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A Theory of Marriage: Part II

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1. Introduction

In "A Theory of Marriage: Part I," published in the July/August 1973 *Journal of Political Economy*, I presented an analysis of the "marriage market." This paper extends the analysis in that paper to include caring between mates, polygamous marital arrangements, genetic selection related to assortive mating, and separation, divorce, and remarriage. Its purpose is both to enrich the discussion in Part I and to show the power of this approach in handling different kinds of marital behavior.

In Part I (1973) I offered a simplified model of marriage that relies on two basic assumptions: (1) each person tries to find a mate who maximizes his or her well-being, with well-being measured by the consumption of household-produced commodities, and (2) the "marriage market" is assumed to be in equilibrium, in the sense that no person could change mates and become better off. I argued that the gain from marriage compared to remaining single for any two persons is positively related to their incomes, the relative difference in their wage rates, and the level of nonmarket-productivity-augmenting variables, such as education or beauty.

The optimal association between mates with respect to different traits, such as ability, education, race, income, and height, was analyzed. I showed that positive associations, matings of likes, are usually optimal, although with respect to some traits mating of unlikes is optimal, for example, with wage rates. The division of the total "output" produced

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by mates is not assumed to be given a priori, but is determined by the nature of the marriage-market equilibrium.

The simplified analyses in Part I have now been extended in several directions. The effect of "love" and caring between mates on the nature of equilibrium in the marriage market is considered. Polygamy is discussed, and especially the relation between its incidence and the degree of inequality among men and the inequality in the number of men and women. The implications of different sorting patterns for inequality in family resources and genetic natural selection are explored. The assumption of complete information about all potential mates is dropped and I consider the search for information through dating, coeducational schools, "trial" marriages, and other ways. This search is put in a life-cycle context that includes marriage, having children, sometimes separation and divorce, remarriage, and so forth.

2. Love, Caring, and Marriage

In Part I, I ignored "love," that cause of marriage glorified in the American culture. At an abstract level, love and other emotional attachments, such as sexual activity or frequent close contact with a particular person, can be considered particular nonmarketable household commodities, and nothing much need be added to the analysis, in the earlier paper, of the demand for commodities. That is, if an important set of commodities produced by households results from "love," the sorting of mates that maximizes total commodity output over all marriages is partly determined by the sorting that maximizes the output of these commodities. The whole discussion in Part I (1973) would continue to be relevant.

There is a considerable literature on the effect of different variables such as personality, physical appearance, education, or intelligence, on the likelihood of different persons loving each other. Since I do not have anything to add to the explanation of whether or why one person would love another, my discussion concentrates on some effects of love on marriage. In particular, since loving someone usually involves caring about what happens to him or her,[1] I concentrate on working out several implications, for marriage, of "caring."

An inclusive measure of "what happens" is given by the level of commodity consumption, and the natural way for an economist to measure "caring" is through the utility function.[2] That is, if M cares about F, M's utility would depend on the commodity consumption of F as well as on his own; graphically, M's indifference curves in figure 1 are negatively

[1] The *Random House Dictionary of the English Language* includes in its definitions of love, "affectionate concern for the well-being of others," and "the profoundly tender or passionate affection for a person of the opposite sex."

[2] This formulation is taken from my paper, "A Theory of Social Interactions" (1969).

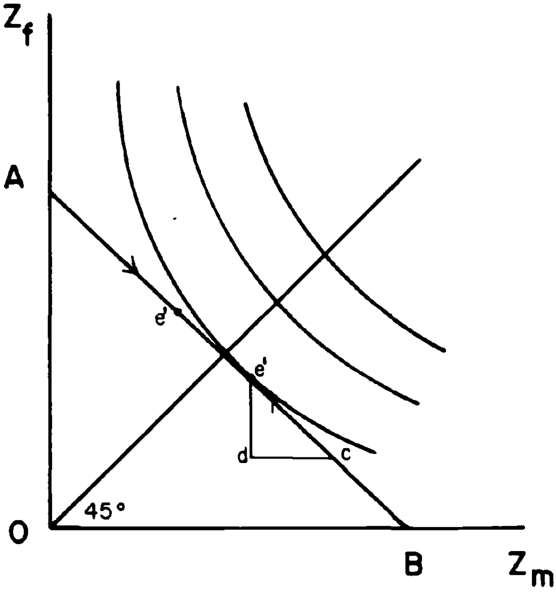

FIG. 1

inclined with respect to Z_m and Z_f, the commodities consumed by M and F respectively.[3] If M cared as much about F as about himself (I call this "full" caring), the slopes of all the indifference curves would equal unity (in absolute value) along the 45° line;[4] if he cared more about himself, the slopes would exceed unity, and conversely if he cared more about F.

Point *c* in figure 1 represents the allocation of commodities to M and F that is determined by equilibrium in the marriage market. Only if M were married to F could he transfer commodities to F, since household commodities are transferable within but not between households. If the terms of transfer are measured by the line *AB*, he moves along *AB* to point *e*: he transfers *cd* and F receives *de*. Presumably commodities can be transferred within a household without loss, so that *AB* would have a slope of unity. Then the equilibrium position after the transfer would be on the

[3] Since there is only a single aggregate commodity, saying that M's utility depends on F's consumption is equivalent to saying that M's utility depends on F's utility (assuming that F does not care about M). If many commodities $Z_1, \ldots, Z_q$, were consumed, M's utility would depend on F's utility if $U^m = U^m[Z_{1m}, \ldots, Z_{qm}, g(Z_{1f}, \ldots, Z_{qf})]$ where g describes the indifference surface of F. Hence $(\partial U^m/\partial Z_{if})/(\partial U^m/\partial Z_{jf}) = (\partial g/\partial Z_{if})/(\partial g/\partial Z_{jf})$; this ratio is F's marginal rate of substitution between Z_i and Z_j.

[4] "Full" caring might also imply that the indifference curves were straight lines with a slope of unity, that Z_f was a perfect substitute for Z_m.

45° line with full caring, and to the right of this line if M preferred his own consumption to F's.

Most people no doubt find the concept of a market allocation of commodities to beloved mates strange and unrealistic. And, as we have seen, caring can strikingly modify the market allocation between married persons. For example, the final allocation (point *e*) after the transfer from M to F has more equal shares than does the market allocation (point *c*).[5] Moreover, if F also cared about M, she would modify the market allocation by transferring resources to M from anywhere in the interval *Ae′* until she reached a point *e′*,[6] generally to the left of *e*. The market completely determines the division of output only in the interval *e′e*: positions in *Be* are modified to *e*, and those in *Ae′* are modified to *e′*. Furthermore, if each fully cares for the other, points *e* and *e′* are identical and on the 45° line. Then the total amount produced by M and F would be shared equally, regardless of the market-determined division. This concept of caring between married persons, therefore, does imply sharing—equal sharing when the caring is full and mutual—and is thus consistent with the popular belief that persons in love "share."

Sharing implies that changes in the sex ratio or other variables considered in section 4 of Part I (1973) would not modify the actual distribution of output between married M and F (unless the market-mandated distribution were in the interval *ee′*). This is another empirical implication of caring that can be used to determine its importance.

I indicated in the earlier paper that total income would be less than total output in a marriage if resources were spent "policing" the market-mandated division of output, whereas total income would exceed total output if some output were a "family" commodity, that is, were consumed by both mates. Caring raises total income relative to total output both by reducing policing costs and by increasing the importance of family commodities.

Consider first the effect of caring on policing costs. "Policing" reduces the probability that a mate shirks duties or appropriates more output than is mandated by the equilibrium in the marriage market.[7] Caring reduces the need for policing: M's incentive to "steal" from his mate F is weaker if M cares about F because a reduction in F's consumption also lowers M's utility. Indeed, caring often completely eliminates the incentive to "steal" and thus the need to police. Thus, at point *e* in the figure, M has no incentive to "steal" from F because a movement to the right along *AB* would lower M's utility.[8] Therefore, if M cares about F suf-

[5] Provided it were in the interval *Ae*, M would not modify the market allocation.

[6] We assume that *AB* also gives the terms of transfer for F, and that *e′* is the point of tangency between *AB* and her indifference curves.

[7] Policing is necessary in any partnership or corporation, or, more generally, in any cooperative activity (see Becker 1971, pp. 122–23; Alchian and Demsetz 1972).

[8] A fortiori, a movement along any steeper line—the difference between *AB* and this line measuring the resources used up in "stealing"—would also lower M's utility.

ficiently to transfer commodities to her, F would not need to "police" M's consumption.[9] Consequently, marriages with caring would have fewer resources spent on "policing" (via allowances or separate checking accounts?) than other marriages would.

M's income at *e* exceeds his own consumption because of the utility he gets from F's consumption. Indeed, his income is the sum of his and F's consumption, and equals *OB* (or *OA*), the output produced by M and F. Similarly, F's income exceeds her own consumption if she benefits from M's consumption.[10] Caring makes family income greater than family output because some output is jointly consumed. At point *e*, all of F's and part of M's consumption would be jointly consumed. Since both *e* and *e'* are on the 45° line with mutual and full caring, the combined incomes of M and F would then be double their combined output: all of M's and all of F's consumption would be jointly consumed.

Love and caring between two persons increase their chances of being married to each other in the optimal sorting. That love and caring cannot reduce these chances can be seen by assuming that they would be married to each other in the optimal sorting even if they did not love and care for each other. Then they must also be married to each other in the optimal sorting if they do love and care for each other because love raises commodity output and caring raises their total income by making part of their output a "family" commodity. Hence, their incomes when there is love and caring exceed their incomes when there is not. Consider the following matrix of outputs:

$$\begin{array}{c} \\ M_1 \\ \\ M_2 \\ \\ \end{array}\begin{array}{c}\begin{array}{cc} F_1 & \quad F_2 \end{array}\\ \begin{bmatrix} 8 & 4 \\ (3, 5) & \\ 9 & 7 \\ & (5, 2) \end{bmatrix}\end{array}. \tag{1}$$

With no caring, this is also the matrix of total incomes,[11] and M_1F_1 and M_2F_2 would be the optimal sorting if incomes were sufficiently divisible to obtain, say, the division given in parenthesis. With mutual and full caring between M_1 and F_1, m'_{11}, the income of M_1, would equal $8 > 3$,

[9] With mutual and full caring, neither mate would have to "police." On the other hand, if each cared more about the other than about himself (or herself), at least one of them, say M, would want to transfer resources that would not be accepted. Then F would "police" to prevent undesired *transfers from* M. This illustrates a rather general principle; namely, that when the degree of caring becomes sufficiently great, behavior becomes similar to that when there is no caring.

[10] F's income equals the sum of her consumption and a fraction of M's consumption that is determined by the slope of F's indifference curve at point *e*. See the formulation in section 1 of the Mathematical Appendix.

[11] We abstract from other kinds of "family" commodities because they can be analyzed in exactly the same way that caring is.

and f'_{11}, the income of F_1, would equal $8 > 5$;[12] clearly, M_1 would still be married to F_1 in the optimal sorting.

That love and caring can bring a couple into the optimal sorting is shown by the following matrix of outputs:

$$\begin{array}{c} \\ M_1 \\ \\ M_2 \\ \\ M_3 \\ \\ \end{array} \begin{array}{c} \begin{array}{ccc} F_1 \quad & F_2 \quad & F_3 \end{array} \\ \left[\begin{array}{ccc} 10 & 6 & 5 \\ (4, 6) & & \\ 9 & 10 & 4 \\ & (6, 4) & \\ 2 & 3 & 10 \\ & & (5, 5) \end{array}\right] \end{array} . \tag{2}$$

Without love and caring the optimal sorting is M_1F_1, M_2F_2, and M_3F_3, with a set of optimal incomes given in parenthesis. If, however, M_1 and F_2 were in love and had mutual and full caring, the optimal sorting would become M_1F_2, M_2F_1, and M_3F_3 because the incomes resulting from this sorting, $m_{12} = f_{21} = k > 6$,[13] and, say, $m_{21} = f_{21} = 4\frac{1}{2}$, and $m_{33} = f_{33} = 5$, can block the sorting along the diagonal.

Does caring per se—that is, as distinguished from love—encourage marriage: for example, couldn't M_1 marry F_1 even though he receives utility from F_2's consumption, and even if he wants to transfer resources to F_2? One incentive to combine marriage and caring is that resources are more cheaply transferred within households: by assumption, commodities cannot be transferred between households, and goods and time presumably also are more readily transferred within households. Moreover, caring partly results from living together,[14] and some couples marry partly because they anticipate the effect of living together on their caring.

Since, therefore, caring does encourage (and is encouraged by) marriage, there is a justification for the economist's usual assumption that even a multiperson household has a single well-ordered preference function. For, if one member of a household—the "head"—cares enough about all other members to transfer resources to them, this household would act *as if* it maximized the "head's" preference function, even if the preferences of other members are quite different.[15]

Output is generally less divisible between mates in marriages with caring than in other marriages[16] because caring makes some output a

[12] The output of love raises these incomes even further.

[13] The difference between k and 6 measures the output of love produced by M_1 and F_2.

[14] So does negative caring or "hatred." A significant fraction of all murders and assaults involve members of the same household (see Ehrlich 1970).

[15] For a proof, see section 1 of the Appendix; further discussions can be found in Becker (1969).

[16] See the proof in section 2 of the Appendix.

family commodity, which cannot be divided between mates. One implication of this is that marriages with caring are less likely to be part of the optimal sorting than marriages without caring that have the same total *income* (and thus have a greater total output).[17]

Another implication is that the optimal sorting of different traits can be significantly affected by caring, even if the degree of caring and the value of a trait are unrelated. Part I (1973) shows that when the division of output is so restricted that each mate receives a given fraction of the output of his or her marriage, beneficial traits are always strongly positively correlated in the optimal sorting. A negative correlation, on the other hand, is sometimes optimal when output is fully divisible. Caring could convert what would be an optimal negative correlation into an optimal positive one because of the restrictions it imposes on the division of output.

For example, assume that a group of men and women differ only in wage rates, and that *each* potential marriage has mutual and full caring, so that the degree of caring is in this case uncorrelated with the level of wage rates; then the optimal correlation between wage rates would be positive, although I showed in Part I (1973) that it is negative when there is no caring.[18] The (small amount of) evidence in that paper indicating that wage rates are negatively correlated suggests, therefore, that caring does not completely determine the choice of marriage mates.

3. Polygamy

Although monagamous unions predominate in the world today, some societies still practice polygamy, and it was common at one time. What determines the incidence of polygamous unions in societies that permit them, and why have they declined in importance over time?

I argued in Part I (1973) that polyandrists—women with several husbands—have been much less common than polygynists—men with several wives—because the father's identity is doubtful under polyandry. Todas of India did practice polyandry, but their ratio of men to women

[17] See the example discussed in section 2 of the Appendix.

[18] As an example, let the matrix of outputs from different combinations of wage rates be

$$\begin{array}{cc} & \begin{array}{cc} F_{w_1} & F_{w_2} \end{array} \\ \begin{array}{c} M_{w_1} \\ \\ M_{w_2} \\ \\ \end{array} & \begin{bmatrix} 5 & 10 \\ (5,\ 5) & (10,\ 10) \\ 12 & 15 \\ (12,\ 12) & (15,\ 15) \end{bmatrix} \end{array}.$$

If outputs were fully divisible, the optimal sorting would be $M_{w_1}F_{w_2}$ and $M_{w_2}F_{w_1}$, since that maximizes the combined output over all marriages. With mutual and full caring in all marriages, the income of each mate equals the output in his or her marriage; these incomes are given in parenthesis. Clearly, the optimal sorting would now be $M_{w_2}F_{w_2}$ and $M_{w_1}F_{w_1}$.

was much above one, largely due to female infanticide.[19] They mitigated the effects of uncertainty about the father by usually having brothers (or other close relatives) marry the same woman.

I showed in Part I (1973) that if all men and all women were identical, if the number of men equaled the number of women, and if there were diminishing returns from adding an additional spouse to a household, then a monogamous sorting would be optimal, and therefore would maximize the total output of commodities over all marriages.[20] If the plausible assumption of diminishing returns is maintained, inequality in various traits among men or in the number of men and women would be needed to explain polygyny.

An excess of women over men has often encouraged the spread of polygyny, with the most obvious examples resulting from wartime deaths of men. Thus, almost all the male population in Paraguay were killed during a war with Argentina, Brazil, and Uruguay in the nineteenth century,[21] and apparently polygyny spread afterward.

Yet, polygyny has occurred even without an excess of women; indeed, the Mormons practiced polygyny on a sizable scale with a slight excess of men.[22] Then inequality among men is crucial.

If the "productivity" of men differs, a polygynous sorting could be optimal, even with constant returns to scale and an equal number of men and women. Total output over all marriages could be greater if a second wife to an able man added more to output than she would add as a first wife to a less able one. Diminishing marginal products of men or women within each household do not rule out that a woman could have a higher marginal product as a second wife in a more productive household than as the sole wife in a less productive household.

Consider, for example, two identical women who would produce 5 units of output if single, and two different men who would each produce 8 and 15 units, respectively, if single. Let the married outputs be 14 and 27 when each man has one wife, and 18 and 35 when each has two.[23] Clearly, total output is greater if the abler man takes two wives and the

[19] See Rivers (1906). Whether the infanticide caused polyandry, or the reverse, is not clear.

[20] An optimal sorting has the property that persons not married to each other could not, by marrying, make some better off without making others worse off. I show in Part I (1973) that an optimal sorting maximizes total output of commodities.

[21] After the war, males were only 13 percent of the total population of Paraguay (see *Encyclopaedia Britannica*, 1973 ed., s.v. "Paraguay"). I owe this reference to T. W. Schultz.

[22] See Young (1954, p. 124). The *effective* number of women can exceed the number of men, even with an equal number at each age, if women marry earlier than men and if widowed women remarry. The number of women married at any time would exceed the number of men married because women would be married longer (to different men—they would be sequentially polyandrous!). This apparently was important in Sub-Saharan Africa, where polygyny was common (see Dorjahn 1959).

[23] These numbers imply diminishing marginal products, since $18 - 14 = 4 < 6$, and $35 - 27 = 8 < 12$.

other remains single than if they both take one wife: $35 + 8 = 43 > 14 + 27 = 41$. If the abler man received, say, 21 units and each wife received, say, 7 units, no one would have any incentive to change mates.

Our analysis implies generally that polygyny would be more frequent among more productive men—such as those with large farms, high positions, and great strength—an implication strongly supported by the evidence on polygyny. For example, only about 10–20 percent of the Mormons had more than one wife,[24] and they were the more successful and prominent ones. Although 40 percent of the married men in a sample of the Xavante Indians of Brazil were polygynous, "it was the chief and the heads of clans who enjoyed the highest degree of polygyny" (Salzano, Neel, and Maybury-Lewis 1967, p. 473). About 35 percent of the married men in Sub-Saharan Africa were polygynous (Dorjahn 1959, pp. 98–105), and they were generally the wealthier men. Fewer than 10 percent of the married men in Arab countries were polygynous, and they were the more successful, especially in agriculture (Goode 1963, pp. 101–4).

I do not have a satisfactory explanation of why polygyny has declined over time in those parts of the world where it was once more common.[25] The declines in income inequality and the importance of agriculture presumably have been partly responsible. Perhaps the sex ratio has become less favorable, but that seems unlikely, wartime destruction aside. Perhaps monogamous societies have superior genetic and even cultural natural selection (see the next section). But since more successful men are more likely to be polygynous, they are more likely to have relatively many children.[26] If the factors responsible for success are "inherited," selection over time toward the "abler" might be stronger in polygynous than in monogamous societies. I have even heard the argument that Mormons are unusually successful in the United States because of their polygynous past! However, if the wives of polygynous males were not as able, on the average, as the wives of equally able monogamous males, selection could be less favorable in polygynous societies.

The decline in polygyny is usually "explained" by religious and legislative strictures against polygyny that are supposedly motivated by a desire to prevent the exploitation of women. But the laws that prevent men from taking more than one wife no more benefit women than the

[24] Young (1954, p. 441) says that "in some communities it ran as high as 20–25 percent of the male heads of families," but Arrington (1958, p. 238) says about 10 percent of all Mormon families were polygynous.

[25] Polygyny was more common in Islamic and African societies than in Western and Asian ones, although in China and Japan concubines had some of the rights and obligations of wives (see Goode 1963, chap. 5).

[26] Salzano, Neel, and Maybury-Lewis (1967, p. 486) found evidence among the Xavante Indians of "similar means but significantly greater variance for number of surviving offspring for males whose reproduction is completed than for similar females." This indicates that polygynous males (the more successful ones) have more children than other males.

laws in South Africa that restrict the ratio of black to white workers (see Wilson 1972, p. 8) benefit blacks. Surely, laws against polygyny reduce the "demand" for women, and thereby reduce their share of total household output and increase the share of men.[27]

4. Assortive Mating, Inequality, and Natural Selection

I pointed out in Part I (1973) that positive assortive mating of different traits reduces the variation in these traits between children in the same family (and this is one benefit of such mating). Positive assortive mating also, however, increases the inequality in traits, and thus in commodity income, between families. Note that the effects on inequality in commodity and money incomes may be very different; indeed, if wage rates, unlike most other traits, are negatively sorted (as argued in Part I), assortive mating would reduce the inequality in money earnings and increase that in commodity income.

Positive sorting of inherited traits, like intelligence, race, or height, also increases the inequality in these traits among children in different families, and increases the correlation between the traits of parents and children (see proofs in Cavalli-Sforza and Bodmer [1971, chap. 9]). Moreover, positive sorting, even of noninherited traits such as education, often has the same effect because, for example, educated parents are effective producers of "education-readiness" in their children (see Leibowitz [1972] and the papers by her and Benham in this volume). The result is an increase in the correlation between the commodity incomes of parents and children, and thereby an increase in the inequality in commodity income among families spanning several generations. That is, positive assortive mating has primary responsibility for noncompeting groups and the general importance of the family in determining economic and social position that is so relevant for discussions of investment in human capital and occupational position.

Since positive assortive mating increases aggregate commodity income over all families, the level of and inequality in commodity income are affected in different ways. Probably outlawing polygyny has reduced the

[27] An alternative interpretation of the religious and legislative strictures against polygyny is that they are an early and major example of discrimination *against* women, of a similar mold to the restrictions on their employment in certain occupations, such as the priesthood, or on their ownership of property. This hypothesis has been well stated by (of all people!) George Bernard Shaw: "Polygamy when tried under modern democratic conditions as by the Mormons, is wrecked by the revolt of the mass of inferior men who are condemned to celibacy by it; for the maternal instinct leads a woman to prefer a tenth share in a first rate man to the exclusive possession of a third rate." See his "Maxims for Revolutionists" appended to *Man and Superman* (Shaw 1930, p. 220). Shaw was preoccupied with celibacy; he has three other maxims on celibacy, one being "any marriage system which condemns a majority of the population to celibacy will be violently wrecked on the pretext that it outrages morality" (1930, p. 220).

inequality in commodity income among men at the price of reducing aggregate commodity income. Perhaps other restrictions on mating patterns that reduce inequality would be tolerated, but that does not seem likely at present.

Since positive assortive mating increases the between-family variance, it increases the potential for genetic natural selection, by a well-known theorem in population genetics.[28] The actual amount of selection depends also on the inheritability of traits, and the relation between the levels of the traits of mates and the number of their surviving children (called "fitness" by geneticists). For example, given the degree of inheritability of intelligence, and a positive (or negative) relation between number of children and average intelligence of parents, the rate of increase (or decrease) per generation in the average intelligence of a population would be directly related to the degree of positive assortive mating by intelligence.

Moreover, the degree of assortive mating is not independent of inheritability or of the relation between number of children and parental traits. For example, the "cost" of higher-"quality" children may be lower to more-intelligent parents, and this affects the number (as well as quality) of children desired.[29] In a subsequent paper I expect to treat more systematically the interaction between the degree of assortive mating and other determinants of the direction and rate of genetic selection.

5. Life-Cycle Marital Patterns

Life-cycle dimensions of marital decisions—for instance, when to marry, how long to stay married, when to remarry if divorced or widowed, or how long to stay remarried—have received little attention in my earlier paper or thus far in this one. These are intriguing but difficult questions, and only the broad strokes of an analysis can be sketched at this time. A separate paper in the not-too-distant future will develop a more detailed empirical as well as theoretical analysis.

A convenient, if artificial, way to categorize the decision to marry is to say that a person first decides when to enter the marriage market and then searches for an appropriate mate.[30] The age of entry would be earlier

[28] This theorem was proved by Fisher (1958, pp. 37–38) and called "the fundamental theorem of natural selection." For a more recent and extensive discussion, see Cavalli-Sforza and Bodmer (1971, sec. 6.7).

[29] For a discussion of the interaction between the quantity and quality of children, see Becker and Lewis (1973).

[30] This categorization is made in an important paper by Coale and McNeil, "The Distribution by Age of the Frequency of First Marriage in a Female Cohort" (1973). They show that the frequency distribution of the age at first marriage can be closely fitted in a variety of environments by the convolution of a normal distribution and two or three exponential distributions. The normal distribution is said to represent the distribution of age at entry into the marriage market, and the exponential distributions, the time it takes to find a mate.

the larger the number of children desired, the higher the expected lifetime income, and the lower the level of education.[31]

Once in the marriage market, a person searches for a mate along the lines specified in the now rather extensive search literature.[32] That is, he searches until the value to him of any expected improvement in the mate he can find is no greater than the cost of his time and other inputs into additional search. Some determinants of benefits and costs are of special interest in the context of the marriage market.

Search will be longer the greater the benefits expected from additional search. Since benefits will be greater the longer the expected duration of marriage, people will search more carefully and marry later when they expect to be married longer, for example, when divorce is more difficult or adult death rates are lower. Search may take the form of trial living together, consensual unions, or simply prolonged dating. Consequently, when divorce becomes easier, the fraction of persons legally married may actually *increase* because of the effect on the age at marriage. Indeed, in Latin America, where divorce is usually impossible, a relatively small fraction of the adult population is legally married because consensual unions are so important (see Kogut 1972); and, in the United States, a smaller fraction of women have been married in those states having more-difficult divorce laws (see Freiden [1972] and his paper in this volume).[33]

Search would also be longer the more variable potential mates were because then the expected gain from additional "sampling" would be greater. Hence, other determinants being the same, marriage should generally be later in dynamic, mobile, and diversified societies than in static, homogeneous ones.

People marry relatively early when they are lucky in their search. They also marry early, however, when they are unduly pessimistic about their prospects of attracting someone better (or unduly optimistic about persons they have already met). Therefore, early marriages contain both lucky and pessimistic persons, while later marriages contain unlucky and optimistic ones.

The cost of search differs greatly for different traits: the education, income, intelligence, family background, perhaps even the health of persons can be ascertained relatively easily, but their ambition, resiliency under pressure, or potential for growth are ascertained with much greater difficulty.[34] The optimal allocation of search expenditures implies that marital decisions would be based on fuller information about more-easily searched traits than about more-difficult-to-search traits. Presumably,

[31] For a theoretical and empirical study of these and other variables, see Keeley (1973).

[32] The pioneering paper is by Stigler (1961). For more recent developments, see McCall (1970) and Mortensen (1970).

[33] These results are net of differences in income, relative wages, and the sex ratio.

[34] In the terminology of Nelson (1970), education, income, and intelligence are "search" traits, whereas resiliency and growth potential are "experience" traits.

therefore, an analysis of sorting that assumes perfect information (as in Part I [1973]) would predict the sorting by more-easily searched traits, such as education, better than the sorting by more-difficult-to-search traits, such as resiliency.[35]

Married persons also must make decisions about marriage: should they separate or divorce, and if they do, or if widowed, when, if ever, should they remarry? The incentive to separate is smaller the more important are investments that are "specific" to a particular marriage.[36] The most obvious and dominant example of marriage-specific investment is children, although knowledge of the habits and attitudes of one's mate is also significant. Since specific investments would grow, at least for quite a while, with the duration of marriage, the incentive to separate would tend to decline with duration.

The incentive to separate is greater, on the other hand, the more convinced a person becomes that the marriage was a "mistake." This conviction could result from additional information about one's mate or other potential mates. (Some "search" goes on, perhaps subconsciously, even while one is married!) If the "mistake" is considered large enough to outweigh the loss in marriage-specific capital, separation and perhaps divorce will follow.

The analysis in Part I (1973) predicts sorting patterns in a world with perfect information. Presumably, couples who deviate from these patterns because they were unlucky in their search are more likely than others to decide that they made a "mistake" and to separate as additional information is accumulated during marriage. If they remarry, they should deviate less from these patterns than in their first marriage. For example, couples with relatively large differences in education, intelligence, race, or religion, because they were unlucky searchers, should be more likely to separate,[37] and should have smaller differences when they remarry. In the subsequent paper referred to earlier, I plan to develop more systematically the implications of this analysis concerning separation, divorce, and remarriage, and to test them with several bodies of data.

6. Summary

The findings from this extension of my earlier paper on "The Theory of Marriage" (1973) include:

a) An explanation of why persons who care for each other are more likely to marry each other than are otherwise similar persons who do not.

[35] See the discussion in section 3 of the Appendix.

[36] The distinction between general and specific investment is well known, and can be found in Becker (1964, chap. 11). Children, for example, would be a specific investment if the pleasure received by a parent were smaller when the parent was (permanently) separated from the children.

[37] If they have relatively large differences because they were less efficient searchers, they may be less likely to separate.

This in turn provides a justification for assuming that each family acts as if it maximizes a single utility function.

b) An explanation of why polygyny, when permitted, has been more common among successful men and, more generally, why inequality among men and differences in the number of men and women have been important in determining the incidence of polygyny.

c) An analysis of the relation between natural selection over time and assortive mating, which is relevant, among other things, for understanding the persistence over several generations of differences in incomes between different families.

d) An analysis of which marriages are more likely to terminate in separation and divorce, and of how the assortive mating of those remarrying differs from the assortive mating in their first marriages.

The discussion in this paper is mainly a series of preliminary reports on more extensive studies in progress. The fuller studies will permit readers to gain a more accurate assessment of the value of our economic approach in understanding marital patterns.

Mathematical Appendix

1. Formally, M (or F) maximizes his utility function

$$U_m = U_m(Z_m, Z_f) \tag{A1}$$

subject to the constraints

$$\left.\begin{aligned} Z_m^0 - C_m &= Z_m \\ Z_f^0 + C_m &= Z_f \\ C_m &\geq 0 \end{aligned}\right\}, \tag{A2}$$

where Z_m^0 and Z_f^0 are the market allocations of output to M and F, and C_m is the amount transferred by M to F. If $C_m > 0$, these constraints can be reduced to a single income constraint by substitution from the Z_f into the Z_m equation:

$$m_{mf} = Z_{mf} = Z_f^0 + Z_m^0 = Z_m + Z_f, \tag{A3}$$

where Z_{mf} is the output produced by M and F, and m_{mf} is M's income. Maximization of U_m subject to this single income constraint gives

$$\frac{\partial U_m}{\partial Z_m} = \frac{\partial U_m}{\partial Z_f}. \tag{A4}$$

If $C_m = 0$, U_m is maximized subject to the two constraints $Z_m^0 = Z_m$ and $Z_f^0 = Z_f$. The equilibrium conditions are $\partial U_m/\partial Z_m = \lambda_m$, $\partial U_m/\partial Z_f = \mu_m$, where λ_m and μ_m are the marginal utilities of additional Z_m^0 and Z_f^0, respectively. The income of M would then be

$$m_{mf} = Z_m^0 + (\mu_m/\lambda_m)Z_f^0, \tag{A5}$$

where μ_m/λ_m is the "shadow" price of Z_f to M in terms of Z_m.

Since $\mu_m/\lambda_m < 1$ (otherwise $C_m > 0$),

$$Z_m^0 + \frac{\mu_m}{\lambda_m} Z_f^0 < Z_{mf} = Z_m^0 + Z_f^0. \tag{A6}$$

If $C_m > 0$, the "family" consisting of M and F would act as if it maximized the single "family" utility function U_m subject to the single family budget constraint given by (A3), even if F's utility function were quite different from U_m. In effect, transfers between members eliminate the conflict between different members' utility functions.

2. Total income in a marriage between M and F is

$$m_{mf} + f_{mf} = I_{mf} = Z_{mf} + p_m Z^f_{mf} + p_f Z^m_{mf},$$

where I_{mf} is the total income in the marriage, Z^m_{mf} and Z^f_{mf} are the outputs allocated to M and F, Z_{mf} $(=Z^f_{mf} + Z^m_{mf})$ is total output, p_m is the shadow price to M of a unit of Z^f_m, and p_f is a shadow price to F of a unit of Z^m_{mf}. Their incomes must be in the intervals

$$\begin{aligned} Z^m_{mf} + p_m Z^f_{mf} &= m_{mf} \le Z_{mf}, \\ Z^f_{mf} + p_f Z^m_{mf} &= f_{mf} \le Z_{mf}. \end{aligned} \tag{A7}$$

If $p_m = p_f = 0$—no caring—m_{mf} and f_{mf} can be anywhere between 0 and Z_{mf}. But if $p_m = p_f = 1$—mutual and full caring—then $m_{mf} = f_{mf} = Z_{mf}$. And, more generally, if p_m and $p_f > 0$, then

$$\begin{aligned} Z^m_{mf} &< m_{mf} \le Z_{mf} < I_{mf}, \\ Z^m_{mf} &< f_{mf} \le Z_{mf} < I_{mf}. \end{aligned} \tag{A8}$$

Consider the following matrix of total *incomes*:

$$\begin{matrix} & F_1 & F_2 \\ \begin{matrix} M_1 \\ \\ M_2 \\ \\ \end{matrix} & \left[\begin{matrix} 8 \\ \\ 7 \\ (3, 4) \end{matrix} \right. & \left. \begin{matrix} 8 \\ (4, 4) \\ 7 \\ \\ \end{matrix} \right] \end{matrix}. \tag{A9}$$

On the surface, both sortings are equally optimal, but this is not so if only M_1 and F_2 have a marriage with caring, say full and mutual, so that $m_{12} = f_{12} = 4$.[38] The sorting M_1F_2 and M_2F_1 is not as viable as the sorting M_1F_1 and M_2F_2 because income is more divisible between M_1 and F_1 than between M_1 and F_2.[39] For if, say, $m_{11} = 4\frac{1}{2}$, $f_{11} = 3\frac{1}{2}$, $m_{22} = 4\frac{1}{2}$, and $f_{22} = 2\frac{1}{2}$, no two persons have an incentive to change mates and marry each other.[40] On the other hand, since $m_{12} = f_{12} = 4$, unless $m_{21} = 3$ and $f_{21} = 4$, either M_1 and F_1, or M_2 and F_2 would be better off by marrying each other. If $m_{21} = 3$ and $f_{21} = 4$, M_1 and F_1, and M_2 and F_2 could be just as well off by marrying each other. Therefore, this sorting is not as viable as the sorting that does not have any marriages with caring.

3. Assume that the gain from marriage of a particular person M is positively related to the expected values of two traits of his mate, as in $m = g(A_1, A_2)$, with

[38] The *output* between M_1 and F_2 also equals four, half that between M_1 and F_1.

[39] Or, put differently, the output between M_1 and F_1 exceeds that between M_1 and F_2.

[40] F_2 would prefer to marry M_1, but could not induce M_1 to do so because m_{12} cannot exceed four, the output produced by M_1 and F_2 (see eq. [A7]), which is less than $m_{11} = 4\frac{1}{2}$.

$\partial g/\partial A_i = g_i > 0$, $i = 1, 2$. If the marginal costs of search were c_1 and c_2 for A_1 and A_2, respectively, equilibrium requires that

$$\frac{g_1}{g_2} = \frac{c_1}{c_2}. \qquad \text{(A10)}$$

The lower c_1 is relative to c_2, the higher generally would be the equilibrium value of A_1 relative to A_2, since convexity of the isogain curves is a necessary condition for an internal maximum.

If g_1 and g_2 were invariant when search costs changed to all participants in the marriage market, not an innocuous assumption, then A_1^{max} and A_2^{max} would be the equilibrium values of A_1 and A_2 to M when everyone had perfect information about all traits. A reduction in the cost of searching A_1, therefore, would move the equilibrium value of A_1 to M closer to A_1^{max}, its value with perfect information.