The Relationship Between Marriage Market Prospects and Never-Married Motherhood

Derek Neal

ABSTRACT

Many studies document a clear relationship between the supply of marriageable men and marriage rates, but few studies find that the supply of marriageable men affects the number of women who choose to be single mothers. The model presented here addresses this puzzle. Many women view either marriage or single motherhood as an inframarginal choice because a third option, remaining single without children, is relatively attractive to them. Regression models that implicitly treat all women as potential mothers, who simply choose whether to raise children inside or outside marriage, may yield false inferences concerning the relationship between marriage markets prospects and family structure choices.

I. Introduction

During the past four decades, the prevalence of single-parent families has increased dramatically in the United States. The decline of two-parent families is a potential cause for concern since two-parent families may make greater investments in their children. While a significant literature assesses potential explanations for this recent shift away from two-parent families, no consensus explanation has emerged.[1]

Derek Neal is a professor in the department of economics at the University of Chicago and is an NBER research associate. *He is grateful to Dan Black, Serguey Braguinsky, Jonathan Gruber, John Kennan, Robert Moffitt, Jim Walker, and Robert Willis for helpful comments. He owes special thanks to Larry Samuelson. He claims responsibility for all errors. The data used in this article can be obtained upon request from the author.*
[Submitted December 2001; accepted April 2003]
ISSN 022-166XE-ISSN 1548-8004

1. Testa and Krough (1995) and Ellwood and Jencks (2002) provide summaries of the literature.

Table 1 describes certain aspects of how family structures changed between the 1960 and 1990 censuses. The statistics refer to women aged 25–35 within cells defined by race and education level. The first entry in each cell gives the fraction of women who have ever been married. The second entry gives the fraction who have never been married and are nonetheless raising their own children. Because the latter category does not include women who are widowed or divorced, the table isolates changes in single motherhood that result from changes in the number of adult women who raise children without any formal source of spousal support.

In 1960, most single mothers were widowed or divorced. Rates of never-married motherhood were three percent or less regardless of race or education level.[2] Further, regardless of race, the vast majority of women older than 25 were married or had been married before. By 1990, marriage rates were lower for both black and white women of all education groups, but the most striking change in family structures involves the rise in never-married motherhood among black women without a college education. In 1990, more than one-third of black women with less than a high school education were never-married mothers. The corresponding fractions among black women with a high school diploma or some college experience were 0.258 and 0.187. However, among black women with a college education from the same birth cohorts, the number of never-married mothers remained less than one in 15 women, and the comparable fractions of never-married mothers among white women also remained less than one in 15 regardless of education level.

Table 2 describes trends in several measures of the employment and earnings prospects among men aged 26–36. The table provides statistics for groups of men defined by race and education level, and therefore provides suggestive information about trends in marriage market prospects among the groups of women described in Table 1. However, in each census year, these comparisons understate the magnitude of black-white differences in numbers of employed men per woman because sex ratios (ratios of males to females) are consistently lower among blacks than among whites during this period.

The most striking feature of Table 2 involves the dramatic decline in employment rates among less-educated black men after 1970. By 1990, only 44 percent of black men aged 26–36 without a high school diploma reported working at least 26 weeks during the previous calendar year. Further, recent studies suggest that a significant number of black men who were not working full-time in 1990 were actually in prison. Western and Pettit (2000) document a dramatic rise in incarceration rates among black males, especially the less educated, during the 1980s. They estimate that on any given day in 1990 more than 23 percent of all black males aged 20–35 without a high school education were in jail or prison. Note that this number is a lower bound on the fraction who spent some time in prison during the year.

Wilson (1987) claims that these trends in employment and earnings levels among less skilled black men contribute directly to the rise in single motherhood observed

2. The low rate of never-married motherhood among black, high school dropouts in 1960 is not simply a reflection of the fact that the modal black women in 1960 did not have a high school diploma. In 1960, rates of never-married motherhood among black women who received one to three years of schooling are less than 3 percent.

Table 1
Trends in Family Structure Black Women Aged 25–35, Fractions Ever Married and Never Married with Children

	1960	1970	1980	1990
Less than high school	89, 3.1	83, 8.9	69, 20.2	46, 35.3
High school	88, 2.3	84, 6.2	74, 14.0	54, 25.8
Some college	85, 2.5	83, 4.5	72, 11.5	59, 18.7
College graduate	79, 0.3	81, 1.8	65, 4.6	56, 6.2

An entry (x,y) gives two fractions. x = fraction of women ever married. y=fraction never-married with children.

White Women Aged 25–35, Fractions Ever Married and Never Married With Children

	1960	1970	1980	1990
Less than high school	94, 0.3	94, 0.9	92, 2.2	85, 5.8
High school	93, 0.1	93, 0.3	91, 1.0	85, 2.8
Some college	91, 0.1	90, 0.2	85, 0.7	81, 1.9
College graduate	83, 0.1	82, 0.1	76, 0.3	68, 0.5

An entry (x,y) gives two fractions. x = fraction of women ever married. y = fraction never-married with children. The data source is the Integrated Public Use Microdata Series drawn from decennial census files.

among black women during the 1970s and 1980s, and this claim seems quite plausible. It is clear that the marriage market prospects of less-educated black women deteriorated greatly between 1970 and 1990, and this is the only group that exhibits not only notable rates of single motherhood but also significant numbers of never-married mothers, who presumably receive little or no support from the fathers of their children.

However, existing empirical studies do not establish a consistent link between supplies of employed men and rates of single motherhood. While there is clear evidence that sex ratios as well as male earnings and employment prospects affect female marriage behavior,[3] Testa and Krough (1995) note that "findings [concerning the effects of male earnings and employment prospects] are less conclusive for nonmarital parenthood."[4] Based on the current empirical literature, some might easily conclude that the collapse of employment rates and earnings levels among less-educated black men over the period 1970–90 affected marriage rates among less-educated blacks but had

3. See Angrist (2000), Wallace (2000), Pierret (1995), Brien (1997), Fossett and Kiecolt (1993) and Lichter el al (1992).

4. See Testa and Krough (1995) p. 93. Ellwood and Jencks (2002) provide a similar but more recent assessment of the related literature.

Table 2
Trends in Employment and Income Black Men Aged 26–36 (Fraction Who Worked Last Year, Fraction Who Worked 26 Weeks, Average Earnings)

	Less Than High School	High School	Some College	College	Total
1960	0.91, 0.80, $10,469	0.94, 0.86, $13,745	0.93, 0.84, $14,799	0.96, 0.92, $18,391	0.92, 0.82, $11,688
1970	0.87, 0.83, $14,874	0.94, 0.91, $19,865	0.96, 0.91, $22,723	0.96, 0.91, $28,274	0.92, 0.87, $18,115
1980	0.76, 0.62, $11,771	0.87, 0.77, $17,385	0.89, 0.79, $19,738	0.94, 0.86, $25,909	0.85, 0.74, $17,424
1990	0.62, 0.44, $7,164	0.81, 0.67, $12,987	0.89, 0.78, $17,745	0.94, 0.86, $26,375	0.81, 0.68, $14,915

White Men Aged 26–36 (Fraction Who Worked Last Year, Fraction Who Worked 26 Weeks, Average Earnings)

	Less Than High School	High School	Some College	College	Total
1960	0.96, 0.90 $17,858	0.99, 0.96, $22,458	0.98, 0.93, $24,681	0.99, 0.95, $30,445	0.98, 0.93, $22,096
1970	0.95, 0.91, $22,814	0.98, 0.97, $28,513	0.98, 0.94, $30,904	0.98, 0.94, $38,415	0.97, 0.94, $29,421
1980	0.90, 0.80, $18,799	0.96, 0.91, $25,650	0.97, 0.91, $27,302	0.98, 0.93, $33,614	0.96, 0.90, $27,353
1990	0.87, 0.73, $14,117	0.95, 0.88, $21,349	0.96, 0.91, $25,426	0.98, 0.93, $36,920	0.95, 0.88, $25,562

Notes: An entry (x,y,z) gives two employment fractions and average income. x = fraction working at all in the past year, y = fraction working at least 26 weeks in the past year and z = average earnings (1989 dollars). This average includes those with zero earnings. The data source is the Integrated Public Use Microdata Series drawn from decennial census files.

little to do with the contemporaneous rise in rates of single motherhood among less-educated black women.

I argue here that such a conclusion is not warranted, and I explain why the regression methods that dominant the relevant empirical literature are problematic as a vehicle for testing Wilson's hypothesis. I present an economic model that develops a specific version of Wilson's hypothesis, and I flesh out its empirical implications. In the model, single motherhood is one alternative to marriage and the economic surplus available in different family structures *completely* determines marriage and fertility choices. Thus, improvements in overall marriage prospects can only reduce equilibrium rates of single motherhood. Nonetheless, the model could easily generate data

that actually exhibit a *positive* correlation among marriage markets between sex ratios and rates of single motherhood. Further, the model also can generate data that imply a positive correlation between changes in sex ratios and changes in rates of single motherhood over time among different marriage markets.

Regressions of single motherhood on measures of marriage market prospects are problematic because an indicator variable for single motherhood collapses several dimensions of family structure choice into a single dichotomous variable. For many women, single motherhood is an inframarginal choice that is dominated by not only marriage but also by the choice to remain single without children. Among these women, changes in marriage market conditions directly affect marriage rates but have no impact on single-motherhood decisions, and below I show that when such women are more common in some marriage markets than others, regression models can easily yield misleading results concerning the determinants of single motherhood.

The following section of the paper develops the model. Additional sections discuss the results and how they inform the relevant empirical literature. The concluding section discusses future research and the relationship between the literature on single motherhood and the much larger literature on the timing and prevalence of marriage.

II. 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). My approach differs from that of Willis on at least two dimensions. I model government aid to single mothers, and I assume that absent fathers do not enjoy any consumption gains from having children.

I adopt the following notation:

q = collective good.
X_i = private good. 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.
$W \in [W_1, W_h]$ = female endowment.
$E \in [E_1, E_h]$ = male endowment.

There are M males and F females. The collective good, q, is a consumption index associated with children that increases in both child quality and quantity. Utility functions are the same for all males and females. They take the form:

$$U_i = \phi(q) + \gamma(q) X_i \quad i = f, m.$$

This form ensures that utility is transferable between marriage partners. Assume that

$$0 < \gamma' < \infty,\ \gamma'' \leq 0,\ 0 \leq \phi' < \infty, \text{and } \phi'' \leq 0.^5$$

5. Bergstrom and Cornes (1983) illustrate how the use of transferable utility functions facilitates analyses of models like this one. None of the results presented below require that men and women have the same preferences. However, this restriction simplifies notation.

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.

To begin, consider a model with no men. Here, women may choose to remain childless, to live as independent single mothers, or to live as single mothers on aid. I derive the relationships between endowments and indirect utility under the assumption that aid is not available and under the assumption that women must be in the government aid program. The upper 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.

Without men or government as sources of income, a woman's optimization problem is the following:

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

There exists an endowment W^q such that women with endowments $W > W^q$ choose $q > 0$ while women with endowments $W \leq W^q$ choose $q = 0$, where

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

Now consider the case where women must participate in a government aid program. Here, women must have children, and while the program provides resources for women, it also constrains their consumption choices. Specifically, private consumption must be less than the benefit level, $X_f \leq B$. Thus, in the aid program, a woman's problem is given by

$$\max_{q, X_f} U = \phi(q) + \gamma(q) X_f \text{ s.t. } W + B = cq + X_f, q > 0, 0 \leq X_f \leq B$$

Although I do not explicitly model the labor supply decision that is often discussed in the welfare literature, the constraint $X_f \leq B$ 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. For example, when earnings outside the home are taxed at a 100 percent rate, mothers cannot increase private consumption beyond B by diverting time away from producing q. I consider values of B that are generous enough to attract poor women with no available spouse but never so generous that the program constraints do not bind.[6] The constraint, $X_f \leq B$, simplifies the analysis, but the model has the same properties given any other constraints associated with aid that diminish the marginal value of endowment income. As long as V^{aid} rises more slowly

6. I assume that, for a woman with the lowest endowment, the value of being on aid, $V^{aid}(W_1)$ is greater than the value of being single without children, $\gamma(0)W_1$. This avoids equilibria with no women on aid. It is easy to show that if the poorest woman would rather be childless than accept aid, all women would rather be childless than accept aid. I also assume that $B < W^q$, and this implies that the constraint $X_f \leq B$ is always binding.

with endowments than $V^{no\ aid}$ at each endowment level, the equilibrium properties of the model and the comparative static results described below remain.[7]

Figure 1 illustrates the indirect utility functions associated with accepting aid and not accepting aid given a particular specification of the utility function.[8] A women with endowment $W = W^B$ is indifferent between being on aid and being childless. In the figure, $W^B < W^q$. However, the equilibrium properties described below hold even if $W^B > W^q$.

In this model, 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 these features generate positive assortative mating in marriage,[9] and a similar result holds in this model. 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. Appendix 1 provides a definition of surplus in marriage and proofs of the first two propositions below. These propositions describe the equilibrium in the model and the type of assortative mating that it exhibits. The remaining three propositions are comparative static results.

Proposition 1

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 perturbation 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 the number of females constant, consider changes in the number of males that are accomplished by cloning existing males. Instead of M men, new markets con-

7. For example, consider any fixed constraint, $X_f \leq K$. K may vary with B but not with individual endowments. If $K < \min (B + W_l, W^q)$, the program constraints bind for the woman with the lowest endowment, and the key properties of the model are immediate. Even if the private consumption constraints under aid equaled the sum of B plus a specific fraction of each women's endowment, I could still derive the key results presented below, but I would need to place restrictions on the size of this fraction.

8. The utility function for this example is $U(q,X_f) = q + (k+q)\ X_f$.

9. This result is common in two-sided matching problems where partner endowments are complements in the production of surplus. See Becker (1991), Bergstrom (1997), and Roth and Sotomayor (1990).

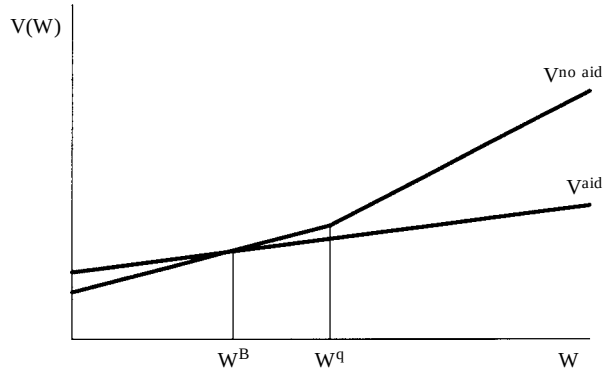

Figure 1

tain $(R+1)M$ men and contain R copies of each of the original M men. The number of marriages is a nondecreasing function of R. The number of single mothers is a nonincreasing function of R.

Proposition 5

The number of marriages is 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 V^{aid} and $V^{no\ aid}$ never cross more than once.[10] All single mothers on aid have endowments less than W^B, and all single women without aid, if they exist, have endowments greater than W^B. The remaining propositions are easily understood with the aid of Figure 2. The indirect utility functions associated with remaining single without aid, $V^{no\ aid}$, and single with aid, V^{aid}, are the same as in Figure 1, and the critical endowments, W^B and W^q, are defined as before. Now, consider rankings of men and women according to their endowments. If a given woman is in the nth place in the female ranking and there are at least n men, define the nth man in the male ranking as the assortative match for the nth woman. The function V^m gives the indirect utility associated with marriage between each woman and her assortative match, if one exists. Proposition 1 states that, in equilibrium, each woman will either be single or in the particular marriage associated with V^m.

Figure 2 introduces two critical endowment levels, W^{ml} and W^m, that play a prominent role in the analyses below. The first, W^{ml}, 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^{ml} equals the smallest female endowment. If $M < F$, then W^{ml} is the endowment of the Mth woman. The second, W^m, is the smallest endowment among women who are actually married in equilibrium.

10. Recall that $V^{aid} > V^{no\ aid}$ for the poorest women. See the Appendix for proofs of Propositions 1 and 2.

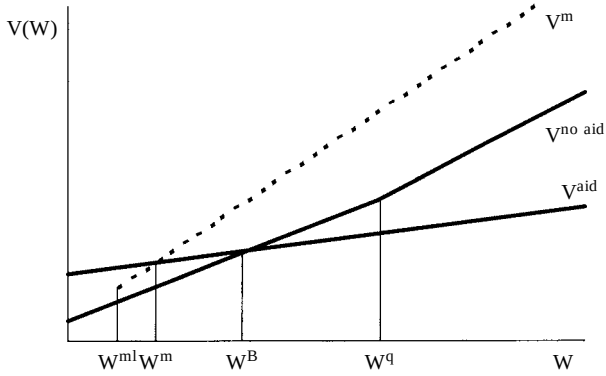

Figure 2

Note that women with $W < W^{ml}$ never marry, even if all men have high endowments, because there are simply not enough men to go around. Women with $W^{ml} \leq W < W^m$ 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.

III. Types of Marriage Market Equilibria

According to Propositions 3 and 4, any decrease in the wealth of men or the number of available men may decrease and can never increase the number of marriages. From the perspective of women, a decrease in M removes potential mates. In terms of Figure 2, W^{ml} rises. Further, the value of V^m at each point in the female endowment distribution will either decrease or remain constant depending on the distribution of endowments among these new men. Therefore, W^m may rise and the number of marriages may decrease. A decrease in male incomes implies a similar shift in V^m, but in this case W^m rises and marriages fall while W^{ml} remains constant. In this scenario, the marriage rate is lower not because there are fewer available men but because those who are available are less desirable. When marriage market prospects decline, more women may find that marriage does not involve positive surplus for them, and this is at the heart of Wilson's (1987) argument about marriage markets and single motherhood. Note that in Figure 2 all women have children. Therefore, any decrease in the number of marriages is associated with a one for one increase 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 $W < W^B$ accept aid as single mothers. Women with $W^B \leq W < W^m$ remain single and have no children, and women with $W \geq W^m$ marry and have children. Starting with such an equilibrium, imagine a decrease in M or a decrease in male wealth that raises W^m and therefore decreases the number of marriages. Note that the number of women raising children outside mar-

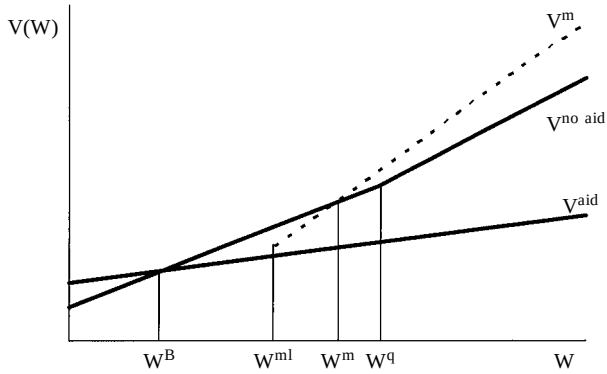

Figure 3

riage remains unchanged. In Figure 3, all women raising children without a spouse are on aid, and because $W^B < W^m$, these women are not at the margin in the marriage market. Marginal changes in W^m are associated with changes in the number of single women without children, but these marginal changes do not affect the number of single women with children.

The contrast between Figures 2 and 3 illustrates an important interaction between marriage market conditions and aid to unwed mothers in determining family structures. Given the relative generosity of aid in Figure 2, the marginal women in the marriage market view raising children on aid as their next best option outside marriage. Thus, any change in sex ratios or male incomes that influences the gains from marriage will simultaneously change marriage rates and the number of single mothers. This is precisely the type of effect that Wilson highlights, but Wilson fails to stress that his conjecture concerning the role of marriage markets in single parenting decisions may be most relevant in a world with significant government aid to unwed mothers.

Although all single mothers in Figures 2 and 3 receive aid, other types of equilibria involving single mothers are possible. Beginning with the equilibrium in Figure 2, imagine a deterioration in male endowments such that $W^m > W^q$. Such an equilibrium would involve married women, independent single mothers, single women without children and single mothers on aid. Further, from this starting point, consider an increase in B such that $W^q < W^B < W^m$. This type of equilibrium would involve married women, independent single mothers, and single mothers on aid. I use figures similar to Figures 2 and 3 in order to illustrate key results below. However, none of the results require that only these two types of equilibria exist.[11]

11. Nonetheless, I focus on Figures 2 and 3 because I am offering a framework for thinking about the forces that may have influenced the recent and dramatic rise in never-married motherhood among less-educated black women. Among these never-married mothers, aid receipt is the norm. I constructed a sample of all National Longitudinal Survey of Youth (1979) women who experience at least three years of never-married motherhood. Among black women in this sample who have no post-secondary education, almost 90 percent report receiving government aid.

IV. Testing Wilson's Hypothesis

In the model presented above, better marriage market conditions can only decrease and can never increase the number of single mothers in a given marriage market. Further, assuming that marriage is not an inframarginal choice for all potential single mothers in all marriage markets, economy-wide declines in male earnings and employment prospects necessarily increase rates of single motherhood. Nonetheless, one can generate data from this model that might lead some to falsely reject Wilson's hypothesis.

Consider Figures 4a, 4b, and 4c. Figure 4a describes two different equilibria for 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 $V^{m'}$ traces the surplus available from marriage in this market under the 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 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 $V^{m'}$ involves three married women and seven single mothers.

Now, 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 decrease the number of single mothers.[12]

The one-dimensional stratification of women into family structures based on their endowments simplifies the analyses developed in Figures 4a–c. However, the insight provided by this example does not hinge on one-dimensional sorting. The key point is that many women at the margin of some marriage markets may view single motherhood as an inframarginal choice, and this raises questions about the empirical models that dominate the literature on determinants of single motherhood. Like Figure 4c, regression models in this literature focus on spatial correlations between changes in

12. Although all the single mothers described in Figure 4a-c receive aid, it is straightforward to construct similar examples involving some marriage markets in which marginal women are choosing between marriage and independent single motherhood, and other markets where marginal women are choosing between marriage and remaining single and childless.

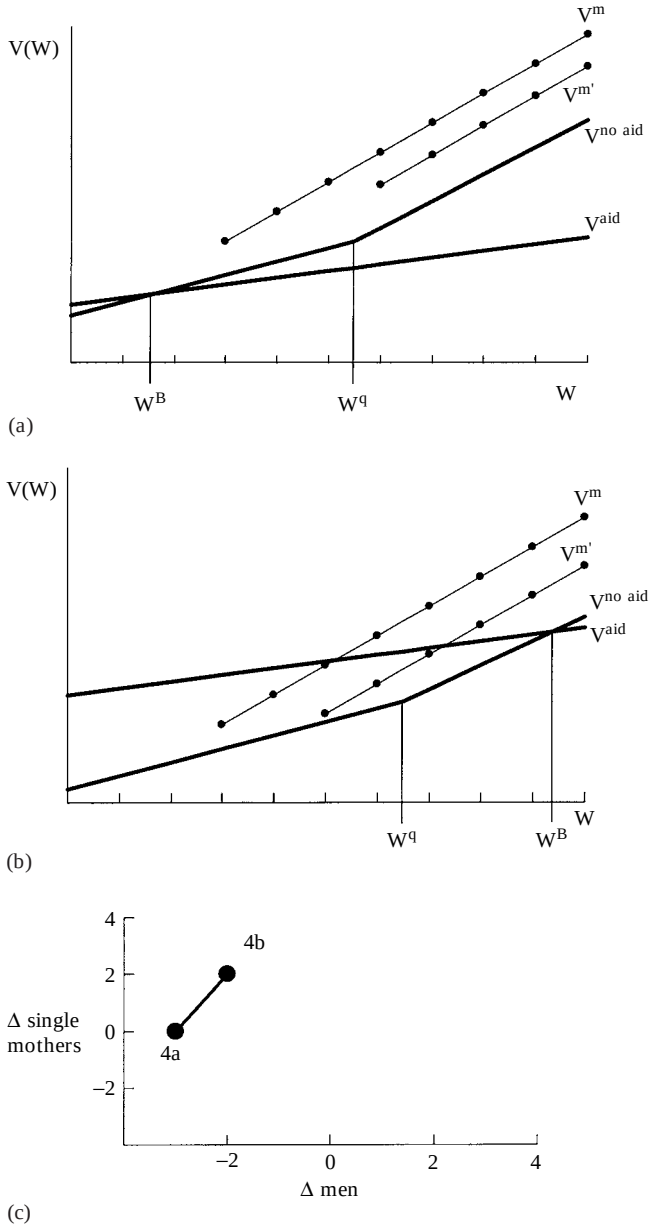
V(W)
V^m
$V^{m'}$
$V^{no\ aid}$
V^{aid}
W^B
W^q
W
(a)
V(W)
V^m
$V^{m'}$
$V^{no\ aid}$
V^{aid}
W^q
W^B
W
(b)
4
2
0
−2
Δ single mothers
4b
4a
−2
0
2
4
Δ men
(c)

Figure 4

single motherhood and changes in marriage market conditions.[13] Although these models implicitly assume that young women choose directly between single motherhood and marriage, significant numbers of women do not view single motherhood as one their two best options.

Appendix Table A1 shows that, in the 1990 census, roughly 15 percent of all black women aged 31 to 35 report being never-married without children, and this rate of 15 percent holds even among black women aged 31 to 35 who never finished high school. These women remained single and avoided having children for well over a decade after finishing their education, and thus appear to have decided that, regardless of their marriage market prospects, being single without children dominates single motherhood. In addition, there may be considerable numbers of married women in the population who would have chosen to remain single without children if their marriage prospects had been worse. Although many women make a direct choice between marriage and single motherhood, others will not choose single motherhood regardless of their marriage market prospects. Figures 4a–c indicate that without strong assumptions concerning how these different types of women are distributed among marriage markets, single motherhood regressions cannot provide useful information about the causal relationship between changes in marriage market prospects and single motherhood decisions.[14]

It is easy to imagine several scenarios in which women who respond most directly to changes in marriage market conditions do not view single motherhood as their best alternative to marriage, but one particular scenario may be relevant for thinking about the recent dynamics of single motherhood rates among black women in some large cities. Assume that incarceration rates are high and employment rates are very low among less-educated young men. In this circumstance, most less-educated and economically disadvantaged women face no viable marriage prospects. Thus, starting from this baseline, modest changes in the supply of marriageable men primarily affect the choices of women with significant education and earnings capacity. These women are more likely to weigh marriage and remaining single without children as their best options, and therefore, changes in their decisions may not change observed rates of single motherhood.[15]

13. See O'Hare (1988), Wilson (1987), White (1979), Plotnick (1988), and Black, McKinnish, and Sanders (2001). Taken together, these studies provide little evidence that declining marriage market prospects actually lead to higher rates of single motherhood.

14. Regression methods do not even provide a consistent estimator of the average effect of changes in marriage market conditions on single motherhood, given a particular set of initial equilibria, unless shocks to marriage market conditions are orthogonal to differences among marriage markets in the margins of choice facing various women. This orthogonality condition requires strong restrictions on the time series properties of aid programs, women's earnings, and marriage market conditions within markets.
The figures illustrate what is likely the most important reason that the elasticity of single motherhood to marriage market conditions varies among women and marriage markets. However, it is also straightforward to show that among women who have similar endowments but face different aid programs, those choosing between marriage and independent single motherhood are less responsive to changes in marriage market prospects than women choosing between marriage and single motherhood on aid.

15. See Figure 3. This type of baseline equilibrium may be more likely in states with low aid levels for single mothers.

V. Changes in Aid

A comparison of Figures 2 and 3 illustrates that, in a given marriage market, government aid levels influence the relationship between changes in marriage market conditions and changes in rates of single motherhood because generous aid levels increase the likelihood that marginal women consider single motherhood to be their best option outside marriage. However, it is also the case that marriage market conditions may influence how changes in aid affect rates of single motherhood. It is clear that if we begin with the equilibria described in Figures 2 and 3, any reduction in B can only reduce the number of single mothers. However, I noted earlier that there may also be equilibria such that $W^q < W^B < W^m$.[16] In this case, there are no single women without children. Women with $W > W^m$ are married. Those with $W^B < W < W^m$ are independent single mothers, and those with $W < W^B$ are single mothers on aid. Beginning at this equilibrium, marginal changes in benefits do not change the number of single mothers. Changes in B simply shift single mothers on or off aid.

If $W^q < W^B < W^m$, both marriage and remaining single without children may not be marginal choices for a significant group of women who have decided to be single mothers. Among these women, marginal changes in the terms of aid programs simply determine whether or not they will accept aid. If women like these exist in significant numbers in some but not all marriage markets, regressions models of the determinants of single motherhood may give misleading results concerning the relationship between changes in benefits and changes in rates of single motherhood. The results described here and in the previous section are just a few of many potential scenarios that illustrate how marriage market conditions and aid levels interact at a point in time to determine how rates of single motherhood will change in response to subsequent changes in aid or marriage market conditions.[17]

VI. Related Work

In a related model without government aid but with absent fathers who gain utility from children, Willis (1999) argues that equilibria may exist in which low-income women raise children on their own and low-income men father children out of wedlock by numerous women. Willis does not provide a set of conditions that are sufficient to ensure equilibrium but argues that such underclass equilibria are possible given unbalanced sex ratios and low levels of male incomes relative to female 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 equilibria exist because aid raises the relative incomes of single mothers.

16. To be concrete, consider the market described in Figure 4b, and assume that all men but the richest one are removed from the market.

17. Wilson (1987) offered his hypothesis concerning the role of supplies of marriageable men, at least in part, as a response to Murray (1984), who pointed to welfare programs as the catalyst for increasing single motherhood among disadvantaged black women. The existing literature contains numerous regression models of single motherhood that attempt to discriminate between these two hypotheses. The findings are quite mixed, and one might expect this given the analyses presented here.

In contrast, Akerlof, Yellen, and Katz (1996) raise the possibility that changing norms rather than changing opportunities may be primarily responsible for the recent changes in family structure that we observe. In AYK's model, widespread access to birth control pills and abortion erodes the custom of shotgun marriage. Women who adopt these new contraceptive technologies are more willing to engage in premarital sex without a commitment to marriage in the event that a conception occurs. Competition may force women who do not adopt these contraceptive methods to also engage in premarital sex without commitment, and out of wedlock births may rise as some of these women find their partners unwilling to legitimate their pregnancies.

Nonetheless, any explanation for the observed patterns in Table 1 that focuses on changes in norms alone, without incorporating changes in the economic resources that women enjoy in different family structures, must confront two questions. First, why is the rise in never-married motherhood concentrated among the economically disadvantaged, or put differently, is there a reason that AYK's hypothesis is more applicable to disadvantaged women? Further, and more important, if the observed increase in nonmarital fertility ratios primarily reflects a retreat from shotgun marriage as a custom, wouldn't one expect to see a rise in adoptions per nonmarital birth over this period? Before and after the expansion of access to abortion services, women experiencing nonmarital births have had the option to relinquish their children to adoptive parents. This option allows economically disadvantaged women to avoid the burden of raising children in poverty. However, the rate at which black women relinquish infants for adoption has been low historically and actually fell below one percent of nonmarital births by the early 1990s. Further, since the 1960s, relinquishment rates among white women have fallen dramatically.[18] AYK provide a compelling story about nonmarital births, but their model alone cannot explain why women who experience nonmarital births have stopped giving their children up for adoption. The observed change in relinquishment behavior suggests that women who experience nonmarital births now have access to significantly more resources than women who experienced nonmarital births prior to the expansions of both government aid for single mothers and labor market opportunities for women in general that took place during the past four decades.

VII. Conclusion

There is no single effect of changes in marriage market conditions on the family structure decisions of individual women. Some women view single motherhood as their best option outside marriage while others do not. Further, some single mothers may be infra-marginal to the entire marriage market. This heterogeneity among women complicates empirical work on the determinants of single motherhood. Measured correlations between changes in marriage market conditions and changes in rates of single motherhood may yield misleading inferences concerning the role of marriage market prospects in determining family structure choices.

18. See *http://www.adoptioninstitute.org/research* for details.

These insights are important because, taken at face value, the existing literature on relationships between marriage market conditions and family structure decisions creates a puzzle. Although existing studies do not provide clear evidence of a causal link between marriage market prospects and single motherhood, there is evidence that young women consider the employment and earnings prospects of potential spouses when deciding whether and when to marry. Further, there is much historical evidence that times of economic crisis are associated with declines in marriage. Wrigley and Schofield's (1989) demographic history of England shows that, when agriculture dominated England's economy, poor harvests were associated with marriage delay. In the United States, vital statistics data indicate that marriage rates were quite low during the worst years of the Great Depression. While the average marriage rate for the first half of the century was 10.6, the average from 1930 through 1933 was 8.6. More recently, data from the United Nations Economic Commission on Europe indicate that marriage rates declined dramatically in transition economies during the economic crises of the 1990s.[19]

Yet, prior to the 1960s, trivial numbers of never- married women chose to raise children on their own regardless of marriage market conditions. The model presented here highlights the possibility that, prior to the expansion of aid to single mothers, never-married motherhood was not an attractive option, even for women who faced poor marriage prospects. Without government aid, women who faced the worst marriage market prospects may not have enjoyed the resources required to raise children on their own. The expansion of welfare programs may be the key event that made an expansion of never-married motherhood among economically disadvantaged women possible, and once a system of aid was in place, the drastic decline in the supply of marriageable, less-educated, black men may have been the driving force behind the observed changes in family structure among black women. This possibility is somewhat ironic. The existing literature puts forth government aid to single mothers and shortages of marriageable men as competing explanations for changes in observed family structures among black women, but these two factors may have worked together over time to shape changes in black family structure.

More work is required to formulate an empirical model that captures how interactions between marriage market opportunities, government programs, and women's own earning opportunities simultaneously impact marriage and fertility decisions among different types of women in different marriage markets. In the end, we may yet conclude that changing marriage market opportunities play a small role in explaining the rise in never-married motherhood documented in Table 1. But, such a conclusion is not warranted given the available evidence. Table 2 documents a near complete collapse of marriage market prospects for less-educated black women after 1970. We cannot yet rule out the possibility that this collapse was an important catalyst behind the subsequent rise in never-married motherhood among less-educated black women.

19. See Wrigley and Schofield Chapters 9 and 10. Chapter 9 is by Ronald Lee. See also *100 Years of Marriage and Divorce Statistics: United States, 1867–1967,* and *Recent Demographic Developments in Europe*, 1999.

Theory Appendix

Given that utility is transferable within marriage, the following problem is equivalent to the problem of maximizing the joint surplus in a potential marriage. Consider a woman who chooses q and X_f to maximize her gains from marriage to a man with a particular endowment $E \in [E_1, E_h]$. The woman must provide her spouse with a utility level equal to his outside option $E\gamma(0)$, assuming $\phi(0) = 0$. Thus, the value of marriage given a woman with endowment W and a man with endowment E is given by $V^*(W, E)$.

$$V^*(W,\ E) = \max_{q, X_f, X_m} \phi(q) + \gamma(q) X_f$$

$$\text{s.t. } W + E - \varepsilon = X_f + X_m + cq, \phi(q) + \gamma(q) X_m = E\gamma(0)$$

where ε represents the cost of forming a marriage.

Proof of Proposition 1

Define $V^s(W)$ as the upper envelope of V^{aid} and $V^{no\ aid}$ in Figure 1, and consider the following matching process. Define $S(W, E) = V^*(W, E) - V^s(W)$ as the surplus in a marriage between a woman and a man with endowments W and E respectively. Rank M men and F women according to their endowments. Then, for each woman at each rank, $n = 1, 2, \ldots F$, calculate $V^*(W_n, E_n)$ as the value of marriage between a woman of endowment rank n and a man of equal rank, if one exists. If a man of equal rank does not exist, calculate $V^*(W_n, E_n)$ under the assumption that $E_n = 0$. Next, construct $S(W_n, E_n)$ for all women, $n = 1, 2, \ldots F$. The unique marriage market equilibrium assortatively mates each woman for whom $S(W_n, E_n) \geq 0$. All other women remain single and receive $V^s(W_n)$. This assignment rule yields a unique equilibrium. Any other set of assignments to marriage, single with aid and single without aid will not maximize total surplus.

Consider the two possible sources of deviations from this assignment rule. To begin, any assignment rule that results in a single woman of endowment rank n and a married woman of rank $n+k$ leads to a contradiction. It is straightforward to show that $V_W^{aid} < V_W^{no\ aid} \leq V_W^*(W, E)\ \forall\ W \in [W_1, W_h]$, holding constant any $E \in [E_l, E_h]$. Further, $V_W^{aid} < V_W^{no\ aid} < V_W^*(W, E)$ at all endowment levels (W, E) such that $q > 0$ is part of the solution to the problem that defines $V^*(W, E)$. If woman $n + k$ is married to a man with endowment E, the inequalities above imply that $S(W_n, E) > S(W_{n+k}, E) \geq 0$. Thus, woman n would be willing to marry the husband of woman $n + k$, and total surplus would increase if one dissolved the marriage of woman $n + k$ and then paired her husband to woman n.

Further, assignments that do not involve assortative mating within marriage cannot maximize total surplus. The gains from marriage in the model derive from collective consumption. Lam (1988) shows that, in this case, assortative mating maximizes the total surplus from any set of marriages involving a fixed number of men and women.

Proof of Proposition 2

Recall that by assumption $B < W^q$. Now, consider the maximization problem of a hypothetical woman who chooses aid and possesses an arbitrarily small endowment

$W = \delta$ such that $B + \delta < W^q$. Clearly, the consumption constraint associated with receiving aid is binding for this woman. Without the constraint, she would choose $q = 0$ and $X_f = B + \delta$, but the program requires $X_f \leq B$. Since X_f is a normal good, this constraint must also bind for all women with $W > \delta$. Therefore, for all $W \in [W_1, W_h]$,

$$V_w^{aid} = \frac{\phi'(q^{aid}) + \gamma'(q^{aid})B}{c}$$

Using the envelope theorem, it is straightforward to show that

$$V_w^{no\ aid} = \gamma(q^{no\ aid}) \geq \frac{\phi'(0) + \gamma'(0)W^q}{c} = \gamma(0)$$

Since $B < W^q$ by assumption, we know that $V_w^{aid} < V_w^{no\ aid}$ for all $W \in [W_1, W_h]$. This ensures that V^{aid} and $V^{no\ aid}$ never cross more than once and that V^{aid} may only cross $V^{no\ aid}$ from above. Therefore, given any two women such that $V^{aid} < V^{no\ aid}$ for one and $V^{aid} \geq V^{no\ aid}$ for the other, the former possesses a larger endowment than the latter.

Table A1

Share of Black Women Aged 31–35 Who Are Never Married Without Children

	Less Than High School	High School	Some College	College	Total
1960	5.7	7.3	8.5	15	6.62
	(4,463)	(1,482)	(401)	(281)	(6,627)
1970	6.0	6.6	5.6	12.7	6.55
	(3,401)	(2,289)	(537)	(369)	(6,596)
1980	6.8	8.1	9.5	19.6	9.3
	(2,550)	(3,999)	(1,956)	(1,060)	(9,565)
1990	14.6	13.5	13.4	25	15.2
	(1,930)	(5,153)	(4,706)	(1,909)	(13,698)

Share of White Women Aged 31–35 Who Are Never Married Without Children

	Less Than High School	High School	Some College	College	Total
1960	4.5	5.8	6.5	13.6	5.9
	(21,297)	(23,344)	(5,963)	(4,059)	(54,663)
1970	4.4	4.7	6.1	12.5	5.6
	(14,278)	(23,526)	(6,245)	(5,446)	(49,495)
1980	3.9	4.6	7.2	14.3	7.0
	(11,317)	(31,464)	(14,967)	(14,798)	(72,546)
1990	6.9	7.6	10.5	20.4	11.5
	(8,429)	(30,224)	(29,417)	(21,035)	(89,105)

Notes: Both panels employ data from women who are aged 31–35 at their census interview. The entries are the fractions of each race, education, year cell that report having never married and having no children. It is possible that some of these women gave birth to a child who is now deceased or living independently. The numbers in parentheses are sample sizes. The data source is the Integrated Public Use Microdata Series drawn from decennial census files.

References

Akerlof, George A, Janet L. Yellen, and Michael L. Katz. 1996. "An Analysis of Out-of-Wedlock Childbearing In the United States." *Quarterly Journal of Economics* 111(2): 277–316.

Angrist, Joshua. 2000. "Consequences of Imbalanced Sex Ratios." NBER Working Paper 8402.

Becker, Gary S. 1991. *A Treatise on the Family*, Enlarged Edition. Cambridge, Mass.: Harvard University Press.

Bergstrom, Theodore. 1997. "A Survey of Theories of the Family." In *Handbook of Population and Family Economics*, Vol 1A. ed. Mark Rosenzweig and Oded Stark. New York: Elsevier.

Bergstrom, Theodore, and Richard Cornes. 1983. "Independence of Allocative Efficiency from Distribution in the Theory of Public Goods." *Econometrica* 51(6):1753–65.

Black, Dan, Terra McKinninsh, and Seth Sanders. 2001. "Does the Availability of High Wage Jobs for Low-Skill Men Affect Welfare Expenditures and Family Structure? Evidence for the Coal and Steel Industries." Unpublished.

Brien, Michael. 1997. "Racial Differences in Marriage and the Role of Marriage Markets." *Journal of Human Resources* 32(4):741–78.

Chandra, Amitabh. 2000. "Labor Market Dropouts and the Racial Wage Gap: 1940-1990." *American Economic Review* 90(2):333–38.

Ellwood, D., and Mary Jo Bane. 1986. "The Impact of AFDC on Family Structure and Living Arrangements." *Research in Labor Economics* 7:137–207.

Ellwood, D., and Christopher Jencks. 2002. "The Growing Differences in Family Structure: What Do We Know? Where Do We Look for Answers?" Presented at the Institute for Research on Poverty Summer Workshop.

Fossett, M. A., and K. J. Kiecolt. 1993. "Mate Availability and Family Structure Among African Americans in U.S. Metropolitan Areas." *Journal of Marriage and Family* 55:288–302.

Fossett, M. A., and K. J. Kiecolt. 1993. "A Methodological Review of the Sex Ratio: Alternatives for Comparative Reseach." *Journal of Marriage and Family* 53:941–47.

Heckman, James, T. M. Lyons and P.E. Todd. 2000. "Understanding Black-White Wage Differentials, 1960–1990." *American Economic Review* 90(2):344–49.

Hoffman, Saul, and E. Michael Foster. 2000. "AFDC Benefits and Non-Marital Births to Young Women." *Journal of Human Resources* 35(2):386–91

Kiecolt, K. Jill, and Mark A. Fossett. 1995. "Mate Availability and Marriage Among African Americans: Aggregate and Individual-Level Analyses." In *The Decline in Marriage Among African Americans*, ed. M. Belinda Tucker and Claudia Mitchell-Kernan. New York: Russell Sage.

Lam, David. 1988. "Assortative Mating with Household Public Goods: Theoretical Results and Empirical Implications." *Journal of Human Resources* 23(4):462–87.

Lichter, Daniel et al. 1992. "Race and the Retreat from Marriage: A Shortage of Marriageable Men?" *American Sociological Review* 57:781–99.

Murray, Charles. 1984. *Losing Ground—American Social Policy, 1950–1980*. Basic Books.

Neal, Derek A. 2001. "The Economics of Family Structure," NBER Working Paper 8519.

Olsen, Randall, and George Farkas.1990. "The Effects of Economic Opportunity and Family Background on Adolescent Cohabitation and Childbearing among Low-Income Blacks." *Journal of Labor Economics* 8(3):341–62.

Pierret, Charles. 1995. *Models of the Marriage Market: Theories and Evidence*. Disseration. Evanston: Northwestern University.

Plotnick, Robert D. 1988. "Determinants of Teenage Out-of-Wedlock Childbearing." Presented at the 1988 meetings of the Population Association of America in New Orleans.
Rosenzweig, Mark. 1999. "Welfare, Marital Prospects and Nonmarital Childbearing." *Journal of Political Economy* 107(6): S1–32.
Roth, Alvin, and Marilda Sotomayor. 1990. *Two-Sided Matching*. Econometric Society Monographs No. 18. Cambridge: Cambridge University Press.
Sampson, Robert J. 1995. "Unemployment and Imbalanced Sex Ratios: Race-Specific Consequences for Family Structure and Crime." In *The Decline in Marriage Among African Americans* ed. M. Belinda Tucker and Claudia Mitchell-Kernan. New York; Russell Sage.
South, Scott. and Kim Lloyg.1992. "Marriage Markets and Nonmarital Fertility in the United States." *Demography* 29:247–64.
Testa, Mark, and Marylin Krough. 1995. "The Effect of Employment on Marriage Among Black Males in Inner-City Chicago." In *The Decline in Marriage Among African Americans*, ed. M. Belinda Tucker and Claudia Mitchell-Kernan. New York: Russell Sage.
Wallace, Geoffrey. 2000. "An Assessment of Several Explanations for the Decline in Marriage." Madison: University of Wisconsin. Unpublished.
Western, Bruce, and Becky Pettit. 2000. "Incarceration and Racial Inequality In Men's Employment." *Industrial and Labor Relations Review* 54:3–16.
White, Lynn K. 1979. "The Correlates of Urban Illegitimacy in the United States, 1960–1970." *Journal of Marriage and Family* 715–26.
Willis, Robert.1999. "A Theory of Out-of-Wedlock Childbearing." *Journal of Political Economy* 107(6): S33–64.
Wilson, William J. 1987. *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy*. Chicago: University of Chicago Press.
Wilson, William J. and Neckerman, Katherine M. "Poverty and Family Structure: The Widening Gap between Evidence and Public Policy Issues," In *Fighting Poverty: What Works and What Doesn't*, ed. S. H. Danziger and D. H. Weinberg, 232–59. Cambridge: Harvard University Press.
Wrigley, E. A. and R. S. Schofield. 1989. *The Population History of England 1541–1871*. Cambridge, England: Cambridge Press.
Wood, Robert. 1995. "Marriage Rates and Marriageable Men: A Test of the Wilson Hypothesis." *Journal of Human Resources* 30(1):163–93.