DECLINING MARRIAGE RATIOS OF YOUNG BLACK WOMEN: TESTING ALTERNATIVE ECONOMIC HYPOTHESES

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Modeled in the choice−theoretic framework favored by economists, a marriage results when two parties have determined that marriage to the other is preferred to the alternatives. A secular rise in the proportion of young adults living outside the institution of marriage (interpreted as a market-clearing phenomenon) is therefore explained by a corresponding reduction in welfare-improving marriage opportunities for this population. Such a trend is likely to have manifold social and economic repercussions—some of which may be deleterious.[1] Thus it is important to ask: What *economic* factors might explain why a sharply increased proportion of young adults have evidently been unable to find a utility-enhancing marital choice?

The purpose of this article is to submit alternative economic explanations of falling marriage ratios of young, black females (ages 22 to 34) to econometric investigation. [For purposes of this investigation, a marriage ratio is defined as the proportion of individuals in a specified class that are married.] Two hypotheses to account for the decrease in marriage among young black women are appraised. The market opportunity (*MO*) hypothesis finds the cause of declining marriage in a secular rise in the (relative) rate of return to women's investment in market-specialized human capital. The man shortage (*MS*) hypothesis explains ebbing marriage ratios by a diminution over time of the population of economically qualified men of marrying age. A vector autoregression (VAR) model is specified and estimating using time series variables constructed from public use microdata for the period 1965–2003.

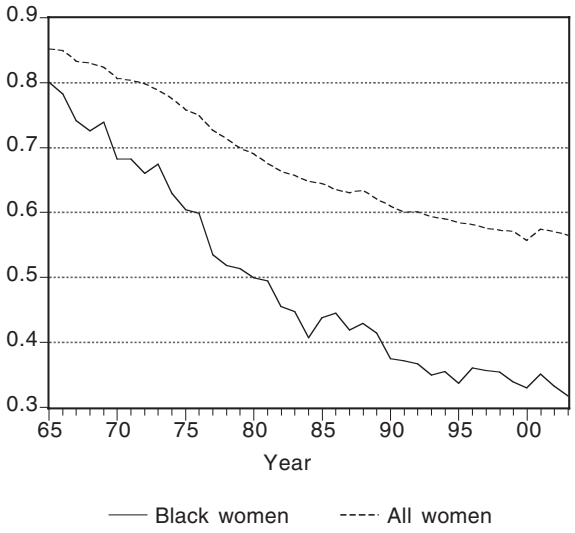
The article is organized in five sections. Section 2 develops the theoretical arguments concerning marriage rates. The methodology employed to test the respective theories is described in Section 3. Results are reported and discussed in Section 4. Concluding remarks are contained in Section 5.

WHY ARE MARRIAGE RATIOS FALLING? ALTERNATIVE ECONOMIC EXPLANATIONS

The rapidly declining marriage ratio of young, black females is illustrated by Figure 1. Micro data extracted from the *Current Population Survey* (*CPS*) March Demographic files reveal that 76 percent of black females ages 22–34 in the year 1965 were married.[2] The figure in 1980 was 53 percent. By 2003 the marriage ratio for young black females had fallen to 34 out of 100.

Gary Becker's economic theory of marriage (Becker 1973, 1981) explains fluctuating marriage ratios as the cumulative result of optimizing behavior by individuals who choose to marry (or remain married) if, and only if, their expected utility is increased compared to remaining (or becoming) single. Technically speaking, a welfare-improving union is one that enables a more efficient utilization of partners' time and human capital resources—such that the joint production of commodities (including "household" commodities such as good meals, the quality of children, social status, companionship and love) exceeds the sum of the commodities produced by the individuals functioning in severalty. Economies of scale in *consumption* are ordinarily achieved in marriage. But these cannot explain why individuals elect to marry, since such economies are available to apartment mates or cohabitating couples.

FIGURE 1
Marriage Ratios of Women, Ages 22–34



Source: Authors' calculations from public use microdata.

The gains from marriage ostensibly arise from *specialization* and *complementarities* in production. Becker (1973) differentiates between human capital useful in market-related activities (H^1) and human capital that mainly raises productivity in household production (H^2). A single person disproportionately endowed with H^2 (which, for biological and cultural reasons, women tend to be) is limited in realizing gains from specialization, insofar as numerous inputs needed for household production must be purchased in markets. Thus marriage facilitates the pursuit of gains from comparative advantage in household versus market production.

Complementarities are obvious in the case of own children (whom, for analytical purposes, are treated as simply another "household-produced commodity"), but are found in other areas as well. Anything of value which cannot be obtained or produced *except by marriage* gives evidence of complementarities—or at least of a zero elasticity of substitution in production.[3] Certainly the cooperation of a man and women within the legal parameters of marriage is capable of yielding a unique bundle of utilities that could not be acquired through co-habitation. Among these are "status rewards." That marriage is widely viewed as a profound life event is revealed by the vast expenditures of time, energy, and money for weddings. The betrothed are assuming a new, and hopefully improved, position in society. The change in status can manifest itself in several (sometimes subtle) ways. For example, a man may experience a boost to his professional standing. Or, the repeated queries of parents about their son or daughter's prospects happily cease. By marrying, an individual may gain access to a coveted social milieu. Note that the quest for marriage by gay couples may be partly motivated by a desire for the status or social approbation that is often denied those who merely live together.

The status rewards produced by marriage are functionally tied to viewpoints of those within the relevant social orbit as to the *quality* of the marriage. Some marriages are considered better than others. This much is evident from the favored location and disproportionate space allocated to the coverage of some weddings in the society pages. For women especially, the status rewards gained depend on the social standing their new husbands bring with them to the marriage. As the social standing of men is determined in large part by occupational status or earning power, a "good catch" is a man with prospects. Marriage to a man without prospects may disappoint family members and friends and damage a woman's reputation. The desire of women for marriages that improve social standing does not appear to be class-specific. Kathryn Edin interviewed 292 low-income mothers in three U.S. cities and concluded that:

> Even within poor communities, residents make class-based distinctions among themselves. Most of our mothers' eventual goal was to become

> "respectable," and they believed that respectability was greatly enhanced by a marriage tie to a partner earning wages significantly above the legal minimum. . . . Marriage made a statement to the larger community about each partners' current and prospective class standing. . . . Mothers who were unmarried were able to maintain their dream of upward mobility. "Marry up" guaranteed the woman the respect of her community, while marrying at her own class level only made her look foolish in the eyes of her family and neighbors (Edin 2000, 120).

A satisfactory economic explanation of declining marriage ratios of young black females must account for diminished gains to specialization and/or vanishing complementarities in marital unions. Becker, Elizabeth Landes, and Robert Michael have noted that "[t]he gain from marriage compared to being single depends in part on the extent to which investments in skills are oriented to the division of labor within a marriage" (Becker, Landes, and Michael 1977, 1146). The market opportunity (*MO*) hypothesis claims that human capital possessed by women has become on average more directed to labor market opportunities. The lesser degree of gender specialization of human capital has diminished the gains from marriage specifically attributable to the specialization of labor between market and non-market activities.

Human capital theory predicts that women would redirect their efforts to the acquisition of market specialized human capital (H^2) in reaction to an increase in the relative return to this type of human capital. What real world phenomena might have caused an increase in the relative return to women's investment in H^2 since 1965? Changes in the structure of production or technological innovations have led to the growth of market occupations in which physical strength confers no advantage. Another explanation: a secular moderation in the degree of sexual or racial discrimination faced by black women in market activities as manifested by reduced gender and racial disparities in returns to H^2.

As the individual's optimal stock of H^1 and H^2 is conditioned by expected returns to each type of human capital, a secular rise in the relative rate of return to H^2 is likely to induce young women to allocate a larger share of their time to the accumulation of H^2 and a lesser share to acquiring H^1. This means more degrees for women in fields such as accounting, nursing, computer science, or journalism, and fewer in art history or human ecology. Non-credit courses in gardening or gourmet cooking are bypassed in favor of training for such things as professional school admission exams, brokerage or real estate licenses.

Time allocated to childbearing and rearing could alternatively be used to augment the stock of H^2, to earn market income, or both. A highly significant effect of an increase in the return to women's investment in H^2, at least with respect to marriage, is that it raises the opportunity cost of childbearing and

rearing as measured by discounted present value of forgone market income. Women who decide to postpone or forgo childbearing will effectively foreclose opportunities for marriage with men who view parenting as a binding clause of the marriage contract.

Women are single because they have never married or because they have divorced. Becker has observed that the cost of divorce is an *increasing* function of the number of children. Couples with children have accumulated "marital-specific" capital that is less valuable after a divorce. Moreover, children (and especially young children) damage prospects for remarriage. Thus, rising divorce rates might be partly explained by the women's substitution of H^2 for marriage-related human capital.

Let w_m and w_f denote the compensation per unit of time expended for market activities received by the male and female, respectively. Becker has shown that the gains from the sexual division of labor within the household production unit are positively related to the w_m/w_f ratio, *ceteris paribus*.[4] It follows that a decrease in this ratio would diminish the returns to the sexual division of labor and enervate the incentive to marry—other things remaining the same.

It is possible to think of an *aggregate* w_m/w_f ratio for a specific time interval (or W_M/W_F) that is computed by averaging together the ratios for an optimal sorting of single males and females—including both those pairs who eventually marry and those who do not. The labor force participation rate of women (LF_W), whether single or married, is an inverse function of the W_M/W_F ratio.

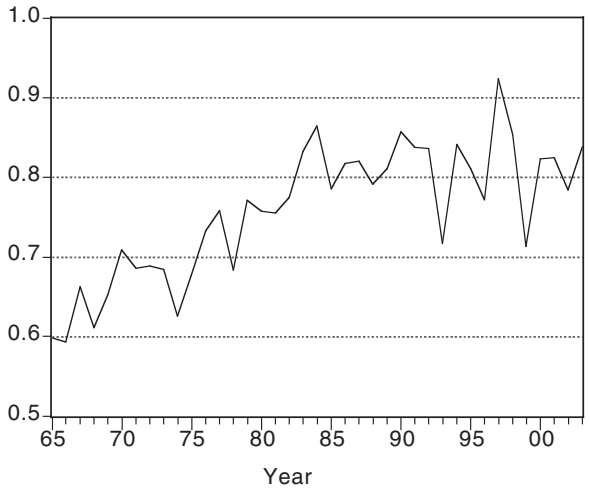
The proportion of singles of marrying age that actually marry within a defined time interval (MR) is, *ceteris paribus*, positively related to this aggregate ratio. That is:

$$\frac{\partial LF_W}{\partial (W_M / W_F)} < 0 \quad \text{and} \quad \frac{\partial MR}{\partial (W_M / W_F)} > 0 \tag{1}$$

Thus falling marriage ratios for young black women might be explained, at least partly, by a decrease in the hourly incomes of potential spouses, an increase in the hourly incomes of young black women, or both. The market opportunity (MO) hypothesis explains the disappearance of life-improving marriage opportunities for young black women by an increase over time in the denominator of the W_M/W_F expression. Figure 2 illustrates the time path of the aggregate ratio of weekly incomes.

The man shortage (MS) hypothesis explains ebbing marriage ratios by a diminution over time of the population of economically and socially qualified men of marrying age .A secularly rising share of young men are, according to this view, being "sorted out" by the marriage market because they lack the qualifications to make a net positive contribution in a marriage. Foremost among these qualifications is current or future income-earning ability.

FIGURE 2
Ratio of Average Weekly Incomes of Black Females to Black Male, Ages 22–34



Source: Authors' calculations from public use microdata.

The *MS* hypothesis is sometimes credited to William Julius Wilson, who wrote that "the increasing delay of first marriage and low rate of remarriage among black women seem to be directly tied to increasing labor force problems of men" (Wilson 1987, 84). Wilson constructed a "male marriageable pool index" (employed men per 100 women) using census data to show that, for example, whereas there were 71.4 employed black men ages 25–34 for every 100 black women in the same age group in the Northeast U.S. in 1960, the index fell to 60.4 men per 100 women by 1980.[5]

An important question (and one that is largely outside the scope of the present inquiry) is: What can explain the dramatic decline in the economic fortunes of young men since 1965? As Figure 2 above reveals, median income of young black men fell by a staggering 37 percent in real terms between 1973 and 1993 (compared to a decrease of 27 percent for all young men in the same interval). Some economists attribute much importance to "skill-biased" technical change.[6] Others point to the loss of high-wage manufacturing employment and the de-unionization of the workforce.[7] Mary King (1998) has identified subtle, institutional systems of placement that block access of blacks to high-paying jobs.

Wilson for his part commented that:

> Urban minorities have been particularly vulnerable to structural economic changes, such as the shift from goods-producing to service-

> producing industries, the increasing polarization of the labor market into low-wage and high-wage sectors, technological innovations, and the relocation of manufacturing industries outside of central cities (Wilson 1987, 39).

George Akerlof (1998) has argued that social factors are more important than diminished economic opportunity in explaining the weakened earning power of young men.[8] Specifically, the option to avoid or terminate pregnancy has provided men with expanded opportunities for sex outside marriage. Whereas pregnancy once compelled a young man to "do the right thing" and enter into marriage, evolving social mores have relieved him of that obligation. The result has been a sharp decrease in the *relative* incidence of "shotgun marriage"—that is, the proportion of out-of-wedlock births resolved by marriage (Akerlof, Yellen, and Katz 1996).[9] Akerlof believes marriage and fatherhood have a beneficial effect on the habits and attitudes of young men, rendering them more able to seize what chances may exist. It should be noted that there are conflicting views as to the effects of low cost, widely available abortion on the overall marriage rate.[10]

No one disputes that young men ensnared in the criminal justice system face reduced prospects for economic success. Michael Tonry (1995) has documented the devastating and disproportionate impact of the Reagan-era War on Drugs on black youths. It is difficult to reject the hypothesis that the stunning increase in juvenile arrest and incarceration rates for drug offenses beginning in the mid-1980s (see Tonry 1995, Figure 3-11, p. 112) have had a detrimental impact on the secular path of earnings among blacks.

RESEARCH DESIGN

Econometric studies of marriage typically involve cross-sectional analysis.[11] As this paper is concerned with the forces shaping the long-run movement of the marriage ratio, time series methods are indicated. The lack of time series studies of marriage ratios to date is most likely explained by a lack of long and dense data sets. To surmount this difficulty, we have extracted microdata from the *Current Population Survey* March Demographic files for the years 1965–2003. The result is a data set consisting of 39 annual observations.

To assess the empirical saliency of the hypotheses outlined in the preceding section, we specify and estimate a vector autoregression (*VAR*) model. Estimates obtained from *VARs* are useful in establishing *predictive causality*—that is, one can determine if lagged values of one variable are useful in predicting the future value of another variable. The first step in the process is the selection of variables to proxy labor market and marriage market conditions.

Measuring Marriage Market Conditions

The time path of Wilson's male marriageable pool index (MMPI) offers a serviceable indicator of changing marriage market conditions so long as: (1) the average (real) income of employed young men does not decrease; and (2) there are no significant changes over time in the distribution of income among employed young men. A possible criticism of the MMPI is that, given the rising incidence of interracial marriage, the pool of marriage candidates available to black females should not be restricted to employed black men. This criticism would have merit if it could be shown that a substantial proportion of married black females have spouses who are not black. But the numbers do not bear this out. According to the 2000 Population Census, 96.7 percent of the spouses of black women were black, 2.0 percent were white, 1.0 percent Hispanic, and 0.3 percent were "other."[12]

A secular deterioration of the overall economic status of employed men would have clear implications for the marriage market—even if the ratio of employed men to women of similar age (or the MMPI) remained unchanged. CPS microdata reveal that black men ages 22–34 suffered retrogression in labor market fortunes after 1973. Though there was improvement in the mid-to-late 1990s, the post-1973 peak of real median income (2000 dollars) was still nearly 20 percent short of its all-time high value (see Figure 3).

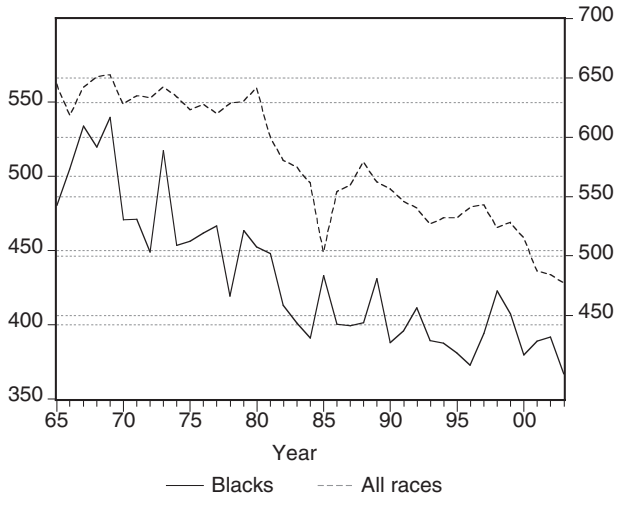
FIGURE 3
Median Income, Gini Ratios of Black Men, Ages 22–34

Source: Authors' calculations from public use microdata.

An equally troubling development has been the sharp increase in income inequality within this group. Figure 3 displays the time path of the Gini ratio for young black men since 1965. A rise in the Gini ratio effectively stiffens the penalty for falling "below average," *ceteris paribus*. As within-group inequality worsens, a greater share of employed men may earn incomes that fall below the minimum that would make them viable marriage candidates. An alternative approach to measuring marriage market conditions is to count the number of men per 1000 women of the same age with incomes exceeding a threshold for marriageability. We call this the *breadwinner index.* Changes in the mean as well as higher moments of the income distribution function will alter the share of men above or below the threshold, and thus will be reflected in the breadwinner index. Defining an income threshold for marriageability does entail conceptual problems. However, the objective in specifying such a threshold is not to give precise estimates of marriage market conditions in any specific year, but rather to measure the magnitude of changes over time.

Two breadwinner indices were computed using CPS microdata for the period 1965–2003. The results are displayed in Figures 4 and 5. The respective indices are based on different assumptions about the income sufficient to

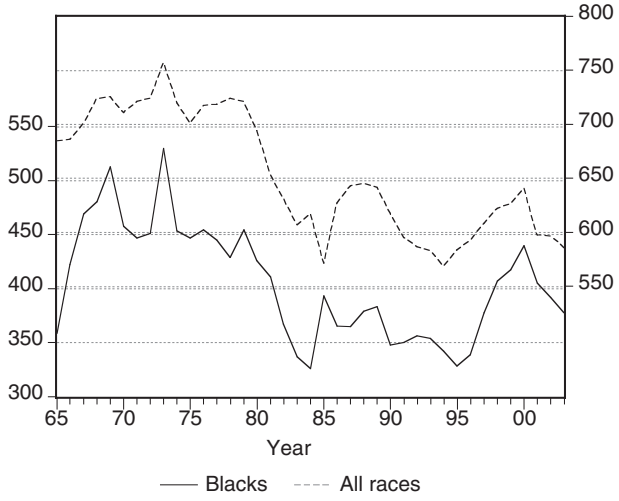
FIGURE 4
Breadwinner Index—Relative Standard (Men Ages 22–34 per 1,000 Women Ages 22–34 Qualifying as Marriageable by an Income Test)



Relative standard: Income exceeds 60 percent of the mean income of married men ages 22–34.

Source: Authors' calculations from public use microdata.

FIGURE 5
Breadwinner Index—Absolute Standard (Men Ages 22–34 per 1,000 Women Ages 22–24 Qualifying as Marriageable by an Income Test)



Absolute standard: Income exceeds the official poverty threshold for a family of four.

Source: Authors' calculations from public use microdata.

qualify as marriageable. The "relative" approach takes the incomes of those who are actually married as good indicia of the income that a young man needs to be a viable marriage candidate. The relative" standard sets the threshold at 60 percent of the average income of black married men ages 22–34. The "absolute" standard makes a young man marriageable if his income exceeds the official poverty threshold for a family of four (equal to $18,810 in 2003 and $3,320 in 1965). The data reveal that the two versions of the breadwinner ratio track very closely over the study period. Using the absolute standard, we see the breadwinner index for young black men peaking in 1973 at 530 marriageable men per 1000 women. It decreased by nearly 45 percent (530 to 305) between 1973 and 1996. The figure for "all races" during the same period was a decrease of 19 percent (724 to 584). The breadwinner index using the relative standard also bottomed out in 1996 at 373, a 31 percent dip from its peak it 1969.

A question arises: Does the breadwinner index measure the impact on marriage market conditions of the increase in incarceration rates of black men since the mid-1980s? The answer is yes. Though the CPS survey does not include

institutionalized persons, incarcerated persons would in nearly every case have incomes insufficient to qualify as marriageable.

Measuring Labor Market Conditions

Direct measurement of changing labor market conditions or returns to human capital is exceedingly difficult, if not impossible. As a rule, researchers are forced to make inferences about labor market conditions on the basis of *outcomes*—that is, from data about hours worked, hourly wages, or weekly or annual incomes. The VAR model described in the following section is based on the assumption that year-to-year changes in market opportunities are revealed in movements in average weekly incomes of young black women and men (converted to base year prices using the Consumer Price Index).

THE VAR MODEL

The main advantage of the VAR model is its lack of theory regarding causality. All variables in the model are treated as endogenous and each is assumed to be a function of lagged values of all other (endogenous) variables. The primary disadvantage is that, because no *a priori* specification is defined and no restrictions are applied, the model is atheoretical. For our application, the advantages of the VAR are considerable. It is highly likely that the variables identified to explain the number of black marriages are also influenced by the number of black marriages. For example, Akerlof's position implies that a falling marriage ratio is a *cause*, as well as an effect, of weakened job market performance by young men. Also, it would be logical for women to make greater investments in market-specialized human capital in the face of poor marriage prospects.

There are four critical variables to be modeled by the VAR:

1. MBF—the number of married black females per 1000 black females in the 22 to 34 age group,
2. EARN1—mean real black female weekly earnings in the 22 to 34 age group,
3. EARN2—black female weekly earnings per $1000 of black male weekly earnings in the 22 to 34 age group, and
4. BWINDEX—the number of black males with incomes equal to or exceeding the poverty threshold for a family of four per 1000 black females in the 22 to 34 age group.

The system of equations to be estimated is:

$$MBF_t = \alpha_1 + \sum_{i=1}^{n} \beta_{1i} MBF_{t-i} + \sum_{i=1}^{n} \gamma_{1i} EARN1_{t-i} + \sum_{i=1}^{n} \theta_{li} EARN2_{t-i} + \sum_{i=1}^{n} \lambda_{1i} BWINDEX_{t-i}\ 1\ \mu_{1t} \tag{2.1}$$

$$EARN1_t = \alpha_2 + \sum_{i=1}^{n} \beta_{2i} MBF_{t-i} + \sum_{i=1}^{n} \gamma_{2i} EARN1_{t-i} + \sum_{i=1}^{n} \theta_{2i} EARN2_{t-i} + \sum_{i=1}^{n} \lambda_{2i} BWINDEX_{t-i} + \mu_{2t} \tag{2.2}$$

$$EARN2_t = \alpha_3 + \sum_{i=1}^{n} \beta_{3i} MBF_{t-i} + \sum_{i=1}^{n} \gamma_{3i} EARN1_{t-i} + \sum_{i=1}^{n} \theta_{3i} EARN2_{t-i} + \sum_{i=1}^{n} \lambda_{3i} BWINDEX_{t-i} + \mu_{3t} \tag{2.3}$$

$$BWINDEX_t = \alpha_4 + \sum_{i=1}^{n} \beta_{4i} MBF_{t-i} + \sum_{i=1}^{n} \gamma_{4i} EARN1_{t-i} + \sum_{i=1}^{n} \theta_{4i} EARN2_{t-i} + \sum_{i=1}^{n} \lambda_{4i} BWINDEX_{t-i} + \mu_{4t} \tag{2.4}$$

Two problems must be addressed before the unrestricted VAR specified above can be estimated. First, the series representing each variable must be tested for the existence of unit roots. Second, the appropriate number of lags for the right-hand-side variables must be determined (n in the above system of equations).

Recognition of the problem of nonstationary time series and spurious regression can be traced to Granger and Newbold (1974). They produced irrefutable evidence that if nonstationary time series variables are related in regression form, the resulting statistics are unreliable. Unfortunately, these unreliable statistics frequently make regressions of this type look very good. So, it is imperative that the researcher confirm the stationarity of times series variables prior to using them in their levels form.

All variables were, therefore, tested for stationarity using the two most frequently referenced tests for unit roots—the augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. Table 1 presents the results of applying the ADF test to the entire set of variables. One of the variables, BWINDEX, tests stationary in levels form using the ADF test. However, according to the ADF test MBF, EARN1 and EARN2 may well have unit roots. Thus an addi-

TABLE 1
Augmented Dickey-Fuller (ADF) Unit Root Tests

Variable (Annual Data)	Test Statistic τ	Critical Values $\tau^*_{90\%}$	$\tau^*_{95\%}$	$\tau^*_{99\%}$	Lags	SIC
Levels Data						
MBF	−1.87	−2.63	−2.99	−3.73	14	10.00[a]
EARN1	0.65	−1.62	−1.95	−2.64	8	8.50
EARN2	−0.62	−3.25	−3.62	−4.42	15	11.00[a,b]
BWINDEX	−4.64*	−3.20	−3.53	−4.22	0	9.36[a,b]

*, ** and *** indicate the null hypothesis of a unit root is rejected at the 1%, 5% and the 10% level, respectively. All tests are one-tailed tests. SIC = Schwarz Information Criteria. [a] = regression deriving ADF test includes an intercept. [b] = regression deriving ADF test includes a time trend.

tional test based on a non-parametric correction to the t-statistic on the coefficient to be tested (usually noted as γ—the coefficient on the lagged term in the test equation) was applied to the data. The results of the Phillips-Perron (PP) tests are presented in Table 2. In this case, all four variables meet at least the 95% level of confidence for stationarity in their (respective) levels measurement. Based on the results of the PP tests, and given that the power of the various unit root tests tends to be, in general, very low (the tendency being that the existence of unit roots is accepted too frequently[13]), it seems reasonable to assume that these variables are stationary in their levels form.

The next issue to be resolved is the correct number of lags to include in the VAR. The idea is to include enough lags such that the error terms essentially become white noise. Three common tools are typically employed to make this determination: the Akaike information criterion, the Schwarz information cri-

TABLE 2
Phillips-Perron (PP) Unit Root Tests

Variable (Annual Data)	Test Statistic τ	Critical Values $\tau^*_{90\%}$	$\tau^*_{95\%}$	$\tau^*_{99\%}$	SIC
Levels Data					
MBF	−5.960*	−1.62	−1.95	−2.62	8.93
EARN1	−3.07**	−2.61	−2.94	−3.61	7.81[a]
EARN2	−4.71*	−3.20	−3.53	−4.22	10.85[a,b]
BWINDEX	−4.70*	−3.20	−3.53	−4.22	9.36[a,b]

*, ** and *** indicate the null hypothesis of a unit root is rejected at the 1%, 5% and the 10% level, respectively. All tests are one-tailed tests. SIC = Schwarz Information Criteria. [a] = regression deriving PP test includes an intercept. [b] = regression deriving PP test includes a time trend.

terion, and a likelihood ratio test. In our case, there was agreement between the Schwarz and Akaike information criteria that a single lag was appropriate for this system of equations. Table 3 provides the estimates obtained from applying ordinary least squares to each equation in the four-equation system. A systems estimator is unnecessary because the variables included in each equation are identical. Consequently, ordinary least squares provides exactly the same results as would a seemingly unrelated approach.

One-fourth (4) of the estimated coefficients are significantly different from 0 at any conventional level of significance. However, as is common with most VARs, the equations tend to predict very well. The equation of most interest to this research is the MBF equation. Its estimated R-squared is 0.98 and the estimated coefficients of determination for the remaining equations all exceed 0.7. Additional evidence for the accuracy of the MBF equation is provided graphically in Figure 6. The plots of actual versus fitted values for the MBF equation are impressively close.

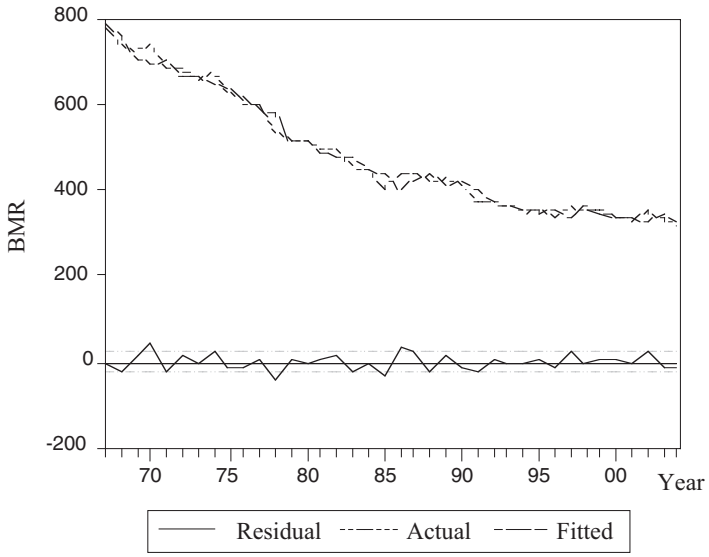
Does the econometric evidence support the hypothesis that the two earnings variables (EARN1 and EARN2) have exerted a depressing effect on black female marriages (MBF)? Moreover, can it be established that the breadwinner index (BWINDEX) has a positive impact on the same variable? The first step

TABLE 3
Unrestricted VAR Estimates—1965–2003
(t-scores in parenthesis)

	Dependent Variables			
	MBF	**EARN1**	**EARN2**	**BWINDEX**
Intercept	152.36	218.31*	1163.05*	303.54*
	(1.59)	(4.92)	(5.48)	(2.99)
MBF (−1)	1.02*	−0.06	−0.26	0.31*
	(15.18)	(−0.62)	(−1.78)	(4.44)
EARN1 (−1)	−0.06	0.82*	0.11	−0.04
	(−0.33)	(9.62)	(0.27)	(−0.23)
EARN2 (−1)	−0.03	−0.16*	−0.04	−0.02
	(−0.42)	(−4.39)	(−0.22)	(−0.43)
BWINDEX (−1)	−0.31	−0.05	−0.61	−0.08
	(−1.79)	(−0.62)	(−1.58)	(−0.43)
R^2	0.98	0.82	0.71	0.82
F	462.92†	37.08†	19.83†	37.82†
SIC	9.17	7.63	10.76	9.28
System SIC	36.24			

*, ** and *** implies the estimated coefficient is statistically different from zero at the 1%, 5% and 10% level, respectively. †implies that the null hypothesis that all the slope coefficients are simultaneously equal to zero is rejected at the 1% level.

FIGURE 6
Actual Values, Fitted Values and the Residual for the MBF Equation



Source: Authors' calculations from public use microdata.

in making this determination is usually to check for Granger causality. A time series *X* is said to Granger-cause *Y* if it can be shown, by a series of F-tests on lagged values of *X*, that those *X* values provide statistically significant information on future values of *Y*.

Table 4 provides all possible Granger causality tests for the variable MBF and the remaining variables in the system. In three cases, it is possible to statistically reject the null hypothesis—i.e., no Granger causality. In two of the three cases, MBF is the causal factor and, therefore, of little interest to the arguments made in this research. However, the statistical evidence indicates that BWINDEX (the breadwinner index) does Granger cause MBF and BWINDEX is definitely a variable of interest. However, the mere existence of Granger causality does not reveal the nature of the causality, although it does seem likely that a fall in BWINDEX would lead to a decrease in MBF.

An *impulse response function* measures the time profile of the effect of an exogenous shock (or impulse) on the expected future values of a variable of interest. The technique entails "shocking" the error term of one of the VAR equations (called an *innovation* in VAR terminology)—meaning, increasing it by one standard deviation. The effects of the innovation can then be traced through the entire system. As long as the innovations are uncorrelated, inter-

TABLE 4
Pairwise Granger Causality Tests
(All Possible Combinations Involving BMR)
(One Lag as Determined by Schwartz Information Criterion)

Null Hypothesis:	*F*-Statistic	Probability
BMR does not Granger Cause EARN1	0.12564	0.62099
EARN1 does not Granger Cause BMR	0.50987	0.47993
BMR does not Granger Cause EARN2	22.0015	0.00001
EARN2 does not Granger Cause BMR	0.24041	0.62697
BMR does not Granger Cause BWINDEX	31.8627	0.00001
BWINDEX does not Granger Cause BMR	3.68839	0.06297

pretation of impulse response functions is clear-cut. If, as is the normal case, the innovations are correlated, additional steps should be taken. The most common technique is to orthogonalize the errors using the Cholesky decomposition so that the covariance matrix of the resulting innovations is diagonal (See Hamilton 1994, pp. 318–231). This method was used to produce the impulse response functions displayed in Figures 7 through 10.

Examination of the impulse response functions (IRF) relating to MBF is revealing. Figure 7 describes the (expected) response of MBF for 10 periods

FIGURE 7
Response of BMR One Standard Deviation Innovation of EARN1

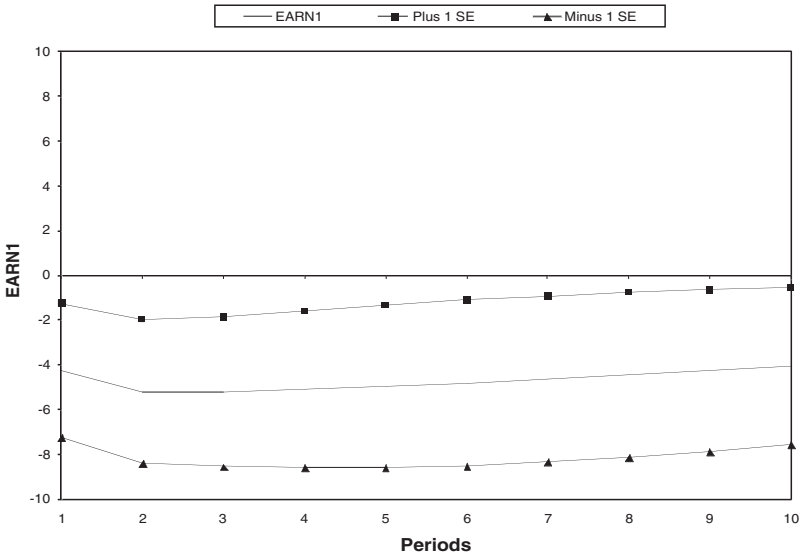


FIGURE 8
Response of BMR to 1 Standard Deviation Innovation of EARN2

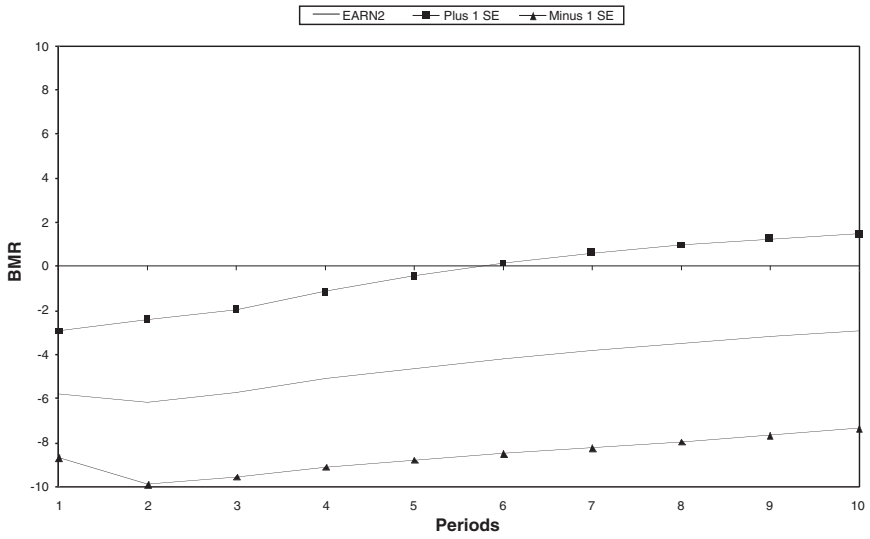
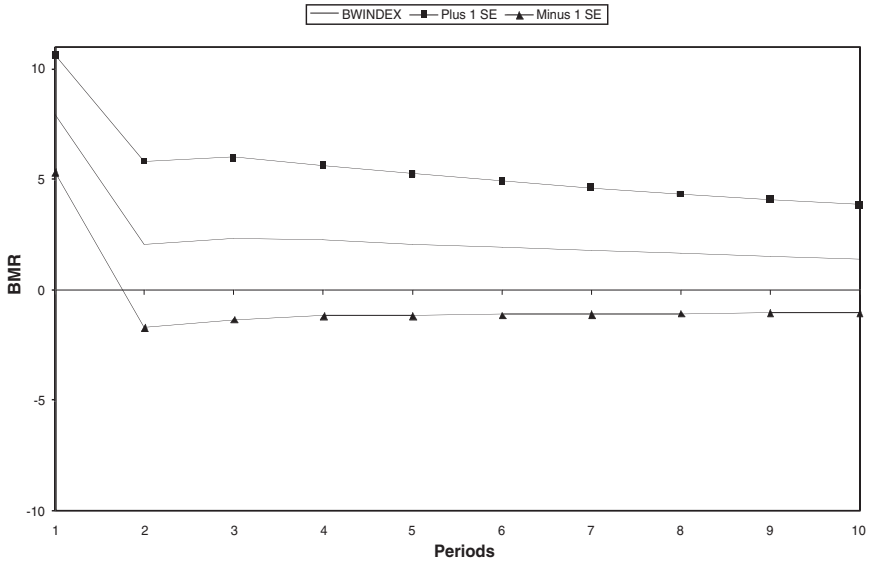


FIGURE 9
Response of BMR to 1 Standard Deviation Innovation of BWINDEX



(years) to a one-time, one standard deviation impulse of EARN1 at time *t* with all other variables dated *t* or earlier held constant. Notice that the time profile of MBF turns immediately negative in response to a positive (one standard) deviation shock to the EARN1 equation (real black female wages) and remains at the reduced value on a protracted basis. Figure 8 shows that the short-run repercussion of a shock to EARN2 (the relative measure of black female earnings) is instantly a little larger than EARN1's effect, but then tapers off. Overall, it appears that prior knowledge of changes in black male earnings—both in absolute and relative terms—is useful in forecasting future values of the black female marriage rate. Users of impulse response analysis must take care in inferring causality in the normal (epistemological) sense from the presence of *predictive* causality. With this in mind it is possible to conclude that the empirical findings do not falsify the theory developed earlier in the paper.

The most interesting results have to do with the behavior of MBF when a shock is applied to BWINDEX. Examination of Figure 9 reveals that the MBF variable jumps by nearly one standard deviation in the first year following an innovation to the breadwinner index. This response quickly diminishes but continues in a diminished capacity for a significant number of years.

In addition to impulse response functions, it is common practice to examine the forecast error variance decomposition of the variable of interest. In this case that variable is BMR and Table 5 provides this data. The results mirror those produced by the impulse response functions. The initial impact of BWINDEX is substantially larger than either EARN1 or EARN2. Over time, the impact of BWINDEX decays more rapidly than either EARN1 or EARN2.[14]

TABLE 5
Ordering: BEARN1 BEARN2 BWINDEX2 BMR

Variance Decomposition of BMR

Period	S.E.	EARN1	EARN2	BWINDEX2	BMR
1	18.69596	5.138013	9.596809	18.21355	67.05162
2	25.71893	6.779880	10.77546	10.26696	72.17769
3	30.64317	7.661145	11.08565	7.816838	73.43637
4	34.42378	8.261586	10.99235	6.619055	74.12701
5	37.46268	8.731142	10.79490	5.891792	74.58216
6	39.96763	9.116668	10.57666	5.404264	74.90241
7	42.06605	9.440382	10.36508	5.055635	75.13890
8	43.84367	9.715603	10.17021	4.794840	75.31935
9	45.36180	9.951352	9.995040	4.593322	75.46029
10	46.66621	10.15428	9.839580	4.433789	75.57236

CONCLUSIONS

The main contribution of this paper is that it subjected alternative economic theories of declining marriage rates of young black women to empirical test using modern time series methods. We were able to deploy these techniques by constructing annual time series from public use microdata for the period 1965–2003. Estimates obtained from a vector autoregression model support the conclusion that falling marriage rates cannot be understood without taking into account *both* improving labor market opportunities and worsened marriage market conditions. The evidence produced by the statistical procedures, while not conclusive, does argue in favor of what was earlier termed the "man shortage" hypothesis. Granger causality results, impulse response functions and variance decomposition results all indicate that decreases in the breadwinner index have a depressing effect on black marriage rates. Additionally, impulse response functions and variance decomposition results show that increases in real black female weekly income and rising black female wages relative to black male wages both have a negative impact on black female marriage rates.

The economic theory of marriage explains declining marriage rates as an aggregate effect of rational, maximizing responses of individuals to shifting opportunity sets. The theory does not attach much importance to changing "values" or preferences for marriage. We are inclined to believe that the aspirations of young black women with respect to marriage and family have not changed much in the past 40 years—though such hopes have no doubt in many cases been tempered by harsh marriage market realities. The findings reported here suggest that the marriage promotion initiatives of the type favored by the Bush administration are likely to have limited success for this population. Measures such as the elimination of the marriage penalty or larger tax deductions for children should help some. However, a significant rise in the marriage rate is not likely to occur without a quantum improvement in the economic status of young black men.

NOTES

1. It is important to distinguish between the individual and social benefits of marriage. The net benefits of marriage to self-interested persons are *not* unambiguously positive. Some benefits of connubiality (e.g., sex, companionship, economies of scale in consumption) are available outside matrimony and, as Flanders writes, "[m]arriage is disabling in a lot of obvious ways: professional, sexual, economic" (Flanders 1996, p. 81). Academic studies have identified numerous individual gains from marriage. These include economic and health benefits (Schwartz 2005), a greater capacity to accumulate assets (Schmidt and Puvak 2006), the ability to hedge uncertainty about future income (Chami and Hess 2005), and better outcomes for children (Waite 1995). The proposition that the institution of marriage produces collective benefits arising from (for example) a sufficiently high birth rate,

greater development of human capital, or reduced crime and dependency, appears to be less controversial.

2. Those women reporting they were "separated" in the *CPS* survey are counted as married.

3. A confusing issue in Becker's work pertains to the nature of complementarities between male and female 'inputs' in the household production function, and how these compare to relationships among conventional inputs. Formally, inputs *m* and *f* and are complements if, when a production function of the form $Z = (x, m, z)$ is totally differentiated, the cross partial derivatives of *m* with respect to *f* (and vice versa) have a positive sign. But Becker seems to be thinking in terms of the production of items for which both male and female inputs are indispensable. In this sense, copper and tin are "complements" in the production of bronze. He uses a Cobb-Douglas production function to explain his meaning. It takes the following form: $Z = kx^a t_m^b t_f^c$, where t_m and t_f are the time allotments to joint production made by husband and wife respectively. Thus $Z = 0$ if $t_m = 0$ or $t_f = 0$. See Becker, "A Theory of Marriage, Part I." *Journal of Political Economy 81* (August 1973): 813–846 (819).

4. The female would completely specialize in household production and forgo market activities if the w_m/w_f ratio or the ratio of the female's to the male's marginal product in household production for the same expenditure of time (MP_{tf}/MP_{tm}) was sufficiently high. See Becker, *Treatise on Family* (Cambridge, MA: Harvard University Press, 1973), Chapter 2.

5. See Wilson, *The Truly Disadvantaged* (Chicago: University of Chicago Press 1987), Table 4.1.

6. For example, see Acemoglu, "Technical Change, Inequality, and the Labor Market." *Journal of Economic Literature*, 40 (March 2002): 7–72, and Krueger, "How Computers have Changed the Wage Structure." *Quarterly Journal of Economics*, 110 (March 1993): 33–60.

7. See Freeman, "How Much has De-Unionization Contributed to the Rise in Male Earnings Inequality?" In *Uneven Tides: Rising Inequality in America*, Danziger and Gottschalk, Editors (New York: Russell Sage Foundation, 1993), 133–163.

8. The Akerlof position does not apply exclusively to black men. It was noted above that, overall, young men in the U.S. have suffered declines in real income.

9. As reported by Phillip Levine, the shotgun marriage rate for women ages 15 to 29 hovered around 50 percent from the 1930s into the early 1970s: "But by the late 1970s, this rate began to fall dramatically. It has fallen by more than half for women 15 to 29 and more than two-thirds for women 15 to 19 by the date of the most recent statistic (1990–94)"(Levine 2004, pp. 161–162).

10. For example, Kane and Staiger (1996) argue that widened abortion access leads to an increase in teen pregnancy, giving rise to a much larger number of cases that might be resolved by a shotgun marriage. Their model "assumes that women get information during the early months of pregnancy, and abort the birth if it turns out unwanted. Given that the majority of teen pregnancies are conceived out of wedlock, the father's willingness to marry is an obvious example of such information"(p. 468). Also see Levine (2004, Chapter Eight).

11. Recent examples include Blau, Kahn, and Waldfogel, "Understanding Young Women's Marriage Decisions: The Role of Labor and Marriage Market Conditions." *Industrial and Labor Relations Review*, 53 (July 2000): 624–628; Wood, "Marriage Rates and Marriageable Men: A Test of the Wilson Hypothesis." *Journal of Human Resources*, 30 (Winter 1995): 163–193, and Lichter, Leclere, and Mclaughlin, "Local Marriage Market Conditions and the Marital Behavior of Black and White Women." *American Journal of Sociology*, 97 (June 1992): 781–799.

12. This data comes from Table FG3, which can be viewed at the Bureau of the Census web site, www.census.gov/population/socdemo/hh-fam/p20-537/2000/tabFG3.txt.

13. For a good discussion of these issues see Enders, *Applied Econometric Time Series* (New York: John Wiley and Sons, 1995), 251, and Diebold, *Elements of Forecastin*g (Cincinnati: South-Western, 2001), 339–40.

14. At the request of an anonymous referee who preferred to assume that the series all had unit roots in their levels form, cointegration tests and a vector error correction model were run. In their first differences, the variables were all clearly stationary. After placing the appropriate restrictions on the VAR, impulse response functions were again examined. The results were remarkably similar to those of the unrestricted VAR reported in this paper.

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