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Extended Abstract

A remarkable feature of English demographic history is the explosion in childbearing outside marriage during the last quarter of the twentieth century, after 400 years of relative stability. Over the period 1845-1960, the percentage of births outside marriage moved within a small range, averaging about 5%. The paper finds that, up to the First World War, higher unemployment discouraged marriage and increased non-marital births, with a recovery in marriages in the subsequent year. This pattern is consistent with poorer labour market conditions discouraging marriages among pregnant would-be brides, thereby increasing bastardy. During the inter-war period, higher unemployment continued to produce postponement of marriages, but non-marital childbearing was no longer linked to unemployment, nor is there a clear link to unemployment in the post-war period.

After 1960, when the contraceptive pill was introduced, childbearing outside marriage began to climb slowly, and it exploded after 1980, reaching 42% in 2004. This was partly driven by a steep increase in the age-specific non-marital births rates of women aged 20-34 from the mid-1970s to the early 1990s, after which they stabilised at a high level. At *fixed* average non-marital and marital age-specific birth rates, this increase in the proportion of births outside marriage can be mainly *accounted for* by a large fall in the proportion of women aged 20-34 who are married, which is in turn associated with a dramatic rise in cohabiting unions. These unions are short-lived before either dissolving or being converted into marriage. But this begs the question: why didn't average non-marital fertility rates fall when more women cohabited? Women had the means (contraception and legal abortion) to avoid non-marital childbearing if they wanted to do so, and so the substitution of cohabiting unions for marriages need not have raised non-marital fertility.

A theory of marriage market search (courtship) in which out-of-wedlock childbearing is an option suggests why it may be a rational choice, even when fertility can be controlled. A woman's welfare as a single mother is likely to be influenced by the prevalence of single mothers in the population, which may reflect social stigma against single mothers. When their prevalence is low, non-marital childbearing is discouraged. A temporary change in the determinants of non-marital childbearing that raises it, like the large rise in unemployment in the late 1970s/early 1980s, can produce rapid erosion of the stigma and a self-reinforcing rise in childbearing outside marriage. This dynamic is likely to be concentrated among a segment of the population who already had stronger incentives to have a child before marriage. If this social influence model is valid, then it is likely to be the case that socio-economic differences in the chances of having a child before marriage widen as childbearing outside marriage becomes more common, and the paper provides evidence that this has happened. An alternative, or complementary, explanation stresses the role of the rise in cohabiting unions and delay in partnership. These generated an increase in non-marital births by increasing the unmarried population. This view also points to the operation of a social influence model in explaining the dramatic rise in cohabitation, and the paper provides evidence of a diffusion of cohabiting unions from the better educated to the less educated population.

1. Four centuries of bastardy in England

A remarkable feature of English demographic history is the explosion in childbearing outside marriage during the last quarter of the twentieth century, after 400 years of relative stability. Figure 1 plots the number of live births outside marriage per 1000 live births between 1845 and 2003. With the exception of a ‘spike’ at the end of the Second World War (peaking at 9.3%), the percentage of births outside marriage stayed within the range of 3.9 to 7.0% between 1845 and 1960. In the late 16th century it was about 3%, fell to 1% percent in the mid-17th century, and then rose to about 6% at the beginning of the 19th century (Laslett 1977, Fig.3.2). Thus, over 400 years, the proportion of births outside marriage moved within a relatively narrow range.

In the 17th and 18th centuries, childbearing outside marriage was associated with courtship. The fact that premarital childbearing tended to be higher when marriage ages were lower, and that the age at first ‘illegitimate’ birth was approximately equal to the age at first marriage (Laslett, 1980; Oosterveen *et al*, 1980)), suggest that it was part of the courtship process. In times when general marriage opportunities were good there would be more courtship, hence more sexual activity, and more risk of non-marital births when, for a number of reasons, a particular marriage failed to take place. Wrightson (1980, p.190) interprets the proportion of births outside marriage in seventeenth century England as “an index of the degree of disjunction between socially acceptable premarital sexual activity and particular marital opportunities.” This paper focuses on the last 160 years, particularly the period since 1870. It aims to explain fluctuations in non-marital childbearing during the period of relative stability and the explosion in the last quarter of the twentieth century.

Background: Fertility and Birth Control, 1845-1940

Figure 1 also shows the evolution of fertility since 1845, as measured by the General Fertility Rate (GFR). Fertility began its steep long-term fall in the second half of the 1870s, reaching a low point just before the Second World War. The GFR was not this low again until the end of the twentieth century. It is important for the analysis of non-marital childbearing to consider how fertility was controlled to produce the long fertility decline, during which births outside marriage were usually less than 5%.

Szreter (1996, pp.398-9) argues convincingly that ‘attempted abstinence within marriage was the single most widespread and frequently used method of birth control’ during the long decline, particularly before the First World War. He identifies (p.420) ‘conscious, attempted abstinence to restrict births as the main cause of reduced coital frequency in the late Victorian and Edwardian period. ... a public discourse explicitly promoting the virtues of sexual continence, primarily on moral and health grounds was, in fact, consciously developed and elaborated during this period.’ Research by Cook (2004) reinforces Szreter’s conclusion: ‘Abstinence within marriage was a course of desperation that could be sustained only by imposition of a repressive sexual and emotional culture, initially by individuals of their own accord, and then, as they internalised those dictates, upon succeeding generations.’ (p.161)

Throughout the nineteenth century, premarital sex continued to be a part of courting behaviour among working class people. As Cook (2004, p.17) explains,

...individual caution backed up by community sanctions stopped most couples from marrying unless they had sufficient savings and income to support a new separate household containing wife and children.

Premarital sexual intercourse was regulated by this system. Most unmarried women would not have sexual intercourse except with a partner who had agreed to marriage, and the man would not make this offer until he could afford to do so. Note that this is not the same as delaying intercourse until marriage was imminent...There was probably considerable leeway if the woman did not become pregnant.’

Cook argues that the decline in the percentage of births outside marriage between 1870 and 1900 reflected the spread of a culture of sexual restraint: ‘The falling illegitimacy rates are evidence of women’s increasing sexual caution and diminishing opportunity to relaxed premarital sexual activity...’ (Cook, p.105). It spread from the middle-class to the working classes. From the 1870s, the slowing down of urbanisation ‘led to establishment of more settled working class communities enabling women (and parents) to establish networks of support and surveillance. Respectability was increasingly central to working-class women’s identity.’ (Cook, pp. 105-106). While increasingly repressed, premarital sex remained an important part of courting behaviour among working class people into the early twentieth century. Having intercourse marked a point in courtship, a staging post en route to marriage and household formation.

Birth control during the inter-war years was similar to the preceding fifty years. Low marital birth rates in 1930s were primarily attained through intended low coital frequencies—the reported levels of birth control use (even if underreported) and the low effectiveness of these methods cannot account for low birth rate. The culture of sexual restraint supported abstinence as the main control on marital fertility and kept births outside marriage low. While knowledge about contraception improved during the inter-war years, the unmarried had difficulty obtaining such information.

Outline of paper

The next section demonstrates that, up to the First World War, fluctuations in the percentage of births outside marriage responded to the unemployment rate. Higher unemployment discouraged marriage and increased non-marital births, which is consistent with poorer labour market conditions discouraging marriages among pregnant would-be brides, thereby increasing bastardy. This is further support for the hypothesis that non-marital childbearing is associated with courtship. During the

inter-war period, higher unemployment continued to produce postponement of marriages, but non-marital childbearing was no longer linked to unemployment.

The remainder of the paper considers the period after World War II. An important technological change dominates this period: the introduction of the contraceptive pill in 1961. Section 3 shows that the increase in the percentage of births outside marriage from 9% in 1975 to 42% in 2003 is mainly accounted for by a large fall in the proportion of women aged 20-34 who are married. This is in turn associated with a dramatic rise in cohabiting unions. As these unions are short-lived before either dissolving or being converted into marriage, non-marital childbearing appears, therefore, to be associated with modern courtship. Section 4 presents a theory of marriage market search (courtship) in which out-of-wedlock childbearing may be a rational choice, and Section 5 explains how it can become widespread when a woman's welfare as a single mother is influenced by the prevalence of single mothers in the population. If this social influence model is valid, then it is likely to be the case that socio-economic differences in the chances of having a child before marriage widen as childbearing outside marriage becomes more common. Section 6 presents evidence that this has indeed happened. Section 7 discusses the diffusion of cohabiting unions from the better educated to the rest of the population, which may provide an alternative or complementary explanation for the explosion of non-marital childbearing, and section 8 presents conclusions.

2. Unemployment and bastardy before World War II

Taking the period from 1845 to 1960 (i.e. before the contraceptive pill), it appears that live births outside marriage per 1000 live births (*bom*) was a covariance-stationary series (i.e. its mean, variance and all of its autocovariances are finite and constant over time). We can reject the hypothesis that it is a 'random walk' at the 0.05

significance level, but not at the 0.01 level.¹ Modelling it as a simple auto-regressive process, we obtain the following dynamic equation: $bom_t = 5.65 + 1.07bom_{t-1} - 0.18bom_{t-2} + \varepsilon_t$, where t indicates year and ε_t is a ‘white noise’ error term, estimated to have a standard deviation of 4.1 for this time period. Thus, a shock (to ε_t) raises bom further in the subsequent year, after which the impact of the shock gradually wears off. For instance, a unitary shock in year t increases bom by 0.6 in $t+5$.

One interpretation of these dynamics is suggested by the following identity:

$$(1) \quad bom/(1000-bom) \equiv (U/M)(f_u/f_m)$$

where U is the population of unmarried women, M is the population of married women, and f_u and f_m are the fertility rates of unmarried and married women, respectively. A shock that reduces marriages in year t reduces marriages of *pregnant* women, which raises f_u/f_m in year t , and it raises U/M in the next year. This may help explain why bom rises further in $t+1$ after a shock in year t , after which the effect of the shock declines. One such shock is unemployment.

A simple theory of how bastards are born can be based on two premises that are supported by English socio-demographic history, outlined in the first section. The first is that getting married meant establishing a new household, which required sufficient earnings and reasonably good economic prospects. The second is that pre-marital sex was not uncommon, particularly when both partners had the intention of marrying one another at the time of the sexual act, and contraception was usually not practised and inefficient when it was. For instance, there is evidence that in rural England in the latter eighteenth and the nineteenth century 30-40% of brides had a birth within 8 months of marriage (Hair 1970, Table 1), consistent with pregnancy at

¹ In contrast to y_t being covariance-stationary, if it is a random walk it takes the form $y_t = \alpha + y_{t-1} + u_t$, where u_t is independently and identically distributed with zero mean and finite variance. In this case, y_t does not have a finite variance. The Dickey-Fuller (DF) test provides a test for stationarity; its null

marriage for a substantial proportion of brides. In 1963, the earliest year that official statistics give similar information (and before the widespread use of the contraceptive pill), the corresponding figure was about 20%.²

If for some reason the marriage planned by a pregnant woman did not take place, then the child would be born outside marriage. Thus, a change in the environment that reduced marriages would also increase the birth rate outside marriage. We can examine the consistency of the historical experience with this simple theory by exploiting the long series on marriages of single women. Data on the stock of single women, which is required to convert the marriages into a marriage rate, is not available for the entire period. But as the stock is likely to move slowly, this is not a major problem. Over the period 1930-2002, the number of marriages to single women and the marriage rate of single women move together closely—their correlation coefficient is 0.844, and the correlation coefficient between the first differences of the two variables is 0.963.

Focussing on the period before the disruption of the World Wars, 1845-1913, neither the *bom* series, nor the marriages of single women are stationary series, both are trended as Figure 2 shows.³ Their first differences are, however, stationary. A vector auto-regression (VAR) involving these two differenced endogenous variables is estimated, and the results are shown in Table 1. More marriages of single women reduce the proportion of births outside marriage in subsequent years, and an increase in the proportion of births outside marriage subsequently increases marriages of single

hypothesis is that $\rho=1$ in the model $y_t = \alpha + \rho y_{t-1} + u_t$. Rejection of the null is consistent with stationarity. The DF statistic for *bom* for the 1845-1960 period is -2.92 , the p value of which is 0.043.

² This is calculated as the ratio of births within 8 months of marriage in 1963 to the number of marriages in 1962.

³ The p -values associated with the DF statistics in the level of the variables are 0.17 and 0.63 for single marriages and *bom*, respectively.

women. Each variable ‘Granger-causes’ the other.⁴ The negative impact of marriages on *bom* one year later is consistent with the simple theory’s prediction that shocks that reduce marriages increase births outside marriage.⁵

One such shock may be poorer labour market conditions, as indicated by a higher unemployment rate. Southall and Gilbert (1996) present evidence that during the period 1860-1914 there were fewer marriages when unemployment (reported by various unions operating unemployment insurance schemes) was higher. Whether unemployment also affected births outside marriage is investigated here for the period 1870-1913 using the new estimates of British unemployment compiled by Boyer and Hatton (2002). Their estimate of the unemployment rate (*ur*), *bom* and marriages to single women are plotted in Figure 3. The Dickey Fuller test indicates that *ur* is a stationary series during the period 1870-1913, and it will be assumed that *ur* is strictly exogenous. Estimation of a vector autogression (VAR) with first differences in *bom* and marriages being endogenous and *ur* being exogenous indicates that lags of the endogenous variables do not have significant effects. Thus, the model can be simplified to that shown in the first two columns of Table 2. The estimated parameters indicate that a higher unemployment rate raises births outside marriage. It also initially reduces marriages to single women, but there is a strong recovery in marriages in the following year. The prolonged positive effect of unemployment (over two years) on *bom* probably reflects the gestation lag in births in conjunction with the annual measurement of births. These estimates are consistent with poorer labour market conditions discouraging marriages among pregnant would-be brides, thereby increasing bastardy. As poorer people are affected more by fluctuations in

⁴ A variable *x* is said to Granger-cause variable *y* if, given past values of *y*, past values of *x* are useful for predicting *y*. Operationally, rejection of the hypothesis that the coefficients of the past values of *x* are jointly zero in a regression with these values and past values of *y* is evidence of Granger causality.

labour market conditions, these results are consistent with the long established tendency for non-marital childbearing to be disproportionately among poorer members of society, which goes back to at least the 16th century in Britain (e.g. Oosterveen *et al*, 1980, Smout, 1980). Note that, because *bom* is a random walk during this period, persistently higher or lower unemployment would alter the trend in *bom*, but in fact the unemployment rate fluctuated around a constant mean of about 5.8%.

During the inter-war period, the relationship between bastardy and unemployment appears to have disappeared. This is suggested by Figure 3, and the second set of parameter estimates in Table 2 confirms this. Note that marriages of single women continue to be discouraged by higher unemployment, but with nearly complete recovery in the following year. The absence of an impact of unemployment on births outside marriage may reflect the pervasive culture of sexual restraint that had evolved by the inter-war years. It could also be the case that, by sharply diminishing economic prospects, the very high level of inter-war unemployment discouraged childbearing generally, so that abstinence was more likely to be practised in the lead-up to a marriage. As a consequence, fewer women became pregnant before marriage, thereby sharply reducing the impact of unemployment on births outside marriage. It is certainly the case that the general fertility rate was much lower in the inter-war period than in the decade before the First World War (70 births per 1000 women aged 15-44 compared with 104; see Figure 1).

In the discussion of the long-term changes in bastardy in the pre-World War II years it has been necessary to rely on the proportion of births outside marriage as its indicator. But as the identity in (1) indicates, this proportion depends on non-marital

⁵ The positive effect of *bom* on subsequent marriages of single women may reflect subsequent marriages of women who had become single mothers.

and marital fertility rates and the proportion of women of fertile ages who are not married. All of these are affected by changes in the age distribution of the female population. For the years preceding 1938 it is not possible to obtain annual estimates of the marital status distribution of the population by age, and this explains the reliance on the overall *bom* indicator. The next section focuses on accounting for changes in *bom* over the period since 1938, when such information is available.

3. Demographic Accounting, 1938-2003

Figure 4 shows the age-specific fertility rates outside marriage, a direct measure of the propensity to have a birth outside marriage relative to the ‘population at risk’. After the Second World War ‘spike’, these non-marital fertility rates did not return to their 1938 levels, and from the mid-1950s they increased dramatically for all age groups, peaking in 1964 (for those aged 20-34) and then declining until the mid-1970s. As comparison with Figure 5 indicates, marital fertility rates showed a similar ‘baby boom and bust’ pattern, but rose and fell proportionately less around their much higher levels. Figure 4 suggests no clear relationship between non-marital birth rates and the unemployment rate.

The number of births outside marriage among women in the *j*-th age group in year *t* (BOM_{tj}) can be written as $BOM_{tj} \equiv (Pop_t) \cdot (a_{tj}) \cdot (1 - m_{tj}) \cdot (fom_{tj})$, where Pop_t is the female population aged 15-34 in year *t*, a_{tj} is the proportion of the population aged 15-34 in the *j*-th age group, m_{tj} is the proportion of the female population in the *j*-th age group who are married, and fom_{tj} is the fertility rate of the unmarried women in the *j*-th age group.⁶ The number of births inside marriage for women in the *j*-th age group is defined analogously: $BIM_{tj} \equiv (Pop_t) \cdot (a_{tj}) \cdot (m_{tj}) \cdot (fim_{tj})$, where fim_{tj} is the fertility rate

⁶ Over the period 1938-64, women aged 15-34 produced about 85% of all births and 90% of all births outside marriage. During 1964-2003, women aged 15-34 produced about 90% of all births and 93% of all births outside marriage.

of married women in the j -th age group. Then the proportion of births to women aged 15-34 outside marriage is given by:

$$(2) \quad bom_t \equiv (\sum_j BOM_{ij}) / (\sum_j BIM_{ij} + \sum_j BOM_{ij})$$

where \sum_j indicates summation over the four five-year age groups 15-19, 20-24, 25-29 and 30-34. We can decompose changes in bom_t between any two years by holding each of the various components of BOM_{ij} and BIM_{ij} constant at base year values.

First consider the period 1938-1964. Among women aged 15-34, 4.4% of births were outside marriage in 1938, and at the peak of the baby boom this percentage was 7.4%.⁷ Figure 6 shows the large declines in the proportion of women *not* married among women aged 20-34. The decomposition indicates that the percentage of births outside marriage to women aged 15-34 would have increased from 4.4% in 1938 to 17.2% in 1964, rather than the actual value of 7.4% in 1964, if the proportions married in each age group had remained at their 1938 values while the age structure and fertility rates of unmarried and married women changed as they actually did. Thus, large rises between 1938 and 1964 in the proportion of women in each five-year age group who are married is mainly responsible for the moderate increase in bom in the face of the large increase in non-marital fertility rates (fom_{ij}).

Changes in the proportion of women married also played a large role in accounting for changes in bom during the period 1975-2003. Figure 4 shows that the age-specific fertility rates of unmarried women increased from the mid-1970s to the early 1990s and then were relatively constant after that, at levels higher than at the 1964 peak. Age-specific fertility rates of married women aged 20-34 exhibited a moderate upward trend (Figure 5). The big change is the large rise in the proportion of women who are not married during the post-1975 period, as shown in Figure 6.

⁷ The corresponding percentages for births to women of all ages were 4.3% and 7.2%.

The decomposition for the 1975-2003 period indicates that if the proportions married in each age group had remained at their 1975 values while the age structure and fertility rates of unmarried and married women changed as they actually did, the proportion of births outside marriage to women aged 15-34 would have increased from 9.1% in 1975 to only 11.6% in 2003, rather than the actual value of 44.2% in 2003.⁸ Thus, less than one-tenth of the 1975-2003 increase in the proportion of births outside marriage can be accounted for by simultaneous changes in components other than proportions married in each age group. The large role played by changes in the proportions married is also clear if we consider what would have happened if age-specific non-marital and marital fertility rates were held constant at their 1975 level. This decomposition indicates that percentage of births outside marriage among women aged 15-34 would have risen to 40%, very close to the observed 44%.

The shift from legal marriage to cohabiting unions as the common mode of first partnership mainly accounts for the delay of first marriage in Britain and the rise in the proportion of women not married (Ermisch and Francesconi 2000). Among women born in the 1950s, about one-fourth cohabited in their first live-in partnership. This proportion increased to three-fifths among women born in the 1960s and to 85% among women born in the 1970s.⁹ But there has also been a delay in the age of first partnership: comparing women born in the 1950s, 1960s and 1970s, the median age at first partnership has risen from 22 to 24 to 25, respectively. Section 7 discusses possible reasons for the diffusion of cohabiting unions.

These are, of course, accounting exercises. Similar socio-economic factors may have produced the rise in cohabitation, the delay in first partnership and an

⁸ The corresponding percentage for births to women of all ages were 9.1% and 41.4%.

⁹ These estimates come from the partnership histories in the British Household Panel Study, described in the Appendix.

increase in the propensity to have children outside marriage, making the changes in non-marital fertility rates and the changes in proportions married interdependent.

4. The decision to have a child outside marriage

Throughout the 1950s and early 1960s, *unmarried* women continued to have no recognised legal right of access to contraception. The absence of reliable contraception produced many unplanned pregnancies, and the risks of and taboos against abortion made the outcome of premarital pregnancies relatively clear—have the child, with or without a husband. The contraceptive pill changed all that. It was introduced in 1961 to family doctors (General Practitioners—GPs), and in 1962 the Family Planning Association (FPA) started offering it to married women, provided they had permission of their GP. It became available from the National Health Service (NHS) from December 1961, but only to married women whose health would be endangered by further pregnancy. In 1966, the NHS allowed GPs to charge for pill prescriptions not given for medical reasons—pill sales rose sharply from then on, helped by a fall in its price during the 1960s. In 1968, the FPA gave branches permission to provide contraceptives to unmarried women, and from 1970 they were required to make provision. Contraception became free to all women from 1975. These developments were associated with a relatively rapid diffusion of pill use. Among women born in 1946, 48% had used the pill by their 23rd birthday, and 70% had used it by the time that they were 34 (Cook, p.269). Among women born in 1950-59, 80% had used the Pill by 1989 (Thorogood, M. and M.P. Vessey 1990). Abortion became legal in 1969.

The free availability of contraception and abortion after 1975 is likely to have played an important role in the postponement of marriage discussed in the previous section and illustrated in Figure 6. Before the pill and legal abortion, there were

considerable costs from delaying marriage—sexual abstinence or pregnancy risk. By reducing these costs, the pill encouraged all women and men to delay marriage to a time when their tastes, character and economic position were better formed. In particular, widespread unmarried cohabitation is inconceivable without the pill (with legal abortion as a backup).

After 1975, ‘accidents’ were no longer a convincing reason why a large percentage of women had a birth outside marriage. While, in accounting terms, the increase in the birth rate among non-married women played a minor role in the dramatic rise in births outside marriage between 1975 and 2003, its increase is not independent of the increase in the single population. For example, women who object to abortion may marry the father when pregnant, even though they would reject him as a marriage partner otherwise, in preference to having a child outside marriage. An increase in the willingness of such women to become single mothers would reduce marriage rates as well as increase non-marital childbearing, as fewer marry in response to a pregnancy. Furthermore, the accounting exercise attributing a large role to the decrease in the proportion of young women who are married assumes that non-marital birth rates are constant. But why didn’t they fall when more women remained single and had the means to avoid non-marital childbearing if they wanted to do so? A better understanding of the increase in non-marital childbearing requires a behavioural model of the decision to have a birth outside marriage that takes into account the reliability of modern fertility control and the interdependency between marriage and childbearing decisions.

Marriage markets are subject to frictions. It takes time to meet potentially suitable members of the opposite sex and gather information, and whom one meets is a stochastic process. These market frictions affect who marries whom, the gains from

each marriage and the distribution of gains between spouses. They also open the possibility of childbearing outside marriage as a rational choice, even when a woman can control her fertility perfectly.¹⁰ When a man and woman are in a relationship, the man can choose whether to marry the woman or not, if she will have him. While a woman faces the same choice when she meets a man, she can also choose to have a child by the man and then raise it without the father. Depending on the social welfare system she faces, and whether the father is willing to contribute resources, a woman's welfare when raising a child by herself may be greater than what she obtains when single and childless. But there are also costs in terms of future marriage market prospects associated with raising a child alone. A single woman with child may find it more difficult to meet potential husbands while looking after a child. A woman who has a relationship with a man she does not wish to marry, or who will not marry her, would choose to have a child by the man if the short-run gain exceeds the long-term costs in terms of her marriage prospects.

An important implication of this model is that couples who find each other to be mutually acceptable marriage partners wait to have children within marriage, while a woman may have a child outside marriage if this is not the case. This suggests that sexual relationships that produce a child outside marriage should be much less likely to lead to marriage than those that do not. In general it is difficult to observe the outcomes of relationships, but we can observe the outcome of cohabiting unions, which have become widespread in recent years. The evidence indicates that cohabiting unions that produce children are much less likely to be converted into marriage and more likely to break up than childless ones (Ermisch and Francesconi,

¹⁰ What follows is a brief description of the matching model presented in Burdett and Ermisch (2002) and Ermisch (2003, Chapter 7).

2000). About 65% of these fertile unions dissolve, compared with 40% of childless unions. Births in cohabiting unions make up 60% of recent non-marital births.

Those women who expect to obtain a significant increase in welfare when they marry suffer a greater long-term cost by having a child while single than women whose marriage prospects are such that they expect to gain little from marriage. Thus, women with poorer marriage prospects are more likely to have children outside marriage. If marriage market prospects are worse for poorer women (e.g. those with low educational attainments), because they can only marry poorer men, we would expect that poorer women would be more likely to have children before marriage, a prediction which is repeatedly confirmed (e.g. Ermisch 2001; Del Bono 2004).

Conditions of higher unemployment tend to reduce men's incomes, particularly those men whom women with poorer marriage market attributes might have a chance of marrying. Thus, the value of waiting childless for the right man to come along is reduced relative to the utility of having a child as a single mother in labour markets in which the unemployment rate is higher. Poor employment opportunities also reduce a woman's opportunity cost of having a child on her own. Thus, like our simple theory of section 2, this model also leads us to expect that a higher unemployment rate increases childbearing outside marriage, a relationship that we found in the aggregate data during the pre-World War I era, but which disappeared during the inter-war period. Analysis of a large cohort of women born in 1970 (Del Bono 2004), who were making childbearing and partnership decisions in the late 1980s and 1990s, indicates that women living in counties with higher male unemployment were more likely to become a mother outside a live-in partnership and less likely to enter a partnership. This is consistent with the model's prediction.

A woman's welfare as a single mother (and possibly the amount by which being a single mother reduces her subsequent marriage prospects) is affected by any 'social stigma' attached to being a single mother. Throughout the 1950s and early 1960s, 'Illegitimacy continued to carry a great stigma.' (Szreter 1996, p.577) For women who object to abortion, this stigma increases the chances that she marries if she becomes pregnant and reduces the odds of a birth outside marriage. If such stigma declines, then more women would decide to have a child (on her own) with a man whom she rejects as husband (or who rejects her as a wife), and among women who object to abortion, fewer would marry in response to a pregnancy. The next section presents a social interaction model that can produce rapid erosion of such stigma, which would both increase childbearing outside marriage directly and increase the single population.

5. Social influence and interaction

Suppose that the utility associated with being a single mother relative to the utility associated with remaining childless is larger when more women in her reference group (e.g. defined by nationality, religious or ethnic group) become mothers outside marriage. This may be because social stigma is less when more women become single mothers. Then the probability that a woman becomes a single mother when she and her partner do not agree to marry depends on the *expected* proportion of women in a woman's reference group who have their first birth outside marriage in this situation.¹¹ Social influence (or social stigma) effects imply that a higher expected proportion of non-marital fertility in a woman's reference group would increase an

¹¹ The social stigma (or social contagion) model can be written as $P = H[\alpha + \beta P^e + z'\eta]$, where P is the probability that a woman becomes a single mother, P^e is the *expected* proportion becoming a single mother in that person's 'reference group', z denotes a vector of individual attributes, $H[\cdot]$ is a specified continuous, strictly increasing distribution function, such as the logistic distribution, and α , β and η are parameters. Social stigma or social influence effects would imply $\beta > 0$. See Ermisch (2003, Chapter 11) for details on the model.

individual's probability of becoming a single mother. This is what we shall call a *social interaction effect*.

A *social equilibrium* occurs when people's expectations are consistent with the average proportion in the reference group who become single mothers when a couple does not marry; that is, when the actual proportion in the reference group is equal to the expected proportion. The non-linear curve in Figure 7 plots the relationship between actual and expected proportions becoming single mothers for a relatively large social interaction effect, and the 45-degree line represents the condition that the actual and expected proportions are equal. The points at which the curve intersects the line are 'social equilibria'. The Figure illustrates the possibility of more than one social equilibrium. If we make some plausible assumptions about dynamics, then we can characterise an equilibrium like *B* in Figure 7 as unstable.

In the spirit of Schelling (1978), assume the following dynamics. A birth cohort of young women base their expectations on the behaviour of the preceding birth cohort. Starting at any value of the expected proportion above the one corresponding to equilibrium *B* in Figure 7, the proportion who become single mothers in the current cohort will exceed their expectations, which increases the expected proportion in the succeeding cohort. Some people with attributes who would not have had a child outside marriage at a lower expected proportion becoming single mothers now have a child rather than remain single and childless. This behaviour raises the proportion becoming single mothers and increases the expected value for the next cohort and so forth until the society converges to a "pervasive non-marital childbearing" equilibrium at point *C*.

Conversely, starting at values of the expected proportion below the one associated with the equilibrium at *B*, the proportion of the current cohort becoming

single mothers will be less than they expected, and so the succeeding cohort has lower expectations. People who would have become a single mothers if more of their peers did, will not do so, leading to lower expectations for the next cohort and so on, ultimately producing a “rare non-marital childbearing” equilibrium at *A*. With these dynamics, the equilibrium at *B* is clearly unstable, and so there are only two stable equilibrium candidates. Initial expectations can, therefore, be important in determining the proportion who become single mothers when people respond sufficiently to what others are doing. In this sense, ‘history matters’ for the selection of the low-level or high-level equilibrium. Furthermore, *temporary* changes in the socio-economic environment that alter non-marital childbearing behaviour and/or expectations can produce dramatic changes in the proportion who become single mothers, by causing a move from a type-*A* equilibrium to a type-*C* equilibrium. For example, some temporary development that encouraged women to expect that the proportion becoming single mothers would be above that associated with equilibrium *B* in Figure 7 would produce a *permanent* dramatic increase in the proportion.

The relevance of this model for recent English history is the following. It is difficult to believe that the fundamental determinants of the decision to become a single mother have changed by an order of magnitude sufficient to raise the percentage of births outside marriage from 9% in 1975 to 42% in 2004. The large observed changes in the percentage of births that are non-marital may reflect temporary changes in these determinants, the effects of which are magnified by social interaction effects.¹² One possible driver of these changes is the steep rise in unemployment during the late 1970s and early 1980s, which may have reduced the

¹² It is interesting to note that, after 1960, when the contraceptive pill was introduced and its use diffused, the dynamic behaviour of the percentage of births outside marriage (*bom*) changed considerably. It is no longer a covariance-stationary series, exhibiting a strong upward trend,

pool of men that poorer women would find acceptable to marry, thereby discouraging them from waiting to begin childbearing within marriage. Figure 4 shows that the timing of its increase roughly coincides with the large increase in non-marital birth rates. Even though unemployment subsequently fell, the rise may have been sufficient to move the actual proportion becoming single mothers above that in an equilibrium like *B* in Figure 7, which in turn altered expectations for subsequent cohorts. The new equilibrium to which England is moving may be one like *C*, and we may be observing the dynamics that takes it there during recent years.

There are some further implications of the model. The model in section 4 predicts that women with poorer economic prospects are more likely to become a single mother. To be more concrete, it seems likely that women with lower educational attainments have poorer prospects in marriage and labour markets. Also, assume that a person's reference group consists of those with a similar level of education. Those with 'low education' would be represented by the upper curve in Figure 8, while those with 'high education' would be represented by a similar, but lower curve, which only intersects the 45-degree line once. In the initial equilibrium, there is a small difference between the two education groups in the equilibrium proportions of women becoming single mothers. Suppose that there is a temporary change in the environment that increases the actual proportion of women in the lower education group who become single mothers above the middle (unstable) equilibrium (like point *B* in Figure 7). Then the dynamics of social interaction would drive them to the higher equilibrium point (like point *C* in Figure 7). In this new equilibrium, the difference between the education groups in their equilibrium proportion would be

particularly after 1975; indeed, the first difference of *bom* is not stationary either. The Dickey-Fuller test statistic for the first difference of *bom* is -2.22, which has a *p*-value of 0.20.

much greater. The next section uses individual data on women's birth histories to test this proposition.

6. Educational differences in pre-marital birth rates—changes by birth cohort

The data for this analysis come from the British Household Panel Survey (BHPS) retrospective histories of cohabiting unions, marriages and births, which have been updated with information during the panel, 1993-2003.¹³ For simplicity, a dichotomous indicator of educational attainments is used to measure educational differences between women. It is whether or not a woman's highest qualifications did not exceed 'O-levels (later, 'General Certificate of Secondary Education'), which are usually obtained by the time a person is 16 years old. Denote these women as having 'low qualifications'. Three sets of cohorts are distinguished: those born in the 1950s, in the 1960s and the 1970s, who reach the primary ages for having births before marriage about 20 years later. Note that all of these cohorts 'come of age' in the post-pill era. The dependent variable of interest is the 'hazard rate' of a pre-marital first birth for woman j at age t , denoted h_{jt} . Women are assumed to be at risk for such a birth from the age of 14, and they drop out of the population at risk when they marry or when they have a first birth. Women who remained childless and never-married from age 14 to the time of the last survey in which they are present remain in the population at risk until the time of their last interview. Thus, there are two groups who are 'censored': those who marry childless and those who neither marry, nor have a child before the time they are interviewed last.

In order to have a simple parameter to compare across cohorts, a 'proportional hazard' model is estimated for each cohort; it takes the form

$$(3) \quad h_{jt} = g(t) \exp(\beta E_j),$$

where $E_j=1$ denotes a woman leaving education with ‘low qualifications’ and $E_j=0$ denotes a woman with higher qualifications. The function $g(t)$ is an unspecified function of age. This model has the property that, for two women j and k , the ratio of their hazard rates is equal to $h_{jt}/h_{kt} = \exp[\beta(E_j - E_k)]$. The parameter β is estimated by Cox’s partial likelihood method, and Table 3 reports the estimate of $\exp(\beta)$, which is the ratio of the pre-marital birth hazard of a woman with ‘low education’ to that of a woman with ‘high education’. The estimates of this hazard ratio increase across cohorts, which is consistent with the emergence of a ‘high level equilibrium’ for less educated women. Table 4 breaks down non-marital first births between those before the first live-in partnership and those in the first cohabiting union. In each case, the hazard ratio is higher for later birth cohorts, particularly for births outside of a live-in partnership.

A survivor function is associated with any hazard function. In this case it is the proportion surviving childless and never-married. Tables 3 and 4 report the chi-square statistic of the log-rank test for the equality of the survivor functions of the two education groups. The value of the test statistic clearly increases for more recent cohorts, indicating bigger differences in their survival functions. Thus, this non-parametric test also supports the emergence of larger educational differences, which may have been driven by social interaction effects.

7. The diffusion of cohabiting unions

An alternative, but also possibly complementary, explanation is that the large rise in the proportion of women who cohabit in their first partnership (rather than marry) is responsible for the dramatic increase in bastardy in the last quarter century. The reason that this may be the case follows from examining the dynamics of cohabiting

¹³ See Appendix for further details. I am grateful to Chiara Pronzato for constructing the demographic

unions. Analysis of the BHPS data indicates that the time spent living together in cohabiting unions before either marrying each other or the union dissolving is usually very short—the median duration was about 2 years for women born in the 1950s and 1960s, rising to 3.5 years for those born in the 1970s. There has been an upward trend in the proportion of women’s first cohabiting unions that dissolve rather than turn into marriage: 30%, 37% and 50% for women born in the 1950s, 1960s and 1970s, respectively. Most of those who re-partner after their cohabiting union dissolved also start their next partnership by cohabiting. It takes about 2 years for one-half to have formed a new partnership, which is again subject to the high risk of dissolution. Thus, the time spent cohabiting, the relatively high risk that the union dissolves and the time it takes to cohabit again all contribute to a longer time before any marriage takes place and, therefore, more time at risk to have a birth outside marriage. Adding to this time at risk is the delay in first partnerships for more recent cohorts discussed earlier. At *fixed* average age-specific fertility rates outside of a live-in partnership and in cohabiting unions, the increase in the exposure time to these non-marital birth rates would have increased non-marital childbearing. This is consistent with the large accounting contribution of the decline in the proportion of women married to the rise in the proportion of births outside marriage discussed in section 3.

But why didn’t average non-marital fertility rates fall when more women cohabited? Women had the means (contraception and legal abortion) to avoid non-marital childbearing if they wanted to do so, and so the substitution of cohabiting unions for marriages need not have raised non-marital fertility. This consideration leads us back to the explanations suggested by the models in sections 4 and 5: purposeful decisions to have a child outside marriage and erosion of the stigma

history files combining retrospective and prospective panel information.

against doing so. Also, the demographic accounting begs the question: why did cohabiting unions become the common type of first partnership, and why was first partnership delayed? If there was initially social stigma operating against cohabitation, its dramatic increase may be due to a social interaction model like that outlined in section 5, applied to cohabiting unions. It could also be the case that cohabiting unions and partnership delay were only attractive when the stigma associated with childbearing outside marriage was less important.

In addition to the contraceptive pill and legal abortion, another possible driving force for change in patterns of first partnership may have been important changes in young people's education. For instance, one-third of 18-year olds were in full-time education in 1992, compared with 15 per cent in 1979. Bagnoli and Bergstrom (1993) argue that young men who expect to prosper in later life will postpone marriage until their success becomes evident to potential marriage partners. Those who do not expect their economic status to advance much will seek to marry at a relatively young age. The careers of those who obtain university degrees take longer to develop and their earnings peak later in their life. Thus, as more young men go on to higher education, the proportion of young men who think it is worth waiting to signal their better economic status is likely to increase. The same may now apply to women, and also women who are university graduates prefer to marry graduate men.

Beyond a certain age, young people may nevertheless prefer to have a live-in partner, particularly in an era of reliable contraception, and cohabiting unions cater for this preference while allowing them to postpone making a long-term commitment. Thus, higher educational achievement would both encourage young people to enter live-in partnerships later and to cohabit when they do. The short spells of

cohabitation that are observed are consistent with the argument that it is used while waiting to signal economic success and as a learning experience before stronger commitments are made. The social interaction model outlined above could explain why cohabitation spread so rapidly in response to these stronger incentives to cohabit before marriage, even if the incentives were confined to those with higher educational attainments.

Table 5 presents evidence from the BHPS on the timing of first live-in partnership and the odds of cohabiting in this partnership. Panel A presents the estimates of a proportional hazard model like (3) for the hazard of a first union. It indicates that there is little change between the 1950s and 1960s birth cohorts in the educational difference in the timing of first union—the hazard rate for ‘low educated’ (as defined earlier) women is about 30% higher—but the difference in union formation rates widens for the 1970s cohort—i.e. the higher educated wait even longer to start their first partnership. Panel B presents estimates of a logit model for the odds of cohabiting relative to marrying in a woman’s first union. As the arguments above predict, low educated women born in the 1950s and 1960s were much less likely to cohabit in their first partnership, but as cohabiting in one’s first partnership became almost universal (85%), arguably through social interaction effects, this is no longer true for the 1970s cohort.¹⁴ The results are consistent with social interaction effects spreading cohabitation widely from better educated women, who always had an incentive to cohabit before marrying, to a large proportion of the population.

¹⁴ The impact (standard error) of having a *higher educational attainment* (i.e. above ‘A-level’ qualifications, usually obtained by 18, or nursing qualifications) on the log odds of cohabiting in one’s first partnership relative to not having one is: 0.64 (0.13), 0.54 (0.12) and –0.38 (0.17) for women born in the 1950s, 1960s and 1970s, respectively. But note that those who have formed a union in 1970s cohort under-samples women who have a higher educational attainment, both because they have not had a union and because some of them have not had time to complete a higher educational attainment.

Through its link to the widespread substitution of cohabiting unions for direct marriage, the increase in non-marital childbearing may, therefore, be due in part to the expansion of higher education acting in conjunction with social interaction effects. For this argument to be correct it is not necessary to show that university graduates were themselves having children in cohabiting unions to a significant degree (they were not). They were the pioneers of cohabiting unions, but social interaction effects spread them widely through society, to people who would have stronger incentives to have children within such unions (see section 4).

8. Conclusions

Over the period 1845-1960, the percentage of births outside marriage moved within a small range, averaging about 5%. Up to the First World War, higher unemployment discouraged marriage and increased non-marital births, with a recovery in marriages in the subsequent year. This pattern is consistent with poorer labour market conditions discouraging marriages among pregnant would-be brides, thereby increasing bastardy. During the inter-war period, higher unemployment continued to produce postponement of marriages, but non-marital childbearing was no longer linked to unemployment, nor is there a clear link to unemployment in the post-war period.

After 1960, when the contraceptive pill was introduced, childbearing outside marriage began to climb slowly, and it exploded after 1980, reaching 42% in 2004. This was partly driven by a steep increase in age-specific non-marital births rates among women aged 20-34 from the mid-1970s to the early 1990s, after which they stabilised at a high level. At *fixed* average non-marital and marital age-specific birth rates, this increase in the proportion of births outside marriage can be mainly *accounted for* by a large fall in the proportion of women aged 20-34 who are married,

which is in turn associated with a dramatic rise in cohabiting unions. These unions are short-lived before either dissolving or being converted into marriage. But this begs the question: why didn't average non-marital fertility rates fall when more women cohabited? Women had the means (reliable contraception and legal abortion) to avoid non-marital childbearing if they wanted to do so, and so the substitution of cohabiting unions for marriages need not have raised non-marital fertility.

A theory of marriage market search (courtship) in which out-of-wedlock childbearing is an option suggests why it may be a rational choice, even when fertility can be controlled. A woman's welfare as a single mother is likely to be influenced by the prevalence of single mothers in the population, which may reflect social stigma against single mothers. When their prevalence is low, non-marital childbearing is discouraged. A temporary change in the determinants of non-marital childbearing that raises it, like the large rise in unemployment in the late 1970s/early 1980s, can produce rapid erosion of the stigma and a self-reinforcing rise in childbearing outside marriage. This dynamic is likely to be concentrated among a segment of the population who already has stronger incentives to have a child before marriage. If this social influence model is valid, then it is likely to be the case that socio-economic differences in the chances of having a child before marriage widen as childbearing outside marriage becomes more common, and the paper provides evidence that this has happened. An alternative, or complementary, explanation stresses the role of the rise in cohabiting unions and delay in partnership. These generated an increase in non-marital births by increasing the unmarried population. This view also points to the operation of a social influence model in explaining the dramatic rise in cohabitation, and the paper provides evidence of a diffusion of cohabiting unions from the better educated to the less educated population.

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APPENDIX

The British Household Panel Study

In Autumn 1991, the BHPS interviewed a representative sample of 5,500 households, containing about 10,000 persons. The same individuals are re-interviewed each successive year, and if they split off from their original households to form new households, all adult members of these households are also interviewed. Similarly, children in original households are interviewed when they reach the age of 16. Thus, the sample remains broadly representative of the population of Britain as it changes through the 1990s. The core questionnaire elicits information about income, labour market behaviour, housing conditions, household composition, education and health at each yearly interview.

The second wave of the BHPS collected, during the last quarter of 1992, complete fertility histories and also histories of all spells of marriage and cohabitation from a representative sample of 9459 adults aged 16 and over throughout Great Britain. Information on cohabitation is elicited by the following question: “As you know some couples live together without actually getting married. Have you ever lived with someone as a couple for three months or more?” If the answer is yes, questions then proceed to ask how many of such partnerships he/she had and the months and years at which they started and stopped living together. Booster samples for Scotland and Wales were added in 1999, and demographic histories were collected for these respondents in 2001. In 2001, a Northern Ireland sample was added, and demographic histories were collected from these respondents in 2002. These histories are matched with the information obtained from the annual panel interview during the period 1991-2003. This produces a history for each person through the last year that they participated in the panel, and also a partial history for people joining the panel who did not report a complete history in 1992, 2001 or 2002.

Table 1: VAR model of Births outside marriage (per 1000 births) and Marriages of Single Women (10,000s), 1849-1913*

	$bom_t - bom_{t-1}$	$mar_t - mar_{t-1}$
$bom_{t-1} - bom_{t-2}$	0.12 (0.12)	0.17 (0.06)
$bom_{t-2} - bom_{t-3}$	0.24 (0.12)	0.079 (0.064)
$mar_{t-1} - mar_{t-2}$	-0.64 (0.24)	0.23 (0.12)
$mar_{t-2} - mar_{t-3}$	-0.31 (0.22)	-0.11 (0.11)
<i>constant</i>	-0.01 (0.14)	0.281 (0.07)
<i>Granger causality:p value</i>	0.003	0.002
R^2	0.22	0.24

* standard errors in parentheses

Table 2: VAR model of Births outside marriage (per 1000 births) and Marriages of Single Women (10,000s), 1871-1939

	1871-1913*		1921-1939*	
	$bom_t - bom_{t-1}$	$mar_t - mar_{t-1}$	$bom_t - bom_{t-1}$	$mar_t - mar_{t-1}$
$bom_{t-1} - bom_{t-2}$	--	--	0.21 (0.10)	--
$mar_{t-1} - mar_{t-2}$	--	--	--	0.34 (0.31)
ur_t	0.23 (0.10)	-0.44 (0.04)	0.02 (0.12)	-0.54 (0.20)
ur_{t-1}	0.20 (0.10)	0.37 (0.04)	-0.16 (0.11)	0.52 (0.17)
<i>constant</i>	-2.81 (0.44)	0.63 (0.18)	1.31 (0.96)	0.83 (1.83)
R^2	0.47	0.74	0.31	0.41
<i>DW</i>	1.92	1.85	1.78	1.19
<i>LM (lag 1),p-val.</i>	1.00	0.69	0.71	0.28
<i>LM (lag 2),p-val.</i>	0.62	0.82	0.64	0.49

* standard errors in parentheses

Table 3: First Birth Rate before Marriage: Differences by Educational group

Birth cohort:	1950-60	1960-70	1970-80
<i>exp(β)*</i>	3.05	3.95	4.41
<i>SE</i>	(0.60)	(0.45)	(0.44)
Log-rank test, $\chi^2(1)$	35.63	172.26	265.07
<i>N-high education</i>	468	852	1374
<i>N-low education</i>	794	987	1062
<i>N</i>	1262	1839	2436
<i>N of pre-marital births</i>	148	419	516

*Cox proportional hazard model of a pre-marital first birth

Table 4: First Birth Rate before Marriage: Differences by Educational group

A. Before first live-in partnership

Birth cohort:	1950-60	1960-70	1970-80
<i>exp(β)*</i>	2.17	3.91	4.82
<i>SE</i>	(0.51)	(0.48)	(0.67)
Log-rank test, $\chi^2(1)$	22.98	142.54	154.84
<i>N-high education</i>	514	890	1329
<i>N-low education</i>	871	1077	1067
<i>N</i>	1385	1967	2396
<i>N of pre-partnership births</i>	183	359	276

*Cox proportional hazard model of first birth before the first partnership.

B. Within first cohabiting union

Birth cohort:	1950-60	1960-70	1970-80
<i>exp(β)*</i>	1.81	2.50	2.80
<i>SE</i>	(0.64)	(0.48)	(0.43)
Log-rank test, $\chi^2(1)$	2.96	24.67	48.01
<i>N-high education</i>	147	412	450
<i>N-low education</i>	154	371	428
<i>N</i>	301	783	878
<i>N of within first cohab. union births</i>	37	124	198

*Cox proportional hazard model of first birth within the first cohabiting union

Table 5: First Union: Differences by Educational group

A. Age at First Union

Birth cohort:	1950-60	1960-70	1970-80
<i>exp(β)*</i>	1.30	1.29	1.46
<i>SE</i>	(0.08)	(0.07)	(0.08)
<i>N-high education</i>	516	905	1332
<i>N-low education</i>	876	1086	1072
<i>N</i>	1392	1991	2404
<i>N of first unions</i>	1100	1576	1237

*Cox proportional hazard model of first partnership formation.

B. Odds of cohabiting union relative to marriage

Birth cohort:	1950-60	1960-70	1970-80
<i>β*</i>	-0.69	-0.38	0.13
<i>SE</i>	(0.14)	(0.10)	(0.15)
<i>N-high education</i>	395	691	595
<i>N-low education</i>	705	885	642
<i>N</i>	1100	1576	1237
<i>N of cohab.unions</i>	297	955	1034

*Logistic model of odds of cohabiting in first partnership.

Figure 1: Births outside Marriage(per 1000 births) and General Fertility Rate (per 1000 women aged 15-44)

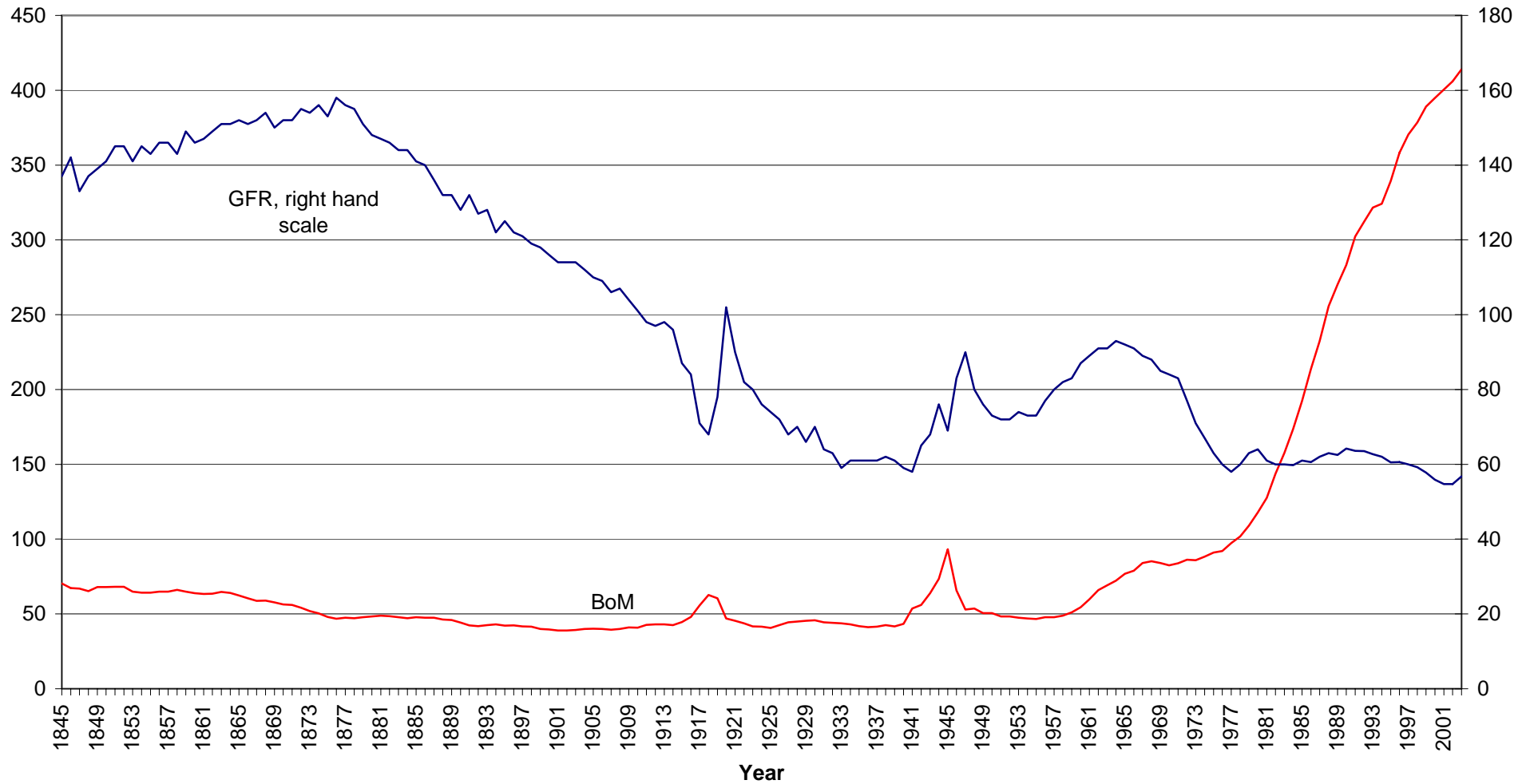


Figure 2: Births Outside Marriage (per 1000 births) and Marriages of Single Women (10,000s)

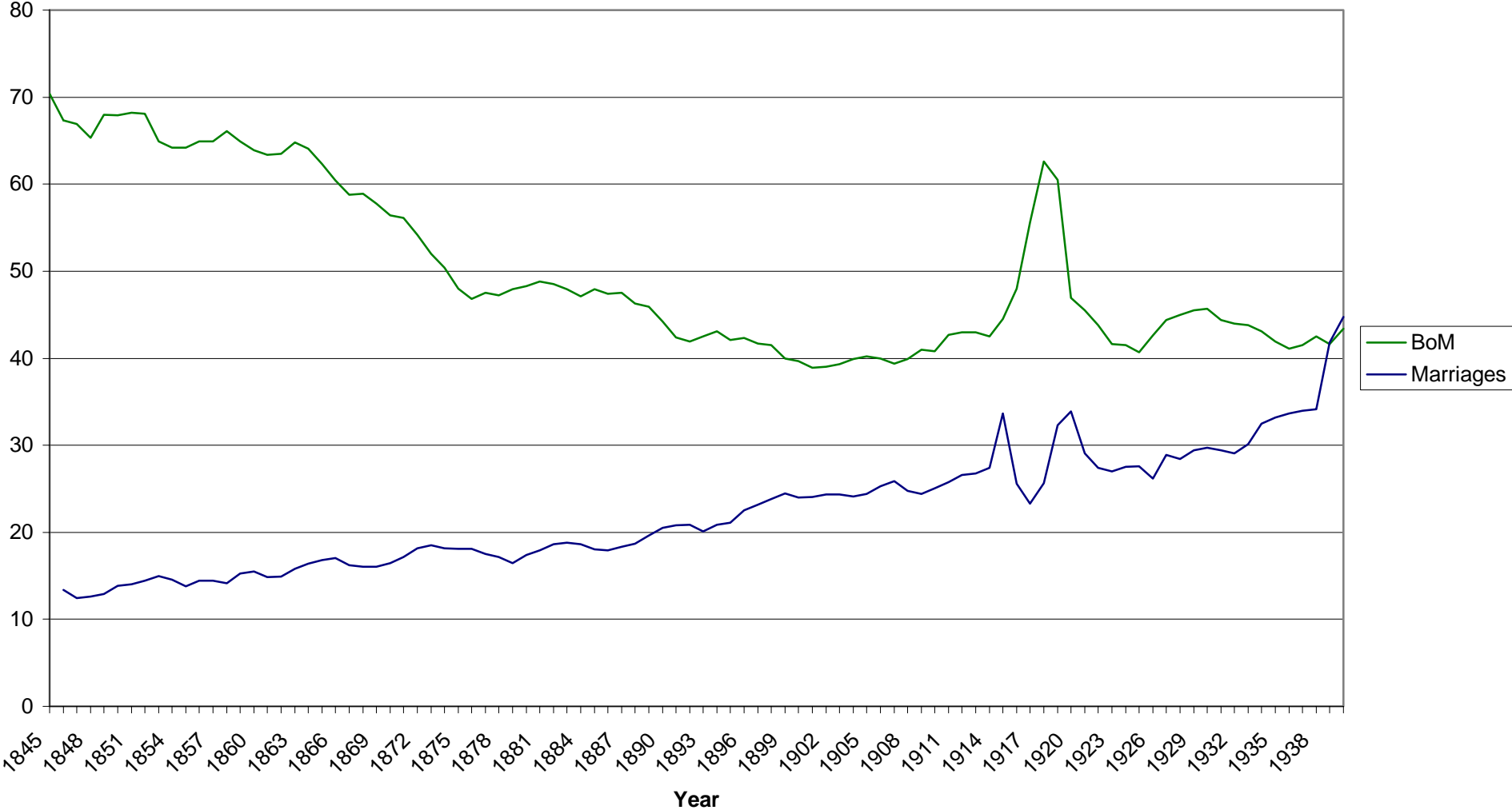


Figure 3: Marriages of Single Women, Births Outside Marriage and the Unemployment rate

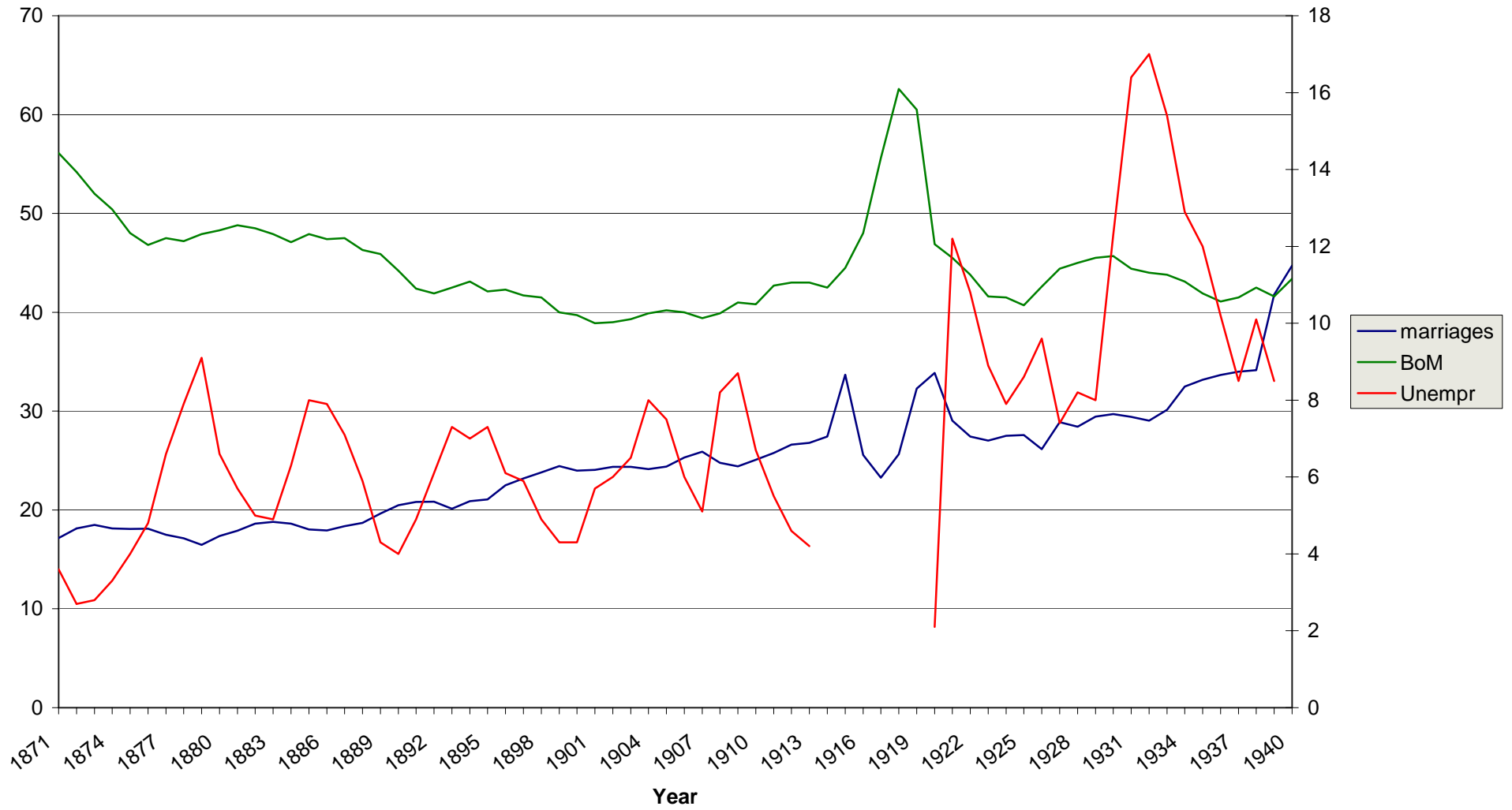


Figure 4: Birth rate Outside Marriage, per 1000 unmarried women

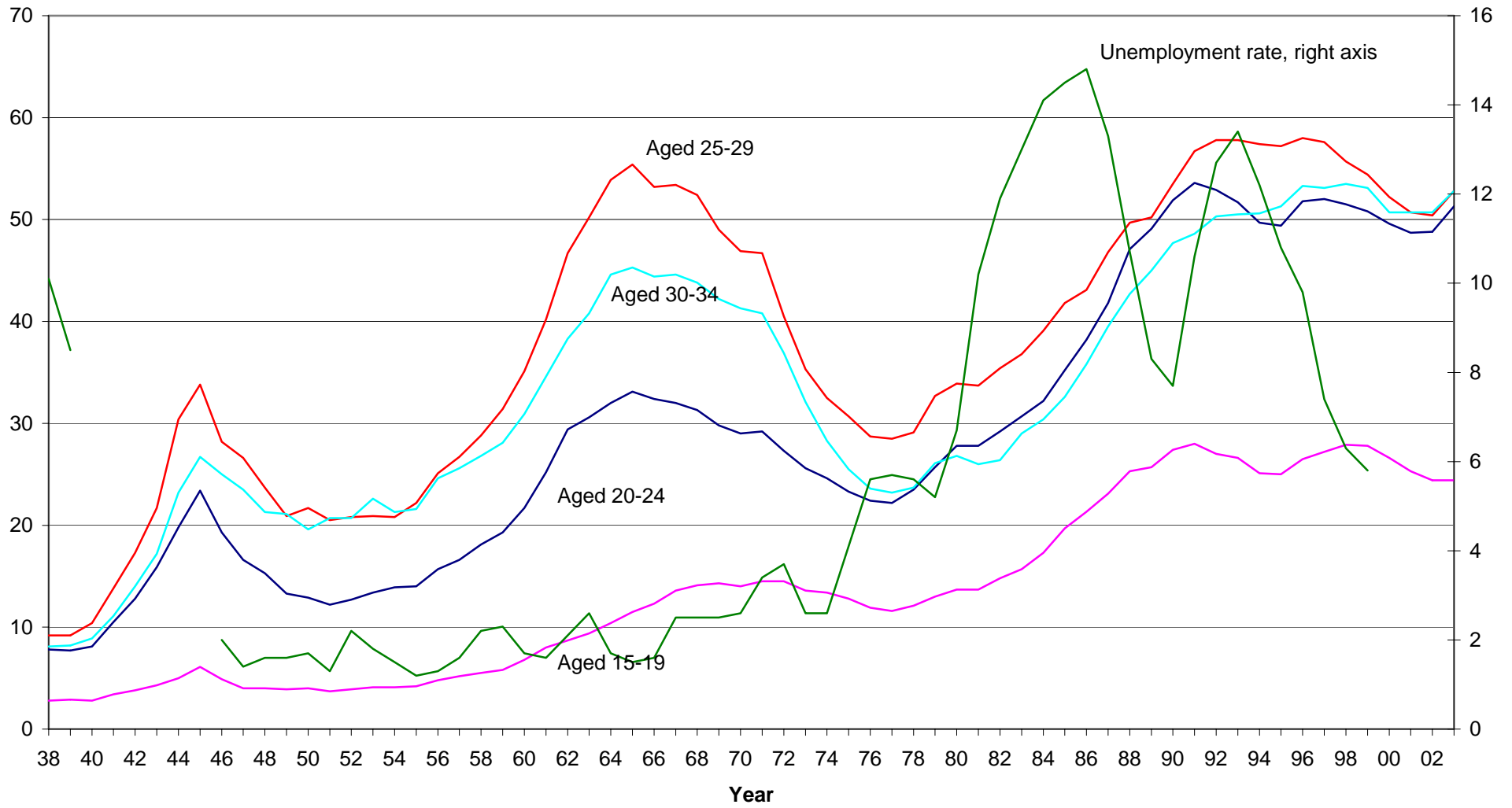


Figure 5: Birth rate within Marriage, per 1000 married women

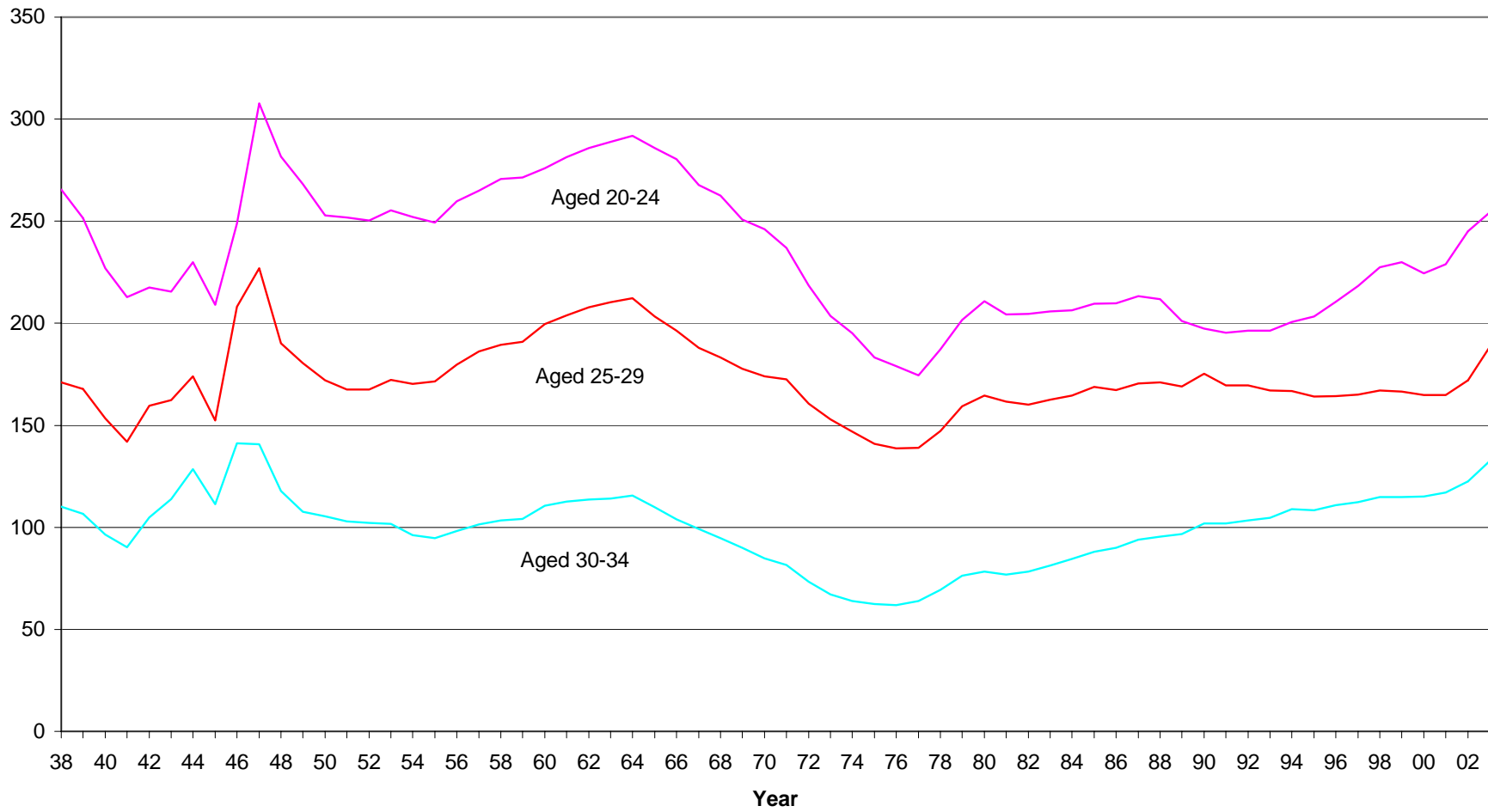


Figure 6: Proportion of Women not Married

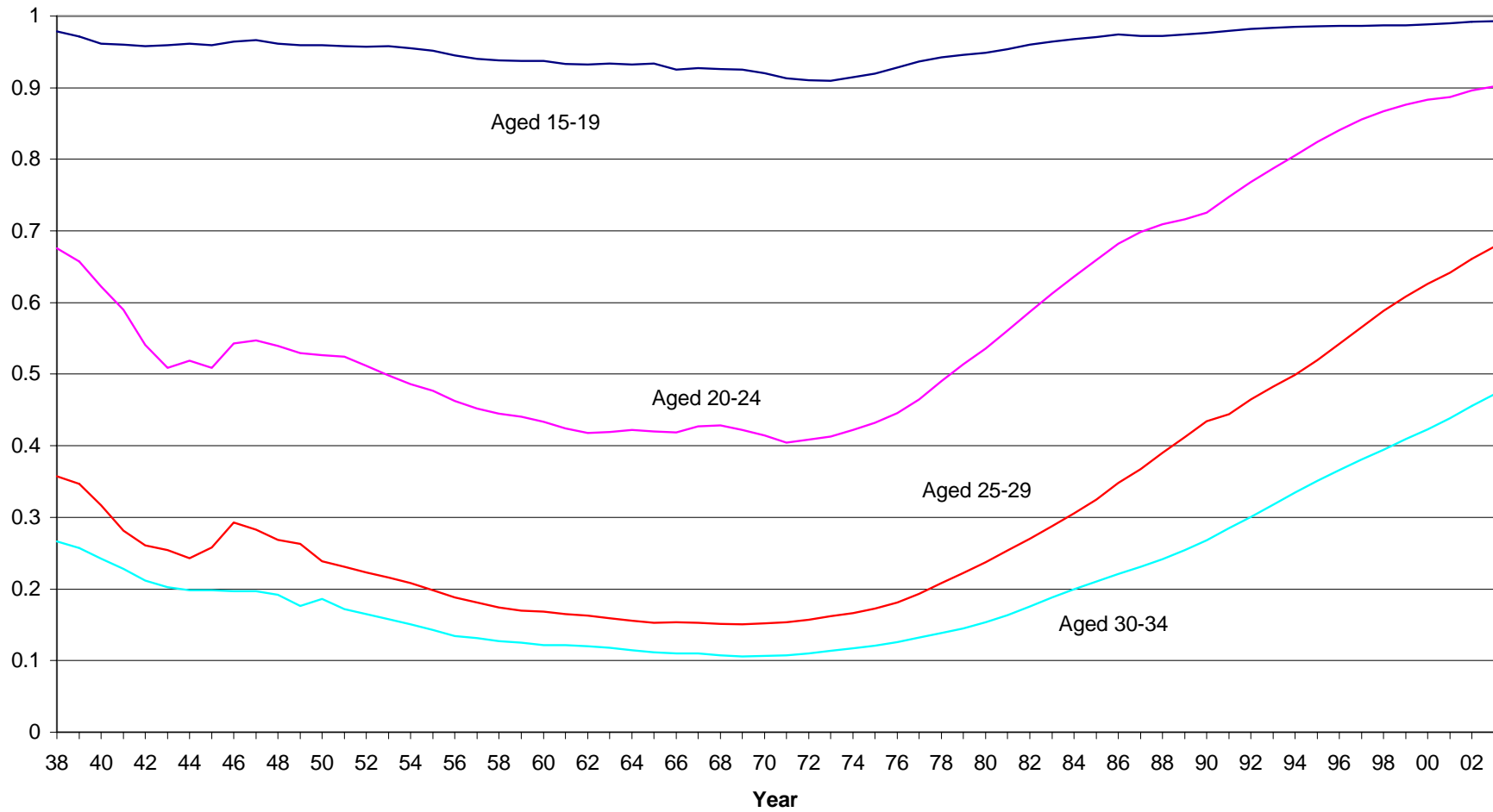


Figure 7: Equilibria in Proportions becoming a Single Mother

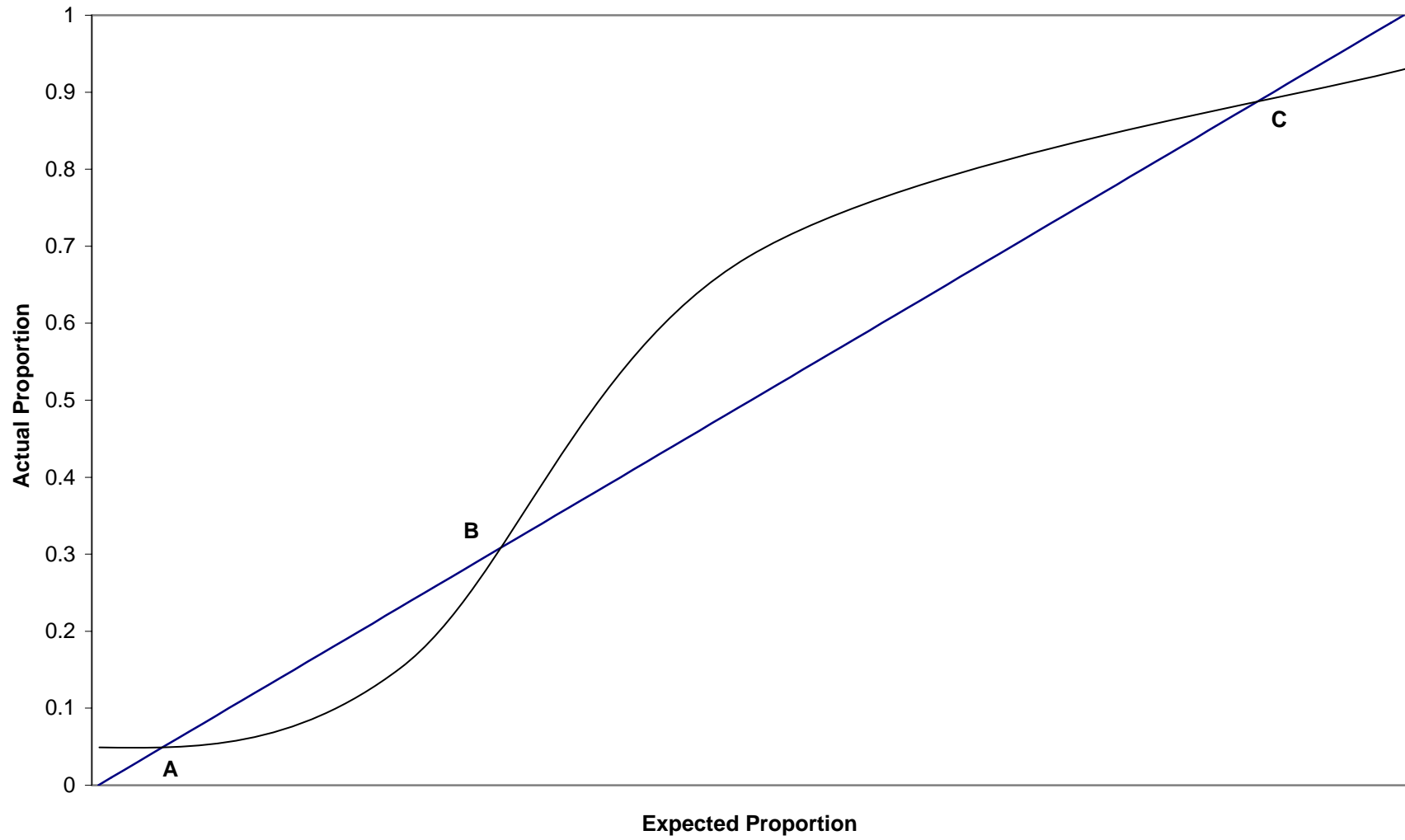


Figure 8: Equilibrium Proportions becoming a Single Mother

