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ABSTRACT

A significant literature in demography and demographic history documents clear relationships between the supply of men with stable earnings and marriage rates among women. Wilson (1987) reasons that because single motherhood is an alternative to traditional marriage, circumstances that impede marriage should also encourage single motherhood. However, few studies provide evidence that the supply of marriageable men affects single parenting rates among women in any significant way. To address this puzzle, this paper presents a model based on a specific version of Wilson's hypothesis. The model demonstrates how previous studies based on various regression methods may have misstated the actual relationship between declining marriage market prospects and the prevalence of never-married mothers.

Much of the existing literature frames the expansion of welfare and decreasing supplies of marriageable men as two competing explanations for the rise in single motherhood, especially among less educated black women, but the model developed here shows that the interaction between these two factors may be crucial for understanding the demographic trends we observe. Wilson asserts that, after 1970, economically disadvantaged black women responded to poor marriage markets by choosing to raise children on their own, but this choice may not have been desirable or even feasible without the expansion of welfare programs during the 1960s. The logic of assortative mating implies that, during economic downturns, the women who face the worst marriage prospects are themselves economically disadvantaged and may not possess the resources required to raise children on their own. Studies in demographic history indicate that, in previous eras, women in western societies routinely choose to remain single and childless whenever economic crises or wars eroded their marriage market prospects. Never-married mothers are a relatively recent demographic phenomenon.

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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 more efficient 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

Table 1 documents two sets of descriptive statistics concerning changes in family structures for census years between 1960 and 1990. The table describes women ages 25 to 35 in each census year. The statistics are calculated for subgroups 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. These later fractions are lower than contemporaneous rates of overall single motherhood because they do not include women who are widowed or divorced. Further, the number of never-married mothers in a group of adult women is lower than the total number of women who have experienced non-marital births. Some non-marital births result in adoptions while others lead to marriage in the years immediately following the birth. Table 1 does not give a complete picture of how rates of single motherhood have changed over time, but it does isolate changes in the number of adult women who both have and raise children without any formal source of spousal support.

The overall shift in family structures from marriage toward single parenting has been well documented. Nonetheless, rates of never-married motherhood have not been as widely discussed, and it is interesting to note that, regardless of race or education level, very few adult women in 1960 lived as never-married mothers. At that time, most single mothers were widowed or divorced, and rates of never-married motherhood were three percent or less regardless of race or education level. Further, regardless of race, the vast majority of women over 25 were married or had been married before.

By 1990, marriage rates were lower and rates of never-married motherhood were higher for both black and white women of all education groups. However, the number of never-

¹ See Testa and Krough (1995) for a summary and assessment of the literature.

married mothers remained quite low among white women and college-educated black women.² The most striking results in the table involve black women without a college education. In this group, rates of never-married motherhood are quite noteworthy. For example, in 1990, over 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 .258 and .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 fifteen women, and the comparable fractions of never-married mothers among white women were less than one in fifteen regardless of education level.

Wilson (1987) argues that both the dramatic drops in marriage rates and the coincident rise in rates of single motherhood observed among less educated black women are most likely the result of declines in the availability of marriageable men. He offers this hypothesis, in part, as an answer to Murray (1984) and others who point to the 1960s expansion of government aid to single mothers as the catalyst for recent changes in family structure. Wilson's hypothesis is plausible because the employment and earnings prospects of less skilled black men have declined dramatically since 1970, and because a substantial literature in demography documents the clear relationships between economic conditions and marriage behavior.

Table 2 describes trends in a specific index of marriage market prospects for women. Consider the following algorithm. In each census year within every state, rank all women of a particular race and age range according to their education level.³ Then, construct similar rankings for men. Next, given these rankings, identify the men that would be the assortative mates for various groups of women defined by state, age, race, and education level if marriage markets exhibited strict assortative mating on education. Finally, sum the total personal income reported by all men in these groups and divide these sums by the numbers of women in the

² Part of this decline in marriage represents marriage delay rather than a decision to never marry. This is particularly true among more educated women.

³ In these calculations, I use a seven year age range with the interval for women lagged one year behind the corresponding interval for men.

associated state-age-race-education cells. The result is an “available income index” (AII). AII is an estimate of available male earnings per woman by race and education class within marriage markets under the assumption of assortative mating with respect to years of schooling. It serves as a summary statistic for the combined influences of sex ratios, employment levels, and wage distributions on the marriage market prospects of women.⁴

According to Table 2, marriage prospects as measured by this index have declined for women of all race and education groups since 1970. For highly educated women, the declines are small, and in part, reflect the fact that over time more men have remained in school or returned to school after age 25. However, over the same period, black women with a high school education or less have seen their marriage market prospects deteriorate greatly. Chandra (2000) reports that, in 1990, roughly 35% of black male high school dropouts ages 25-55 were either not seeking work or living in institutions.⁵ With large numbers of less educated black men absent from the labor force, black women without a high school education in 1990 faced marriage markets that, on average, provided potential husbands with \$2,500 per year in expected earnings. This figure is less than one third of the comparable figure for 1970. Existing studies indicate that there is a significant link between these declining marriage market prospects and the steep decline in marriage rates among less educated black women. Studies based on both aggregate data and individual data provide support for the hypothesis that marriage rates among women vary positively with sex ratios and with the supply of men who enjoy stable earnings prospects. These studies employ different conventions to define the scope of marriage markets and the supply of marriageable men. Nonetheless, there is consistent evidence that the supply of men as well as their earnings and employment prospects do affect

⁴ 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 three percent.

⁵ See Chandra (2000) and Heckman et al (2000) for further details.

female marriage behavior.⁶

Wilson (1987) reasons that because single motherhood is an alternative to traditional marriage, circumstances that impede marriage should also encourage single motherhood. However, in contrast to the literature on marriage behavior, the results in the empirical literature surrounding the relationship between marriage market prospects and single motherhood are quite mixed. Testa and Krough (1995) write, “recent empirical investigations demonstrate a robust association between male employment and marriage. [but] The findings are less conclusive for nonmarital parenthood.”⁷ Few studies provide evidence that single parenting rates observed among women are driven in any significant way by the supply of marriageable men. Thus, based on the existing literature, one might conclude that the collapse of employment rates and earnings levels among less educated black men over the period 1970-1990 was a key contributing factor to the large drop in marriage rates observed among less educated black women, yet at the same time, conclude that reductions in the supply of marriageable men had little to do with the contemporaneous rise in rates of single motherhood among the same group of women.

I argue here that such a conclusion is not warranted. I present an economic model that develops a specific version of Wilson's hypothesis, and I flesh out the details of its empirical implications. I use the model to make two points about the paradox created by the empirical literatures that examine Wilson's hypotheses concerning marriage and single motherhood. To begin, the model does demonstrate that it is logically possible for shocks to marriage markets to have effects on marriage rates without affecting rates of single motherhood. In particular, if marriage market conditions are poor and aid to single mothers is meager, those women considering single motherhood may be inframarginal to the marriage market, and marginal changes in marriage market conditions may not affect their decisions. On the other hand, while one can construct specific examples in which declining marriage market prospects have no

⁶ See Angrist (2000), Wallace (2000), Pierret (1995), Brien (1997), Fossett and Kiecolt (1993) and Lichter et al (1992).

⁷ See page 53.

affect on rates of single parenting, it is equally easy to construct examples that demonstrate how commonly used empirical methods may yield false rejections of Wilson's hypothesis. In section 3, I show how several commonly used methods may produce misleading inferences concerning the relationship between marriage market conditions and rates of single motherhood. In the model developed here, single motherhood is an 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, it is possible to generate data from this model that actually create a *positive* correlation among marriage markets between sex ratios and rates of single motherhood. Further, the model can also 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.

These results arise because single mothers in different marriage markets may face different marginal choices. As I note above, some economically disadvantaged women reside in marriage markets with ratios of marriageable men to women that are far below one, and given assortative mating, these women are inframarginal in the marriage market. If government aid did not permit them to live as single mothers, they would simply remain single without children. Among such women, family structure choices are orthogonal to all but the largest shocks to marriage market conditions. In contrast, other women in other markets may be choosing directly between marriage and single motherhood as their two best options, and for these women, even modest shocks to their marriage market prospects may greatly affect the likelihood that they become single mothers. This is precisely the scenario that Wilson describes, but he does not explore how the generosity of welfare programs determines whether or not this scenario is empirically relevant. This omission is noteworthy because generous aid for single mothers directly increases the likelihood that women view single motherhood as their best option outside marriage.

Much of the existing literature frames the expansion of welfare and decreasing supplies of marriageable men as two competing explanations for the rise in single motherhood, especially among less educated black women. However, the interaction between these two

factors may be crucial for understanding the demographic trends we observe. Wilson asserts that, after 1970, economically disadvantaged black women responded to poor marriage markets by choosing to raise children on their own, but this choice may not have been desirable or even feasible without the expansion of welfare programs that preceded the employment and earnings declines among black men during the post 1970 period. The logic of assortative mating implies that, during economic downturns, the women who face the worst marriage prospects are themselves economically disadvantaged and may not possess the resources required to raise children on their own. Studies in demographic history indicate that, in previous eras, women in western societies routinely choose to remain single and childless whenever economic crises or wars eroded their marriage market prospects. Never-married mothers are a relatively recent demographic phenomenon.

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.

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 numeraire. $i=f,m$.

c = the cost per unit of q .

B= transfer made to a woman participating in a government program for single mothers.

$W \in [W_l, W_h]$ = female endowment.

$E \in [E_l, E_h]$ = 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:

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

This form ensures that utility is transferable between marriage partners. Assume that $0 < \gamma' < \infty$, $\gamma'' \leq 0$, $0 < \phi' < \infty$, and $\phi'' \leq 0$.⁸

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

⁸ Even though marriage creates scale economies in the consumption of collective goods, the assumptions concerning the derivatives of N and γ guarantee that preferences are convex both at the individual and household level. For men, women, and households, the willingness to sacrifice collective consumption for increased private consumption rises with the level of collective consumption. None of the results presented below require that men and women have the same preferences. However, this restriction simplifies notation.

deriving the relationship between endowments and utility 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:

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

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

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

I assume that $W^q \in (W_l, W_h)$. 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 $cq \leq W$. 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

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

It is important to realize that the assumption $X_f \neq B$ 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. Here, I also assume that $B < W^q$, and this implies that the constraint $X_f \neq B$ is always binding. Therefore, the marginal utility of endowment income within the aid program is always less than the marginal utility of endowment income in the unconstrained problem. Any alternative characterizations of the aid program that preserve this property will yield similar results.

In developing a model of welfare stigma, Moffitt (1983) discusses the possibility that an additional dollar of benefit income is worth less than an additional dollar of own income among persons receiving aid. This property does not hold in this model. Here, it is straightforward to show that, among women receiving aid, additional benefit income contributes more to welfare than additional endowment income because additional benefit income relaxes the binding constraint on private consumption.⁹

I also assume that, for a woman with the lowest possible endowment, the value of being on aid, $V^{\text{aid}}(W_1)$ is greater than the value of being single without children, $(0)W_1$. I make this assumption to avoid an equilibrium where no women choose aid. I can show that if the poorest woman would rather be childless than accept aid, all women would rather be childless than

⁹ Moffitt actually reports empirical results that are consistent with the hypothesis that the marginal utility of benefit income does exceed the marginal utility of own income among women on aid. He finds no evidence that the stigma associated with welfare receipt increases with the amount of benefits. It is straightforward to incorporate a constant utility loss, or fixed stigma, associated benefit receipt in the model developed here. None of the results outlined below would change.

accept aid.¹⁰ In sum, I consider aid programs that are generous enough to attract poor women with no available spouse but 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. In a world with no available spouses, the indirect utility function is simply the upper envelope of the two indirect utility functions in Figure 1.¹¹ 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 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 $E \in [E_l, E_h]$. The woman must provide her spouse with a utility level equal to his outside option $E\gamma(0)$. Thus, the value of marriage given a women with endowment W and a man with endowment E is given by $V^*(W,E)$.

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

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

ϵ represents the cost of forming a marriage, and by assumption, $\epsilon < E_l$.

Here, the gains from marriage derive solely from the collective consumption value of

¹⁰ 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 $W > W_1$.

¹¹ The utility function for this example is $U(q, X_f) = q + (k + q) X_f$.

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.

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

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 the number of females constant, 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 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 $V^{\text{no aid}}$ never cross more than once.¹² Thus, as in Figure 1, all single mothers have endowments less than W^B , and all single women without children, if they exist, have endowments greater than or equal to 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^{single} , 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 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^{married} 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^{married} . None of the results in Propositions 1 through 5 or any of the implications discussed below rely on a specific rule concerning how men and women divide the surplus from marriage. The transferable utility framework implies that the optimal choice of q and the resulting total surplus in a given marriage may be determined without considering how the surplus will be divided. Therefore, the analyses presented here only require the assumption that bargaining is efficient.

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 M^{th} woman. The second, W^{m} , is the smallest

¹² Recall that $V^{\text{aid}} > V^{\text{no aid}}$ for the poorest women. See <http://www.ssc.wisc.edu/~dneal> for an Appendix with proofs of Propositions 1 and 2.

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 $W^{ml} \leq W < W^m$ 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.

2. 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 perspective of women, an increase in M introduces new potential mates. In terms of Figure 2, W^{ml} falls. Further, the value of $V^{married}$ 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 $V^{married}$, 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, $V^{married}$. 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 number of marriages 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 $W < W^B$ 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 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^B , the number of women raising children outside marriage remains unchanged. In Figure 3, all women raising children without a spouse are on aid, $W < W^B$, and because $W^B < W^m$, 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.

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 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 stress 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.

Table 2 documents a severe decline in the marriage market prospects of less educated black women. As I note in the introduction, numerous studies indicate that this decline in marriage market prospects contributed to the coincident decline in marriage among these women. It seems counterintuitive that this decline in marriage market prospects could contribute to a contemporaneous decline in marriage rates for these women but have little to do with the striking rise in never-married motherhood documented in Table 1. Nonetheless, the model demonstrates that this is a logical possibility. If marriage markets for all black women in 1970 looked like those described in Figure 3 above, further reductions in the supply of marriagable men would have reduced marriage rates but had no affect on rates of single parenting.

However, this scenario simply begs the question. Figure 3 alone does not point to a reason for rates of never-married motherhood to rise. Welfare programs did not increase greatly in generosity after 1970, yet Table 2 shows that rates of never-married motherhood continued to rise, especially among less educated black women. Thus, in the next section, I

discuss other implications of Figures 2 and 3. I use the model outlined above to show how existing empirical studies may have simply failed to detect the role that declining marriage prospects have played in the rise of single motherhood among black women.

3. 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. Here, I show that one could nonetheless generate data from this model that, given the empirical methods used in this literature, might lead some to falsely conclude that the data are inconsistent with Wilson's hypothesis.

I begin by considering a simple, but often used method, that many studies take as a starting point for testing Wilson's hypothesis. Numerous studies report cross-section correlations between various indices of marriage market prospects and rates of single motherhood or non-marital fertility among metropolitan areas or states. Such studies generally report correlations that are negative and statistically significant¹³, however it is important to note that Wilson's hypothesis, as expressed in the model above, does not necessarily imply that these correlations must be negative. Imagine a world in which women who lived in metropolitan areas with the worst marriage prospects also lived in the areas with the most meager aid for single mothers. In this case, rates of single motherhood could be relatively low in the areas with the worst marriage market conditions.

Other studies use regression models that examine the spatial correlations between marriage market conditions and rates of single motherhood while introducing controls for the generosity of aid to single mothers and women's own market opportunities.¹⁴ This approach, in part, addresses the shortcomings of methods that focus on unconditional correlations.

¹³ See Fossett and Kiecolt (1991) for a review of various correlations between indices of marriage market prospects and various measures of family structure.

¹⁴ Kiecolt and Fossett (1995), Sampson (1995), South and Lloyd (1992), and White (1979) are examples. These studies produce varied results. In fact, South and Lloyd find a significant and negative relationship between male nonemployment and nonmarital fertility rates.

However, these methods may suffer from two other problems. To begin, the policies that states or counties adopt concerning aid for single mothers may well be correlated with community norms that affect family structure directly. Further, measures of marriage market conditions in such studies typically focus on market aggregates, e.g. sex ratios, average male earnings per woman in the market. However, the distribution of earnings and employment opportunities may be more important. Once again, an example involving two marriage markets demonstrates the point. Consider two marriage markets, A and B. Both market A and market B contain F women. The women in market B are clones of the women in market A, and both markets provide the same aid program for single mothers. In market A, the sex ratio is higher and average male earnings are higher as well. However, the distribution of male earnings is quite skewed in market A relative to the corresponding distribution in market B. In fact, 50 percent of the men in market A earn less than the 30th percentile in the male earnings distribution for market B. A cursory examination of Figure 2 shows that the equilibrium assignments for these hypothetical markets might well involve more single mothers in market A where the sex ratio is higher and average earnings are higher. Even though market A has more men who earn more on average, market B could have more who, from the perspective of their assortative mate, are worth marrying.

A third group of studies focuses on spatial correlations between changes in rates of single motherhood and changes in marriage market conditions. These studies are motivated by the possibility that the correlations between marriage market conditions and family structures observed in cross-sections reflect correlations between marriage market conditions and unmeasured differences in cultural norms among communities. Studies that focus on changes within marriage markets over time seek to measure the impact of changes in male earnings and employment prospects while holding constant community-specific norms concerning family structures. Taken together, these studies provide little evidence that declining marriage market prospects actually lead to higher rates of single motherhood.¹⁵

¹⁵ A recent study by Black, McKinnish, and Sanders (2001) does show that the fraction of female-headed households in counties that rely on coal mining as a major source of economic activity does vary inversely with long term movements in the price of coal. The magnitude of the

Do such results really provide a direct challenge to Wilson's hypothesis? The model developed here indicates that this is not necessarily the case. 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 $V^{\text{married}(\text{new})}$ 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 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 $V^{\text{married}(\text{new})}$ 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

estimated effects is difficult to interpret because the authors do not calculate how changes in the price of coal affect standard measures of marriage market prospects or the distribution of individual gains from marriage. See also O'Hare (1988), Wilson (1987), and White (1979). Plotnick (1988) uses individual level data on decisions by women in different birth cohorts of a panel data set. But, he also uses variation over time in aggregate measures of marriage market prospects to identify the effects of changes in the supply marriageable men.

never decrease the number of single mothers.¹⁶

Most studies in the existing literature on Wilson's hypothesis examine relationships between aggregate measures of marriage market conditions, such sex ratios or marriageable men indices, and rates of non-marital fertility or single motherhood. However, Duncan and Hoffman (1990) stands out as an important exception. Duncan and Hoffman focus on the incidence of teen births to unwed mothers that result in AFDC receipt using data on teenage girls during the period 1973 to 1985 taken from the Panel Survey of Income Dynamics. However, in a departure from the most of the literature, they include individual specific estimates of the family income that young women will enjoy at age 26 if they do not have an unwed, teen birth. These individual specific forecasts reflect variation in individual characteristics as well as variation in local labor market conditions and marriage market prospects. Given this methodology, Duncan and Hoffman conclude that expected economic opportunities have a large impact on the decision to become a single, teen mother. Duncan and Hoffman construct a counterfactual measure of expected future family income for black teens by using the characteristics of black teens and the estimated coefficients from the white equation for family income at age 26. They conclude that if black teens could expect the same future family income as white teens with similar background characteristics, rates of unwed, AFDC-related, teen births would be roughly 20% lower among black teens. This change represents about one fourth of the black-white gap in births of this type over the sample period, and it places a lower bound on the contribution of black-white differences in economic opportunities to black-white differences in this measure of family structure because it contains no adjustment for differences in background characteristics. Duncan and Hoffman are not directly addressing marriage market opportunities because their predicted family income equations do not involve only married couples. However, their results show that individual specific estimates of economic opportunities can be strongly associated with individual

¹⁶ Unless changes in marriage market conditions are completely orthogonal to all aspects of initial marriage market equilibria, such first-difference regression techniques will, in general, not provide a consistent estimate of the average effect of changes in marriage market conditions on rates of single motherhood.

marriage and fertility choices.¹⁷

Duncan and Hoffman's study notwithstanding, the whole of the existing empirical literature provides limited support for Wilson's hypothesis that the supply of marriageable men not only influences marriage behavior but is also a key determinant of the rate of single motherhood. But, the studies in this literature do not link specific empirical models of family structure to a particular formulation of Wilson's idea. Given the specific version of Wilson's hypothesis developed in the model above, one might choose a multinomial choice model as the natural vehicle for examining Wilson's hypothesis. Such a model would characterize the indirect utility of various family structures by constructing measures of the each women's own earning potential, the earnings of her potential spouse, and the aid available to her from the government given various marriage and fertility choices. Developing and estimating such a model remains for future research. However, the absence of empirical studies that involve complete and specific statements of Wilson's hypothesis should give pause to those who would claim that the data have not supported Wilson's conjecture. The relationship between marriage market conditions and a given woman's choice to be or not to be a single mother is jointly determined by her relative position in the marriage market, her own individual earnings capacity, and the relative generosity of aid to single mothers. The examples presented above demonstrate how these factors interact to influence whether single motherhood or remaining single without children is the best option for a given woman outside marriage. Estimation strategies that ignore these interactions may well produce misleading inferences concerning the total impacts of changes in marriage market conditions.¹⁸

¹⁷ Olsen and Farkas (1990) find that improved employment and earnings opportunities do reduce non-marital fertility among teens. They also find a weak positive relationship between the local employment prospects and the establishment of consensual unions.

¹⁸ 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.

4. Ratios versus Rates

The model presented here also illustrates how empirical studies that employ different measures of family structure might arrive at different conclusions concerning the effects of a particular marriage market crisis. In Figures 4a-4c, I considered an empirical study that linked changes in the availability of men to changes in the number of single mothers or the fraction of all women who choose single motherhood. However, many empirical studies use the ratio of non-marital to marital births as a measure of the prevalence of non-traditional families. These approaches differ in important ways. To begin, the number of births per mother may vary by family structure. Therefore, the ratio of non-marital to marital births does not equal the ratio of single mothers to married women. Further and of particular concern here, both the numerator and denominator of non-marital fertility ratios reflect the influence of marriage market conditions.

Consider Figures 2 and 3 once again. In both cases, a negative shock to marriage markets will certainly decrease the number of marriages and may well decrease the number of marital births. The model is not completely clear on this point because the collective good q is a composite index of child quantity and quality. However, any shock that lowers the average marital consumption of q could in part be realized by a reduction in marital fertility. Thus, beginning with the equilibrium in Figure 2, we expect the non-marital fertility ratio to rise following negative shocks to the marriage markets. The rise in single mothers should be associated with an increase in non-marital births, and the resulting decline in marriages combined with any reduction of average q within marriages may well result in a decline in marital births. However, even if single mothers are inframarginal in the original equilibrium, as in Figure 3, and shocks to marriage markets have no effect on rates of single motherhood, these shocks will still impact non-marital fertility ratios through their impact on marital fertility. Thus, when single mothers are inframarginal, a further deterioration of marriage market conditions may raise non-marital fertility ratios even if this deterioration does not affect the rate of single motherhood.

5 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. But, 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. In sum, aid always directly influences levels of single motherhood because aid directly influences the indirect utility of being a single mother. However, aid levels do not influence marriage rates among women who do not view welfare as a marginal choice. The earlier sections provide similar results concerning marriage market effects. Marriage market prospects always have a direct influence on marriage behavior. However, marriage prospects do not influence rates of single motherhood among women who are inframarginal in their marriage markets.

6. 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 in which 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 payments from several fathers, they may choose to be single mothers instead of living without children. This is true 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.

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 erode 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 the nonmarital fertility ratio primarily reflects a retreat from shotgun marriage as a custom, wouldn't one expect to see a rise in adoptions per non-marital birth over this period? Before and after the expansion of access to abortion services, women experiencing non-marital 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 non-marital births by the early 1990s. Further, since the 1960s, relinquishment rates among white women have fallen dramatically.¹⁹ AYK provide a compelling story about non-marital births. However, this model alone cannot explain why women who experience non-marital births have stopped giving their children up for adoption. The observed change in relinquishment behavior suggests that women who experience non-marital births now have access to significantly more resources than women who experienced non-marital births prior to the expansion of both government aid for single mothers and labor market opportunities for women in general that took place during the past four decades.

Conclusion

In the literature on marriage rates, there is considerable 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.²⁰ In the United States, Vital Statistics data indicate that

¹⁹ See <http://www.adoptioninstitute.org/research> for details.

²⁰ See Chapters 9 and 10. Chapter 9 is by Ronald Lee.

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 8.6.²¹ 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.²²

In light of this evidence, it is interesting to note that before the expansion of aid to single mothers during the 1960s, trivial numbers of never-married women chose to raise children on their own regardless of marriage market conditions. The model presented above points to 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. Assortative mating implies that, without government aid, women who face the worst marriage market prospects may not have the resources required to raise children on their own. Seen in this light, the expansion of welfare programs during the 1960s may be the key event that made never-married motherhood among economically disadvantaged women possible. However, once a system of aid was put 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. In short, while the existing literature puts forth government aid to single mothers and shortages of marriageable men as competing explanations for observed changes in observed family structures among black women, these two factors may have worked together over time to shape changes in black family structure.

A complete assessment of this hypothesis is beyond the scope of this paper. Future work

²¹ See *100 Years of Marriage and Divorce Statistics: United States, 1867-1967*. DHEW Publication No. (HRA)74-1902. Series 21-No.24. During the years 1930-33, the crude marriage rates per 1,000 persons per year were 9.2, 8.6, 7.9, and 8.7 respectively. After 1933, the marriage rate remained above 10 until 1952. Before 1930 and after 1902, the rate never fell below 9.7. Angrist (2000) examines data on ethnic groups that immigrated to the United States in the early twentieth century. He finds that among these groups higher sex ratios were associated with higher marriage rates.

²² Data from the UNECE show dramatic declines in marriage rates between 1990 and 1995 for many transition economies. Examples include Latvia, Estonia, Lithuania, Poland, Hungary, and Bulgaria. See *Recent Demographic Developments in Europe, 1999*.

is required to formulate a discrete choice model of family structures based on the theoretical model described above. Such an empirical model would specify the indirect utility of various family structures, i.e. single without children, single with children, and married, as a function of the earnings capacities of individual women, the earnings capacities of their assortative mates, and the aid levels available in their current location. Correctly measuring the relevant earnings capacities presents several technical problems because women's earnings functions must be estimated on select samples and because existing studies suggest that male earnings may be endogenous to family structure. Further, it is difficult to measure changes in budget sets that are associated with various changes in welfare benefits over time. In the end, one 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 now warranted given the available evidence. Table 2 documents declining marriage market prospects for many women and a complete collapse of marriage market prospects for less educated black women after 1970. We do not yet fully understand how this collapse shaped subsequent changes in family structures.

TABLE 1 - TRENDS IN FAMILY STRUCTURE

Black Women Ages 25-35

Fractions Ever Married and Never Married With Children

| | 1960 | 1970 | 1980 | 1990 |
|-----------------------|---------|---------|----------|----------|
| Less Than High School | 89, 3.1 | 84, 8.9 | 69, 20.2 | 46, 35.3 |
| High School | 88, 2.3 | 83, 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 Ages 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.

TABLE 2 - Available Earned Income (by Males) Per Woman In Marriage Markets

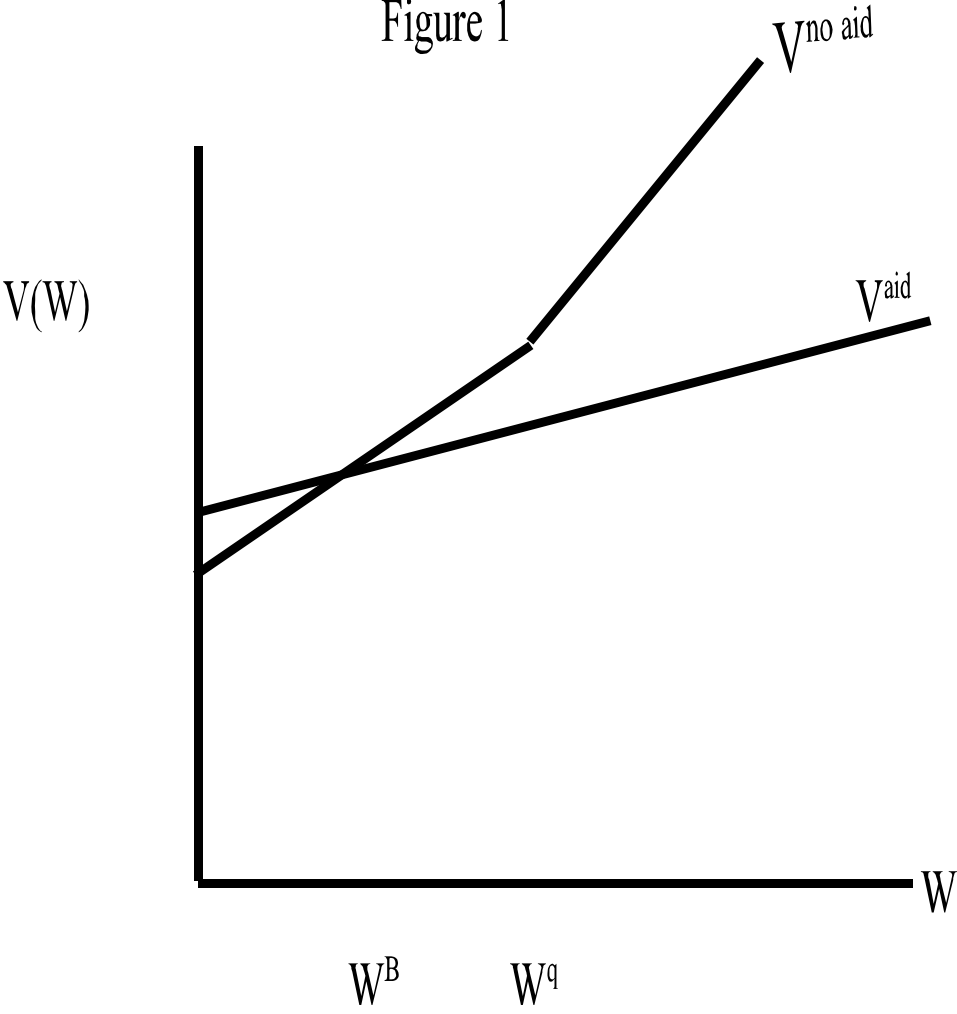
Women Ages 25-35

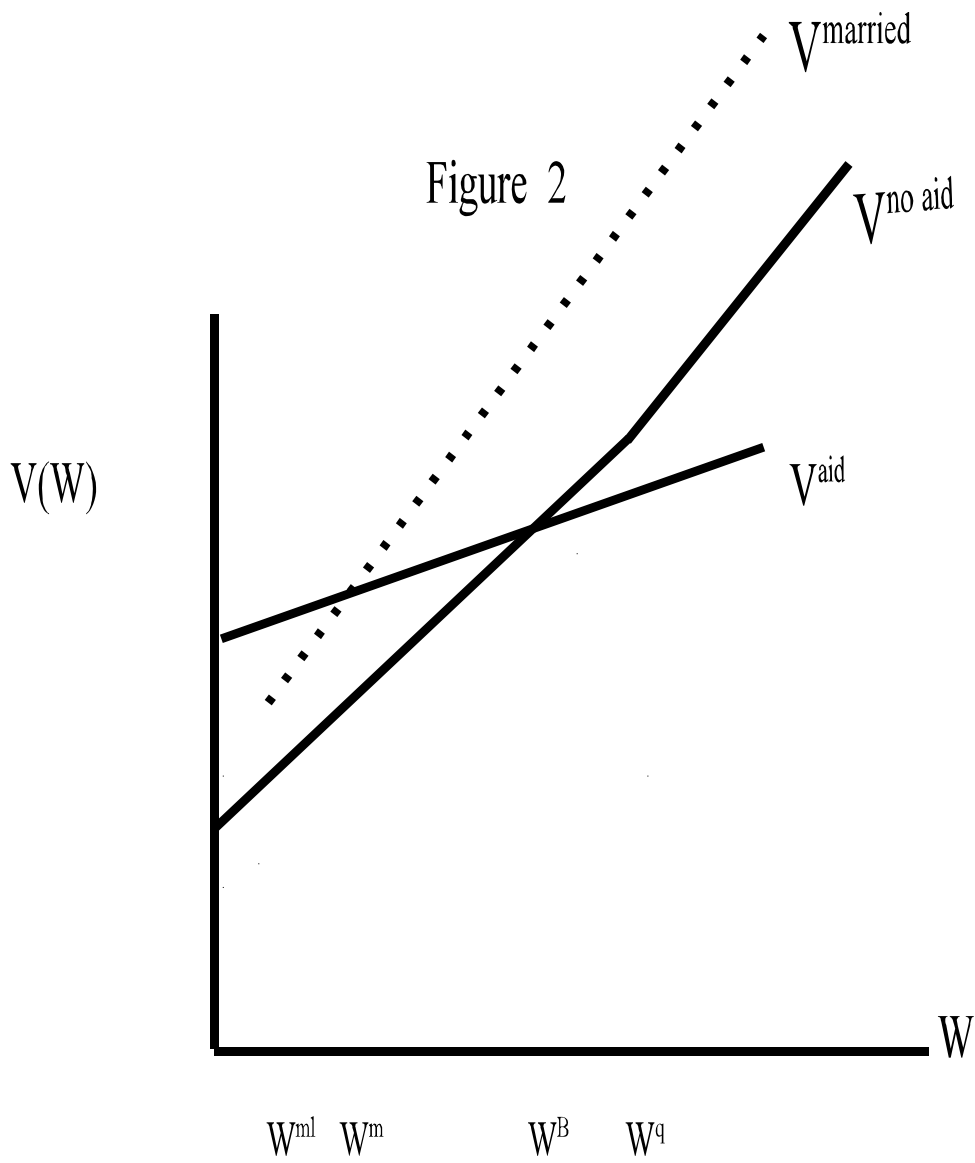
(top=Black, bottom=White, all averages expressed in 1990 dollars)

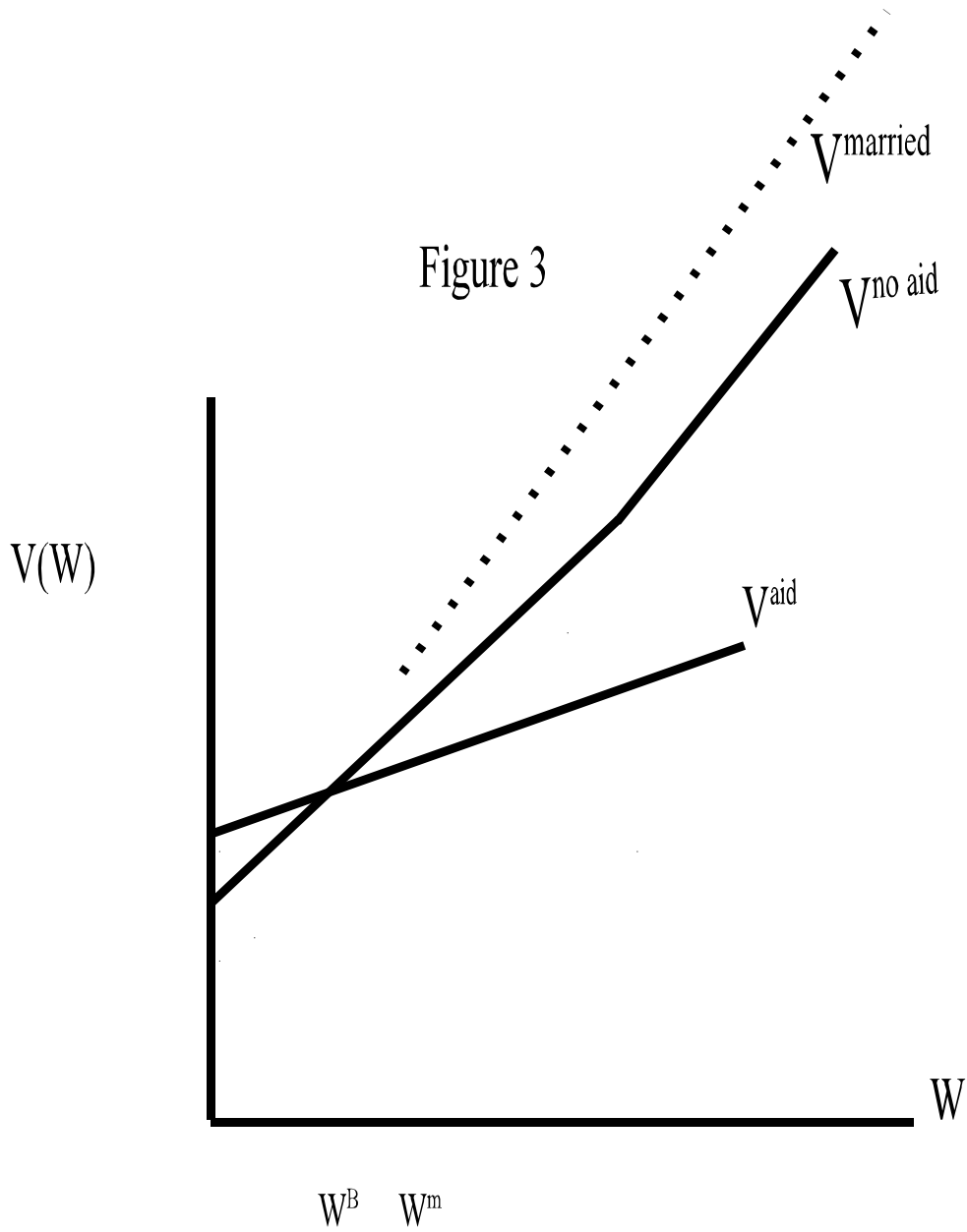
| | 1960 | 1970 | 1980 | 1990 |
|-----------------------|--------|--------|--------|--------|
| Less Than High School | 8,104 | 8,196 | 4,444 | 2,461 |
| High School | 16,057 | 17,172 | 14,784 | 12,479 |
| | 11,503 | 17,483 | 15,502 | 10,270 |
| | 21,114 | 27,144 | 24,752 | 20,498 |
| Some College | 13,303 | 20,278 | 19,476 | 16,041 |
| | 26,742 | 33,609 | 28,575 | 24,282 |
| College Graduate | 16,823 | 25,375 | 24,316 | 23,595 |
| | 29,291 | 36,428 | 32,378 | 33,602 |

Entries denote average male income per woman among marriage markets defined by age and race for each census year assuming that potential mates are assortatively matched on education. For each age, markets contain the men in the seven year interval [age+4,age-2] and the women in the seven year interval [age+3,age-3].

Figure 1







Note: in this example $W^{m1} = W^m$

Figure 4a

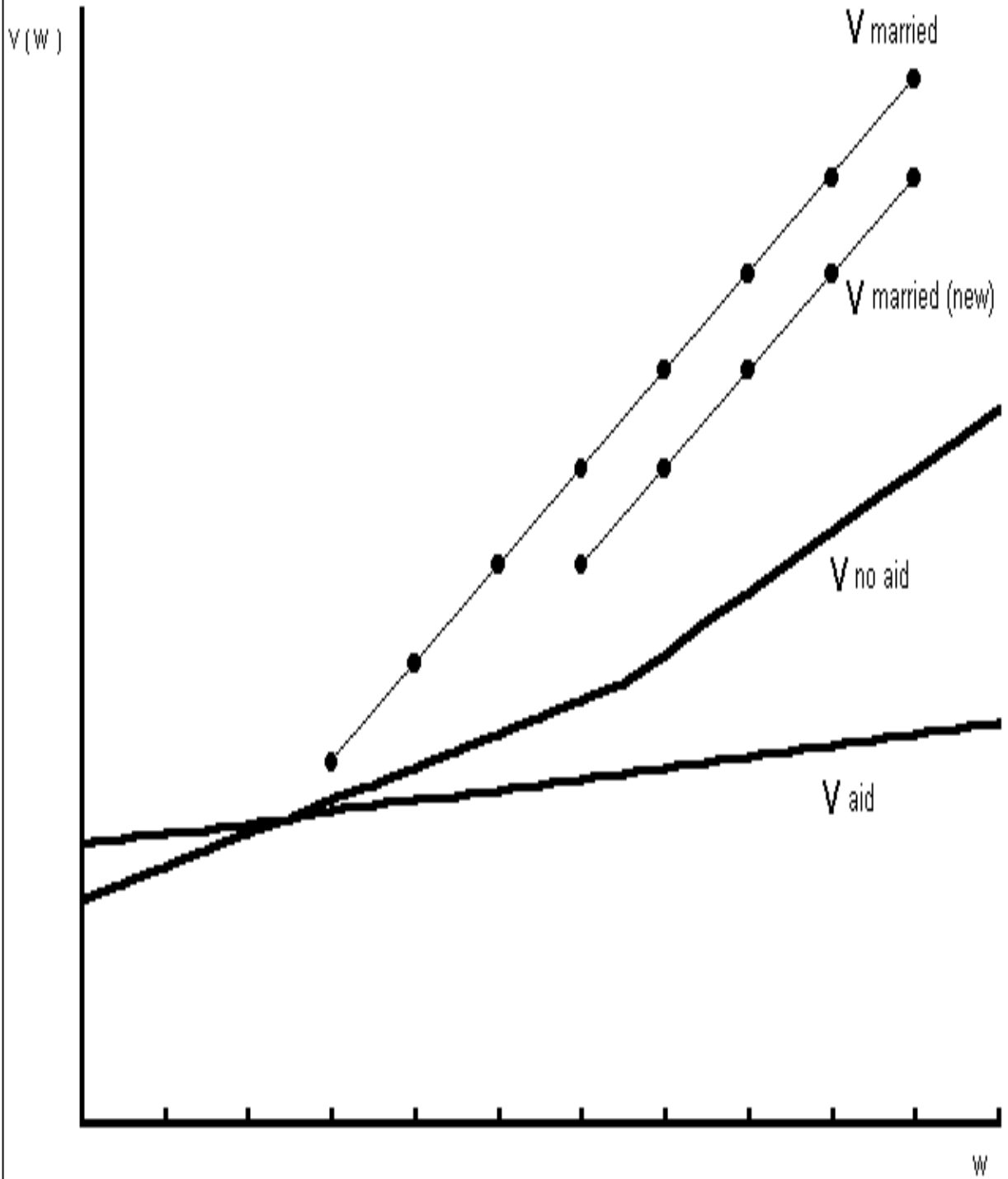
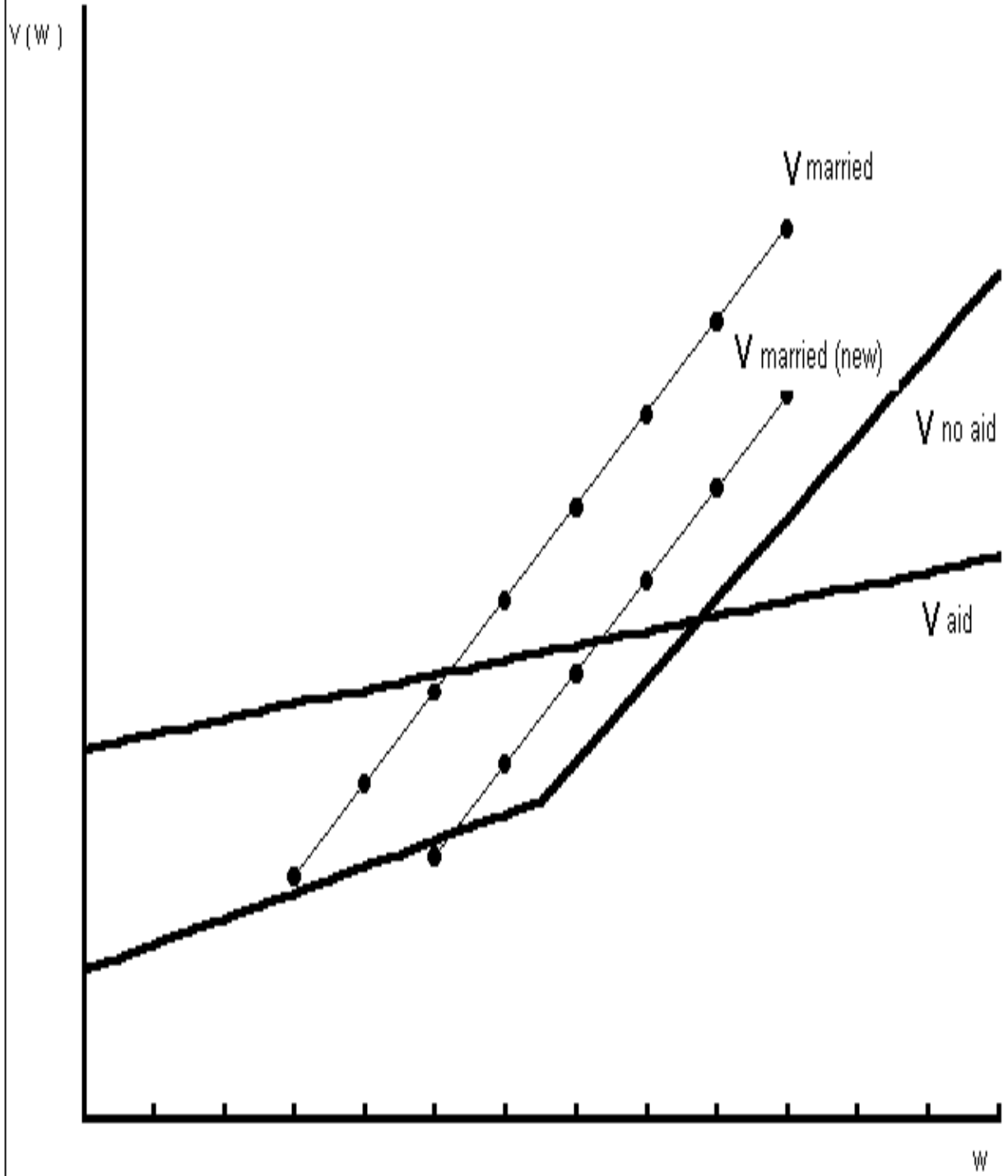
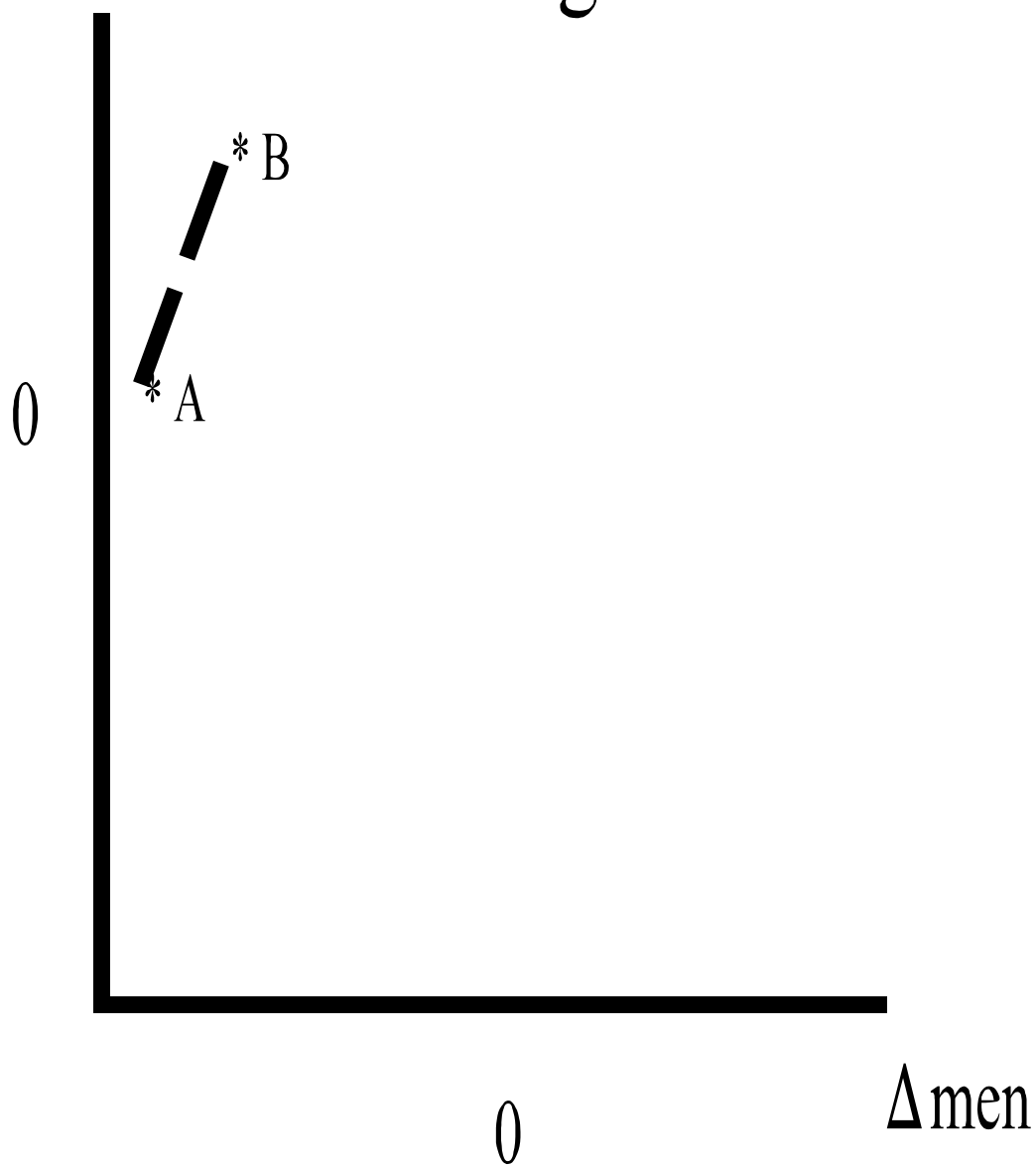


Figure 4b



Δ single mothers

Figure 4c



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