaviour in the United States. For example, by this time living with parents at the beginning of marriage became less of a social norm (Modell et al., 1978) and therefore one could argue that the strength of the negative relationship between the housing cost burden and marriage rates during this decade partly reflects this shift in behaviour. Indeed, recall from the previous section that an increase in the housing cost burden was also associated with a fall in marriage rates when a model using the 1970 Census data only was estimated. It might also be the case that the rampant house price inflation in the 1970s altered the structure of American housing markets. The results for the 1980s and 1990s are inconsistent across the various specifications and it is difficult to draw any meaningful conclusions. For example, in Column 4 (state and year fixed effects) for both decades, the housing cost burden coefficient is negative and statistically significant and in line with theory. However, in Column 3 (state fixed effects) for both decades and in Column 1 for the 1980s (county fixed effects), the housing cost burden coefficient is

Table 4.3 OLS estimates of effect of housing cost burden on marriage rates in U.S counties (1970 – 1999)

Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Housing value (1)	3E-05 (8E-06)***	3E-05 (1E-05)***	5E-05 (3E-06)***	6E-05 (4E-06)***	2E-05 (1E-05)*	2E-05 (6E-06)***
Income (2)	-2E-05 (8E-06)	8E-05 (9E-05)	-0.003 (3E-05)***	-3E-04 (2E-05)***	-5E-05 (1E-04)	-2E-04 (2E-05)***
Housing cost burden ((1)*mortgage interest rate/(2)	-0.71 (0.34)**	-0.21 (1.06)	-1.41 (0.37)***	-3.70 (0.83)***	-9.41 (3.22)***	-19.7 (3.85)***
HCB x white interaction					-0.01 (0.01)	-0.02 (0.006)***
HCB x income interaction					4E-04 (1E-04)***	1E-04 (5E-05)***
HCB x labour force interaction					-0.04 (0.04)	0.02 (0.02)
HCB x education interaction					0.16 (0.03)***	0.16 (0.01)***
HCB x median age interaction					-0.09 (0.07)	0.26 (0.06)***
Female labour-force participation	-0.02 (0.02)	-0.02 (0.02)	-0.04 (0.008)***	-0.03 (0.01)***	-0.01 (0.03)	-0.04 (0.01)**
Female education	-0.06 (0.01)***	-0.03 (0.01)*	-0.02 (0.005)***	-0.01 (0.005)***	-0.12 (0.02)***	-0.08 (0.009)***
White	0.10 (0.02)***	0.10 (0.02)***	0.07 (0.003)***	0.07 (0.002)***	0.10 (0.02)***	0.09 (0.003)***
Black	0.17 (0.06)***	0.18 (0.06)***	-0.005 (0.006)	-0.006 (0.003)*	0.15 (0.06)**	-0.003 (0.003)
Foreign born	0.009 (0.07)	0.03 (0.07)	-0.03 (0.01)***	-0.02 (0.01)***	0.02 (0.07)	-0.01 (0.01)*
Median age	-0.06 (0.04)	-0.07 (0.05)	-0.09 (0.01)***	-0.09 (0.01)***	-0.07 (0.05)	-0.21 (0.03)***
Population	-1.6E-07 (1.0E-06)	-5E-07 (1E-06)	-8E-07 (1E-07)***	-8E-07 (8E-08)***	-6E-07 (1E-06)	-7E-07 (8E-08)***
15-49 population	-0.01 (0.05)	0.004 (0.04)	0.10 (0.03)***	0.09 (0.01)***	-0.01 (0.05)	0.07 (0.01)***
Males per 100 females	-0.02 (0.01)	-0.03 (0.01)*	-0.04 (0.004)***	-0.05 (0.005)***	-0.02 (0.01)	-0.04 (0.005)***
Urbanization	0.01 (0.01)	0.008 (0.01)	0.01 (0.002)***	0.009 (8E-04)***	0.006 (0.01)	0.009 (8E-04)***
County fixed effects	Yes	Yes	No	No	Yes	No
State fixed effects	No	No	Yes	Yes	No	Yes
Year fixed effects	No	Yes	No	Yes	Yes	Yes
R^2	0.05	0.05	0.06	0.05	0.05	0.05
Sample size	82800	82800	82800	82800	82800	82800

Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 4.4 'High' Crude Marriage Rate Counties in the U.S. (1970-1999)

Cheburne, AL. (20.6)	Pasquotan, NC (51.3)	Giles, VA. (98.3)**
Russell, AL. (24.9)	Swain, NC. (22.7)	Wise, VA. (26.1)**
Sumter, AL. (25.1)	Bryan, OK (50.7)*	Alexandria, VA. (22.3)**
Yuma, AZ. (26.4)	Carter, OK (20.4)*	Clifton Forge, VA. (44.8)**
Boone, AR. (23.7)	Choctaw, OK (32.9)*	Covington, VA. (32.5)**
Carroll, AR. (67.5)	Le Flore, OK (26.4)*	Emporia, VA. (73.6)***
Chicot, AR. (22.1)	Ottawa, OK (154.2)*	Fairfax, VA. (30.1)***
Alpine, CA. (30.4)*	Aiken, SC. (26.1)	Falls Church, VA. (36.3)**
El Dorado, CA. (40.2)*	Allendale, SC. (24.7)	Mananassas, VA. (20.0)*****
Hinsdale, CO. (22.6)	Cherokee, SC. (53.2)	Williamsburg, VA. (44.7)**
Pitkin, CO. (23.5)	Chesterfield, SC. (32.2)	Winchester, VA. (109.4)**
San Juan, CO. (24.6)	Dillon, SC. (204.1)	Clark, WA. (20.5)
Brantley, GA. (55.8)*	Jasper, SC. (91.5)	Teton, WY. (37.8)
Camden, GA. (188.0)*	Marlboro, SC. (38.3)	
Catoosa, GA. (101.0)*	Oconee, SC. (35.1)	
Charlton, GA. (362.6)*	York, SC. (39.4)	
Dade, GA. (171.9)*	Codington, SD. (38.7)	
Decatur, GA. (24.0)*	Grant, SD. (23.0)	
Echols, GA. (42.3)*	Roberts, SD. (29.6)	
Grady, GA. (24.3)*	Union, SD. (41.4)	
Long., GA. (21.9)*	Campbell, TN. (72.8)*	
Lowdes, GA. (21.9)*	Cannon, TN. (33.3)*	
Seminole, GA. (170.3)*	Claiborne, TN. (35.3)*	
Kauai, HI. (34.5)	Clay, TN. (62.9)*	
Maui, HI. (27.9)	Fentress, TN. (27.6)*	
Kootenni, ID. (63.3)	Pickett, TN. (68.8)*	
Gallatin, IL. (34.4)	Robertson, TN. (76.6)*	
Hardin, IL. (35.4)	Sevier, TN (31.6)*	
Chickasaw, IO. (44.1)	Trousdale, TN. (108.8)*	
Geary, KS. (20.8)	Cooke, TX. (38.6)	
Boyd, KY. (23.2)	Harrison, TX. (21.9)	
Campbell, KY. (22.2)	Rockwall, TX. (68.3)	
Henderson, KY. (24.7)	Somervell, TX. (32.7)	
Cecil, MD. (63.3)	Wheeler, TX. (28.3)	
Garrett, MD. (35.4)	Wichita, TX. (24.7)	
Nantucket, MA. (29.9)	Wilbarger, TX. (24.7)	
Mercer, MO. (27.6)	Daggett, UT. (32.8)	
Colfax, NM (24.3)*	Sanpete, UT. (27.6)	
Hildago, NM (19.9)*	Bath, VA. (26.5)**	
Union, NM (36.0)*	Buchanan, VA. (22.4)**	
Alleghany, NC (46.2)	Dickenson, VA. (90.0)**	

The crude marriage rate is the number of marriages per 1000 population.

* 1970 – 1988 average *** 1970 - 1997 ***** 1982-1999
** 1970 – 1997 average **** 1982 – 1997

Table 4.5 OLS estimates of effect of housing cost burden (omitting 'high marriage' counties) on marriage rates in U.S counties (1970 – 1999)

Variable	**(1)**	**(2)**	**(3)**	**(4)**
Housing value (1)	3E-05 (8E-06)***	3E-05 (1E-05)***	5E-05 (3E-06)***	6E-05 (4E-06)***
Income (2)	-3E-05 (9E-05)	6E-05 (9E-05)	-3E-04 (3E-05)***	-4E-04 (3E-05)***
Housing cost burden ((1)*mortgage interest rate/(2)	-0.76 (0.34)**	-0.38 (1.08)	-1.52 (0.38)***	-4.06 (0.87)***
Female labour-force participation	-0.03 (0.02)*	-0.02 (0.02)	-0.03 (0.008)***	-0.03 (0.01)***
Female education	-0.06 (0.01)***	-0.03 (0.02)*	-0.02 (0.006)***	-0.01 (0.005)***
White	0.10 (0.02)***	0.10 (0.02)***	0.07 (0.003)***	0.07 (0.002)***
Black	0.18 (0.06)***	0.19 (0.06)***	6E-04 (0.006)	-4E-04 (0.003)
Foreign born	0.01 (0.07)	0.03 (0.06)***	-0.03 (0.01)***	-0.02 (0.01)***
Median age	-0.06 (0.04)	-0.07 (0.05)	-0.09 (0.01)***	-0.09 (0.01)***
Population	-2E-07 (1E-06)	-6E-07 (1E-06)	-7E-07 (1E-07)***	-8E-07 (8E-08)***
15-49 population	-0.01 (0.05)	0.005 (0.05)	0.28 (0.07)***	0.29 (0.06)***
Males per 100 females	-0.02 (0.01)*	-0.03 (0.01)**	-0.04 (0.004)***	-0.04 (0.005)***
Urbanization	0.01 (0.01)	0.01 (0.01)	0.009 (0.002)***	0.008 (9E-04)***
County fixed effects	Yes	Yes	No	No
State fixed effects	No	No	Yes	Yes
Year fixed effects	No	Yes	No	Yes
R^2	0.04	0.04	0.06	0.06
Sample size	80130	80130	80130	80130

Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 4.6 OLS estimates of effect of housing cost burden (lagged one year) on marriage rates in U.S counties (1970 – 1999)

Variable	**(1)**	**(2)**	**(3)**	**(4)**
Housing value (1)	3E-05 (9E-06)***	3E-05 (1E-05)***	4E-05 (4E-06)***	6E-05 (5E-06)***
Income (2)	-6E-06 (9E-05)	8E-05 (9E-05)	-2E-04 (3E-05)***	-3E-04 (3E-05)***
Housing cost burden ((1)*mortgage interest rate/(2)	-0.64 (0.34)**	-0.09 (1.07)	-1.45 (0.38)***	-3.73 (0.88)***
Female labour-force participation	-0.04 (0.02)**	-0.03 (0.02)	-0.04 (0.008)***	-0.04 (0.01)***
Female education	-0.06 (0.01)***	-0.03 (0.01)**	-0.01 (0.006)***	-0.01 (0.005)***
White	0.09 (0.02)***	0.09 (0.02)***	0.07 (0.003)***	0.07 (0.002)***
Black	0.17 (0.06)***	0.18 (0.06)***	-0.009 (0.006)	-0.008 (0.004)**
Foreign born	0.006 (0.07)	0.02 (0.07)	-0.02 (0.01)***	-0.02 (0.01)**
Median age	-0.06 (0.04)	-0.06 (0.05)	-0.09 (0.01)***	-0.10 (0.01)***
Population	-1.1E-07 (1.0E-06)	-3E-07 (1E-06)	-8E-07 (1E-07)***	-8E-07 (1E-07)***
15-49 population	-0.01 (0.05)	4E-04 (0.05)	0.08 (0.03)***	0.09 (0.01)***
Males per 100 females	-0.02 (0.01)	-0.02 (0.01)*	-0.04 (0.004)***	-0.04 (0.006)***
Urbanization	0.01 (0.01)	0.01 (0.01)	0.01 (0.002)***	0.009 (9E-04)***
County fixed effects	Yes	Yes	No	No
State fixed effects	No	No	Yes	Yes
Year fixed effects	No	Yes	No	Yes
R^2	0.03	0.04	0.06	0.05
Sample size	82272	82272	82272	82272

Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 4.7 OLS estimates of effect of housing cost burden on marriage rates in U.S counties in 1970, 1980, 1990, 1999 (state fixed effects)

Variable	1970	1980	1990	1999
Housing value (1)	1E-04 (1E-04)*	8E-05 (4E-05)**	5E-05 (2E-05)**	5E-05 (4E-05)
Income (2)	-1E-03 (5E-04)***	-4E-04 (2E-04)	-2E-04 (1E-04)	-3E-04 (3E-04)
Housing cost burden ((1)*mortgage interest rate/(2)	-22.5 (12.3)*	3.98 (3.88)	-2.18 (3.55)	-0.78 (8.78)
Female labour-force participation	-0.17 (0.10)*	-0.08 (0.06)	0.004 (0.01)	0.09 (0.07)
Female education	0.06 (0.05)	0.02 (0.03)	-0.02 (0.02)	-0.01 (0.03)
White	0.08 (0.06)	0.05 (0.02)**	0.06 (0.01)***	0.009 (0.01)
Black	-0.03 (0.07)	-0.03 (0.03)	0.007 (0.02)	-0.01 (0.02)
Foreign born	0.04 (0.13)	-0.07 (0.05)	0.008 (0.05)	0.04 (0.06)
Median age	-0.13 (0.13)	-0.17 (0.09)*	-0.02 (0.05)	0.17 (0.09)*
Population	-7E-08 (6E-07)	-7E-07 (5E-07)	-1E-06 (8E-07)**	-1E-06 (6E-07)***
15-49 population	-0.26 (0.42)	0.03 (0.05)	0.23 (0.15)	0.21 (0.10)**
Males per 100 females	-0.09 (0.03)***	-0.07 (0.03)**	-0.01 (0.02)	0.001 (0.01)
Urbanization	0.004 (0.01)	0.009 (0.009)	0.01 (0.008)**	0.01 (0.004)***
County fixed effects	No	No	No	No
State fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No
R^2	0.05	0.06	0.12	0.14
Sample size	2974	3063	2597	2420

Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 4.8 OLS estimates of effect of housing cost burden on marriage rates in U.S counties in 1970, 1980, 1990, 1999 (pooled)

Variable	**(1)**	**(2)**	**(3)**	**(4)**
Housing value (1)	3E-05 (9E-06)***	3E-05 (1E-05)***	5E-05 (1E-05)***	7E-05 (1E-06)**
Income (2)	-7E-05 (9E-05)	5E-05 (1E-04)	-3E-04 (1E-04)***	-4E-04 (1E-04)*
Housing cost burden ((1)*mortgage interest rate/(2)	-1.61 (0.69)**	-0.88 (1.76)	-2.62 (0.38)**	-5.67 (3.24)
Female labour-force participation	-0.02 (0.02)	-0.02 (0.02)	-0.03 (0.02)*	-0.03 (0.03)
Female education	-0.06 (0.02)***	-0.05 (0.02)*	-0.02 (0.01)	-0.01 (0.01)
White	0.09 (0.02)***	0.08 (0.02)***	0.08 (0.01)***	0.07 (0.01)***
Black	0.14 (0.05)***	0.15 (0.05)***	4E-04 (0.01)***	-0.003 (0.01)
Foreign born	-0.03 (0.07)	-0.003 (0.07)	-0.03 (0.03)***	-0.01 (0.02)
Median age	-0.07 (0.07)	-0.05 (0.08)	-0.09 (0.01)***	-0.08 (0.04)
Population	5E-07 (1E-06)	-1E-07 (1E-06)	-7E-07 (1E-07)***	-9E-07 (3E-07)*
15-49 population	0.02 (0.03)	0.02 (0.03)	0.28 (0.07)***	0.12 (0.07)
Males per 100 females	-0.01 (0.01)	-0.01 (0.01)	-0.04 (0.004)***	-0.03 (0.02)
Urbanization	-1E-04 (0.01)	5E-04 (0.01)	0.009 (0.002)***	0.005 (0.004)
County fixed effects	Yes	Yes	No	No
State fixed effects	No	No	Yes	Yes
Year fixed effects	No	Yes	No	Yes
R^2	0.03	0.03	0.06	0.06
Sample size	10710	10710	10710	10710

Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 4.9 OLS estimates of effect of housing cost burden on marriage rates in U.S counties using pooled census data (1960, 1970, 1980, 1999) - alternative specification 1

Variable	**(1)**	**(2)**	**(3)**	**(4)**
Housing value*mortgage interest rate /income	0.09 (0.61)	2.52 (1.20)**	0.33 (0.94)	2.23 (1.49)
Female labour-force participation	-0.01 (0.01)	-0.01 (0.02)	-0.04 (0.02)**	-0.03 (0.03)
Female education	-0.05 (0.02)***	-0.04 (0.02)*	-0.02 (0.01)*	-0.01 (0.01)
White	0.09 (0.02)***	0.10 (0.02)***	0.07 (0.01)*	0.06 (0.009)***
Black	0.13 (0.04)***	0.15 (0.04)***	-0.009 (0.01)	-0.01 (0.01)
Foreign born	-0.004 (0.07)	0.02 (0.07)	0.009 (0.01)	0.002 (0.03)
Median age	-0.05 (0.07)	-0.03 (0.08)	-0.09 (0.04)**	-0.07 (0.04)
Population	1E-6 (1E-6)	1E-06 (1E-6)	-8E-07 (3E-07)***	-9E-07 (3E-7)**
15-49 population	0.02 (0.03)	0.03 (0.03)	0.05 (0.07)	0.06 (0.05)
Males per 100 females	-0.007 (0.07)	-0.008 (0.01)	-0.03 (0.01)***	-0.03 (0.02)
Urbanization	0.007 (0.01)	0.009 (0.01)	0.007 (0.005)	0.005 (0.004)
County fixed effects	Yes	Yes	No	No
State fixed effects	No	No	Yes	Yes
Year fixed effects	No	Yes	No	Yes
R^2	0.03	0.03	0.06	0.06
Sample size	10710	10710	10710	10710

Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$

Table 4.10 OLS estimates of effect of housing cost burden on marriage rates in U.S counties using pooled census data (1960, 1970, 1980, 1999) - alternative specification 2

Variable	**(1)**	**(2)**	**(3)**	**(4)**
Income	1E-5 (7E-5)*	1E-4 (8E-5)**	5E-5 (6E-5)	8E-6 (7E-5)
Housing value*mortgage interest rate	7E-5 (4E-5)*	3E-4 (8E-5)***	-0.01 (0.92)	1E-4 (7E-5)
Female labour-force participation	-0.02 (0.01)***	-0.02 (0.02)	-0.04 (0.02)**	-0.04 (0.02)**
Female education	-0.07 (0.02)***	-0.06 (0.02)**	-0.03 (0.01)**	-0.03 (0.01)**
White	0.07 (0.02)***	0.08 (0.02)***	0.07 (0.01)***	0.06 (0.01)***
Black	0.12 (0.04)***	0.13 (0.04)***	-0.009 (0.01)	-0.01 (0.01)
Foreign born	-0.03 (0.07)	-0.002 (0.07)	0.005 (0.01)	0.002 (0.03)
Median age	-0.03 (0.07)	-0.06 (0.08)	-0.10 (0.04)**	-0.09 (0.04)**
Population	9E-7 (1E-6)	3E-07 (1E-6)	-9E-07 (3E-07)	-9E-07 (3E-7)***
15-49 population	0.01 (0.03)	0.03 (0.03)	0.06 (0.07)	0.05 (0.07)
Males per 100 females	-0.004 (0.01)	-0.009 (0.01)	-0.03 (0.01)***	-0.03 (0.01)***
Urbanization	0.004 (0.01)	0.003 (0.01)	0.006 (0.006)	0.007 (0.006)
County fixed effects	Yes	Yes	No	No
State fixed effects	No	No	Yes	Yes
Year fixed effects	No	Yes	No	Yes
R^2	0.03	0.03	0.06	0.06
Sample size	10710	10710	10710	10710

Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$

positive and statistically significant. This is certainly more problematic to explain in terms of theory, although it is broadly consistent with comparing the movement of the marriage rate and the housing cost burden over these decades in Figures 4.1 and 4.3 respectively.

4.7.2 The cost of housing versus the cost of renting

Another extension to the analysis is to examine whether the relationship between the housing cost burden and the annual cost of rental housing affects the marriage rate. As discussed earlier, previous empirical work by Haurin et al. (1993) and Hughes (2003) found that individuals residing in high rent areas are less likely to be married. In contrast to these studies, the focus here is on a flow measure of marriage (not a stock measure indicating the proportion of individuals married) and a variable is constructed that is the difference between the annual cost of owning housing and the annual cost of renting as a proportion of per capita income. One implication of this chapter's theoretical model is that the greater the value of this measure, the lower the probability that individuals will choose to marry.

Figure 4.8 shows annual rents in the U.S. between 1970 and 1999, expressed in 1989 U.S. dollars and indicates that rents increased fairly sharply over this period (particularly during the 1980s) and only experienced a slight levelling during the mid-1990s. Figure 4.9 plots the measure of the relationship between the annual cost of housing and annual cost of renting as a proportion of per capita income. It shows that the measure increased dramatically during the late-1970s and early-1980s (driven by the rampant house price inflation and high mortgage interest rates over this period) and then declined until the early 1990s.

Table 4.11 OLS estimates of effect of housing cost burden on marriage rates in U.S counties (1970 – 1979)

Variable	**(1)**	**(2)**	**(3)**	**(4)**
Housing value (1)	9E-05 (1E-05)***	1E-04 (2E-05)***	5E-05 (1E-05)***	1E-04 (1E-05)***
Income (2)	-2E-04 (2E-04)	-1E-05 (2E-04)	-5E-04 (1E-04)***	-8E-04 (1E-04)***
Housing cost burden ((1)*mortgage interest rate/(2)	-4.32 (1.30)***	-5.38 (3.25)*	-5.03 (1.72)***	-11.4 (2.93)***
Female labour-force participation	0.03 (0.04)	0.05 (0.05)	-0.10 (0.02)***	-0.10 (0.009)***
Female education	-0.15 (0.03)***	-0.09 (0.04)**	0.005 (0.01)	0.006 (0.005)
White	0.16 (0.10)	0.11 (0.10)	0.07 (0.01)***	0.08 (0.005)***
Black	0.39 (0.15)***	0.36 (0.14)***	-0.02 (0.01)*	-0.02 (0.005)***
Foreign born	-0.02 (0.15)*	-0.26 (0.15)*	-0.06 (0.02)***	-0.07 (0.01)***
Median age	-0.02 (0.07)	-0.002 (0.07)	-0.15 (0.03)***	-0.09 (0.01)***
Population	6E-06 (2E-06)***	4E-06 (2E-06)**	-3E-07 (1E-07)*	-3E-07 (4E-08)***
15-49 population	-0.02 (0.07)	-0.02 (0.07)	0.007 (0.09)	0.008 (0.03)
Males per 100 females	-0.03 (0.02)	-0.04 (0.02)*	-0.08 (0.01)***	-0.07 (0.003)***
Urbanization	-0.01 (0.03)	-0.02 (0.03)	0.01 (0.004)**	0.01 (0.001)***
County fixed effects	Yes	Yes	No	No
State fixed effects	No	No	Yes	Yes
Year fixed effects	No	Yes	No	Yes
R^2	0.02	0.03	0.05	0.05
Sample size	30071	30071	30071	30071

Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$

Table 4.12 OLS estimates of effect of housing cost burden on marriage rates in U.S counties (1980 – 1989)

Variable	**(1)**	**(2)**	**(3)**	**(4)**
Housing value (1)	7E-06 (8E-06)	2E-05 (9E-06)***	3E-05 (5E-06)***	6E-05 (3E-06)***
Income (2)	5E-04 (1E-04)***	3E-04 (1E-04)***	-1E-04 (5E-04)***	-4E-04 (3E-05)***
Housing cost burden ((1)*mortgage interest rate/(2)	2.35 (0.36)***	-0.72 (0.83)	1.71 (0.49)***	-2.71 (0.30)***
Female labour-force participation	-0.05 (0.02)**	-0.05 (0.02)**	-0.01 (0.01)	-0.003 (0.01)
Female education	-0.04 (0.02)*	-0.02 (0.03)	-0.007 (0.008)	0.009 (0.004)*
White	0.13 (0.03)***	0.13 (0.03)***	0.07 (0.007)***	0.06 (0.003)***
Black	0.37 (0.26)	0.35 (0.26)	-0.008 (0.008)	-0.01 (0.005)*
Foreign born	-0.20 (0.18)	-0.21 (0.18)	-0.05 (0.01)***	-0.05 (0.005)***
Median age	-0.08 (0.05)	-0.11 (0.07)	-0.10 (0.02)***	-0.11 (0.01)***
Population	1E-06 (2E-06)	3E-07 (2E-06)	-6E-07 (1E-07)***	-7E-07 (5E-08)***
15-49 population	0.02 (0.009)**	0.01 (0.009)	0.09 (0.04)**	0.08 (0.02)***
Males per 100 females	-0.06 (0.06)	-0.06 (0.06)	-0.05 (0.008)***	-0.05 (0.005)***
Urbanization	0.01 (0.03)	0.01 (0.03)	0.009 (0.003)***	0.009 (6E-4)***
County fixed effects	Yes	Yes	No	No
State fixed effects	No	No	Yes	Yes
Year fixed effects	No	Yes	No	Yes
R^2	0.04	0.05	0.07	0.06
Sample size	30108	30108	30108	30108

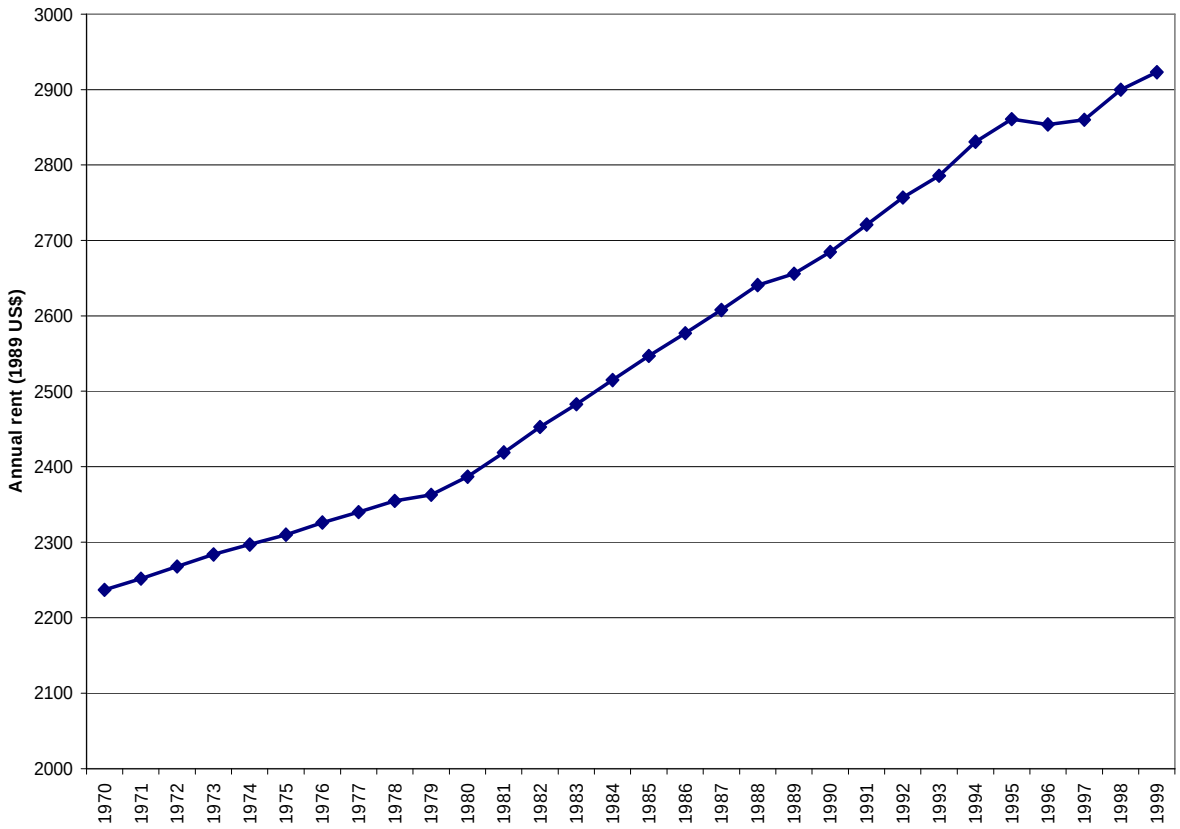
Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 4.13 OLS estimates of effect of housing cost burden on marriage rates in U.S counties (1990 – 1999)

Variable	**(1)**	**(2)**	**(3)**	**(4)**
Housing value (1)	6E-06 (6E-06)	1E-05 (9E-06)	3E-05 (8E-06)***	5E-05 (4E-06)***
Income (2)	-3E-04 (9E-05)***	-1E-04 (9E-05)	-2E-04 (7E-05)***	-3E-04 (4E-05)***
Housing cost burden ((1)*mortgage interest rate/(2)	-0.26 (0.55)	-0.46 (1.39)	3.13 (0.49)***	-1.78 (0.53)***
Female labour-force participation	-0.001 (0.01)	0.004 (0.01)	0.007 (0.01)	0.01 (0.007)**
Female education	0.001 (0.03)	0.06 (0.04)*	-0.02 (0.01)**	0.002 (0.005)
White	0.07 (0.04)*	0.03 (0.04)	0.05 (0.005)***	0.04 (0.006)***
Black	-0.10 (0.08)	-0.07 (0.08)	0.004 (0.007)	-0.002 (0.002)
Foreign born	0.04 (0.15)	0.14 (0.15)	0.02 (0.01)	0.04 (0.009)***
Median age	-0.11 (0.04)***	0.04 (0.04)	0.02 (0.01)	0.05 (0.01)***
Population	-4E-06 (3E-06)	-4E-06 (3E-06)	-1E-06 (2E-07)***	-1E-06 (9E-08)***
15-49 population	0.67 (0.43)	0.99 (0.53)*	0.18 (0.05)***	0.18 (0.01)***
Males per 100 females	0.001 (0.02)	0.01 (0.02)	-0.01 (0.005)***	-0.01 (0.004)**
Urbanization	-0.03 (0.01)***	-0.03 (0.03)***	0.01 (0.002)***	0.01 (0.001)***
County fixed effects	Yes	Yes	No	No
State fixed effects	No	No	Yes	Yes
Year fixed effects	No	Yes	No	Yes
R^2	0.04	0.03	0.12	0.12
Sample size	22621	22621	22621	22621

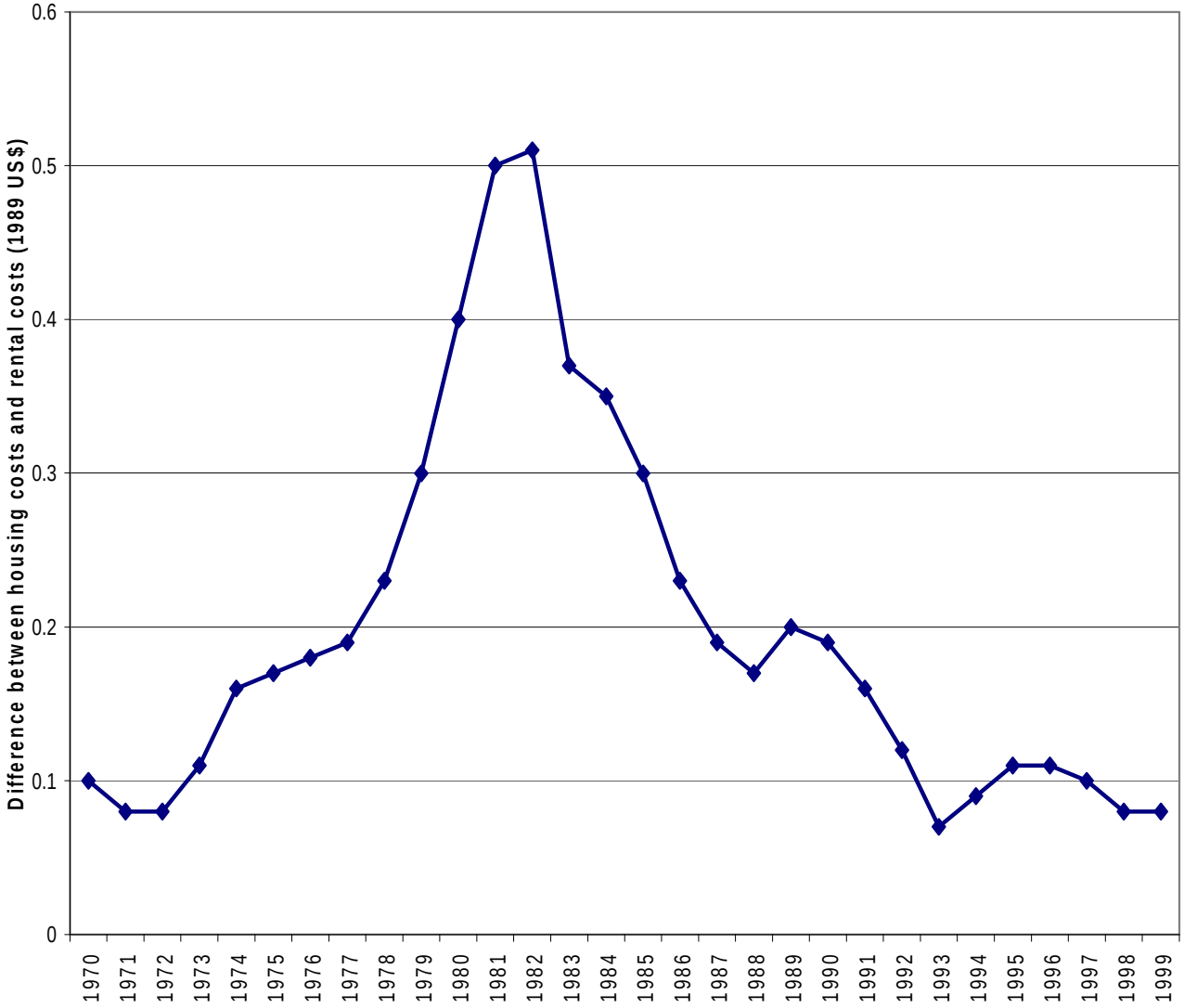
Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$

Figure 4.8 Annual Rental Cost in the U.S. (1989 US$, 1970 – 1999)



Source: U.S. Census

Figure 4.9 Difference between Annual Housing and Rental Costs as Proportion of Per Capita Income in the U.S. (1989 US$, 1970 – 1999)



Source: U.S. Census

Table 4.14 presents the results of OLS regressions with the 'housing cost versus rental cost' measure being of primary interest. The findings are broadly consistent with the predictions from the theoretical model. The coefficients on the 'housing cost versus rental cost' measure are negative and statistically significant in the models in Columns 1, 3, and 4, indicating that the greater the difference between the annual cost of owning a house and the annual cost of renting (expressed as a proportion of per capita income), the lower the marriage rate. The size of the coefficient ranges from 0.76 (including county fixed effects) to 2.48 (including state and year fixed effects), with the results being sensitive again to the inclusion of county and year fixed effects in the model in Column 2.

Table 4.15 shows the results when an alternative model specification is employed. First, the 'housing cost versus rental cost' measure excludes per capita income and the median housing value variable is omitted as an independent explanatory variable. The results do not allow us to draw broad conclusions about the effects of the relationship between this measure and the county marriage rate and, in some cases, are not easily explained by economic theory. In Columns 1 and 3 that include county and state fixed effects respectively, the coefficient on the 'housing cost versus rental cost' measure is not statistically significant although the sign is in the expected direction in both models. When year fixed effects are added in Columns 2 and 4, however, the coefficient turns positive and statistically significant with its size ranging from 2.22 to 2.67. Again, however, there are strong reasons to believe that this model specification is inappropriate for the purposes of our analysis. First, by excluding median housing value as an independent control, the potential effect of wealth on the marriage rate is not captured. Indeed, excluding a statistically significant variable will cause bias to the extent that it is correlated with the included variables. Second, the 'housing cost versus renting cost' measure needs to include per capita

income since it is the difference between the cost of housing and cost of renting *relative* to income that is most likely to affect the marriage rate.

4.8 Conclusions

This chapter analyzes a unique and comprehensive panel of 2441 U.S. counties spanning from 1970 to 1999 to examine the extent to which the burden of housing costs affects the marriage rate. The principal strength of the analysis is that it is, to the best of my knowledge, the first economic study to examine U.S. county-level marriage data over this time period.

To motivate the chapter, a simple theoretical framework was established that argued that the decision to marry involves a decision to purchase appropriate housing. Therefore, when the costs of being married (that include the burden of housing costs) increase relative to being single, individuals are, in theory, less likely to marry. Indeed, anecdotal evidence abounds that individuals consider the state of the housing market when weighing the marriage decision and this chapter's estimation results are broadly consistent with this evidence.

Although one might argue that most individuals marry for reasons other than those relating to the burden of housing costs, it does seem likely that some individuals respond to the burden in the marriage decision. In other words, for most individuals it is unlikely to enter the marriage calculus, but for some individuals it may play an important and decisive role and the results presented in this chapter certainly lend some support to this notion.

It is not argued that the burden of housing costs is the reason why individuals do not marry; other economic and demographic variables affect, and even dominate, the impact of housing costs. However, across several specifications it is found that the burden of housing costs in a given county affects its marriage rate and evidence also suggests that the difference between the annual cost of owning a house and the annual cost of renting affects the marriage decision.

The chapter's findings provide some direction for further analysis. First, it would be interesting to investigate how the burden of housing costs affects the timing of marriage since the analysis, at least implicitly, focuses on the occurrence of marriage. It is particularly important to extend this part of the analysis since many researchers in this field have indicated that in recent years marriage is increasingly being postponed, not simply foregone. Second, there is potential to identify other county-level characteristics that may be important in explaining the propensity for couples to marry. Third, an obvious extension to the analysis is to investigate whether the findings can be replicated using data from other countries, including those in Western Europe. Fourth, the relationship between cohabitation and homeownership might be considered, although this may be a difficult task using aggregate data. This highlights the need for additional research using individual-level longitudinal data.

Overall, the results contained within this chapter represent an important contribution to the literature on the economics of the family. It appears that the marriage decision depends at least in part on the burden of housing costs and this is an important finding since it implies that government policies designed to reduce the cost of housing (such as tax advantages to owner-occupiers) have the potential to encourage entry into marriage.

Notes

[38] A low inclination among singles to become homeowners has been reported by Kendig (1984) and Clark et al. (1994).
[39] Of course, for a married couple, there are other benefits of becoming a homeowner over renting property. For example, rather than just paying for the home, purchasing property can be viewed as an investment that traditionally has tended to keep its value and can be transferred between generations.
[40] Moreover, in the first few years after buying a home, the cost of being a homeowner is typically higher than renting even with comparable housing quality (Mulder and Wagner, 1998).
[41] One might argue that housing costs are essentially a choice variable for a couple. However, to the extent that high housing costs cause a general burden across the whole housing spectrum, one might expect it to affect the marriage rate.

[42] Nevada and Alaska are excluded from the analysis. The former is omitted because over 90 per cent of marriages within this state occur within three tourism-orientated counties. The later is excluded because geographical boundary changes make it very difficult to construct consistent data across time.
[43] A housing unit is defined as owner-occupied if the owner or co-owner lives in the unit even if it is mortgaged or not fully paid for. A unit is a one-family house on less than 10 acres without a business or medical office on the property. The value is an estimate of how much the property would sell for if it were for sale.
[44] As with Chapter 3, the issue of endogeneity with respect to education and marriage is less of a concern compared to Chapter 2 since aggregate data are being used.
[45] The degree of urbanization will also be a major factor differentiating between the availability of rental housing versus owner-occupied housing. For example, in small villages in the U.S., supply consists primarily of owner-occupied dwellings, whereas the majority of dwellings in large cities are rental units (Clark and Dieleman, 1996).
[46] For example, the percentage of black women 20 to 34 who had ever married fell 17 percentage points during the 1970s, from 72.3 per cent in 1970 to 55.6 in 1980. Over the same period, the percentage of white women in this age range who had ever married fell by a much smaller amount, down by 7 percentage points, from 80.7 to 73.4 per cent (Wood, 1995). In 1993, 43.3 per cent of black women aged 30-34 were never married as compared to only 15.5 per cent of white women in the same group (Saluter, 1994).
[47] Model 1 ($\chi 2 = 40.27$, prob > $\chi 2 = 0.0000$), Model 2 ($\chi 2 = 56.06$, prob > $\chi 2 = 0.00296$), Model 3 ($\chi 2 = 112.39$, prob > $\chi 2 = 0.0000$), Model 4 ($\chi 2 = 76.72$, prob > $\chi 2 = 0.0069$), Model 5 ($\chi 2 = 41.24$, prob > $\chi 2 = 0.0002$), Model 6 ($\chi 2 = 73.76$, prob > $\chi 2 = 0.0161$).
[48] The joint significance of the county fixed effects as a group was tested (F(3082, 79704 = 113.41, Prob > F = 0.0000) and the joint significance of the state fixed effects as a group (F(13, 8279) = 94.47, Prob > F = 0.0000). It was expected a priori that most of the variation in the variables is likely to be between counties rather than within counties. Therefore, in addition to county fixed effects, state fixed effects in various model specifications were included.
[49] The interaction terms in this model are jointly statistically significant (F = 7.91 > Critical F = 1.83) and this is likely to explain why the housing cost burden coefficient is statistically significant even with the inclusion of county and year fixed effects.
[50] One could also argue that some counties have high marriage rates because they have a disproportionately high number of eligible bachelors/spinsters. Unfortunately, it is not possible to demonstrate this with the data.

Table 4.14 OLS estimates of effect of difference between annual cost of housing and renting as a proportion of per capita income on marriage rates in U.S. counties (1970-1999)

Variable	**(1)**	**(2)**	**(3)**	**(4)**
Housing value	3E-05 (8E-06)***	3E-05 (1E-05)***	4E-05 (3E-06)***	5E-05 (3E-06)***
Income	-2E-05 (9E-05)	9E-05 (1E-04)	-2E-04 (3E-05)***	-3E-04 (2E-05)***
Housing value * mortgage interest rate – annual rent/per capita income	-0.76 (0.32)**	0.25 (1.18)	-1.37 (0.35)***	-2.48 (0.43)***
Female labour-force participation	-0.03 (0.02)*	-0.02 (0.02)	-0.03 (0.008)***	-0.03 (0.01)***
Female education	-0.06 (0.01)***	-0.03 (0.02)*	-0.02 (0.006)***	-0.02 (0.005)***
White	0.10 (0.02)***	0.10 (0.02)***	0.07 (0.003)***	0.07 (0.002)***
Black	0.18 (0.07)***	0.19 (0.06)***	0.001 (0.006)	8E-04 (0.003)
Foreign born	0.008 (0.07)	0.03 (0.07)	-0.03 (0.01)***	-0.03 (0.009)***
Median age	-0.06 (0.04)	-0.07 (0.05)	-0.08 (0.01)***	-0.08 (0.01)***
Population	-2E-07 (1E-06)	-6E-07 (1E-06)	-7E-07 (1E-07)***	-8E-07 (8E-08)***
15-49 population	-0.01 (0.05)	0.006 (0.05)	0.28 (0.07)***	0.29 (0.06)****
Males per 100 females	-0.02 (0.01)*	-0.03 (0.01)**	-0.04 (0.004)***	-0.05 (0.005)***
Urbanization	0.01 (0.01)	0.01 (0.01)	0.008 (0.002)***	0.007 (0.0009)***
County fixed effects	Yes	Yes	No	No
State fixed effects	No	No	Yes	Yes
Year fixed effects	No	Yes	No	Yes
R^2	0.04	0.04	0.06	0.06
Sample size	80120	80120	80120	80120

Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Table 4.15 OLS estimates of effect of difference between annual cost of housing and renting on marriage rates in U.S counties using pooled census data (1960, 1970, 1980, 1999) – alternative specification

Variable	**(1)**	**(2)**	**(3)**	**(4)**
Housing value*mortgage interest rate - annual rent	-0.13 (0.53)	2.67 (1.19)**	-0.01 (0.92)	2.22 (0.85)*
Income	1E-04 (7E-5)**	2E-4 (8-05)***	5E-5 (6E-5)	5E-5 (4E-5)
Female labour-force participation	-0.02 (0.01)	-0.02 (0.02)	-0.04 (0.02)**	-0.04 (0.03)
Female education	-0.07 (0.02)***	-0.05 (0.02)**	-0.03 (0.01)**	-0.02 (0.01)
White	0.08 (0.02)***	0.08 (0.02)***	0.07 (0.01)***	0.06 (0.01)***
Black	0.12 (0.04)***	0.14 (0.04)***	-0.009 (0.01)	-0.01 (0.01)
Foreign born	-0.02 (0.07)	0.01 (0.07)	0.005 (0.03)	0.01 (0.01)
Median age	-0.06 (0.07)	-0.05 (0.08)	-0.10 (0.04)**	-0.07 (0.04)
Population	8E-7 (1E-6)	-4E-08 (1E-6)	-9E-07 (3E-07)***	-1E-06 (3E-7)**
15-49 population	0.01 (0.03)	0.03 (0.02)	0.06 (0.07)	0.06 (0.05)
Males per 100 females	-0.008 (0.01)	-0.006 (0.08)	-0.03 (0.01)***	-0.03 (0.02)
Urbanization	0.002 (0.01)	0.002 (0.01)	0.006 (0.006)	0.005 (0.004)
County fixed effects	Yes	Yes	No	No
State fixed effects	No	No	Yes	Yes
Year fixed effects	No	Yes	No	Yes
R^2	0.03	0.03	0.06	0.06
Sample size	10710	10710	10710	10710

Notes – The dependent variable in each model is the number of marriages per 1000 population in each county. Standard errors are reported in parentheses and are corrected for heteroskedasticity. *** p<0.01 ** p<0.05 *p<0.10 (two-tailed tests, under H_0: $\beta = 0$)

Appendix

Table A1 State abbreviations

AL	Alabama
AZ	Arizona
AR	Arkansas
CA	California
CO	Colorado
CT	Connecticut
DE	Delaware
FL	Florida
GA	Georgia
HI	Hawaii
ID	Idaho
IL	Illinois
IN	Indiana
IO	Iowa
KS	Kansas
KY	Kentucky
LA	Louisiana
ME	Maine
MD	Maryland
MA	Massachusetts
MI	Michigan
MN	Minnesota
MS	Mississippi
MO	Missouri
MT	Montana
NE	Nebraska
NH	New Hampshire
NJ	New Jersey
NY	New York
NC	North Carolina
ND	North Dakota
OH	Ohio
OK	Oklahoma
OR	Oregon
PA	Pennsylvania
RI	Rhode Island
SC	South Carolina
SD	South Dakota
TN	Tennessee
TX	Texas
UT	Utah
VT	Vermont
VA	Virginia
WA	Washington
WV	West Virginia
WI	Wisconsin
WY	Wyoming

5.

Conclusion

Conclusion

In the thirty-five years since the publication of Gary Becker's (1973, 1974) seminal work on the issue, economists have increasingly sought to improve our understanding of the economic factors that motivate an individual's entry into marriage; a life event that has been shown to have significant implications for the well-being (economic and otherwise) of men, women and their children. The three empirical studies in this thesis that focus on the determinants of marriage in three areas of the world (Great Britain, Eastern Europe and the United States) make a contribution to the burgeoning literature in this field.

In Chapter 2, the effects of family background on timing of first marriage in Great Britain were investigated. The results show, for the first time using western data, that sibling sex composition and birth order matter for timing of first marriage. The presence of a younger sibling in the household during adolescence was associated with early entry into marriage for males, while the presence of a younger brother sped up marriage for both sexes. These results are consistent with the theory that the presence of a younger sibling in the household will dilute resources for older siblings, thereby giving an incentive for older siblings to extract the gains from marriage at an early age. Future research might examine whether these results can be replicated using data from North America or other European countries.

However, there is another strong and robust finding from the study that deserves further investigation: females raised in rural areas tend to marry early, while males raised in rural areas tend to delay marriage. One explanation for this result focuses on the theory that there is a surplus of females in urban areas due to the combination of better labour and marriage markets that draws females from rural areas. The young females that remain in rural females are "snapped up" early for marriage, while the surplus bachelors must engage in a protracted search

for a spouse. A future study of potential interest could examine the extent to which spousal search costs for rural males are being lowered via access to the Internet and, in particular, through usage of online dating websites.

Chapter 3 of the thesis exploited variations in abortion policy in Eastern Europe during the late-eighties and early-nineties to examine their impact on female first marriage rates. The study distinguishes between countries with severe, moderate, and few or no restrictions on abortion access and hypothesized that in a world of uncertainty about a spouse's attitude toward parenthood, liberal abortion laws can speed up the search process leading to earlier marriages. The empirical analysis reveals that the switch from an abortion regime with only moderate restrictions to one in which abortion is available upon request is associated with an increase in first marriage rates among non-teenage females. Previous studies from the United States had found that liberalization of abortion laws is associated with a decline in the marriage rate among females and the results contained in this chapter ought to motivate further analysis of the relationship between abortion access and entry into marriage.

In particular, a natural next step is to examine whether the changes in abortion laws that took place in Western Europe during the 1970s similarly affected female first marriage rates. To the extent that easier access to abortion allows a woman to gather information about the suitability of a potential spouse, future studies might also seek to examine the relationship between abortion availability and match quality.

Chapter 4 of the thesis explored the relationship between the burden of housing costs and marriage rates in the United States between 1970 and 1999. This is a neglected area of research in the economics of marriage literature, despite the fact that anecdotal evidence indicates that prospective couples consider housing market factors when weighing the decisions of whether

and when to marry. Using county-level data, the empirical analysis found that a higher cost of owner-occupied housing is associated with a lower marriage rate. The results also indicated that the greater the difference between the annual cost of owning a house and the annual cost of renting, the lower the marriage rate. One policy implication of these findings is that government initiatives intended to reduce the cost of housing have the potential to encourage entry into marriage.

Clearly, there remains substantial scope for further empirical research into the relationship between the housing market and entry into marriage. One area of research might investigate how financial settlement at divorce (particularly housing) affects the decision to enter marriage. Housing assets dominate household wealth for most families, increasingly so with rising rates of owner-occupation and, until recently, escalating house prices. Consequently, the treatment of housing in divorce settlements will not only affect the decision to divorce but may also be a consideration for entry into marriage relative to non-marital cohabitation, especially for partners with different initial levels of wealth if the rules on division of assets for unmarried couples differ significantly from those for married couples.

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