Marriage and Divorce*

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June 2005

Abstract

We document the increase in marital turnover and survey economic models of the marriage market. Couples match based on attributes but sorting is constrained by costs of search. Divorce is caused by new information on match quality and remarriage requires further search. Although most men and women marry, they are single more often and more children live in one parent household. The impact on children depends on child support transfers. Such transfers may rise with the aggregate divorce (remarriage) rates

1 Introduction

This survey summarizes the economic analysis of marriage markets. The first section provides a description of stylized facts that motivate the interest of economists in this problem. It is shown that marital status is closely tied with "economic" variables such as work and wages. We illustrate these facts using mainly US data but the patterns are similar in all developed countries. The second section demonstrates how the tools of economists bear on "non-economic" subjects such as marriage, fertility and divorce, often analyzed by researchers from other fields. The last section highlights some connections between the theory and empirical evidence.

2 Basic Facts

2.1 Marriage and divorce

The last century has been characterized by substantial changes in family structure (Figure 1). More men and women are now divorced and unmarried or have alternative arrangements, such as cohabitation. Interestingly, the rise in divorce rates is associated with an increase in remarriage rates (relative to first

*Prepared for Palgrave Dictionary of Economics, Second Edition.

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marriage rates), reflecting higher turnover. Most people had a first marriage, and most divorces end in remarriage. Moreover, the remarriage rate is above the first marriage rate and far exceeds the divorce rate, suggesting that, despite the larger turnover, marriage is still a "natural" state (Table 1). Women enter the first marriage faster than men. However, following divorce, men remarry at higher rates than women, especially at old ages. This pattern reflects the earlier marriage of women and their longer life that cause the ratio of men to women to decline with age.

One consequence of higher marital turnover is the large number of children who live in single parent and step parent households. In 2002, 23 percent of US children less than 18 years old lived only with their mother and 5 percent lived only with their father. Children of broken families are more likely to live in poverty and under-perform in school. Lower attainments of such children are observed also prior to the occurrence of divorce, suggesting that bad marriage rather than divorce may be the cause (Piketty, 2001).

2.2 Marriage and work

Time use data (Table 2) show that men work more than women in the market; women do more housework than men. Per day, single women work at home 3 hours while single men work less than 2 hours. These figures roughly double for married couples with young children, showing clearly that children require a substantial investment of time and that most of this load is taken by the mother. The total time worked and the corresponding amount of leisure is about the same for married men and women.

Figure 2 displays the work patterns within couples. The most common situation is that the husband works full time and the wife works part time or does not work at all. However, the proportion of such couples has declined and the proportion of couples where *both* partners work full time has risen sharply, reflecting the increased entry of married women into the labor force.

2.3 Marriage and wages

Male female wage differences of full time workers are larger among married than among single persons. Married men have consistently the highest wage among men, while never married women have the highest wage among women. The wage gap between married men and women rises as the cohort ages, reflecting the cumulative effects of gender differences in the acquisition of labor market experience (Figures 3, 4). The increased participation of married women, associated with the increase in their wages has increased their wage relative to never married women and relative to their husbands (Table 3).

3 Economic theory of marriage and divorce

From an economic point of view, marriage is a voluntary partnership for the purpose of joint production and joint consumption. As such, it is comparable to other economic organizations that aim to maximize some private gains, but are subject to market discipline.

3.1 Gains from marriage

Consumption and production in the family are broadly defined to include non marketable goods and services, such as companionship and children. Indeed, the production and rearing of children is the most commonly recognized role of the family. We mention here five broad sources of *economic* gain from marriage. i.e., why "two are better than one":

1) Sharing of collective (non rival) goods; both partners can equally enjoy their children, share the same information and use the same home.

2) Division of labor to exploit comparative advantage or increasing returns; one partner works at home and the other works in the market.

3) Extending credit and coordination of investment activities; one partner works when the other is in school.

4) Risk pooling; one partner works when the other is sick or unemployed.

5) Coordination of child care, which is a collective good for the parents. Although children can be produced and raised outside the family, the family has a substantial advantage in carrying out these activities. Two inter-related factors cause this advantage: by nature, parents care about their own children and, because of this mutual interest, it is more efficient that the parents themselves determine the expenditure on their children. If the parents live separately, as either single or remarried, the non-custodian parent loses control of child expenditures. Lack of contact further reduces the incentive or ability to contribute time and money to the children. Together, these factors reduce the welfare of both parents and children when they live apart (Weiss and Willis, 1985).

3.2 Family decision making

The existence of potential gains from marriage is not sufficient to motivate marriage and to sustain it. Prospective mates are concerned whether the potential gains will be realized and how they are divided. Family members have potentially conflicting interests and a basic question is how families reach decisions. The old notion that families maximize a common objective appears to be too narrow. Instead of this *unitary* model, it is now more common to consider *collective* models in which partners with different preferences reach some binding agreement that specifies an *efficient* allocation of resources and a *stable sharing rule*. (Browning et al., 2005, ch. 4).

In a special case, referred to as *transferable utility*, it is possible to separate the issues of efficiency and distribution. This situation arises if there is a

commodity (say money) that, upon changing hands, shifts utilities between the partners at a fixed rate of exchange. In this case, the family decision process can be broken into two steps: actions are first chosen to maximize a weighted *sum* of the individual utilities, then money is transferred to divide the resulting marital output. In general, the problems of efficiency and distribution are intertwined. We may still describe the family as maximizing a weighted sum of the individual utilities, but the weights depend on the individual bargaining powers, and any shift in the weights will affect the family choice. The bargaining power may depend on individual attributes such as earning capacity, subjective factors such as impatience and risk aversion, and on market conditions, such as the sex ratio and availability of alternative mates (Lundberg and Pollak, 1993).

The question remains; what enforces the coordination between family members? One possibility is that the partners sign a formal "marriage contract" that is enforced by law. However, such contracts are quite rare in modern societies, which can be probably ascribed to a larger reliance, relative to the past, on emotional commitments and the presumption that too much contracting can "kill love". In the absence of legal enforcement, efficient contracts may be supported by repeated interactions and the possibility to trade favors and punishments. This possibility arises because marriage is a durable relationship, forged by the long-term investment in children and the accumulation of marital specific capital, which is lost or diminished in value if separation occurs. However, repeated game arguments cannot explain unconditional giving, such as taking care of a spouse stricken by Alzheimer who would never be able to return the favor. Emotional commitments and altruism play a central role in enforcing family contracts (Becker, 1991, ch.8).

3.3 The marriage market

Individuals in society have many potential partners. An undesired marriage can be avoided or replaced by a better one. This situation creates competition over the potential gains from marriage. In modern societies, explicit price mechanisms are not observed. Nevertheless, the assignment of partners and the sharing of the gains from marriage can be analyzed within a market framework.

Matching models provide a starting point for such analysis. These models investigate the mapping from preferences over prospective matches into a stable assignment (Roth and Sotomayor, 1990). An assignment is said to be *stable* if no married person would rather be single and no two (married or unmarried) persons prefer to form a new union. To illustrate, assume that each male is endowed with a single trait, m, and each female is endowed with a single trait, f. Let

$$z = h(m, f). \tag{1}$$

be the *household production function* that summarizes the impact of traits of the matched partners on marital output, z, and assume that $h(m, f)$ is increasing in m and f .

Suppose, first, that z is a public good that the partners must consume jointly.

Then, the only stable assignment is such that males with high m marry females with high f, and, if there are more (less) eligible men than women, the men (women) with the lowest endowments remain unmarried. All men want to marry the best woman, and she will accept only the best man. After this pair is taken "out of the game", we can apply the same argument to the next best couple and proceed sequentially. Such a matching pattern is called positive *assortative mating*.

If one assumes, instead, that z can be divided between the two partners and that utility is transferable then a man with low m may obtain women with high f by giving up part of his private share in the gains from marriage. The type of interaction in the gains from marriage determines the willingness to pay for the different attributes. Complementarity (substitution) means that the two traits interact in such a way that the benefits from a woman with high f are higher (lower) for a male with high m than for a male with low m. Thus, a positive (negative) assortative mating occurs if the two traits are complements (substitutes). An important lesson is that in a marriage market with sufficient scope for compensation within marriage, the best man is not necessarily the one married to the best women, because, with negative interaction, either one of them can be bid away by the second best of the opposite sex (Becker 1991, ch. 4).

What determines the division of marital gains? If each couple is considered in isolation then, in principle, any efficient outcome is possible, and one has to use bargaining arguments to determine the allocation. However, in an "ideal" frictionless case, where partners are free to break marriages and swap partners at will, the outcome depends on the joint distribution of male and female characteristics in the market at large. Traits of the partners in a particular marriage have no direct impact on the shares of the two partners, because these traits are endogenously determined by the requirement of stable matching.

These features show up more clearly if one assumes continuum of agents and continuous marital attributes. Let $F(m)$ and $G(f)$ be the cumulative distributions of the male and female traits, respectively, and let the measure of women in the total population be r, where the measure of men is normalized to 1. Assume that the female and male traits are complements and transferable utility. Then, if man m' is married to woman f', the set of men with m exceeding $m\prime$ must have the same measure as the set of women f above $f\prime$. Thus, for all m and f in the set of married couples,

$$1 - F(m) = r(1 - G(f)). \tag{2}$$

This simple relationship determines a positively sloped matching function, $m = \phi(f)$.

A *sharing rule* specifies the shares of the wife and husband in every marriage that forms. Let $v(m)$ be the *reservation utility* that man m requires in *any* marriage and let $u(f)$ be the reservation utility of woman f. Then the sharing rule that supports a stable assignment must satisfy

$$
\begin{aligned}
v(m) &= \max_{f} \left(h(f,m) - u(f) \right), \qquad (3) \\
&\text{and} \\
u(f) &= \max_{y} \left(h(z,y) - v(y) \right).
\end{aligned}
$$

That is, each married partner gets the spouse that maximizes his/hers "profit" from the partnership over all possible alternatives. As we move across matched couples, the welfare of each partner changes according to the *marginal* contribution of his/her *own* trait to the *marital* output, irrespective of the potential impact on the partner whom one marries. With a continuum of agents, there are no rents in the marriage market because everyone receives roughly what can be obtained in the best next alternative. Another condition for a stable assignment is that if there are unmarried men, the least attractive married man cannot get any surplus from marriage. Otherwise, slightly less attractive men could bid away his match. A similar condition applies for unmarried women.

From these considerations, one can obtain a *unique* sharing rule, provided that $r \neq 1$. Basically, one first finds the sharing in the least attractive match, using the no rent condition. Then, the division in better marriages is determined sequentially, using the condition that along the stable matching profile each partner receives his\her marginal contribution to the marital output. The sharing rule is fully determined by the sex ratio and the respective trait distributions of the two sexes. It can be shown that a marginal increase in the proportion of women to men in the marriage market improves (or leaves unchanged) the welfare of *all* men, and reduces (or leaves unchanged) the welfare of *all* women. From (2), it is seen that an upward (downward) first order shift in the distributions of traits is equivalent (in terms of the effects on the sharing rule) to a marginal increase (decrease) in the female/male ratio. In this regard, there is close correspondence between the impact of changes in quality (i.e., the average trait) and size of the two groups that are matched in the marriage market (Browning et al., 2005, ch. 9).

3.4 Search

The process of matching in real life is characterized by scarcity of information about potential matches. Models of search add realism to the assignment model, because they provide an explicit description of the sorting process that happens in real time.

Following Mortensen (1988), consider infinitely lived agents and assume that meetings are governed by a Poisson random process (these two assumptions are made to ensure a stationary environment). The total marital output is observed upon meeting and, assuming transferable utility, marriage will occur whenever this marital output exceeds the *sum* of the values of continued search of the matched partners. This rule holds because it implies the existence of a division within marriage that makes both partners better off. Because meetings

are random and sparse in time, those who actually meet and choose to marry enjoy a positive rent. The division of these rents between the partners is an important issue. Two considerations determine the division of the gains from marriage: outside options, reflected in the value of continued search, and the self-enforcing allocation that would emerge if the marriage continued without agreement (Wolinsky, 1987). Combining these two considerations, the sharing rule is influenced by both the value of search as single and the value of continued search during the bargaining process, including the option of leaving when an outside offer arrives. In this way, a link is created between the division of marital output gains and market conditions.

Search models explain why, despite the gains from marriage, part of the population is not married and the transitions of individuals between married and single states. The steady state proportions of the population in each state are such that the flows into and out of each state are equalized. These two flows are determined by the search strategies that individuals adopt.

Search models may have significant externalities. For instance, it may be easier to find a mate if there are many singles searching for mates. There are several possible reasons for such *increasing returns* in the matching process. One reason is that the two sexes meet in a variety of occasions (work, sport, social life, etc.) but many of these meetings are "wasted", in the sense that one of the individuals is already attached and not willing to divorce. A second reason is that the establishment of more focused channels, where singles meet only singles, is costly. These will be created only if the "size of the market" is large enough. Thirdly, the intensity of search by unattached decreases with the proportion of attached people in the population who are less likely to respond to an offer (Mortensen, 1988). In such a case, the marriage (divorce) rates will be above (below) their efficient levels, as each person fails to consider the affect of marriage or separation on the prospects of other participants in the marriage market.

3.5 Search and Assortative Mating

The presence of frictions modifies somewhat the results on assortative mating. Following Burdett and Cole (1999), consider a case of non-transferable utility with frictions. Assume that if man m marries women f, he gets f and she gets m. There is a continuum of types with continuous distributions and meetings are generated by a Poisson process with parameter λ. Upon meeting, each partner decides whether to accept the match or to continue the search. Marriage occurs only if both partners accept each other and, by assumption, a match cannot be broken.

Each man (woman) chooses a reservation policy that determines which women (men) to accept. The reservation values for men and women, R_m and R_f, respectively, depend on the individual's own trait. Agents at the top of the distribution of each gender can be choosier because they know that they will be accepted by most people on the other side of the market and. Hence, continued

search is more valuable for them. Formally, let

$$\begin{aligned} R_m &= b_m + \frac{\lambda \mu_m}{r} \int_{R_m}^{\bar{f}} (f - R_m) dG_m(f), \\ R_f &= b_f + \frac{\lambda \mu_f}{r} \int_{R_f}^{\bar{m}} (m - R_f) dF_f(m). \end{aligned} \tag{4}$$

Where, the flow of benefits as single, b, the proportion of meetings that end in marriage, μ, and the distribution of "offers" if marriage occurs, all depend on traits, as indicated by the m and f subscripts. The common discount factor, r, represents the cost of waiting.

In equilibrium, the reservation values of all agents must be a best response against each other, yielding a (stationary) Nash equilibrium. In particular, the "best" woman and the "best" man will adopt the policies

$$\begin{aligned} R_{\bar{m}} &= b_{\bar{m}} + \frac{\lambda}{r} \int_{R_{\bar{m}}}^{\bar{f}} (f - R_{\bar{m}}) dG(f), \\ R_{\bar{f}} &= b_{\bar{f}} + \frac{\lambda}{r} \int_{R_{\bar{f}}}^{\bar{m}} (m - R_{\bar{f}}) dF(m). \end{aligned} \tag{5}$$

Thus, the best man accepts some women who are inferior to the best woman and the best woman accepts some men who are inferior to the best man, because one bird at hand is better than two birds on the tree.

The assumption that the ranking of men and women is based on a single trait, introduces a strong commonality in preferences, whereby all men agree on the ranking of all women and vice versa. Because all individuals of the opposite sex accept the best woman and all women accept the best man, μ is set to 1 in equation (5) and the distribution of offers equals the distribution of type in the population. Moreover, if the best man accepts all women with f in the range $[R_{\bar{m}}, \bar{f}]$ then all men who are inferior in quality will also accept such women. But this means that all women in the range $[R_{\bar{m}}, \bar{f}]$ are sure that all men accept them and therefore will have the *same* reservation value, $R_{\bar{f}}$, which in turn implies that all men in the range $[R_{\bar{f}}, \bar{m}]$ will have the same reservation value, $R_{\bar{m}}$.

These considerations lead to a *class structure* with a finite number of distinct classes in which individuals marry each other. Having identified the upper class, we can then examine the considerations of the top man and woman in the rest of the population. Lower class individuals face $\mu < 1$ and a *truncated* distribution of offers because not all meetings end in marriage but, in principle, these can be calculated and then one can find the reservation values for the highest two types and all other individuals in the group forming the second class. Proceeding in

this manner to the bottom, it is possible to determine all classes. This pattern is similar to the case without frictions and non transferable utility except that, because of the need to compromise, low and high quality types mix within each class.

With frictions and transferable utility, there is still a tendency towards positive (negative) assortative mating based on the interaction in traits. If the traits are complements, individuals of either sex with a higher endowment will adopt a more selective reservation policy and will be matched, on the average, with a highly endowed person of the opposite sex. However, with sufficient friction, it is possible to have negative assortative mating even under complementarity. This, again, is driven by the need to compromise. With low frequency of meetings and costs of waiting, males with low m expect some women with high f to accept them. If the gain from such a match is large enough, they will reject all women with low f and wait until a high f woman arrives.

3.6 Divorce and remarriage

Divorce is motivated by uncertainty and changing circumstances. Thus, individuals may enter a relationship and then break it if a better match is met. Or, changing economic and emotional circumstances may dissipate the gains from marriage. As time passes, new information on match quality and outside options is accumulated, and each partner decides whether to dissolve the partnership. In making this choice, partners consider the expected value of each alternative, where the value of remaining married includes the option of later divorce and the value of divorcing includes the option of later remarriage. Under divorce at will, divorce occurs endogenously whenever one partner has an alternative option that the current spouse cannot, or is unwilling, to match by a redistribution of the gains from marriage.

Following divorce, the options for sharing and coordination of activities diminish. The divorced partners may have different economic prospects, especially if children are present. Asymmetries arise because the mother usually loses earning capacity as a result of having a child. To mitigate these risks, the partners have a mutual interest in signing binding contracts that stipulate post divorce transfers. Such contracts are negotiated "in the shadow of the law" and are legally binding. Child support payments are mandatory but the non custodial father may augment the transfer to influence child expenditures by the custodial mother. Payments made to the custodial mother are usually fungible and, therefore, the amount that actually reaches the children depends on the mother's marital status. If she remarries, child expenditures depend on the new husband's net income, including his child support commitments to his ex-wife. Hence, the willingness of each parent to provide child support depends on commitments of others. These interdependencies can yield *multiple equilibria*, with and without children and correspondingly low and high divorce rates (Browning et al., 2005, ch. 11).

4 Theory and Evidence

There is a growing body of empirical research that addresses the testable implications of the models outlined above.

- The unitary model of the household implies that the consumption levels of husband and wife depend only on *total* family income. This, however, is rejected by the data (Lundberg et al., 1997). Nevertheless, consumption and work patterns of married couples indicate that they act efficiently (Browning and Chiappori, 1994), implying that a collective model fits the data.

- Matching models with transferable utility imply positive assortative mating based on the spouses' schooling but negative mating based on their wages (Becker, 1991, ch. 10). In fact, the correlation between the education levels of married partners (about .6) is substantially higher than the correlation between their wages (about .3).

- Because partners are matched based on their traits as observed at the time of marriage, both positive or negative *surprises* trigger divorce (Becker, 1991, ch. 10). Weiss and Willis (1977) find an impact of unexpected changes in husband's and wife's incomes on the probability of divorce.

- Unanticipated shocks are less destabilizing if partners are well matched. Anticipating that, couples would sort into marriage according to characteristics that enhance the stability of marriage. In fact, individuals with similar schooling are less likely to divorce and are more likely to marry. This pattern holds for religion and ethnicity too (Weiss and Willis, 1997).

- Individual types congregate into locations that facilitate matching; gays in San Francisco (Black et al., 2002) or Jews in New York (Bisin et al.,2004). Such patterns suggest increasing returns in search. Higher wage variability among men induces women to search longer for their first or second husband, consistently with an optimal search strategy (Gould and Paserman, 2003).

- Marital choices and family decisions respond to aggregate marriage market conditions. Black women in the USA delay their marriage and have children out of wedlock because of a shortage of eligible black men (Willis, 1999); a higher male female ratio reduces the hours worked by wives and raises the hours worked by husbands, Chiappori et al. (2002).

- The sharp increase in divorce in the U.S. and other countries during 1965-1975 seems to constitute a switch across two different equilibria. A marriage market is capable of such abrupt change because of inherent positive feedbacks in matching and contracting. Explanations for the timing of the change include the appearance of the contraceptive pill, break up of norms, and legal reforms (Michael, 1988, Goldin and Katz, 2001).

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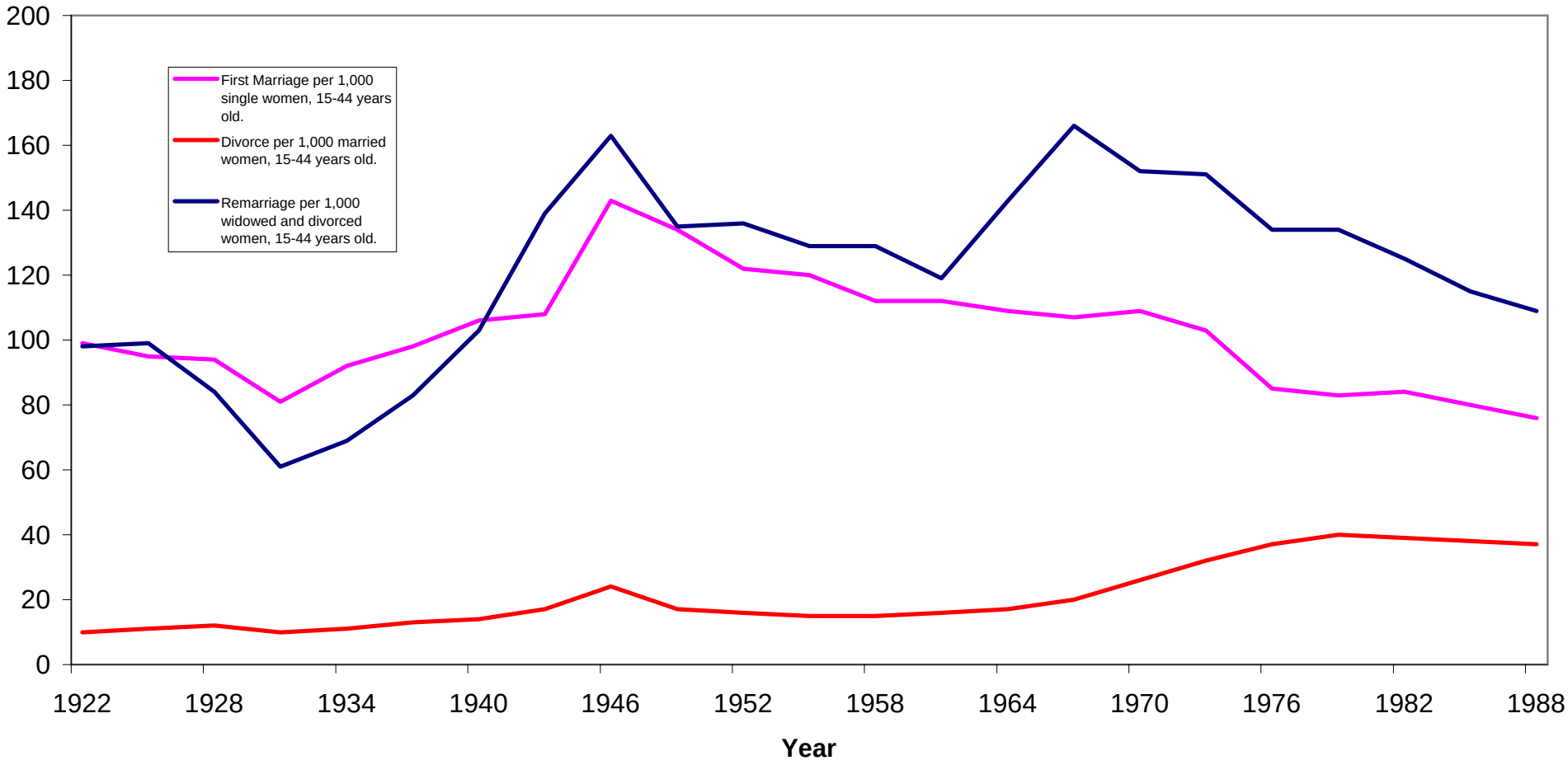
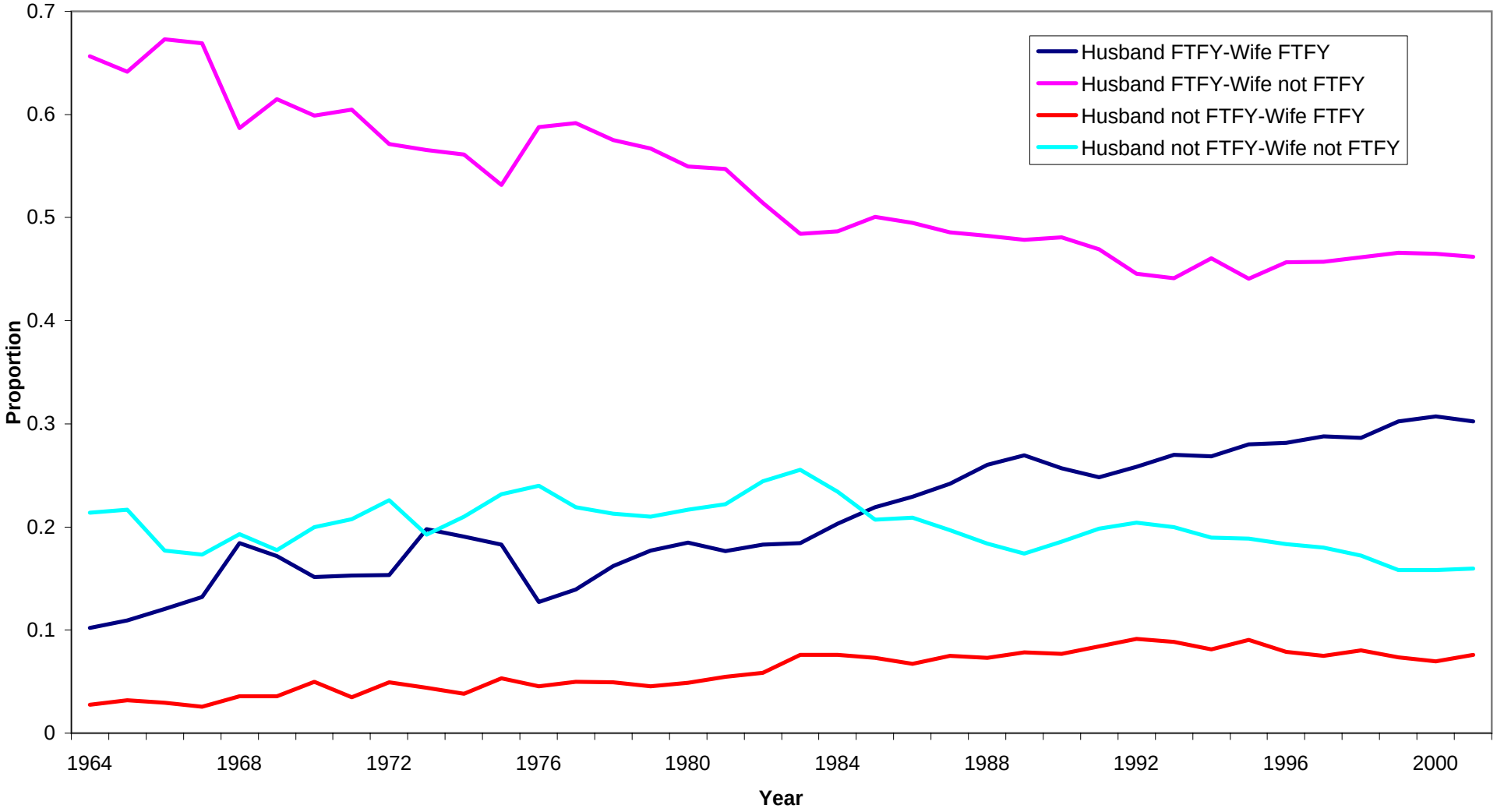
Figure 1: Annual Rates (per 1,000) of First Marriage , Divorce, and Remarriage: U.S. 1921 to 1989 (3-Year Averages)



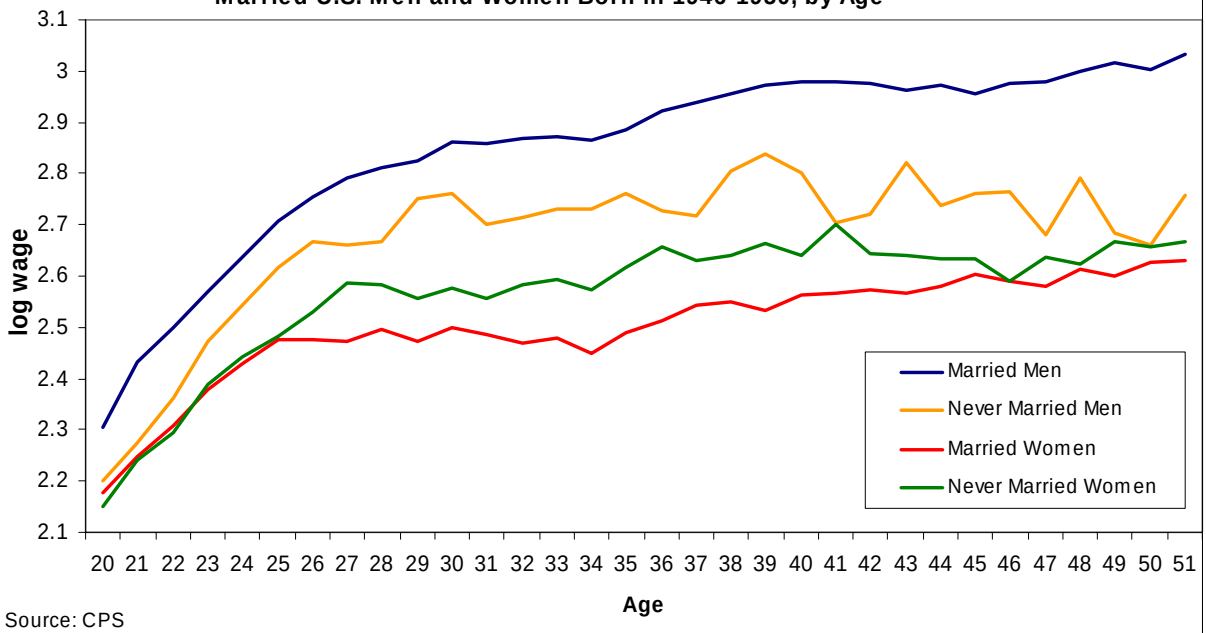
Source: National Center of Health Statistics.

Figure 2: Work Patterns of Husbands and Wives (Aged 30-40), U.S. 1964-2001



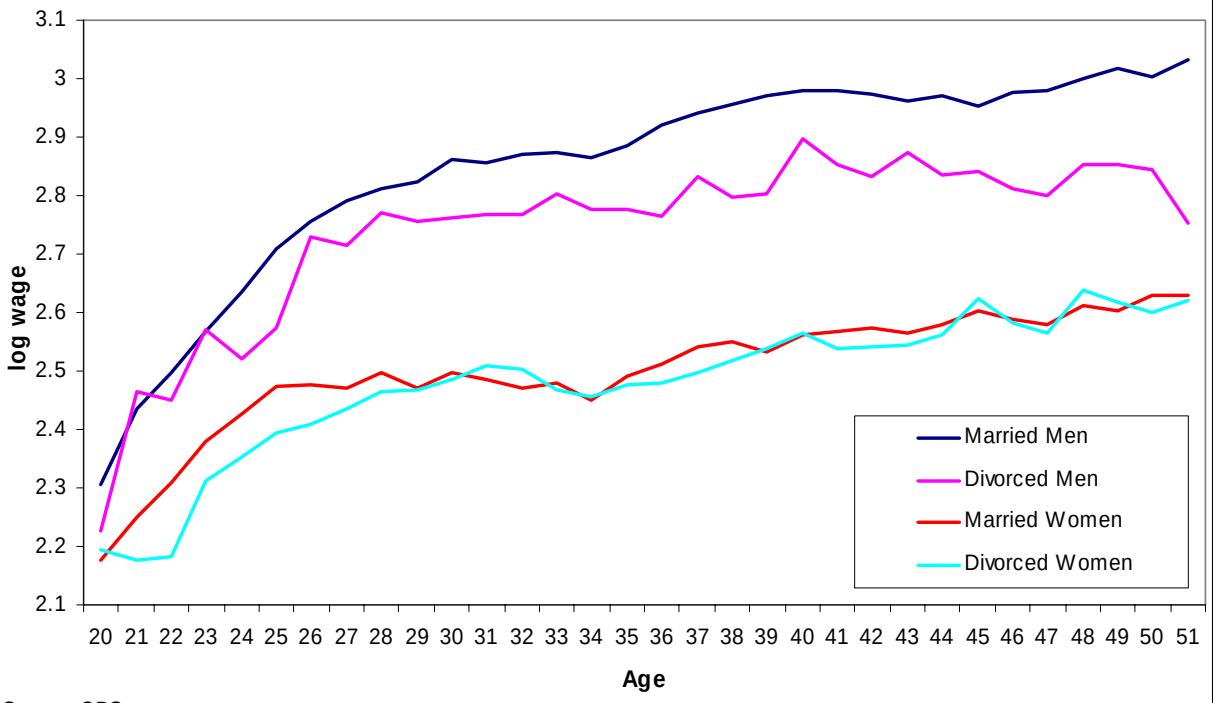
Source: CPS. A spouse is employed full-time-full-year (FTFY) if he/she works 50 weeks or more and hours per week exceed 34.

Figure 3: Hourly Wages (in Logs) of Fully Employed Married and Never Married U.S. Men and Women Born in 1946-1950, by Age



Source: CPS

Figure 4: Hourly Wages (in Logs) of Fully Employed Married and Divorced U.S. Men and Women Born in 1946-1950, by Age



Source: CPS

Table 1: Marital Histories of Men and Women, U.S., 1996

Age at 1966	Ever married by 1966		Divorced from first marriage by 1966		Remarried after first divorce by 1966	
	Men	Women	Men	Women	Men	Women
25	31.8	50.0	4.6	12.2	55.5	44.0
30	65.4	71.1	16.7	17.2	35.6	49.7
35	77.4	84.1	26.9	26.4	60.7	65.1
40	80.9	85.2	34.0	36.5	66.4	67.6
45	87.3	89.8	41.1	41.6	71.6	68.1
50	93.2	91.3	39.8	42.4	78.3	68.9
55	94.5	95.3	38.2	38.0	79.0	64.1
60	96.6	94.9	34.3	30.7	86.9	64.7

Source: U.S. Census Bureau, Survey of Income and Program Participation (SIPP), 1996 Panel, Wave 2 Topical Module.

Table 2: Daily Hours of Work of Men and Women (Age 20-59) in the Market and at Home by Marital Status, Selected Countries and Years

	U.S.	Can.	UK	Ger.	Italy	Norw.
Year	1985	1982	1985	1992	1989	1990
Paid work						
Single men	5.5	5.6	4.2	6.4	4.9	4.7
Single women	4.6	4.3	3.3	5.0	3.3	4.0
Married men, no child	6.2	6.2	5.5	6.3	5.5	5.7
Married women, no child	3.3	4.0	3.8	3.3	2.0	4.2
Married men, child 5-17	6.1	5.9	5.7	6.7	6.1	6.0
Married women, child 5-17	3.5	3.7	2.6	3.2	2.2	3.6
Married men, child <5	6.9	6.2	6.1	6.8	6.2	5.7
Married women, child <5	1.9	2.4	2.0	2.2	1.9	2.1
House work (including child care)						
Single men	1.6	1.7	2.2	1.6	0.7	1.7
Single women	2.8	3.3	3.9	3.4	3.1	2.9
Married men, no child	1.8	2.0	3.3	2.2	1.3	2.1
Married women, no child	4.1	3.9	3.8	4.8	6.4	3.5
Married men, child 5-17	2.3	2.5	2.1	2.3	1.2	2.4
Married women, child 5-17	4.4	4.7	5.5	5.5	7.0	4.5
Married men, child <5	2.3	3.2	2.3	2.8	1.5	3.2
Married women, child <5	6.4	6.8	3.8	6.9	7.6	6.1

Source: Multinational Time Use Study

Table 3: Relative Wage Gaps associated with Marital Status for Fully Employed Men and Women, by Year and Age, U.S.

Years Age	Married- Never Married		Married- Divorced		Mar. Men- Mar. Women	Husband- Wife
1965-74	Men	Women	Men	Women	between groups	within couples
25-34	13.8	-8.8	9.6	4.5	37.2	32.5
35-44	21.5	-17.6	17.1	-1.6	52.1	42.7
1975-84						
25-34	15.6	-6.5	8.5	-.5	35.4	29.6
35-44	21.0	-17.5	12.4	-2.8	52.1	43.8
1985-94						
25-34	15.6	-2.0	15.4	7.7	23.6	21.1
35-44	21.3	-9.9	15.4	2.4	38.7	32.1
1995-2001						
25-34	13.6	2.3	13.6	2.3	17.0	18.1
35-44	23.7	-1.8	21.4	7.8	31.7	27.5

Source: CPS.