

A THEORY OF QUALITY SIGNALING IN THE MARRIAGE MARKET*

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Abstract

This paper advances the current understanding of marriage markets to include a model of quality signaling. The existing literature describes the division of marital output but does little to explain the process of estimating a prospective mate's potential contribution to marital income. Although several traits are readily observable, many of the inputs into marital gains are unseen until well after marital contracts are constituted. The model below helps to explain optimal marital search behavior, the absence of market clearing, the distinctions between marital search and employment search, and the repercussions of misrepresented and misperceived quality on marital relationships.

I. Introduction

Marriage is as universal as it is consequential to our daily conduct. Comprehensive models of marital search would apply to the behavior of the 95 percent of Americans who marry at least once by middle age,¹ and explain why other individuals never marry despite the apparent gains from specialization within a family. The theory of marital search as set forth by Gary Becker (1973a, 1973b) is based on an individual's maximization of his or her share of household output via optimal assortative mating. Becker's theory explains, but does not rectify the fact that when assortative mating occurs, little is known about a sought after individual's ability to produce "marital income."² Several authors have proposed models to explain how known or estimated output will be shared between individuals, and to describe the matching of individuals according to given output potentials,³ yet the crux of the marital search problem involves the estimation of these future output values by individuals. Becker (1981, p.219) states that imperfect information is the "essence" of search in the marriage market. For the first time, this article presents a model that explains the evaluation of potential mates and the inherent problems therein.

To model marital search under certainty overlooks the fundamental issue of how potential output from a particular pairing is estimated. There is a considerable literature supporting the idea that prices influence expectations or preferences for consumer goods and services (e.g., Basmann et al., 1983; Kalman, 1968; Leibenstein, 1950; Martin, 1986; Pollak, 1970; Scitovsky, 1945; Shapiro, 1983; Tirole 1988). This paper argues that quality signaling in the marriage market should be modeled similarly, based on a non-monetary pricing system that relays untold information regarding each individual's potential. The theory suggests that those with the best information on an individual's prospects--the individual, parents, and close acquaintances--establish a social price for the individual, reflected largely in his or her standards for selection and ease of attraction. This social price serves as a proxy for unseen traits in the estimation of potential marital output.

The second section of the paper discusses existing models of the division of marital income. Section III models the evaluation of potential mates in terms of their income potential, and discusses implications of the model on human behavior. Section IV concludes the paper.

II. Review of Past Theory

In his seminal work on the economics of marriage, Gary Becker (1973, 1974, 1981) describes a model in which marriage produces marital output to be divided as "income" between the spouses. In Becker's model, marital income is composed of household commodities that provide direct utility, including love, the quality and quantity of children, prestige, esteem, health, altruism, envy, and the quality of meals. Each utility maximizing individual will choose the mate who maximizes his or her marital income, and in so doing, maximize aggregate output. Thinking in terms of game theory, the optimal sorting will be in the core, as any alternative matching would make at least one individual forfeit his or her maximized income. Assuming the divisibility of marital output, any matching of market participants that does not maximize aggregate output would be blocked by at least one man and one woman who would be better off by marrying each other rather than the mate prescribed in that matching.⁴

Becker's model describes the division of marital income depending on market conditions. An individual will offer a given prospect at most the difference between the marital income they would earn together and her share of income from the next best marriage. At issue in this model is the ability to forecast marital income before the fact. Becker points out that an individual's qualitative and quantitative traits are largely unknown at the time that assortative mating begins: "Participants in the marriage markets hardly know ... the dependability, sexual compatibility, and other traits of potential spouses." Becker mentions the use of observed traits to predict unobserved traits that are correlated, such as education and intelligence, and discusses the cost-benefit analysis of

efforts to lessen uncertainties in the marriage market. He does not, however, develop the parameters used by individuals to adapt to imperfect information. In that regard, this article will argue that the evaluation of prospects and the choice of a target individual are based on social signals, as well as a handful of traits observable in the short run (e.g., outward appearance, education, family background). A marital searcher must use these signals and observances to make inferences about unobserved traits and how these traits would evolve in the event that a marriage took place.

Robert Hutchens (1979) stresses the "striking" parallels between labor market search and marital search. Noting that both are voluntary acts carried out under imperfect information while incurring the costs of time and money, he suggests a similar treatment for market and marital search. He states that an individual's participation in and duration of either type of search are dictated by her cost of search, nonportable income, discount rate, time horizon, and offer distribution. An "offer" here is defined as the expected stream of real income or Beckerian household commodities, with no reference to the formation of such expectations.

The difference between the two markets is largely one of the degree to which unknown characteristics are important. In the labor market, income offers are explicit, and working conditions and the prospects for promotion are either observable or able to be researched. Offers are typically accepted or rejected based on job attributes including the specified title, location, wage, benefits, and number of hours to be worked. The major uncertainties in labor market search are associated with the offers attainable from additional search and the worker's compatibility with the boss and co-workers. Marriage market offers are subject to the same uncertainty regarding the marginal benefit of additional search. The uncertainty regarding compatibility is of greater importance in marital search to the extent that if a better offer comes along, the adjustment costs are higher than in the labor market. Further, the offer of marital income itself is open to speculation. For these reasons, the estimation of unknown qualities is central to marital

search, and secondary to labor market search. The formulation of expected marital income is discussed below, and the ensuing search is found to more closely resemble that for items providing an uncertain income (output) such as schools and automobiles.

Boulier and Rosenzweig (1984) present a mating function in which human capital is a function of education, marital search time, other traits that attract a higher-quality mate, the dispersion of mates, the ratio of potential mates to competitors, sex-specific labor market conditions, and a random error term. They point out that overlooked or unavailable traits that affect the quality of the mate one can attract will bias inferences about marital theory based on econometric analysis. The present article employs a budget constraint analogous to Boulier and Rosenzweig's human capital function, and describes the importance of signaling as one such overlooked variable, the lack of which may have biased the results of previous research on marriage.

Elizabeth Peters (1986), like Becker, attributes divorce to uncertainty, but does not suggest how searchers might infer the value of unknown variables prior to marriage. Peters emphasizes the uncertainty of future opportunities outside of marriage, rather than the uncertainty of marital income with one's prospective mate. She explains that marriage decisions are based on "certain implicit expectations about the value of the marriage, the composition of the output, and the inputs required in the production of the output." However, to simplify the model, she assumes that the joint value of marriage in each period of her two-period model is known at the beginning of the first period. One purpose of the current research is to explain the preceding step in the marital process--the formation of output expectations and the subsequent choice of a mate.

Smith (1997) and Shimer and Smith (1996) revisit matching models with provisions for nontransferable utility, time spent searching, and incomplete information. In contrast with the present research, their departure from the neoclassical assumption of full information entails a broadened willingness for market participants to accept less than ideal matchings, rather than a paradigm for processing signals to fill informational voids. In

their studies the type of each marriage market participant is captured by a single variable that is publicly observable.

In describing their "separate spheres" bargaining model, Lundberg and Pollack (1993) point out that the marriage market will undo any redistributive effects of asset allocations to a husband or a wife if prospective couples can make costless and binding prenuptial agreements to transfer resources within marriage. If such agreements cannot be made, they show that the redistributive effects of acquisitions can induce changes in the distribution of family income and in the equilibrium number of marriages. The ease with which prenuptial agreements can be made depends in part on couples' ability to foresee their future marital incomes, i.e., it depends on the cogency of quality signaling in the marriage market as discussed below.

III. Choice with Imperfect Information

A. Quality Signaling in Markets with Known Supply

Marital search involves highly uncertain offers based on an initially meager number of signals. This makes it analogous to the choice of a doctor, a university, or a bottle of wine under uncertainty.⁵ In such cases the searcher invests time and/or money to observe indicators of the relative value of alternatives. These may include observing the good, surveying the knowledge and opinions of friends, looking into the history of the good, or sampling the good. In these and related markets, information regarding the supply of a product and its substitutes is often more readily available than the more telling information on demand. However, knowing supply and *price* allows buyers to infer demand at the point of equilibrium. If several substitute goods have similar supply curves and differing prices, then prices are certainly demand-driven. Assuming that uninformed buyers of such products either select randomly or select the alternative with the lowest price, relatively high demand and correspondingly higher prices reflect interest from informed consumers, and thus are a valuable basis for judgment.

Given information about the supply curve, prices reveal information about the relevant commodities. Prices embody information about the value of goods to unseen individuals in the market, they reflect expected returns on investments, and they lead individuals towards optimal choices in regard to resource allocation.⁶ In markets where the supply curve for each competing good is the same, one can deduce as superior that product having the highest attainment price. For schools, doctors, and wines, the price would include admissions standards, the size of waiting lists, and the ability to find a wine in stock respectively, in addition to the monetary price.⁷ Attainment prices for inscrutable goods, taking any supply differences into account, serve as the best possible (in some cases the only) proxy for the quality of a commodity relative to one's own deserts. A good student, for example, can satisfy higher admissions standards, and thus, presumably, better schools. Likewise, if a student is easily accepted into one school and admitted off of a waiting list to another school of the same size, this is an important signal regarding the desirability of the two schools.

B. Social Prices

The marriage market is another such known-supply market. Individuals, being the most informed assessors of their own abilities and potential, set what shall be referred to as *social prices* (π) for themselves. Based on familiarity with one's self, the social price is determined as

$$\pi = f(\text{potential contribution to marital income}).$$

Marital income is discussed further below, and one's potential contribution is determined on the basis of self-discipline, intentions, standards, prospects, plans, inner strength, current status, and prior success rates. The resulting social price is paid via courting efforts and marital offers by potential suitors. In the event that another person, such as a parent, does have a better knowledge of an individual's value, he or she is likely to set a price floor

for the individual until age/maturity allow for a better personal assessment.⁸ As with more traditional commodities, an individual's social price is bid up (down) by high (low) demand. In other words, an individual's social price will rise and fall with his or her popularity,⁹ which is determined by friends who know the individual well and by the relative scarcity of individuals with comparable qualities.

Repeated purchase, either by the same or different consumers, is important in enforcing the correlation between price and quality in the product market. In the marriage market, repeated purchase is also a possibility. Every acquaintance that spends time with an individual is a partial investor, with some spending considerably more time and resources on the individual than others. As in the market for homes, diamonds, and other durable goods, limited marriage market exposure and trial (dating) with positive results is generally good, whereas extensive market exposure (multiple marriages) can diminish an individual's social price.

In a manner similar to that described for doctors, schools, and wine, a marital searcher is faced with an array of prospects exhibiting only a fraction of their future value explicitly through observable traits. Searchers must gauge the expected flow of marital income using the social price, π , in addition to directly observable characteristics. Not being a monetary price in most societies,¹⁰ π is reflected by the ease with which one can engage and sustain the prospect in the courting process. Depending on the context, social price could be conveyed by the amount of eye contact made, the handling of initial propositions for social contacts, popularity in desirable social circles, or the length of the interval before sexual intimacy. According to the social price theory, among individuals with similar outward traits, a marriage market participant with imperfect information is likely to anticipate greater marital output from prospects with higher social prices.

C. The Marital Search Model

Gale and Shapley (1962) were the first to formally model equilibrium in the marriage market, and theirs is the foundation for subsequent models as discussed in the literature review above.¹¹ The primary contribution of the present paper is to model the treatment of quality uncertainty. The quality of prospective mates and the associated marital income from alternative matchings are critical but unexplained variables in past models.¹² After reviewing the traditional matching model, we develop a theory of quality signaling that fits into this model and can be applied similarly to virtually all of the modern extensions.

Consider a marriage market with m males and f females, all of whom are heterogeneous and heterosexual. Let μ_{ij} represent a matching of male i with female j . A matching structure can be represented by an $m \times n$ matrix $\mu = [\mu_{ij}]$ in which $\mu_{ij} = 1$ if male i is matched with female j , and $\mu_{ij} = 0$ otherwise. A matching structure is viable if and only if there is at most one “1” in each row and each column. A row of zeros represents a single male, and a column of zeros represents a single female. A stable equilibrium in a marriage market with this structure exists when no male-female set for whom $\mu_{ij} = 0$ would prefer a matching with each other to the status quo, and each matched individual prefers the assigned matching to being single. The pairings in stable match structures are thus undominated, and represent the core of the marriage market.

Let Z_{ij} represent the marital income from the matching μ_{ij} . With risk-neutral Von Neumann and Morgenstern utility functions scaled such that $u_i(Z) = u_j(Z) = Z$, marital income can be thought of in the transferable utility context with utility measured in income units. The general results of the model hold in a variety of other contexts as well.¹³ Male i 's share of the marital income¹⁴ from a marriage to female j is Z_j^i and female j 's share is Z_i^j , with

$$Z_j^i + Z_i^j = Z_{ij}.$$

Let Z_{i0} and Z_{0j} represent the incomes for single males and females respectively. While marital income is assumed to be known in the traditional model, this paper recognizes the uncertainty associated with Z , and denotes the expected value of Z as $E(Z)$. Marriage is desirable for male i when his expected share of the income from marrying the most productively compatible female among those available, j^* , exceeds the expected income from remaining single. That is, when

$$E(Z_{j^*}^i) > E(Z_{i0}).$$

Likewise, female j will marry if

$$E(Z_{i^*}^j) > E(Z_{j0}).$$

Let us now consider the estimation of marital income more closely. The following analysis considers the behavior of person i in reference to a potential mate j . From this point on, the assumptions of the traditional model can be relaxed in that person i could be of either sex, and person j is of the sex that person i prefers. After searcher i has known a prospective mate j for a period of time t , expectations for future income from a marriage with person j are based on a vector of traits observable at that time, $\Omega_j(t)$, and estimated values for a vector of unobservable traits, $\Phi_j(t)$. Person i 's expected share of income from a marriage to person j will thus be

$$E_t(Z_j^i) = f[\Omega_j(t), \Phi_j(t)].$$

When estimating the values of unseen traits, $\Phi_j(t)$, person i places some weight (initially zero) on personal assessments and the remaining weight (initially one), on j 's social price, π , as an indication of quality. Let $A_j(t)$ represent the vector of assessments of unseen traits based on personal experience with individual j , and let α and β represent the

weights placed on personal assessments and the social price respectively. Over time, person i will place increasing reliance on personal assessments. Thus

$$\Phi_j(t) = \alpha(t)A_j(t) + \beta(t)\pi_j(t),$$

$$\alpha(0) = 0, \beta(0) = 1, \quad \alpha(t) + \beta(t) = 1,$$

$$\lim_{t \rightarrow \infty} \alpha_j(t) = 1, \lim_{t \rightarrow \infty} \beta_j(t) = 0.$$

In the initial stage of a relationship, t and α are both zero. Figure 1 provides the marriage market analogue to the familiar utility maximization diagram. On the vertical axis, Ω represents the searcher's evaluation of the observable traits of the prospect on an arbitrary scale. This measure may incorporate such qualities as appearance, personality, present wealth, religion, and family background. On the horizontal axis, Φ is the proxy for such initially unseen qualities as fidelity, future social status, longevity, work ethic, and parenting skills. The searcher's attainment constraint represents the tradeoff (for the types of individuals the searcher could *attract*, not necessarily for individuals that exist) between prospects with strong personality and appearance traits, and prospects estimated to have strong unseen qualities. The slope of the indifference curve reflects the searcher's desired tradeoff between the two types of characteristics.

 Insert Figure 1 about here.

The variable H is the searcher's human capital as defined by Boulier and Rosenzweig (1984) and outlined in Section II above, and P_Ω and P_Φ are the courting costs of attracting a prospect with an additional unit of observable and unobservable qualities,

respectively. These prices are determined by the demand and supply of prospective marital partners with the traits the searcher seeks in the observable and unobservable categories. In a competitive and complete market, an individual's attainment constraint will coincide with her budget constraint, which is the line with intercepts H/P_{Ω} and H/P_{Φ} . An incomplete market will result in a discontinuous attainment constraint lying on or below the budget constraint.¹⁵ Continued search will result in an expansion of the attainment constraint as prospects with presently unavailable combinations of Ω and Φ are identified. A nonlinear attainment constraint can result in multiple tangencies with the searcher's utility-maximizing indifference curve, which explains the difficulty marital searchers sometimes face when choosing between alternative mates.

To illustrate what Figure 1 represents, a prospect at a has outstanding observable qualities but might be exemplified as someone with no intention to provide for a family, to be faithful, or to provide other household goods. This person might be found exhibiting a social price close to zero by soliciting relationships from disinterested parties. Such a person could try to portray a misleadingly high social price, but as with any overpriced good, s/he would likely be "returned" when the poor value is discovered (see section D *infra*).

A prospect at b has marginal observable traits, yet might be exemplified as someone with high aspirations and promise. Based on inner strength and past experience, this person knows that he or she is likely to be successful in attaining marital-production goals. The individual might have strong self-discipline, perseverance, and an undying intention to be the best of parents and spouses. Such a person knowingly deserves better than individuals near the origin with few redeeming qualities. Such inner strength will become evident to friends, and the individual's potential will be conveyed to searchers via his or her relatively high standards and popularity (i.e., π), if not through a pre-relationship friendship.

A prospect at c has both outstanding observed traits and outstanding unseen qualities. It is intuitively clear that a searcher with the human capital budget constraint as shown would be unable to attract such a prospect. In contrast, when a searcher faced with imperfect information receives a courting offer at low cost, this is evidence that the prospect is *within* the searcher's attraction constraint, and that a superior mate can be found at a tangency point where human capital use is optimized. Search continues until the cost of seeking additional offers outweighs the potential gains from such knowledge.¹⁶

A number of intuitive arguments support the workings of social prices as described, with $\delta E(Z)/\delta \pi > 0$: (1) Upon observing a low π , a searcher may assume the existence of unobserved traits that make this prospect unable to maintain higher standards or at least to be more conservative in making and accepting offers. The extreme case would be a "desperate" individual whose $\pi \approx 0$, signaling considerable unseen problems. (2) When faced with a reasonably favorable prospect who is easily attracted, one could reason that by putting forth more effort, an even higher quality spouse could be attained. (3) Included in marital income would be a sense of accomplishment. A prospect who requires little courting effort (i.e., has a very low π) makes for a less exciting search, and a less savored matching. (4) An unrealistic prospect will have a prohibitively high π , meaning that he or she is entirely uninterested and outside the searcher's constraint. (5) An increase in the male/female ratio results in increased competition for female targets and bids up the social prices for women, and vice versa. For example, in New York and Washington D.C., a shortage of eligible males intensifies women's efforts to find suitable mates, whereas in a China, Alaska, and some parts of rural America, disproportionately low numbers of women result in greater competition for female marriage partners.¹⁷

D. Market Imperfections

The above model yields explanations for several of the apparent inefficiencies in the marriage market.¹⁸ This section examines three ways in which the displayed social

price may be distorted from the actual social price of an individual. The displayed social price can be represented by the equation

$$\pi = \pi^* + L + M + \varepsilon,$$

where π^* is the social price that correctly embodies information available at time t regarding the individual's unseen potential; L is a "love-induced" price adjustment; M is a deliberate misrepresentation of price; and ε is a biased error in the individual's price determination resulting from a distorted view of self worth.

Consider two individuals, A and B. Individual A, upon finding individual B near her tangency point in Figure 1, will focus her attention on B. As a result, A's social price as reflected in her ease of attraction may be subsidized by a love-induced price reduction as displayed to B: $\pi_A = \pi^* + L$, $L < 0$. If this occurs before a significant personal appraisal can be made by B of A, then A's deceptively low "discount" price will result in a poor evaluation of A by B.¹⁹ To expand on this idea, imagine a closed heterosexual economy in which three men with identical π 's coexist with three women, and suppose the following preference rankings:

M₁: F₁ F₂ F₃

M₂: F₂ F₃ F₁

M₃: F₃ F₁ F₂

to be read M₁ prefers F₁ over F₂, and F₂ over F₃, etc.. Ceteris paribus, the men will display a lower social price to the women they like the most. This leads to a *reverse* preference ranking by the women:

F₁: M₂ M₃ M₁

F₂: M₃ M₁ M₂

F₃: M₁ M₂ M₃

This glitch in the marriage market leads to a misallocation of information-seeking costs unless the reliance on personal experience, α , rises to a sufficient level (in respect to a particular individual) to nullify the distortion from the love-induced social price. Thus the reverse preference ranking effect is likely to hinder matching attempts, particularly when α is low, as in short-lived encounters.²⁰

It is interesting to note that unlike the case for heterosexual matchings, the single-sided counterpart relevant to homosexual matchings may have an empty core. For example, suppose there are four individuals in the market with the following preferences:

H₁: H₂ H₃ H₄

H₂: H₃ H₁ H₄

H₃: H₁ H₂ H₄

H₄: Indifferent

Here 1 & 2 is blocked by 2 & 3, 2 & 3 is blocked by 1 & 3, and 1 & 3 is blocked by 1 & 2. The core is thus empty. This may provide insight into the reported relative instability of homosexual relationships.²¹

Given the role that social prices play in the evaluation of potential mates, individuals would appear to have an incentive to display an overstated price $\pi = \pi^* + M$. Personal appraisal prevents this strategy from succeeding. Like in the search for doctors and wine, as the searcher becomes more familiar with the item of choice, he or she is better able to ignore the attainment price when evaluating the product. In time, each participant in a relationship begins to see the same predictors of unseen traits that the other has used to set a social price (e.g., initiative, inner strength, aspirations, success rate in achieving goals). Noting that the proxy for unseen traits is $\Phi_j(t) = \alpha(t)A_j + \beta(t)\pi_j(t)$, and that α increases and β decreases with time, we see that $\Phi_j(t)$ will fall steadily in each period as

personal appraisal replaces the overstated social price in the prediction of unobservable qualities. This signals a misrepresented price and gradually corrects for the distortion. The inevitability of truthful quality revelation, the availability of divorce, and the costs of repeated search make deception an imprudent strategy.

Whether due to the merits of specialization²² or the demerits of male chauvinism (the degree to which either is the case is beyond the scope of this article), women do a majority of the menial tasks in the household,²³ they traditionally hold subordinate jobs in the market labor force,²⁴ and they receive less pay.²⁵ To the extent that this elicits feelings of inferiority on the part of women,²⁶ they may underestimate their appropriate social price such that $\pi_f = \pi_f^* + \varepsilon_f$, $\varepsilon_f < 0$. Observing the same phenomenon, males would erroneously estimate their social price with a positive (superiority) bias: $\pi_m = \pi_m^* + \varepsilon_m$, $\varepsilon_m > 0$. The result is that women will pay the males' inflated social prices, perhaps by performing more than their share of home production or exhibiting undue tolerance, and they will be willing to accept this improper share of marital income due to disillusionment about their own appropriate social price. In this way, the two biased price estimates complement each other and act to perpetuate male dominance.

IV. Summary

In the analysis of marital search it is important to consider the uncertain nature of marital offers in contrast to salary offers and similar offers of known value. It is the determination of potential marital income that occupies the marital searcher and results in his or her social conduct. Marital searchers, as if choosing a fine wine, look to the wealth of information embodied in prices, which are the primary signaling device for unseen traits in markets with known supply. While marital searchers face imperfect information about themselves as well as their suitors, they are the best assessors of their own aspirations and potential, and use this knowledge to set standards for courtship and marital offers. These standards, or social prices, are used by searchers to estimate unseen qualities in potential

mates. This theory of quality signaling in the marriage market also explains inefficient market phenomena including the absence of market clearing and the perpetuity of gender inequality.

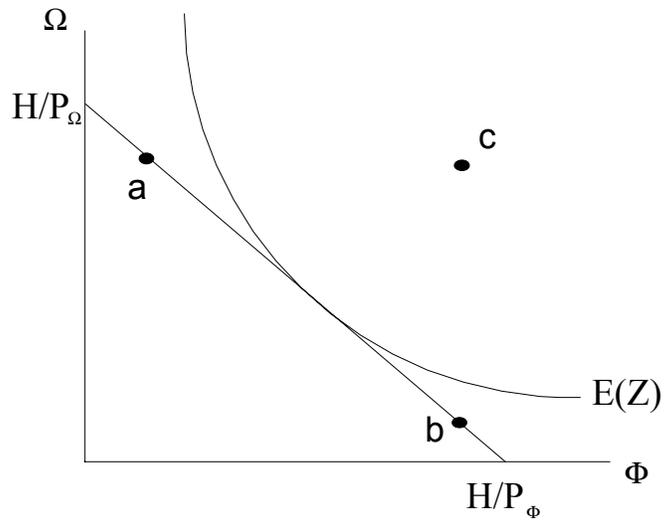


Figure 1

References

- Akerlof, George A. 1970. "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism." *Quarterly Journal of Economics*, 84(3): 488-500.
- Anderson, David A. 1994. "Compensating Wage Differentials and the Optimal Provision of Unemployment Insurance." *Southern Economic Journal*, 60(3): 644-56.
- Basmann, R.L., D. J. Molina, and D.J. Slottje. 1983. "Budget Constraint Prices as Preference Changing Parameters of Generalized Fechner-Thurstone Direct Utility Functions." *American Economic Review*, (June): 411-13.
- Bagnoli, Mark and Theodore C. Bergstrom, 1973. "Courtship as a Waiting Game." *Journal of Political Economy*, 101: 185-202.
- Becker, Gary S. 1973a. "A Theory of Marriage: Part I." *Journal of Political Economy*, 81(July/August): 813-46.
- _____, 1973b. "A Theory of Marriage: Part II." *Journal of Political Economy*, 82(2), pt. 2: S11-S26.
- _____, 1981. *A Treatise on the Family*. Cambridge, Mass.: Harvard University Press.
- _____, 1985. "Human Capital, Effort, and the Sexual Division of Labor." *Journal of Labor Economics*, 3(1): S33-S58.
- Boulier, Bryan L., and Rosenzweig, Mark R. 1984. "Schooling, Search, and Spouse Selection." *Journal of Political Economy*, 92(4): 712-32.
- Doress, Paula B., and Wegman, Peggy N. 1984. "Working Toward Mutuality: Our Relationships with Men." in *The New Our Bodies Ourselves*, 123-40. New York: Simon & Schuster.
- Fuchs, Victor R. 1983. *How We Live*. Cambridge, Mass.: Harvard University Press.
- Gale, David, and Lloyd Shapley. 1962. "College Admissions and the Stability of Marriage." *American Mathematical Monthly* 69: 9-15.
- Gibson, Richard. 1994. "Tom and Rosanne May Be Splitsville, But What of Eldon?" *Wall Street Journal*. 15 September, 1(A), 5(A).
- Grossbard-Shechtman, Shoshana. 1993. *On the Economics of Marriage; a Theory of Marriage, Labor, and Divorce*. Boulder: Westview Press.
- Gross, Jane. 1987. "Single Women: Coping With a Void." *New York Times*. 28 April, 1(A), 2(B).

- Hersch, Joni. 2000. "Marriage, Home Production, and Earnings." Harvard Law School Discussion Paper No. 275, Cambridge, Mass.
- Hutchens, Robert M. 1979. "Welfare, Remarriage, and Marital Search." *American Economic Review*, 69(3): 369-379.
- Kalman, Peter J. 1968. "Theory of Consumer Behavior When Prices Enter the Utility Function." *Econometrica*, (July-October): 497-510.
- Leibenstein, H. 1950. "Bandwagon, Snob and Beblen Effects in the Theory of Consumer's Demand." *Quarterly Journal of Economics*, (May): 183-207.
- Lippman, Steven A., and McCall, John J. 1976. "The Economics of Job Search: A Survey." *Economic Inquiry*, 14(June): 155-166.
- Lundberg, Shelly, and Robert A. Pollak. 1993. "Separate Spheres Bargaining and the Marriage Market." *Journal of Political Economy*, 101(6): 988-1010.
- Manser, Marilyn, and Murray Brown. 1980. "Marriage and Household Decision-Making: A Bargaining Analysis." *International Economic Review*, 21(1): 31-44.
- Martin, Robert E. 1986. "On Judging Quality by Price: Price Dependent Expectations, Not Price Dependent Preferences." *Southern Economic Journal*, 52(3): 665-672.
- McElroy, Marjorie B., and Mary Jean Horney. 1981. "Nash-Bargaining Household Decisions: Toward a Generalization of the Theory of Demand." *International Economic Review*, 22(June): 333-49.
- Mortensen, Dale T. 1988. "Matching: Finding a Partner for Life or Otherwise." *American Journal of Sociology*. 94: S215-40.
- Peters, Elizabeth H. 1986. "Marriage and Divorce: Information Constraints and Private Contracting." *American Economic Review*, 76(3): 437-447.
- Pollak, Robert A. 1977. "Price Dependent Preferences." *American Economic Review*. (March): 64-75.
- Rubinstein, Ariel, and Asher Wolinsky. 1985. "Equilibrium in a Market with Sequential Bargaining." *Econometrica*. 53: 1133-50.
- Scitovsky, Tibor. 1945. "Some Consequences of the Habit of Judging Quality by Price." *Review of Economic Studies*, 100-105.
- Shapiro, Carl. 1983. "Premiums for High Quality Products as Returns to Reputations." *Quarterly Journal of Economics*, 659-79.
- Shimer, Robert, and Lones Smith. 1996. "Assortative Matching and Search." Unpublished, MIT.

Smith, Lones. 1997. "The Marriage Market with Search Frictions." Unpublished: University of Michigan.

Teft, Sheila. 1993. "Matchmakers Operate Under Semi-Suspicious Official Eye." *Christian Science Monitor*. 21 April, 13.

Tirole, Jean. 1988. *The Theory of Industrial Organization*. Cambridge, Mass.: MIT Press.

U.S. Bureau of the Census. 1993. *Statistical Abstract of the United States: 1993* (113th edition). Washington D.C.: Government Printing Office.

Notes

¹ See U.S. Bureau of the Census (1993), p. 53.

² The characterization of the product of marriage as "output" and its benefit as "income" is not intended to dehumanize the goals of relationships. Rather, it allows such goods as love, affection, home-cooked meals and children to be dignified with the analytical attention long granted to manufactured products of arguably less importance.

³ Examples include Becker (1973, 1974, 1981), Lundberg and Pollack (1993), Manser and Brown (1980), McElroy and Horney (1981), Grossbard-Shechtman (1993), and Hersch (2000).

⁴ For a thorough discussion of this point, see Becker (1981) pp. 68-70.

⁵ Needless to say, there are also differences between wine (for example) and marriage. Marriage is more durable than wine, and thus the relative decisions are more important.

⁶ For related arguments and analysis, see Basmann et al. (1983), Kalman (1968), Leibenstein (1950), Martin (1986), Pollak (1970), Scitovsky (1945), and Shapiro (1983).

⁷ If present consumers of the product have identical preferences and complete information, then higher (received) prices are necessarily correlated with higher quality. For rational consumers to use prices as a positive indication of quality requires the weaker assumption that markets approximate these characteristics to the extent that with a probability greater than 0.5 prices rise with quality. This assumption on the consumers' part could be empirically verified.

⁸ Imagine teenager Tammy announcing an impending relationship with inferior Ivan to her parents. The result is likely to be prohibition because the young woman has set her social price too low (i.e. submitted to an unworthy suitor).

⁹ Popularity in social circles in which the inputs to friendships are similar to the inputs to marriage (e.g., respect, charm, humor) is a good proxy for quality in a marriage partner and thus increases social price. Of course, popularity in groups that value inputs incongruous with marital success (violence, casual sex, crime) devalues social price.

¹⁰ Becker (1981) estimates that less than ten percent of all marriages involve dowries.

¹¹ Mortensen (1988) provides a useful overview of earlier models.

¹² See, for example, Becker (1981, 40) and Smith (1997, 4).

¹³ For example, Smith (1997), Bagnoli and Bergstrom (1993), and Becker (1973a, 834-836) explore nontransferable-utility models of the marriage market.

¹⁴ McElroy and Horney (1981) and Rubinstein and Wolinsky (1985) for discussions of how marital income is divided between the spouses.

¹⁵ As an example of an incomplete market, a gentleman from Eldon, Iowa, states that "many of the prettiest and brightest women will simply not tolerate the boredom of small-town Iowa," (Gibson, 1994).

¹⁶ For discussion of the duration of search, see Hutchens (1979) pp.370-371, and Becker (1981) p.220.

¹⁷ See Gross (1987) for a discussion of the shortage of men in New York City, and note 9 *supra* for an example of the shortage of women in some rural areas. Tefft (1993) describes the market for Asian brides.

¹⁸ The resulting frustration of searchers with finding a match is exemplified by the willingness of many to pay fees up to \$20,000 to matchmaking services such as Helena Amram's, whose annual revenues exceed \$16,000,000.

¹⁹ The model predicts that a searcher will pursue the individual with the highest affordable social price. Although social prices are decreased by feelings of attraction and love, the theory does not imply that searchers are repelled by these qualities per se. The attraction and love of all of the prospects within the searcher's attainment constraint is obtainable (by definition of the constraint) and valued. However, searchers are repelled by attraction and love that come too easily, because although it may be flattering, it is one of few available signals of underlying problems.

²⁰ Note that patient and calculating marital searchers avoid the display of love-induced low prices. Rather, they play a delicate cat and mouse game, only hinting enough interest to show the prospect that they are on (not inside or outside) the prospects budget constraint.

²¹ See Saghir and Robins, 1973, pp.56-58, 226-227, as referenced in Becker (1981).

²² See Becker (1985).

²³ For example, Fuchs (1983, p.60) states that very little child care is performed by fathers, even when the mother is employed full time.

²⁴ Fuchs (1983, p.137) states that in recent decades the great majority of women were still heavily concentrated in "female" occupations such as clerical work, health services, and teaching.

²⁵ See, for example, Anderson (1994) p.652.

²⁶ See Doress and Wegman (1984).