Is the male marriage premium due to selection? The effect of shotgun weddings on the return to marriage

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Abstract. In standard cross-sectional wage regressions, married men appear to earn 10 to 20% more than comparable never married men. One proposed explanation for this male marriage premium is that men may be selected into marriage on the basis of characteristics valued by employers as well as by spouses or because they earn high wages. This paper examines the selection hypothesis by focusing on shotgun weddings, which may make marital status uncorrelated with earnings ability. We compare the estimated marriage premium between white men whose first marriages are soon followed by a birth and other married white men in the United States. The return to marriage differs little for married men with a premarital conception and other married men, and the results suggest that at most 10% of the estimated marriage premium is due to selection.

1. Introduction

Research on the determinants of wages has found that married men appear to earn more than comparable single men (e.g., Korenman and Neumark 1991). Traditional estimates of this return to marriage range from 10 to 40 percent

and have motivated several studies of its causes. Proposed explanations for the male marriage premium include employer discrimination and productivity differences due to specialization afforded by marriage. Selection bias may also account for the return to marriage; women may select spouses in part on the basis of characteristics that employers also value but are unobservable to econometricians. The measured marriage premium may simply reflect the return to these characteristics. Estimates of the marriage premium may also suffer from selection bias if men who have high wages or faster wage growth are more likely to marry.

This paper exploits a potentially exogenous cause of marriage among some men in order to control for selection bias in estimates of the male marriage premium. We use the dates of men's first marriage and their children's births to examine whether the return to marriage differs between men who have a child shortly after marriage and other married men. We assume that nonmarital conceptions followed by marriage, or shotgun weddings, make marriage a random event. If so, shotgun weddings allow econometricians to avoid the selection issues associated with traditional estimates of the male marriage premium.

We also explore whether wages affect men's marital status. If high-earning men are more likely to marry, as posited by Becker (1976), estimates of the marriage premium that do not control for the endogeneity of marriage will be biased upwards. Research on the relationship between the availability of "marriageable" men and women's marriage patterns indicates that men's average earnings and employment rates are positively correlated with the incidence of marriage among women in the U.S. (Lichter et al. 1991). Since women may be reluctant to marry low earners, men's earnings may affect their own marital status as well. To address this issue, we examine the effect of men's wages on the likelihood of marriage for both conventional and shotgun weddings.

The results indicate that both married men with a premarital conception and other married men earn significantly more than never-married men in cross-sectional wage regressions. The difference between the returns to conventional and shotgun marriages is small relative to the size of the marriage premium. The results suggest that the form of the marriage premium differs across the two types of marriages, with married men without a premarital conception receiving a larger immediate positive wage premium, as measured by the intercept, and a slightly smaller return to marriage over time than married men with a premarital conception. This indicates that the selection bias associated with cross-sectional estimates of the marriage premium is small or negligible. We assess the validity of our statistical experiment by examining the characteristics of men at the time of marriage and by estimating the effect of wages on the probability of marriage. These estimates indicate that higher-wage men are more likely to get married, suggesting that selection may play a role in marital status even if it does not underlie the majority of the marriage premium.

The remainder of this paper is organized as follows: Sect. 2 summarizes the literature, Sect. 3 explains the empirical methodology, Sect. 4 describes the data, Sect. 5 reports the empirical results, Sect. 6 examines the robustness of our estimation assumptions, and Sect. 7 concludes.

2. Summary of the literature

Although almost all previous research finds a significant return to marriage for men in cross-sectional wage regressions, studies using panel data have

reached differing conclusions on whether selection bias contributes to the male marriage premium.

Korenman and Neumark (1991) find little evidence that selection into marriage biases estimates of the marriage premium. Their specifications using pooled cross-sectional data from the National Longitudinal Survey (NLS) Young Men Cohort in 1976, 1978, and 1980 indicate a positive correlation between marriage and wages. When individual fixed effects are included to control for unobservable, time-invariant characteristics, the estimated return to marriage, as measured by an indicator variable, falls from about 10 to 6% but remains positive and significant. They also find that the return to marriage increases with marital duration, and the return to marriage falls by less than 2 percentage points when individual fixed effects are included in specifications that control for years married. Korenman and Neumark indicate that young men with high wages or high wage growth rates in the NLS data are not more likely to get married.

Cornwell and Rupert (1997), in contrast, conclude that selection underlies much of the marriage premium. They include random and fixed individual effects in wage regressions using NLS data from 1971 as well as the three later years used by Korenman and Neumark. Their results indicate that any return to marriage is an intercept shift rather than a return to marriage over time and that controlling for fixed individual characteristics attenuates the marriage premium. Cornwell and Rupert also report that men who marry between 1971 and 1980 already receive a marriage premium in 1971, so it appears that men who get married have characteristics that earn positive returns in the labor market even before marriage.

Nakosteen and Zimmer (1997) find that men with high earnings are more likely to get married and less likely to get divorced. Using panel data from the Panel Survey of Income Dynamics (PSID), they estimate standard earnings regressions and then include the residuals and predicted earnings in probability regressions of whether men married or divorced. They conclude that single men with higher earnings residuals are more likely to get married, while married men with higher predicted earnings are less likely to get divorced. In a related paper, Nakosteen and Zimmer (1987) present estimates from a Heckman-style selection correction model that suggests that men are positively selected into marriage on the basis of earnings. However, the results have no clear interpretation because the selection correction term is not significant in the second-stage regressions and the standard errors on the estimated marriage coefficients are large.

Gray (1997) pools data from the NLS and the follow-up National Longitudinal Survey of Youth (NLSY) to examine changes in the marriage premium between the two sample time periods. Like Blackburn and Korenman (1994), Gray reports a significant decrease in the marriage premium over time. His results indicate that the marriage premium in the first sample period resulted from the productivity effects of marriage. In the later sample period, the marriage premium disappears when selection is controlled for with individual fixed effects.

Research has also reached differing conclusions on whether productivity differentials contribute to the marriage premium. Loh (1996) finds no evidence that increased specialization between household and nonhousehold production, as measured by wives' labor force participation, underlies the return to marriage. Daniel (1995) reports, in contrast, that the marriage premium falls

as wives' hours of work increase. Using payroll records from a large U.S. manufacturing firm, Korenman and Neumark (1991) find that married men receive higher performance ratings and work in higher job grades. The marriage premium disappears when controlling for these two factors, suggesting that married men are more productive than single men. Absent direct data on workers' productivity, the interaction of marriage, productivity, and wages is unlikely to be resolved.

Taken together, these studies do not reach a consensus on the size of the marriage premium or its underlying causes. Using the fixed effects methodology, Korenman and Neumark find little evidence of selection, whereas Cornwell and Rupert conclude that most of the marriage premium can be attributed to selection and Gray finds conflicting results depending on which sample is used. An alternative approach to examining the selection hypothesis is warranted.

We use the statistical experiment of shotgun weddings in order to examine the effect of selection on the return to marriage and provide alternative estimates of the effect of marriage on wages. In doing so, our study differs from previous research, which has primarily relied on individual fixed effects to control for selection bias. Nonmarital pregnancies potentially change the timing of marriage and cause some men to marry partners they would not otherwise marry. This approach, which has not been used previously in this literature, allows us to examine two potential selection hypotheses: that women and employers choose men based on the same set of unobservable characteristics, contributing to selection; and that women select spouses with high wages or high wage growth. This approach requires several assumptions that are detailed in the following section.

In addition, our methodology differs from previous studies because we examine only the transition into men's first marriage. Fixed effects estimates in the literature are identified from men who transition into or out of marriage. For example, in Korenman and Neumark (1991), over 80% of transitions into marriage are divorces or remarriages; in Cornwell and Rupert (1997) that number is 52%. However, the implications of the selection and productivity hypotheses are not clear for divorce or remarriage. Alimony and child support may motivate men to earn higher wages. Divorce implies negative selection by the first spouse, and the presence of an ex-spouse and dependents may affect selection into subsequent marriages. Focusing on transitions into first marriages may give a clearer estimate of the role of selection. Although we focus on cross-sectional estimates, the appendix presents fixed effects estimates of the marriage premium for comparability of the results to previous studies that use fixed effects methodologies and samples that include divorced men.

3. Empirical methodology

Estimates of the male marriage premium may be subject to selection bias because employers and potential spouses value the same characteristics or because high-earning or high-earnings-growth men are more likely to get married. If uncorrected, both sources of selection bias would lead to an overestimate of the marriage premium.

The first potential source of selection bias is that employers and spouses value the same characteristics in men, and the estimated marriage premium

in cross-sectional data reflects the return to these characteristics, which are unobserved by econometricians. More formally, the true model of wages is

$$\ln Wage_{it} = \alpha + \beta X_{it} + \gamma M_{it} + \delta A_{it} + \varepsilon_{it}, \tag{1}$$

where X_{it} is observable characteristics of individual i at time t, M_{it} is an indicator of marital status, and A_{it} is unobservable characteristics that affect wages. If A_{it} and M_{it} are positively correlated, then the estimated coefficient on M_{it} will also measure the return to A_{it} and be biased upward. For example, loyalty and dependability are likely to be positively correlated with wages and marital status.

The standard correction, as in Korenman and Neumark (1991) and Cornwell and Rupert (1997), is to assume that A_{it} is fixed over time. Unobservable characteristics can then be controlled for in panel data by differencing observations from individual means or by including an individual fixed effect:

$$\ln Wage_{it} = \alpha + \beta X_{it} + \gamma M_{it} + \delta A_i + \varepsilon_{it}, \tag{2}$$

where A_i is a fixed effect for individual i. The fixed effects also control for selection into wages based on time-invariant wage levels, another potential source of selection bias.

The fixed effects methodology does not correct for bias due to unobservable characteristics that are correlated with marital status but not time-invariant. It also does not correct for the other possible source of selection bias, that selection into marriage depends on wage growth. If men are selected into marriage on the basis of wage growth, then changes in $Wage_{it}$ and M_{it} are interdependent and the estimated coefficient on the marriage variable will be biased upward if high wage growth increases the likelihood of marriage. The standard corrections for this endogeneity problem are instrumental variables estimation or a Heckman-style selection correction method. Both methods require that marital status be well correlated with at least one variable that is uncorrelated with the error term in Eq. (1). However, few variables seem like natural candidates for identification; birth order (Behrman and Taubman 1986), religion (Meng and Sentance 1984), and parents' education (Altonji 1996; Ginther 2000) have been found to be correlated with earnings.

Shotgun weddings offer an alternative means of correcting for selection and endogeneity bias. Although the fraction of premarital conceptions that result in marriage has been declining over time, a significant number of premarital pregnancies resulted in marriage during our sample timeframe. Among women who had their first child in 1960–1964, 63% of white women and 26% of black women who had premarital conceptions married before the birth of the child; the respective rates fell to 49% and 11% by 1975–1979 (O'Connell and Rogers 1984).

In order to obtain unbiased estimates of the effect of marriage on wages, we ideally want a sample in which some men were randomly assigned spouses while others remained unmarried. We would then compare the wages of married and single men, with the difference being the marriage premium. However, this experimental design is confounded by individuals' non-random selection of marriage partners. A premarital conception may randomly assign some men to marriage who otherwise would not marry, cause them to marry sooner, or cause them to marry a woman they would not marry absent the pregnancy.

The plausibility of shotgun weddings as a random source of variation in marital status depends on several critical assumptions. First, it requires that the likelihood of a premarital conception is uncorrelated with the man's wages, controlling for observable characteristics, prior to the conception and marriage. It also assumes that the likelihood that a couple marries, given a premarital conception, is uncorrelated with a man's wages, controlling for observable characteristics, prior to the conception and marriage. In addition, the effect of marriage on men's subsequent earnings should be the same for shotgun and non-shotgun weddings if no selection occurred. In other words, we assume that premarital conceptions and shotgun weddings are unplanned, random events. These assumptions imply that people have sexual relations with partners that they would not marry at that time and then subsequently decide to marry after a premarital conception. Essentially, we assume that a premarital conception causes a marriage where one would not otherwise occur.

In addition, shotgun weddings may circumvent assortative mating if people marry partners whom they would not have viewed as potential spouses absent pregnancy. Assortative mating may contribute to the marriage premium if men select those spouses who best contribute to their productivity. For example, men who plan to work long hours may pick wives who plan to specialize in home production. Such assortative mating would contribute to the marriage premium, and it may occur to a lesser extent among shotgun marriages than among other marriages.

The statistical experiment of shotgun marriages provides several alternative hypotheses that can be examined in the data. If marriages with a premarital conception are randomly assigned and there is selection bias in the traditional estimate of the marriage premium, the estimated marriage premium should be lower for married men with a premarital conception than for other married men. However, if marriages with a premarital conception are not randomly assigned, there should be no difference in the estimated coefficients for the two types of married men. If women attempt to use pregnancy to prompt marriage with "desirable" men, the results should be the opposite of our hypothesis. If men with a shotgun marriage are negatively selected, then their return to marriage may be viewed as a lower bound on the marriage premium. Finally, the returns to marriage over time will differ between the two types of marriages if assortative mating affects specialization within marriages and shotgun weddings circumvent or reduce assortative mating.

We test our hypothesis by estimating cross-sectional regressions that include separate marital status indicator variables for the two types of married men:

$$\ln Wage_{it} = \alpha + \beta X_{it} + \gamma Non\text{-}Shotgun_{it} + \rho Shotgun_{it} + \varepsilon_{it}. \qquad (3)$$

The variable $Non\text{-}Shotgun_{it}$ equals one if a man is married and the marriage was not soon followed by a birth and zero otherwise, and $Shotgun_{it}$ equals one if the man's marriage was soon followed by a birth and zero otherwise. The comparison group is never-married men. Our hypothesis is that the coefficient on $Shotgun_{it}$ will be lower than the coefficient on $Non\text{-}Shotgun_{it}$. We also include variables measuring years of marriage and its square in some specifications of Eq. (3) in order to examine whether the return to marriage increases

over time and whether changes in the return to marriage differ across men in shotgun and conventional marriages.

4. Data

We use data from the National Longitudinal Survey Young Men Cohort (NLS) and the 1980 Census 5% Public Use Microdata Sample to examine the correlation between marriage and wages. The NLS is a panel data set that followed a group of young men aged 14–24 in 1966 for fifteen years, and the Census is a cross section of the entire population in 1980. We use both the Census and NLS data to examine the effects of shotgun weddings on the marriage premium in a cross-sectional context. We supplement this analysis with fixed effects estimates using the NLS for comparison between our approach and the previous literature.

The data sets include the date men's first marriage began and children's birth dates, which allow us to determine whether a marriage was shortly followed by a birth. We define a premarital conception that results in marriage, or a legitimated birth, as a marriage that is followed by a birth within seven months in the NLS data and within two quarters in the Census data. Of course, not all legitimated births are the outcome of shotgun marriages since the marriage may have already been planned before the pregnancy began or was realized. In addition, the pregnancy may have been planned to bring about the marriage because the man is a desirable spouse, a possibility that we address below.

In the NLS, we use data from the 1970 and 1976 waves and restrict the data to white men who had completed their schooling by 1970 and who had complete records for the variables used in the empirical analysis. The NLS data set was also used in Korenman and Neumark (1991) and Cornwell and Rupert (1997), but we use focus on earlier survey waves than previous research because most shotgun marriages occur when men are in their teens or early twenties. In addition, using earlier waves yields more transitions into the first marriage. In the Census, we restrict the data to white men aged 19 to 34 in 1980 who are not currently enrolled in school. This sample is similar in age and education to our NLS sample, which pools the 1970 and 1976 waves.

Only men who have never been married or who are presently in their first marriage (with spouse present) are included in the samples. We drop those men who are divorced, separated, widowed, or whose spouse is not present because of difficulties in determining whether these marriages were preceded by a premarital conception. As discussed above, the applicability of the selection hypothesis is unclear for men who divorce or remarry. The final NLS sample size is 621 out of the 5225 records; the Census sample has 493,121 observations.

Table 1 gives descriptive statistics for the samples. There are several clear differences between the groups in the NLS, which are stratified by marital status in 1970. Never-married men earn less and are younger than married men. Married men with a premarital conception earn less than other married men, have less schooling and have been married longer. Men with a premarital conception married at younger ages than other men. These differences also hold between the marital status groups in our Census sample.

A considerable fraction of the men who were single in 1970 married during

Table 1. Descriptive statistics[a]

Characteristics	NLS sample in 1970			Census sample in 1980		
	Never married (1)	Non-shotgun marriage (2)	Shotgun marriage (3)	Never married (4)	Non-shotgun marriage (5)	Shotgun marriage (6)
Hourly wage ($)	3.04	4.10	3.82	5.58	7.19	6.79
	(1.30)	(1.56)	(1.53)	(2.38)	(2.60)	(2.61)
Age (years)	22.2	25.5	24.5	24.0	27.9	26.9
	(2.8)	(2.7)	(2.9)	(3.9)	(3.9)	(4.2)
Year of schooling completed (%):						
Less than 9	3.4	4.8	3.0	2.2	2.6	4.7
9 to 11	8.4	8.8	23.9	10.4	9.1	19.4
12	57.6	52.7	52.2	44.8	39.7	51.0
13 to 15	13.8	13.4	13.4	22.4	23.8	17.7
16 and higher	16.7	20.2	7.5	20.2	24.8	7.1
Years married	—	3.8	4.3	—	5.6	6.2
Age at marriage	—	21.2	19.7	—	21.7	20.2
Married in 1976 (%)	70.9	—	—	—	—	—
Married in 1976, shotgun marriage (%)	6.4	—	—	—	—	—
Number who marry between 1970 and 1976	144	131	13	—	—	—
Sample size	203	351	67	262,626	220,259	10,236

[a] Standard deviations shown in parentheses.

Sources: National Longitudinal Survey of Young Men (NLS) and 1980 U.S. Census of Population and Housing, Public Use Microdata Sample, 5% sample.

the six-year timeframe in our NLS sample. Over 70% of single men married for the first time during the six-year period; these men identify the fixed effect regressions reported in the Appendix because we do not include men who divorced or separated. About 9% of the men who married during the NLS sample period had a child within seven months of marriage, or 13 observations. The Census sample cannot be used to estimate fixed effects models because it has only one observation per individual.

As in previous research, we include variables measuring the number of years of marriage and its square as well as marital status indicator variables in some specifications. The indicator variables capture the constant effect of marriage on wages over time and are equivalent to intercept shifts, while the years married variables capture the effect of marriage over time. A positive correlation between years married and earnings suggests that the marriage premium is due to productivity differences because specialization and human capital accumulation are gradual processes. A positive correlation between the dummy variable and wages is consistent with selection or discrimination underlying the marriage premium since these causes should shift the intercept rather than have a gradual effect. However, the indicator variable may also capture some productivity effects if men begin working harder when they marry and this increased effort is immediately reflected in their pay.

Table 2. Estimates of the male marriage premium, indicator variable of marital status[a]

Covariate	NLS (1)	Census (2)
A. Pooled coefficients		
Both types of marriage	0.150	0.141
	(0.027)	(0.001)
B. Separate coefficients		
Non-shotgun marriage	0.152	0.142
	(0.028)	(0.001)
Shotgun marriage	0.140	0.129
	(0.040)	(0.004)

[a] The dependent variable is the natural log of the hourly wage, and the comparison group is never-married men. Each panel is based on a separate OLS regression. See text for other variables included. Heteroscedasticity-corrected standard errors are shown in parentheses. The sample size in the NLS is 1242 (621 observations each year) and 493,121 in the Census.
Sources: National Longitudinal Survey of Young Men (NLS) and 1980 U.S. Census of Population and Housing, Public Use Microdata Sample, 5% sample.

The equations estimated also contain dummy variables for residence in an urban area, armed forces service, highest grade completed (5 categories), industry (11), and occupation (8). Regressions using the NLS sample also include variables measuring tenure in years and its square, actual experience in years and its square, and dummy variables for whether wages are set by collective bargaining, Southern residence, sample year (2), and year of birth (12); Census regressions include potential experience in years and its square, state dummy variables (51), and age dummy variables (16). Unlike some previous research, we do not include a dummy variable for the presence of nonspouse dependents or children because all married men with a premarital conception have a nonspouse dependent. In addition, we are concerned that the presence in children is endogenous. In estimates not reported here we find that the results are robust to including a linear variable measuring the number of nonspouse dependents or the number of children. The standard errors are White-corrected for individual-specific heteroscedasticity.

5. Estimates of the marriage premium

Table 2 presents the cross-sectional estimates of the effect of marriage on men's wages where the marriage premium is measured by an indicator variable. To conserve space, we report only the coefficients on the marriage variable. The estimates indicate a large positive return to marriage for white men that differs little between shotgun and non-shotgun marriages. The pooled coefficient estimates using the two NLS cross sections, reported in panel A of column 1, show a marriage premium of more than 16%. Panel B compares the premium for shotgun and non-shotgun marriages. Men with a shotgun marriage earn about 15% more than never-married men, and married men without a premarital conception earn about 16.4% more than never-married men. Both estimates are significantly different from zero at the 0.01 level but are not significantly different from each other.

Estimates using the Census sample shown in column 2 of Table 2 are sim-

Table 3. Estimates of the male marriage premium, indicator variable and years of marriage[a]

Covariate	NLS (1)	Census (2)
A. Pooled coefficients		
Both types of marriage	0.086	0.074
	(0.031)	(0.002)
Years married	0.019	0.021
	(0.008)	(0.001)
Years married^2	−0.0003	−0.0008
	(0.0005)	(0.0001)
B. Separate coefficients		
Non-shotgun marriage	0.106	0.075
	(0.031)	(0.002)
Non-shotgun marriage * years married	0.017	0.021
	(0.008)	(0.001)
Non-shotgun marriage * years married^2	−0.0003	−0.0008
	(0.0006)	(0.0001)
Shotgun marriage	−0.054	0.036
	(0.074)	(0.009)
Shotgun marriage * years married	0.043	0.025
	(0.019)	(0.003)
Shotgun marriage * years married^2	−0.0011	−0.0008
	(0.0011)	(0.0002)

[a] The dependent variable is the natural log of the hourly wage, and the comparison group is never-married men. Each panel is based on a separate OLS regression. See text for other variables included. Heteroscedasticity-corrected standard errors are shown in parentheses. The sample size in the NLS is 1242 (621 observations each year) and 493,121 in the Census.
Sources: National Longitudinal Survey of Young Men (NLS) and 1980 U.S. Census of Population and Housing, Public Use Microdata Sample, 5% sample.

ilar. The estimated coefficients indicate that both types of married men earn significantly more than never-married men; the results also indicate that the return is about 1.5 percentage points higher among married men without a premarital conception than among married men with a premarital conception. The estimated coefficients are significantly different from each other at the 0.01 level in the Census sample.

Table 3 presents the specifications that include the years married variables as well as a marital status indicator variable. These results also show a positive return to marriage in the pooled cross-sectional regressions, but the form of the premium appears to differs across the two types of married men. Panel A shows the estimated coefficients pooling the two types of marriages. The coefficients indicate that the return to marriage over time is significant in both the NLS and Census samples.

Panel B of Table 3 shows the estimated coefficients of the marriage indicator variable and the years married and its square variables separately for the two types of marriages. In the pooled NLS cross-sections, married men without a premarital conception have an intercept shift of 11.2% relative to never-married men and an additional return of about 1.7% per year of marriage. Evaluated at the pooled sample mean of 6.2 years of marriage, these men earn about 21% more than never-married men. Men with a shotgun marriage have a negative intercept shift but experience a significant return to marriage over

time; the marriage premium for these men is about 24% when evaluated at the pooled sample mean of 6.9 years of marriage.

The Census results are similar to the NLS results. Married men without a premarital conception have a significantly larger intercept shift and a slightly smaller return to marriage over time than married men with a premarital conception. The cumulative returns to marriage, evaluated at the sample means, are not statistically different for the two types of marriage in the Census sample, but almost 80% of the premium occurs over time for men with a shotgun marriage, compared with about 60% for other married men.

These cross-sectional estimates suggest that selection has little impact on the marriage premium. Our estimates show that the size of the intercept shift due to marriage for men with shotgun marriages is at most 10% smaller than for men with conventional marriages in both the Census and NLS samples. This indicates that much of the marriage premium remains intact after controlling for selection using shotgun weddings. However, the marriage premium occurs at different times for the two samples. Men with shotgun marriages earn most of their return to marriage over time, while those with non-shotgun marriages earn a more immediate return to marriage. Although the form of the premium differs, the cumulative return is similar for the two types of marriage.

Our approach of using shotgun weddings to control for selection differs from the previous literature, which relies on fixed effects. The Appendix presents estimates of the marriage premium that control for unobserved heterogeneity using fixed effects in the NLS sample. As Cornwell and Rupert (1997) find, the marriage premium falls substantially when controlling for individual heterogeneity using fixed effects. None of the marriage premium coefficients are statistically significant at conventional levels. However, these results should be interpreted with caution because of the assumptions needed to identify fixed effects estimates discussed above. Panel B of the Appendix Table presents fixed effects results separately for the two types of marriages, although the estimates for shotgun marriages are unreliable because only 13 observations are used to identify those coefficients.

Fixed effects results that show a significantly lower marriage premium than cross-sectional estimates are usually interpreted as showing that selection contributes to the marriage premium. The fixed effects estimates presented in the Appendix contrast markedly with our statistical experiment of using shotgun marriages to control for selection. The cross-sectional estimates reported in Tables 2 and 3 are more precisely estimated, particularly in the Census sample, than the fixed effects estimates reported in the Appendix. The cross-sectional estimates may be a more reliable estimate of the role of selection in the marriage premium if shotgun marriages are believed to be exogenous with respect to men's earnings ability. The next section investigates the plausibility of this assumption.

6. Further investigation of differences between married and unmarried men

The cross-sectional results indicate that selection does not play a substantial role in traditional estimates of the marriage premium. However, these results do not conclusively demonstrate whether earnings ability affects men's marital status. Using shotgun marriages as a means of controlling for selection will

Table 4. Comparison of mean characteristics at time of marriage and birth, NLS sample[a]

Mean characteristics	Time of marriage		Time of birth	
	Non-shotgun marriage (1)	Shotgun marriage (2)	(Nonmarital conception) Married (3)	Not married (4)
Hourly wage (real $)	2.84	2.20	2.53	2.73
	(1.22)	(0.83)	(0.92)	(2.41)
Schooling completed (years)	12.8	11.9	11.6	11.6
	(2.1)	(1.7)	(1.5)	(1.5)
Age (years)	22.7	20.8	21.2	22.8
	(2.9)	(2.7)	(2.8)	(3.3)
Sample size[b]	322	50	50	19

[a] Standard deviations shown in parentheses.
[b] The samples only include men with complete responses for the survey year they married or the survey year their child was born. If a survey was not administered the year of the marriage or the birth, men are attributed their wage and education in the preceding year.
Sources: National Longitudinal Survey of Young Men (NLS).

yield biased results if the likelihood of marriage, given a premarital conception, depends on the man's earnings ability after controlling for observable characteristics. We therefore examine the validity of our assumption that marriage is exogenous with respect to earnings and characteristics that affect earnings among men with premarital conceptions. We also test whether earnings affect the likelihood of marriage.

6.1. Are shotgun marriages independent of wages?

One of the critical assumptions underlying our approach is that the decision to marry if there is a nonmarital conception is independent of the man's wage and his earnings ability, controlling for observable characteristics. The small literature on the effect of men's characteristics on the likelihood that a non-marital conception is legitimated suggests that shotgun marriages are not related to men's earnings ability. Zavodny (1999) finds that white men's employment status and educational attainment do not significantly affect the likelihood of legitimation in a sample from the NLS. Marsiglio (1987) reports that the educational attainment of men's parents, which is likely to be correlated with men's earnings ability, does not affect the likelihood of legitimation among adolescent fathers in the NLS. Marsiglio also finds that poverty status does not affect the probability that young white fathers marry within 12 months of conception.

One method of gauging the reasonableness of our assumption is to compare wages and other characteristics at the time of marriage between men with a premarital pregnancy and other men. Table 4 shows the mean wage, age, and years of completed schooling at the time of marriage for married men in our NLS sample. The sample used in Table 4 includes only men who married between 1966 and 1976 because the NLS began in 1966. If men with a premarital conception earn more or have more schooling than other men getting married, it might raise concerns that the marriages are related to men's

earnings ability. However, there is little indication that married men with a premarital pregnancy are ''more desirable'' than other men at the time of marriage; white men with a premarital conception earn less, are younger, and have less education than other white men getting married. All of the differences in means at the time of marriage between men with a premarital conception and other men reported in Table 4 are statistically significant.

We also compare wages and other characteristics at the time of the child's birth between men who marry when there is a nonmarital conception and men who do not marry. The 1981 survey wave of the NLS asked men the dates of birth of children not living in the household, and the 1976 survey wave asked the beginning and end dates of up to two previous marriages in addition to the start date of the current marriage. We can therefore determine whether a man reported children born outside of marriage and compare the characteristics at the time of birth between these men and the men in our sample who married and had a birth within seven months. However, only 19 white men reported nonmarital births and had complete responses the year of the birth. Because of the small sample size, our comparison of men who did and did not marry in the event of a nonmarital pregnancy is only suggestive.

Columns 3 and 4 of Table 4 report the mean characteristics of men who did and did not marry after a nonmarital conception. White men who married tended to earn less but had more education than those who did not marry, but the differences are not significant. White men who did not marry were significantly older than fathers who did marry. Although these comparisons are not definitive proof that marriage after a nonmarital conception is not related to the man's earnings, these results give little reason to be concerned about our underlying assumptions.

6.2. Are shotgun marriages more likely to end in divorce?

A second assumption critical to our approach is that the effect of marriage on men's subsequent outcomes should be the same for shotgun and non-shotgun weddings. We evaluate this assumption by comparing divorce rates for the two groups. If individuals in shotgun marriages are more likely to get divorced, this may be evidence that men are negatively selected into shotgun marriages or that the marriage is viewed differently, affecting specialization within the marriage. Using data from 1978 and 1980, we compare divorce rates for men in the NLS sample who are married in 1976. Among men with shotgun marriages, about 33% are divorced; for those with non-shotgun marriages, 30% percent are divorced. The slight difference in these divorce rates provides little evidence of negative selection or of different types of specialization between shotgun and non-shotgun marriages.

6.3. Transitions into marriage

As discussed above, earlier studies have examined the possibility that selection underlies the marriage premium by testing whether including individual fixed effects in regressions affects the return to marriage. Individual fixed effects control for time-invariant unobservable characteristics that affect selection into marriage but do not control for the possibility that time-varying un-

Table 5. Determinants of likelihood that men will marry, NLS sample[a]

Covariate	All men (1)	Non-shotgun marriage (2)	Shotgun marriage (3)
Log hourly wage	0.0022	0.0023	0.0004
	(0.0010)	(0.0010)	(0.0022)
Sample size	203	190	72

[a] The dependent variable is one if a man marries over 1970–1976 and zero otherwise. Each column is based on a separate Probit regression. See text for other variables included. Heteroscedasticity-corrected standard errors are shown in parentheses.
Sources: National Longitudinal Survey of Young Men (NLS).

observable characteristics or wage growth affects selection into marriage. An alternative method of examining the role of selection is finding some factor that makes marriage independent of earnings ability for some men, which is the approach we take in this paper. Another method of gauging whether men are positively selected into marriage on the basis of wages is directly examining whether the likelihood of getting married depends on men's earnings using a probability model.

We examine whether the probability that men in our NLS sample marry between 1970 and 1976 depends on characteristics in 1970, including the wage. We estimate Probit models for white men who are not yet married in 1970, where the dependent variable is one if the man married by 1976 and zero otherwise. The covariates include the log of the hourly wage, age, years of schooling completed, tenure in years and its square, actual experience in years and its square, and dummy variables for collective bargaining status, residence in the South, urban residence, and armed forces service. The standard errors are corrected for heteroscedasticity. The Probit regressions are also estimated separately for men with shotgun weddings and men with non-shotgun weddings to further test our assumption that marriages with a premarital conception are not related to earnings, conditional on observable characteristics.

The results, which are shown in Table 5, indicate that the probability of marrying over 1970–1976 is positively correlated with earnings in 1970 among all never-married white men in 1970. The probability of a non-shotgun marriage is also positively correlated with earnings, as shown in column 2. However, there is no significant correlation between the probability of a shotgun marriage and earnings for white men (column 3). These results are consistent with the hypothesis that marital status depends on wages and provide further support for our underlying assumption that men in shotgun marriages are not selected on the basis of wages.

7. Conclusion

This paper examines the effect of selection bias on estimates of the marriage premium among white men. Using the statistical experiment of premarital conception as a potentially exogenous cause of marriage, about 90% of the marriage premium remains after controlling for selection. The results suggest

differences in the form of the marriage premium for men who married with a premarital conception and other married men. Married men without a premarital conception have a larger time-invariant return to marriage, as measured by the intercept, than married men with a premarital conception. However, married men with a premarital conception earn a larger marriage premium for each year of marriage than men with conventional marriages. These results are generally consistent with the findings of Korenman and Neumark (1991).

The credibility of our results depends on the credibility of the statistical experiment employed in this research. We examine the plausibility of our underlying assumptions by comparing men with shotgun weddings to other men and by estimating the effect of wages on the probability of getting married. Comparisons of mean characteristics at the time of marriage or birth do not indicate that men who marry in the event of a nonmarital conception differ from other men. In addition, men with shotgun and non-shotgun marriages do not differ significantly in divorce rates. Finally, the probability of marriage increases with earnings for most men, but the likelihood of having a shotgun marriage is not associated with earnings. These findings support our assumption of random assignment to marriages in shotgun marriages and also suggest that marital status may depend on earnings for most men.

The findings suggest that little of the cross-sectional return to marriage for white men is the result of selection bias. Even if shotgun weddings are not an exogenous cause of marriage, our estimates provide an alternate measure of the return to marriage. For example, if men who have shotgun weddings are negatively selected on the basis of earnings and other men are positively selected into marriage, our estimates may provide lower and upper bounds on the return to marriage. Future research should incorporate the effects of divorce and remarriage on the returns to marriage and consider how the selection and productivity hypotheses apply to these men.

Appendix

Table. Fixed effects estimates of the male marriage premium, NLS sample[a]

Covariate	Indicator variable only	Indicator variable and years married		
	Marriage	Marriage	Years married	Years married^2
A. Pooled coefficients				
Both types of marriage	0.077	0.054	0.0001	−0.0006
	(0.050)	(0.058)	(0.0137)	(0.0007)
B. Separate coefficients				
Non-shotgun marriage	0.086	0.067	−0.001	−0.0006
	(0.050)	(0.058)	(0.014)	(0.0007)
Shotgun marriage	−0.023	−0.078	0.011	−0.0007
	(0.170)	(0.172)	(0.028)	(0.0017)

[a] The dependent variable is the natural log of the hourly wage, and the comparison group is never-married men. See text for other variables included. Heteroscedasticity-corrected standard errors are shown in parentheses. The sample size is 1242 (621observations each year).
Sources: National Longitudinal Survey of Young Men (NLS).

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