The Economics of Family Structure

by

Derek Neal
Department of Economics
University of Wisconsin
dneal@ssc.wisc.edu

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PRELIMINARY
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I am grateful to Dan Black, John Kennan, Jim Walker, and Robert Willis for helpful conversations. I owe special thanks to Larry Samuelson. All errors are mine.
Wilson (1987) contends that the availability of marriageable men is a key determinant of family structure. He argues that women are most likely to bear and raise children on their own when the prospects of marriage to a man with stable employment are remote. In offering this thesis, Wilson aims to refute the contention of Murray (1984) that government financial aid to unwed mothers is a primary cause of changes in family structure over the decades leading up to 1980. Existing research has not established clear and convincing support for either hypothesis. Relatively few studies find strong links between the generosity of welfare benefits and the nonmarital fertility rate or the nonmarital birth ratio. In addition, the studies that address Wilson’s hypothesis yield varied results.

I present an economic model that captures Wilson’s general hypothesis - marriage markets matter - while simultaneously fleshing out details of the interactions between sex ratios, male income, welfare generosity and other factors that may influence non-marital fertility. The model is useful because it highlights how marriage markets and government aid programs interact as determinants of marriage and fertility choices. Most of the existing empirical literature on the relationship between marriage market conditions, government aid to unwed mothers, and individual decisions concerning marriage and fertility is not motivated by a specific model of marriage and fertility decisions. Rather, the literature contains numerous attempts to test one of two general propositions. The first is that marriage rates are higher and non-marital fertility rates are lower in marriage markets where more men enjoy better employment and income prospects. The second is that marriage rates are lower and non-marital fertility rates are higher when aid to unwed mothers is more generous. The model presented here demonstrates that these propositions are too general. The relationships between marriage market conditions, government aid programs, and a given women’s individual marriage and fertility decisions depend on all the factors that determine her relative
position in the marriage market. The distributions of both male and female incomes as well as the value of government aid to unwed mothers interact in determining margins of choice for individual women. As a result, the effects of changes in marriage market conditions are determined, in part, by the nature of government aid to unwed mothers, and the effects of increasing or decreasing aid to unwed mothers are likewise influenced by current marriage market conditions. By failing to capture the interactions between marriage market conditions and government aid programs, previous empirical studies likely misstate and may understate the importance of both factors.

The model yields several results concerning interactions between marriage market conditions and aid programs. The most striking involves how the existence of government aid shapes the impacts of changes in marriage market conditions. Wilson (1987) argues that declines in the availability of marriageable men are the most likely explanation for the observed increase in rates of single parenting since 1960, and he specifically argues that the time series pattern of changes in government aid to unwed mothers indicates that government aid to unwed mothers is not an attractive explanation for the rising rate of single motherhood. However, Wilson fails to realize that the mere existence of government aid to unwed mothers increases the likelihood that women who face adverse marriage market conditions will choose to be single mothers.

Women who cannot find a husband worth marrying must choose between three other options. They may remain single without children. They may raise children using their own resources, or they may raise children with the help of government aid. The assortative mating predictions of the model presented here indicate that single parenting should be concentrated among women with relatively little wealth and low potential earnings. Since these women may find it difficult if not impossible to raise children using their own resources, they may simply remain single without children when faced with poor marriage prospects. Thus, adverse shocks to marriage markets may have no effect on rates of single
motherhood unless some external source of support, e.g. government aid, makes single motherhood a viable choice for economically disadvantaged women.

The model also illustrates how commonly employed regression models may yield false inferences concerning the links between marriage market conditions and observed family structures. Many common measures of marriage market prospects are quite aggregate and do not capture the importance of relative positions within marriage markets. Further, linear probability models that examine the relationship between marriage markets and family structures necessarily require collapsing multiple dimensions of family structure into a binary classification. Both the aggregation of family structures and the use of aggregate measures of marital prospects may confound attempts to measure the links between marriage market conditions and family structure outcomes.

The following section of the paper develops the model.

1. The Model

The model developed here shares some features with the models in Willis (1999), Lam (1988), and Rosenzweig (1999), but is most closely related to Willis (1999). Both Willis and I seek to formalize the influence of marriage markets on family structure. However, the details are quite different. Willis’ model does not capture the interaction between marriage markets and government aid, but in contrast to the model presented here, it does incorporate relationships between children and absent fathers. In the model below, I assume that absent fathers do not contribute to child welfare, and I also assume that absent fathers do not enjoy any consumption gains from having children.

I adopt the following notation:
q = a collective good.
X_i = private good consumption. This good serves as a numerarie.
i=f,m.
c = the cost per unit of q.
B= transfer made to a woman participating in a government program
for single mothers.

\[ W \in [W_l, W_h] = \text{female endowment.} \]

\[ E \in [E_l, E_h] = \text{male endowment.} \]

I assume a finite number of males and females. There are \( M \) males and \( F \) females, and no two males or females have exactly the same endowment. I interpret the collective good, \( q \), as a composite index of the consumption value of children. The index is increasing in both child quality and quantity, but I make no attempt to analyze these components separately. Utility functions are the same for all males and females. They take the form:

\[ U_i = \phi(q) + \gamma(q) X_i \quad i = f, m \]

Assume that \( 0 < \gamma' < \infty, \gamma'' \leq 0, 0 < \phi' < \infty, \text{and } \phi'' \leq 0 \). This form ensures that utility is transferable between marriage partners. ¹

Women have four options in this model. They may marry, in which case, they will always have children. They may remain single and have no children. They may remain single, have children, and accept government aid, or they may remain single and raise children using their own resources. I begin by describing a woman’s optimal choice from the three options that do not involve marriage. Then, I demonstrate how the number of males and the distribution of their endowments affects the choice between marriage and the best option outside marriage.

To begin, assume that no males exist, but allow the possibility that women may still have children. In this scenario, women must choose whether or not to accept government aid, and if they do not accept aid, they must choose whether or not to have children. I proceed by deriving the relationship between endowments and utility

¹None of the results presented below require that men and women have the same preferences. However, this restriction simplifies notation.
assuming that aid is not available. Then, I derive a similar relationship assuming that a woman must be in the government aid program. The envelope of these indirect utility functions illustrates how choices would vary with endowments in a world without men. Given this envelope, analyses of marriage market equilibria are straightforward.

Assume that no men and no government aid exist, but allow women to have children through a cloning technology. A woman’s optimization problem is the following:

$$\max_{q, X_f} U = \varphi(q) + \gamma(q) X_f \quad \text{s.t.} \quad W = cq + X_f, \quad q \geq 0, \quad X_f \geq 0$$

Given, my assumptions, $q$ is a normal good, and a critical endowment exists that divides the endowment distribution into two regions. Women with endowments $W > W^q$ choose $q > 0$ while women with endowments $W \leq W^q$ choose $q = 0$, where

$$W^q = \frac{c\gamma(0) - \varphi'(0)}{\gamma'(0)}$$

I assume that $W^q \in (W_1, W_h)$. Thus, with no aid and no spouses, only women with endowments above $W^q$ have children. Others spend their resources entirely on private consumption, $X_f$.

Now consider the case where women must participate in a government aid program. Within the program, women receive a resource transfer, but their consumption choices are restricted. Specifically, women must spend their entire endowment on $q$, which implies that $cq \geq W$. In this framework, the constraint on $q$ serves two purposes. First, because $q$ must be positive, all those receiving aid must have children. Second, the precise level of the constraint implies that private consumption must be less than the benefit level, $X_f \leq B$. While I do not explicitly model the labor supply decision that is often discussed in the welfare literature, this private consumption constraint is an attempt to capture the
asset restrictions and high marginal tax rates that until recent years characterized programs that provide support to unwed mothers. If I assume that any earnings outside the home are taxed at a 100% rate, then mothers cannot increase private consumption by diverting time away from producing q. Thus, in the aid program, a woman’s problem is given by

$$\max_{q, X_r} U = \varphi(q) + \gamma(q) X_r \quad \text{s.t.} \quad W + B = cq + X_r, \quad q > \frac{W}{c}$$

It is important to realize that the assumption $X_r \leq B$ is only one of several different ways to model the fact that welfare programs restrict the ability of participants to use their financial and human wealth to finance private consumption. The key point is that the constraint $X_r \leq B$, guarantees that the marginal utility of endowment income within the aid program is always less than the marginal utility of endowment income in the unconstrained problem. Alternative characterizations that preserve this property will yield similar results.

Consider a woman with the smallest possible endowment, $W_1$. I assume that, for this woman, the value of being on aid, $V^{\text{aid}}(W_1)$, is greater than the value of being single with children, $\gamma(0)W_1$. I make this assumption to avoid an equilibrium where no women choose aid. I can show that if $V^{\text{aid}}(W_1) \leq \gamma(0)W_1$, then $V^{\text{aid}}(W) < \gamma(0)W$ for all $W > W_1$. In short, if the poorest woman would rather be childless than accept aid, all women would rather be childless than accept aid.\(^3\) I also assume that $B < W^q$. Appendix A demonstrates that this restriction on aid generosity ensures that the consumption

\(^2\) This will be true as long as $X_r \leq B < W^q$.

\(^3\) Two forces drive this result. First, if $V^{\text{aid}}(W_1) < \gamma(0)W_1$, we know the consumption constraint under the aid program is binding even for women at the bottom of the endowment distribution. Given this result, the slope of $V^{\text{aid}}(W)$ is strictly less than $\gamma(0)$ for all $W > W_1$.  

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constraint $X_c \leq B$ is binding even for women with $W=W_i$. In sum, aid is generous enough to attract poor women with no available spouse, but it is never so generous that the program constraints do not bind.

Figure 1 illustrates the indirect utility functions associated with accepting aid and not accepting aid given a particular specification of the utility function and the assumption that $B$ is generous enough to entice the poorest woman to prefer aid rather than remaining childless. In a world with no available spouses, the indirect utility function is simply the upper envelope of the two indirect utility functions in Figure 1. A women with endowment $W = W^b$ is indifferent between being on aid and being childless. In this example, $W^b < W^q$. Women with $W \in [W^b, W^q]$ choose $q=0$, and women with $W > W^q$ choose to raise children using their own resources. However, the results described below hold even if $W^b > W^q$.

Given this indirect utility function, it is possible to characterize the marriage market equilibrium. Here, the gains from marriage derive solely from the collective consumption value of children, and utility is transferable between marriage partners. In a model without aid to unwed mothers, Lam (1988) shows that transferrable utility and a collective consumption good imply that stable marriage assignments exhibit positive assortative mating. A similar result holds in this model.

Recall that $M$ and $F$ denote the number of men and women in the market. Define an assignment as an allocation of the $F$ women to one of $M+2$ possible outcomes. Each woman must remain single without aid, remain single with aid, or marry a particular man. No two women may be married to the same man, but multiple women may receive aid, and multiple women may remain single without aid. An equilibrium assignment is an allocation of women such that no man, no woman, and no coalition of men and women can benefit by changing the allocation of women.

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4The utility function for this example is $U(q, X_c) = q + b(k + X_c)$.  

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The following propositions describe the key results from the model. The first two describe the equilibrium in the model and the type of assortative matching that it exhibits. The final three are comparative static results.5

Proposition 1: Given a finite number of men and women, there exists a unique equilibrium assignment. In this equilibrium, single persons of either sex, if they exist, possess smaller endowments than all married persons of the same sex. Further, among those who are married, there is positive assortative mating on endowments.

Proposition 2: If an equilibrium assignment involves both single women on aid and single women without aid, single women on aid possess smaller endowments than those who are not on aid.

Proposition 3: Consider any translation of the male endowment distribution that increases (decreases) the endowment of some men without decreasing (increasing) the endowment of any other man. As a result, the number of marriages may increase (decrease) and will never decrease (increase). The number of single mothers may decrease (increase) and will never increase (decrease).

Proposition 4: Holding constant the number of females, consider changes in the number of males that are accomplished by cloning existing males. The number of marriages is a nondecreasing function of the number of males. The number of single mothers is a nonincreasing function of the number of males.

Proposition 5: The number of marriages in a nonincreasing function of the benefit level, B. The number of single mothers is a nondecreasing function of the benefit level, B.

Proposition 1 reflects the fact that collective consumption within marriage yields positive assortative mating. The proof of Proposition 2 simply shows that Vaid and Vno aid never cross more than once. Thus, as in Figure 1, all single mothers have endowments less than W*, and all single women without children, if they exist, have endowments greater than or equal to W*.

The remaining propositions are easily understood with the aid of Figure 2. The indirect utility functions associated with remaining single without aid, Vsingle, and single with aid, Vaid, are the same as in Figure 1, and the critical endowments, W* and W*, are

5 Proofs of these propositions are available upon request.
defined as before. Now, consider rankings of men and women according to their endowments. If a given woman is in the $n$th place in the female ranking and there are at least $n$ men, define the $n$th man in the male ranking as the assortative match for the $n$th woman. The function $V_{\text{married}}$ gives the indirect utility associated with marriage between each woman and her assortative match, if one exists. Proposition 2 states that, in equilibrium, each woman will either be single or in the particular marriage associated with $V_{\text{married}}$. None of the results in Propositions 1 through 5 or any of the implications discussed below rely on a specific assumption concerning how men and women divide the surplus from marriage. However, I do assume that $q$ is chosen efficiently within marriage.

Figure 2 introduces two critical endowment levels, $W_{ml}$ and $W^m$, that play a prominent role in the analyses below. The first, $W^m$, marks the smallest endowment among women who have the "opportunity" to marry in an assortative equilibrium. If $M \geq F$, then potential mates are available for all women, and $W^m$ equals the smallest female endowment. If $M < F$, then $W^m$ is the endowment of the $M$th woman. The second, $W_{ml}$, is the smallest endowment among women who are actually married in equilibrium.

Now, consider three regions of the female endowment distribution. Women with $W < W_{ml}$ never marry because there are simply not enough men to go around. Women with $W_{ml} < W < W^m$ choose not to marry because there is no surplus from marriage to the best men available to them. Women with endowments $W \geq W^m$ choose to marry.

1a. Shocks to Marriage Markets

Let $U$ (unions) denote the equilibrium number of marriages. According to Propositions 3 and 4, any increase in the wealth of men or the number of available men may increase and can never decrease $U$. From the prospective of women, an increase in $M$ introduces new potential mates. In terms of Figure 2, $W^m$ falls. Further, the value of $V_{\text{married}}$ at each point in the female endowment distribution
will either increase or remain constant depending on the
distribution of endowments among these new men. Therefore, \( W^m \) may
fall and \( U \) may increase. An increase in male incomes implies a
similar shift in \( V^{\text{married}} \), but in this case \( W^m \) may fall and \( U \)
increase while \( W^{ml} \) remains constant. In this scenario, the marriage
rate is higher not because there are more available men but because
those who are available are more desirable.

In short, either the introduction of more men or an increase in
the endowments of existing men may create new gains from trade in
the marriage market because both changes provide new alternatives
for women, and these new alternatives may improve the value of
marriage, \( V^{\text{married}} \). Figure 2 provides a specific version of Wilson’s
argument. When the marriage market improves, more women may find
that marriage now involves positive surplus for them. Further, in
Figure 2, all women have children. Therefore, any increase in the
marriage rate is associated with a reduction in the number of single
mothers.

However, Figure 3 presents a slightly different equilibrium
Beginning with the equilibrium in Figure 3, simple comparative
statics provide results that are not part of Wilson’s analysis. In
Figure 3, women with \( W < W^a \) accept aid as single mothers. Women
with \( W^a \leq W < W^m \) remain single and have no children, and women
with \( W > W^m \) marry and have children. Beginning at such an
equilibrium, imagine an increase in \( M \) or an increase in male wealth
that lowers \( W^m \) and therefore increases the number of marriages. As
long as the new value of \( W^m \) remains above \( W^a \), the number of women
raising children outside marriage remains unchanged. In Figure 3,
all the women raising children without a spouse are on aid, \( W < W^a \),
and because \( W^a < W^m \), these women are not at the margin in the
marriage market. Marginal changes in \( W^m \) resulting from
improvements in the marriage market are associated with reductions
in the number of single women without children, but these marginal
changes do not affect the number of single women with children.

This illustrates an important interaction between marriage
market conditions and aid to unwed mothers in determining family
Rosenzweig (1999) analyses nonmarital births within a multinomial choice framework, and he also notes how reduced form approaches that incorporate a subset of available choices should yield inconsistent estimators of structural relationships between women’s opportunities and choices.

At the margin, changes in sex ratios and the distribution of male incomes that change the marriage rate may or may not affect the prevalence of single-parent households. Women with endowments near $W_m$ are the marginal women in the marriage market. If $W_s < W_m < W_q$, then remaining single without children may be the best option outside marriage for these marginal women, and changes in the marriage rate need not be accompanied by changes in the prevalence of single parent families. Single women without children may completely absorb all but the largest shocks to marriage markets.

Note the contrast with the scenario presented in Figure 2 where, $W_s > W_m$. As noted above, the relative generosity of aid in Figure 2 is such that the marginal women in the marriage market view raising children on aid as their next best option outside marriage. Thus, any increase in sex ratios or male incomes that enhances gains from marriage will simultaneously raise marriage rates and reduce the number of single mothers. This is precisely the type of effect that Wilson highlights, but Wilson fails to note that his conjecture concerning the role of marriage markets in single parenting decisions is most relevant in a world with significant government aid to unwed mothers.

Further, the model may also help explain why empirical studies motivated by Wilson’s conjecture have not discovered a clear and consistent statistical relationship between marriage market conditions and measures of family structure. Consider Figures 4a, 4b, and 4c. Figure 4a describes a marriage market with ten women. In the original equilibrium, there are eight men, and all eight are married. Among the women, eight are married, one is single without children, and one is single with children. The function $V^{\text{married(new)}}$ traces the surplus available from marriage in this market under the

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6 Rosenzweig (1999) analyses nonmarital births within a multinomial choice framework, and he also notes how reduced form approaches that incorporate a subset of available choices should yield inconsistent estimators of structural relationships between women’s opportunities and choices.
assumption that the three wealthiest men in the market are no longer present. The new equilibrium involves five women who are married, four women who are single without children, and one woman who is single with children. Note that this negative shock to the marriage market does not change the number of single mothers.

Figure 4b illustrates results for a similar comparative static exercise, except in this case, single mothers are no longer inframarginal in the marriage market. In this example, five women are married and five women are single mothers in the original equilibrium. The shock to the marriage market involves removing only the two wealthiest men, and the equilibrium associated with \( V_{married(new)} \) involves three married women and seven single mothers.

With the aid of Figures 4a and 4b, imagine the following thought experiment. Assume that each of these Figures describes a distinct geographic marriage market and that, within each market, the equilibrium assignments correspond to outcomes for two distinct generations of women. Given these assumptions, Figure 4c plots changes in the number of single mothers resulting from changes in the availability of men for each of these markets. Given data from these two markets, simple regression techniques might lead one to conclude that reductions in the sex ratio yield reductions in the rate of single motherhood. Such a pattern appears in Figure 4c even though the model clearly predicts that a reduction in the supply of men can never increase the number of single mothers.

Taken as a whole, the existing empirical literature provides weak support for Wilson’s hypothesis because it provides little direct evidence that the availability of marriageable men affects non-marital fertility rates or rates of single parenting. However, much of this literature involves regression analyses that suffer from the specification problems that are highlighted in Figures 4a-c. The link between marriage market conditions and a particular

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women’s choice concerning whether or not to be a single mother depends directly on whether or not being a single mother is her best option outside marriage. This is jointly determined by her position in the marriage market and the relative generosity of aid to single mothers. Estimation strategies that do not permit heterogenous responses along these dimensions may well produce misleading inferences concerning the potential impacts of changes in marriage market conditions.

1.b Changes in Aid

So far, I have discussed how the level of benefits plays a role in determining the various impacts of changes in marriage market conditions. However, a comparison of Figures 2 and 3 also illustrates that the effects of changes in aid levels, B, depend on marriage market conditions. Beginning with either one of the equilibria depicted in these Figures, a reduction in B reduces the number of single parents. However, the results of this reduction are different depending on the marriage market conditions in the original equilibria. If we begin with the situation depicted in Figure 2, the reduction in single parent families coincides with an increase in the marriage rate. Here, marriage is the next best option for marginal women receiving aid. On the other hand, if we begin with the assignments displayed in Figure 3, a reduction in B will lower the number of single parents but not the number of single persons. In this case, remaining single without children is the next best option for marginal women on aid.

Thus, when aid is meager and M/F is well below one, further reductions in aid should not impact marriage rates even if they reduce the number of single parents. However, when aid is generous relative to males incomes and M/F is close to one, reductions in aid should be accompanied by a reduction in the number of single parents and increased marriage rates.

Further, Figures 2 indicates that marriage markets may influence the strength of the relationship between the level of
benefits available to single mothers and the number of single mothers. In Figure 2, the marginal woman on aid views marriage as her next best option. If her state reduces benefits, she will be more likely to leave the aid program if she has better marriage prospects. Thus, responses to either increases or decreases in welfare benefits will be determined in part by marriage market conditions among disadvantaged women and any change in these conditions that coincide with a change in benefit regimes.

2. Related Work

Above, I noted that Willis (1999) provides a related model that does not incorporate aid. In Willis’ model, absent fathers derive utility from their children, and Willis argues that equilibria may exist where low income women raise children on their own and low income men father children out of wedlock by numerous women. Such equilibria are most likely when male incomes at the bottom of the income distribution are low relative to female incomes.

In this underclass equilibrium, low income men make small voluntary child support payments to each of their partners. Because women can collect these payments from each father, being a single mother may dominate being single without children even for women with low incomes and no prospect of receiving government aid. In my model, this result is not possible because men derive no utility from children who do not live with them. However, Willis’ underclass equilibrium may not exist. Willis does not provide a set of conditions that are sufficient to ensure an underclass equilibrium. Rather, he argues that this equilibrium is possible given an unbalanced sex ratio and a critical level of female incomes relative to male incomes at the bottom of the income distribution. I conjecture that the existence of a government program of aid for unwed mothers can only increase the likelihood that such an equilibrium exists because aid raises the relative incomes of single mothers.
Rosenzweig (1999) is one of the few related papers that estimates an empirical model with a structure similar to the one described here. He estimates a discrete choice model that treats different combinations of marriage and fertility choice as distinct choices by women. Although his method does not yield direct estimates of the type of marriage market effects described here, he does present estimates of the effects of AFDC benefit levels on family structure. He finds sizeable effects among economically disadvantaged women. Foster and Hoffman (1999) also find large effects when they employ Rosenzweig’s methodology on a different data set.

3. Conclusion

A significant empirical literature examines correlates of the significant rise in single motherhood, especially among black women, following the expansion of aid to single mothers during the 1960s. The literature focuses on two distinct hypotheses. Either the expansion of welfare programs or changes in marriage market conditions caused the observed changes in family structure. To date, existing empirical studies find mixed evidence concerning the direct effects of either aid programs or marriage market conditions on rates of single motherhood. However, the model outlined here demonstrates that the interaction effects associated with marriage market conditions and welfare systems may be a key determinant of rates of single motherhood.

While it is well established that adverse shocks to marriage markets affect marriage and rates of marital fertility, there exists weak evidence that shocks to marriage markets increase rates of single motherhood. These patterns may reflect an important interaction between marriage markets and welfare programs. When aid to single mothers is meager, single parenting may not be an option for women who find themselves with poor marriage prospects. However, if a substantial aid program exists, women may respond to adverse marriage market shocks by choosing to become single parents.
Thus, the model outlined here points to the need for empirical work that will quantify the importance of interactions between aid programs and marriage market conditions.
Figure 1

\[ V(W) \]

\[ W^B \quad W^q \]
Note: in this example $W^m = W^m$
Figure 4a
Figure 4c

$\Delta$single mothers vs $\Delta$men

Points A and B
References


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