Center for Research on Economic and Social Theory
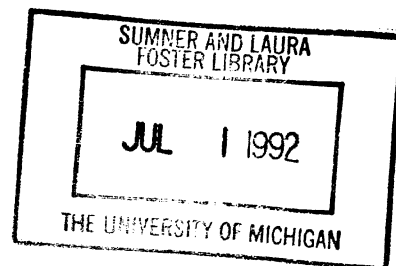## CREST Working Paper

Income Prospects and Age at Marriage

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1. Introduction

With striking universality, across time and nations, males tend to marry later in life than females. In a study conducted by the United Nations,[1] the average age of marriage for males exceeded that for females in each of 90 countries and in every time period studied between 1950 and 1985. The age difference tends to be larger in traditional societies than in modern industrial countries and has diminished over time in most industrial countries.

In a paper called "Courtship as a Waiting Game", Mark Bagnoli and Ted Bergstrom (1991) proposed a theory to explain this difference in behavior between the sexes. They suggest that, at least in traditional societies, women are valued as marriage partners for their ability to bear children and manage a household, while men are valued for their ability to make money. Information about how well a male will perform economically–whether he is diligent and sober–becomes available at a later age than the relevant information about how well a female would perform her household roles. This leads to a kind of "intertemporal lemons model", in which males who do not expect to do poorly in later life will seek to marry at a relatively young age and males who expect to prosper will postpone marriage until their success becomes evident to potential marriage partners. Females, on the other hand, marry relatively early, with more desirable females marrying the successful, older males who postponed marriage and the less desirable females marrying the young males who want to marry young. In equilibrium, a young male who attempts to marry is signaling a lack of confidence in his future economic prospects. While the most desirable females would not accept such males, the less desirable females have no better alternatives in the marriage market and hence are willing to marry young males.

In addition to its implication that males on average will marry later in life than females, this theory implies that males who marry young will tend to be less prosperous in later life than males who postpone marriage. This paper investigates the empirical relationship between age-at-first-marriage and lifetime income, for males and for females. We then relate our findings to existing empirical work on the relationship between marital status and income.

[1] *Patterns of First Marriage: Timing and Prevalence* (1990).

2. Empirical Findings

We use data from the 1980 U.S. Census on age-at-first-marriage and income. We confine our attention to whites who are 40 years old or older, who have married only once and are currently married. [2]

The Results for Males

We regressed family income on current age, powers of current age, and single-year dummy variables for age at first marriage. [3] Figure 1 shows the predicted incomes from this regression by age-at-first marriage. Figure 1a is a "smoothed" version of Figure 1, which is obtained by fitting a cubic curve to the incomes plotted in Figure 1. Table 1 reports the complete regressions that generate these two figures.

Figure 1. Predicted Family Income by Age-at-First-Marriage of Male Partner

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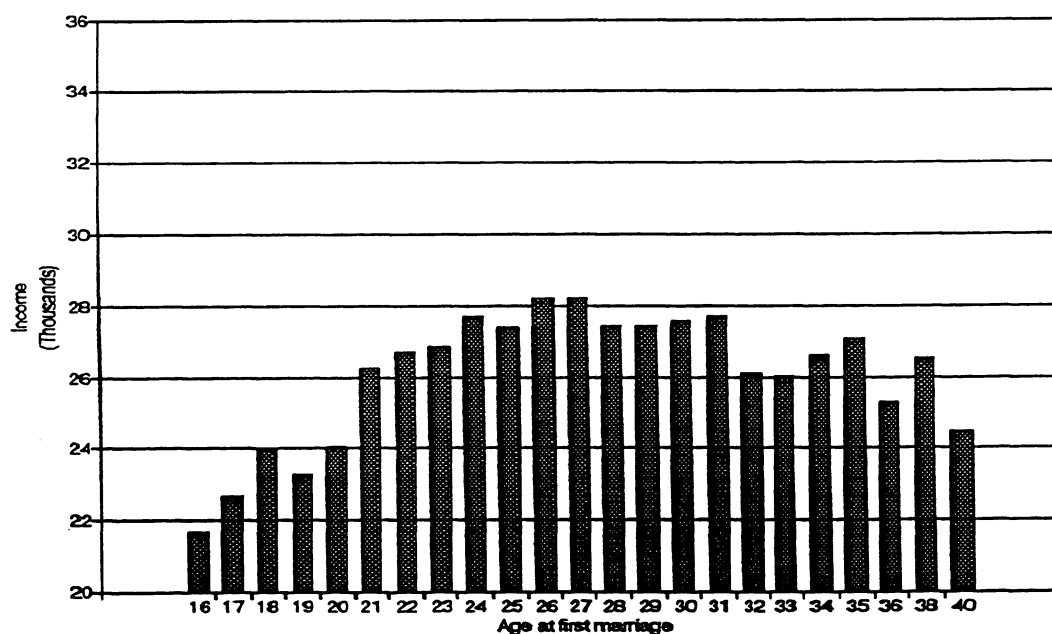
[2] This population consists of 22,002 males and 19,863 females, obtained from a 1/100 sample from the census.

[3] We also included cohort-specific mean age-at-first-marriage as an explanatory variable in an attempt to control for secular changes in the norms for marital age. Excluding this control doesn't affect the estimated relationship between age-at-first-marriage and earnings reported below. The regression coefficients are found in Table 1 of the Appendix. Single year dummies were used for ages 17-35. Because of the small number of cases, those who married at 15-16, 35-36, 38-39, and 40 or more are grouped into respective categories.

Figure 1a. Predicted Family Income by Age-at-First-Marriage
of Male Partner (with Cubic Fit)
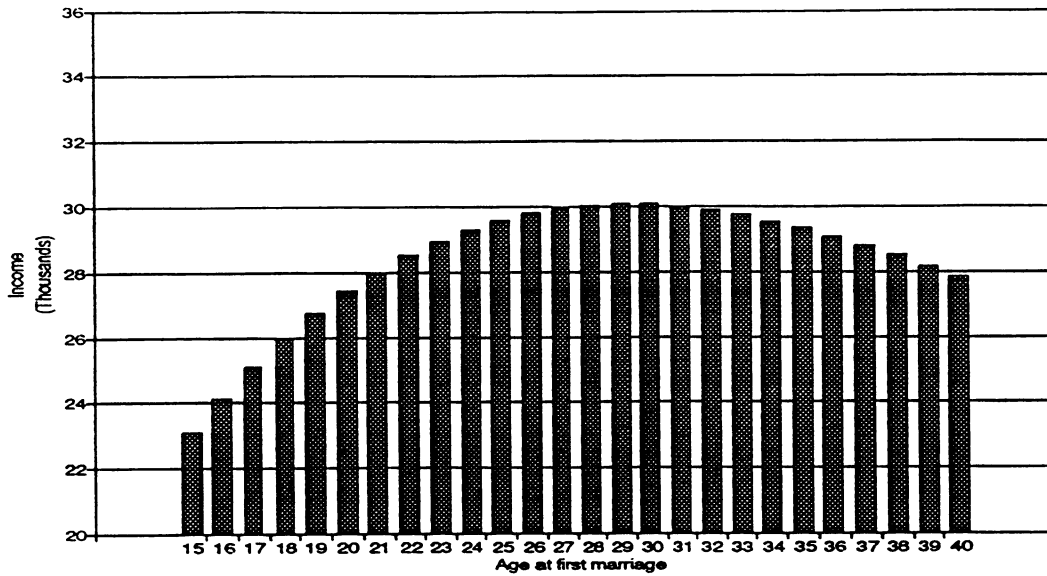
We see from Figures 1 and 1a that males who married before the age of 21, on average, earn substantially less than males who married in their late 20's. It is interesting to see that males who married after age 30 also do less well than those who married in their late 20's. A similar story is told by Figure 2 which charts the relation between age-at-first-marriage and wages. [4]

Figure 2. Predicted Wage Income for Males by
Age-at-First Marriage (with Cubic Fit)
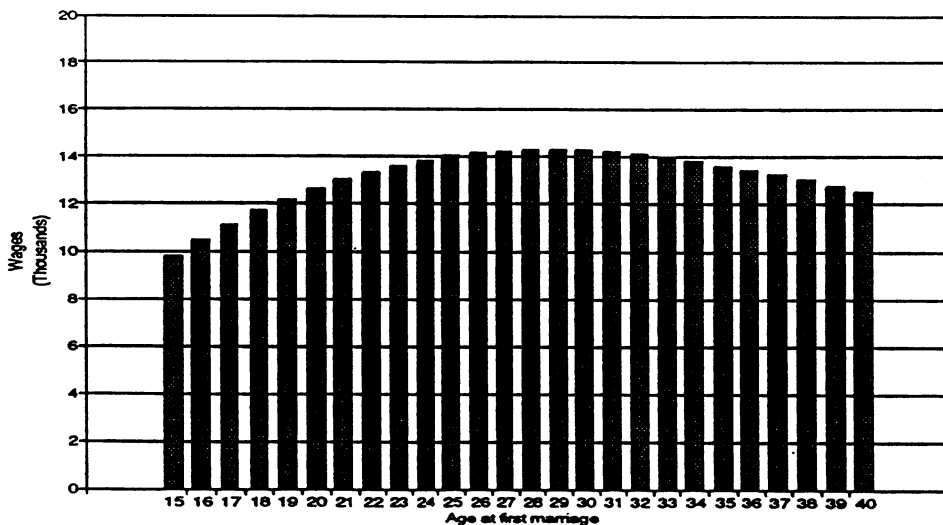
[4] The remaining figures in the main text are for the cubic specification. Graphs of the corresponding, unsmoothed relationship can be found in the appendix.

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It is sometimes argued that the higher incomes of males who marry later are "explained by" the fact that males who marry young are less likely to go to college than those who marry in their late 20's. But this begs the question of why it is that those who go to college tend to marry later than those who do not. The Bagnoli-Bergstrom model suggests an explanation for why males tend to postpone marriage until they complete their educations. A convincing way for a male to demonstrate that he is persistent and able is to finish a college (or for that matter, a high school or a graduate) degree.

If completed education is itself an indicator of success in later life, the hypothesis that males who expect to be successful will marry later is better tested by the relation between age-at-first-marriage and income, without including education level as an explanatory variable. Nevertheless, we investigated the relationship that remains when one controls for years of schooling.[5] When we control for schooling, it remains true that those who marry in their teens and early 20's earn less on average than those who marry in their mid to late 20's, but the differences are much smaller–as is seen in Figure 3.

Figure 3. Predicted Family Income by Age-at-First-Marriage
of Male Partner, with Controls for Schooling.
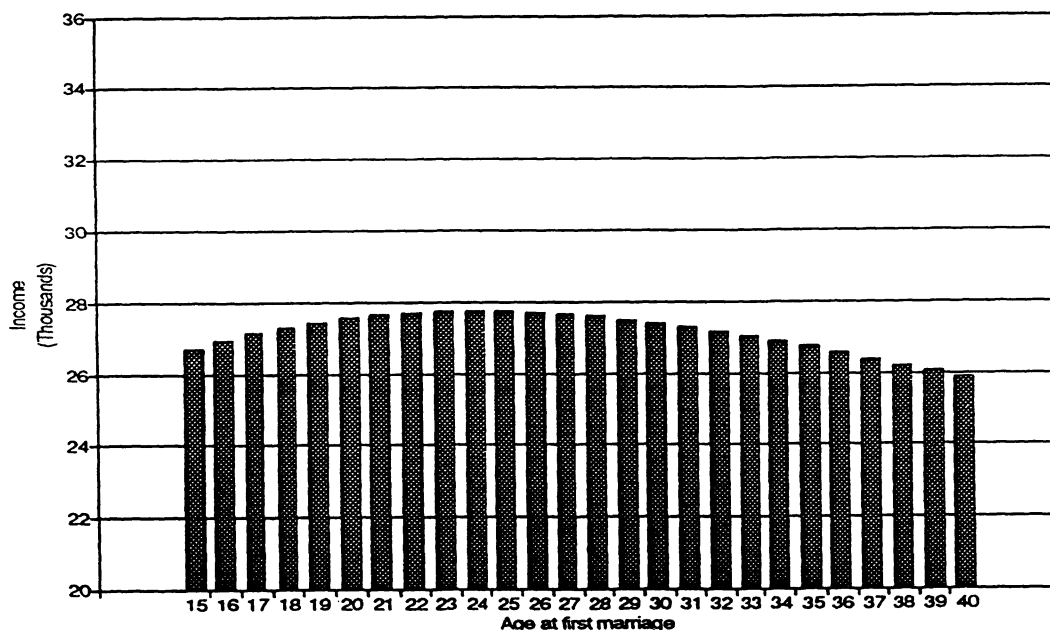
The Results for Females

If females are expected to be less involved in market work than males, then there is less reason for their wage earnings in later life to be related to their desirability as marriage partners. Furthermore, the motive to marry at a later age, when she can show her earnings

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[5] We used a cubic function in highest grade attained, a dummy variable for completion of high school, and another dummy variable for completion of a four-year college degree.

capacity would be less strong than for males. Accordingly, we expect a weaker relation between wage earnings and age-at-first-marriage for females than for males. This is the case, as we see in Figures 4 and 5, which relate women's wages to age-at-first-marriage, with and without controlling for schooling respectively.

Figure 4. Predicted Annual Wage Earnings by Age-at-First Marriage
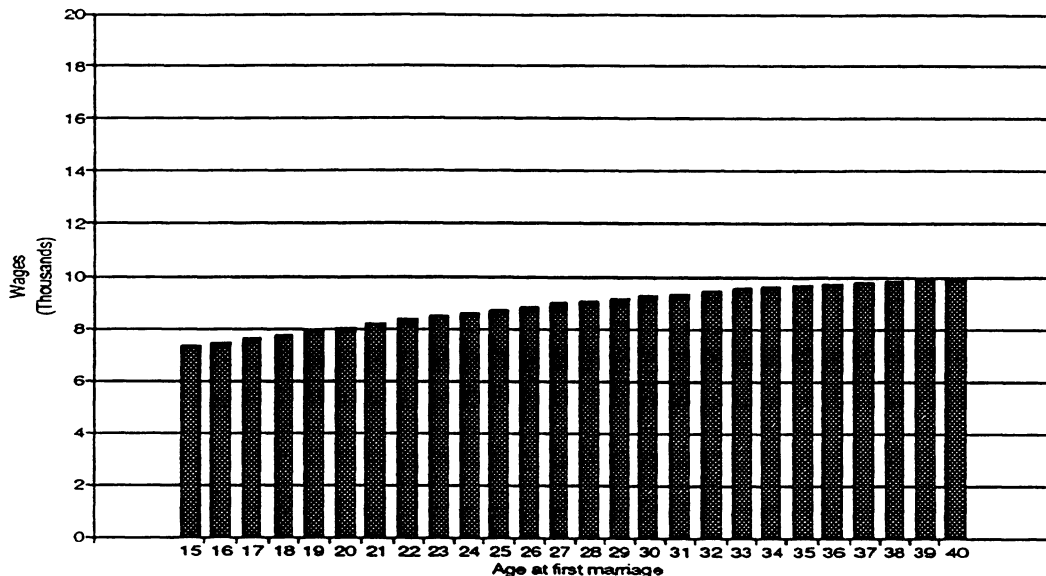for Females with Positive Wages.

Figure 5. Predicted Annual Wage Earnings by Age-at-First Marriage
for Females with Positive Wages, with Controls for Schooling
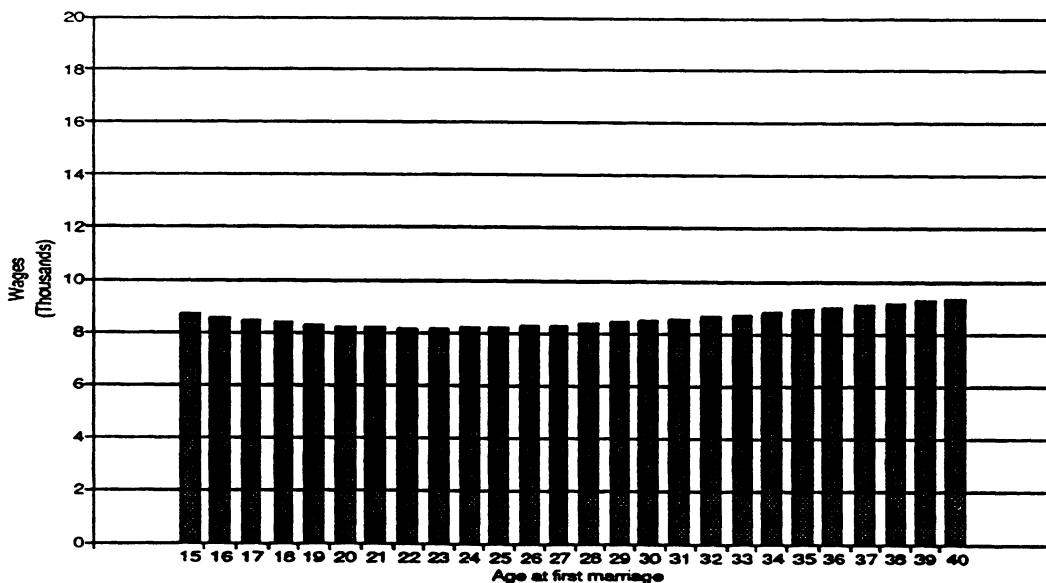
Figures 6 and 7 relate a woman's "total family income" to her age-at-first-marriage with and without controlling for her schooling.[6]

Figure 6. Predicted Family Income by Age-at-First-Marriage
of Female Partner.

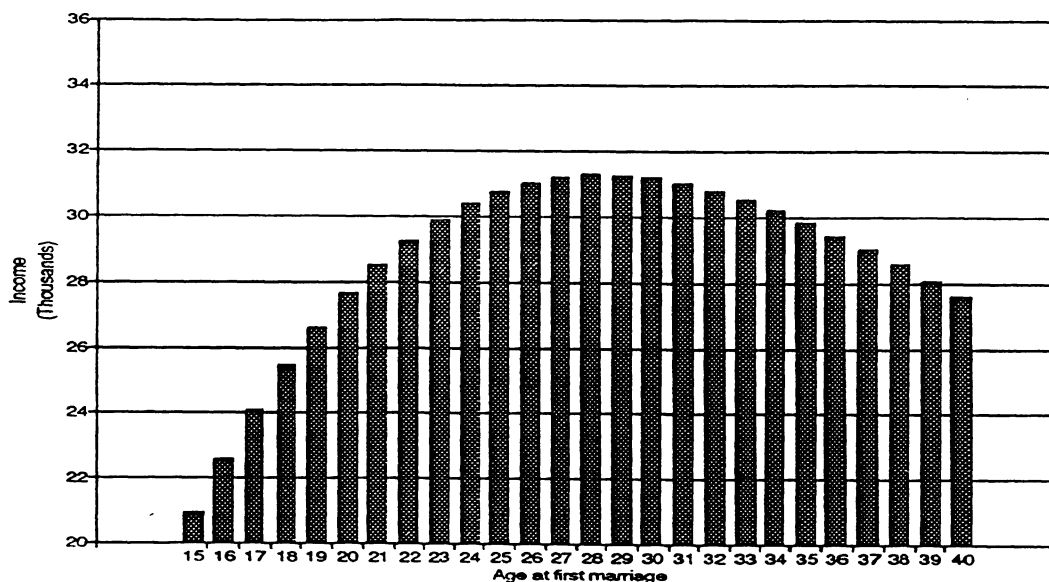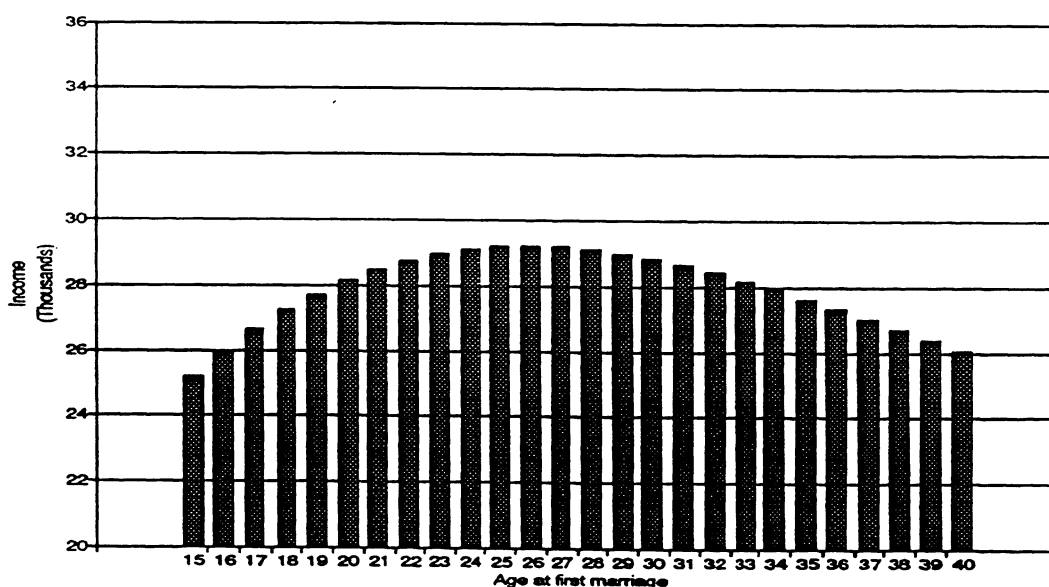

Figure 7. Predicted Family Income by Age-at-First-Marriage
of Female Partner with Controls for Schooling.

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[6] Figures 4 and 5 are based on for a sample of 8,270 women with positive wages. Figures 6 and 7 are based on our entire sample of women, including those who earned no wages of their own.

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We were surprised by the fact that although the relation between age-at-first marriage and *own wages* was much weaker for women than for men, the relation between age-at-first marriage and *family income* was about as strong as that for men. These income differences are largely differences in the incomes of the males whom they married rather than in their own wage incomes.

One possible explanation for the relationship between age-at-first-marriage and income is similar to that which Bagnoli and Bergstrom proposed for males. Females who are confident of their abilities believe that their attractiveness to successful mates will increase as they mature. A related explanation involves search and information. Persons of either sex who expect to be able to attract a successful partner once this person is found, may be more willing to postpone marriage to spend more time searching. They also may find it worthwhile to spend a longer time observing and learning about potential marriage partners, since they realize that they will have many options available to them. Accordingly, it may be that those females who wish to marry a prosperous male are well-advised to postpone marriage and to attend colleges or workplaces where they can observe such males and such males can observe them.

Looking at Figures 6 and 7, one might be tempted (rather unromantically) to estimate the financial rate of return that a female can realize by postponing marriage from her early 20's to her mid 20's. If it is the case that relatively capable females can attract more prosperous males if they delay marriage from their early teens until their mid 20's, then they face an "investment problem" in which they can accept a lower income while they remain single in return for better income prospects later. If sufficient care is taken, such an estimate might be used to impute a "consumption value" of being married as a residual (positive or negative).[7]

3. Related Empirical Studies

Studies Relating Income to Marital Status

Several studies by labor economists indicate that married men tend to earn more money than unmarried men.[8] While these studies are not directly concerned with the question of when people choose to marry, the two issues are quite closely related.

Sanders Korenman and David Neumark (1991) study earnings differences between married men and unmarried men in the U.S. Their paper also offers a fine survey of the literature on this subject. They find that in cross-section, controlling for age, work experience,

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[7] If our speculation that the positive relation between age-at-first-marriage and income is explained by the selection process is correct, then it is important to keep in mind that it is only the relatively desirable females who can expect to realise the income gains from postponing marriage.

[8] Analyzing fourteen developed countries, Schoeni (1991) finds that the annual earnings of currently married men are (statistically) significantly greater than their unmarried counterparts' in each country, and the magnitude of the difference ranges from 3 to 40 percent.

and other demographic variables, married men earn about 11% more than unmarried men. When they pool cross-section and time-series data in a fixed-effects model, they find that the longitudinal estimates of the effect of years married is more than 2/3 of the cross-sectional effect. They also find that the positive effect of marriage on income is stronger, the more years that one has been married.

Korenman and Neumark suggest two competing explanations of the positive association between marriage and income. [9] These are:

1. Marriage *per se* makes male workers more productive.

2. Males who marry are selected to have more inate ability to earn money than those who do not.

Marriage could increase the income of workers either because marriage is "good for" a man ,[10] or because a married man "has to work harder to support his family". Korenman and Neumark argue, on the basis of their results, that the direct effect of marriage on a given individual's earnings appears to be stronger than any selection effects.

Lee Benham (1974) offers evidence to support the case that marriage is good for a man. He finds a significant positive effect of education of women on the wages of their husbands and suggests that this may be a result of shared information and useful advice. In a comment on Benham's paper, Finis Welch (1974) raises doubts about how much of this effect is a direct effect on productivity and how much is a result of selective mating. Welch presents evidence that Benham's effect is much reduced (but not eliminated) when account is taken of other variables that could be used at the time of marriage as predictors of future income. David Lam and Robert Schoeni (1991) formalize these ideas by simultaneously analyzing marriage market and labor market outcomes. They show that variables such as wife's education and parents' and parents-in-laws' education may have statistically significant effects on earnings simply because they are correlated with unobservables that are valued in both the marriage and labor markets.

Lawrence Kenny (1983) presents evidence that married men accumulate human capital more rapidly than unmarried men. He argues that this is likely to be the case because "marriage facilitates the financing of human capital", so that it "may be cheaper to accumulate human capital during married years than during single years." He also suggests that those who anticipate spending a larger fraction of their lifetime as married men will have incentives to work more hours, and they will find it worthwhile to invest in more human capital.

One is led to wonder, given the evidence that marriage may tend to increase male earnings, whether it also tends to increase female earnings. Korenman and Neumark (1990) have investigated this question. They found that while marriage (and children)

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[9] They also mention but devote little discussion to a third "explanation" which appears in the literature, namely "Employers discriminate in favor of married men." If this means that employers rationally discriminate, then this explanation is not really distinct from the other two hypotheses.

[10] One expression of this idea is Gary Becker's (1981) argument that marriage allows specialization in the household.

tends to reduce labor force partition of women, it has no significant effect on the wage rates of women who participate in the labor force.

If, indeed, marriage increases the earnings of males and also the growth rate of earnings, then our estimates of expected wages as a function of age-at-first marriage must *understate* the extent to which early marriage signals poor economic prospects for males. If two males are of the same age, but one married at 17 and the other at 27, then the former will have been blessed with 10 more years of marriage than the latter. According to Korenman and Neumark's estimates, each additional year of marriage adds 1 to 2% to annual income. Therefore, other things being equal, they would expect males who married at Age 17 to earn 10 to 20% more at age 40 than males who married at Age 27.

Evidently other things are not equal, since controlling for current age, males who married at 17 make on the average about 25% *less* income than those who married at 27. To reconcile these results we have to conclude that if those who marry at 27 had married at 17, they would on average have been able to earn 35-45% more per year than the persons who actually marry at 17. [11]

Not all of the empirical work that has appeared supports the view that marriage has direct positive influence on male earnings. In a recent paper, Cornwell and Ruppert (1991) examine panel data on male earnings as reported to the National Longitudinal Survey. On the basis of their results, "when individual effects are controlled for, the estimated returns to marriage are virtually zero...We conclude that the usual OLS marital status coefficient is essentially a statistical artifact."

It is beyond the scope of this paper to attempt to resolve the differences between these views or to try to disentangle any direct effect of marriage on income from the advantages that males with good income prospects can gain by postponing marriage until their merits are evident. Perhaps it will be helpful to other researchers in this area to notice that "selection effects" do not automatically mean that prosperous males will spend more time being married than less prosperous men. As we have observed, income in later life is positively related to age-at-first marriage for males who marry before their late 20's and negatively related to age-at-first marriage for those who marry in their 30's and 40's. Perhaps it would be a good idea to look separately at the effect of years of marriage on earnings for those males who ultimately married by their late 20's and those who married in their 30's or not at all.

If Kenny is correct that marriage makes it cheaper to accumulate human capital, there is need to explain the fact that people who get more formal education tend to marry later than those who get less. The "courtship by waiting" theory suggested by Bagnoli and Bergstrom offers a partial explanation. Although it is likely that married college students would find it easier to study than those who belong to fraternities, this may be outweighed by the likelihood that they will attract more satisfactory females if they first demonstrate that they can finish college and exhibit the social graces that would make them acceptable

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[11] But perhaps it is only the first few years of marriage that add to a person's earnings capacity. Since the members of our sample are all 40 years old or older, the direct effect of the extra years of marriage may be smaller than these estimates suggest.

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marriage partners.

Studies relating Age-at-First-Marriage and Income

We found two interesting papers that present theoretical observations and empirical work on the relation between age-at-first marriage and income. It seems worthwhile to relate these works to the results found in this paper and to the theoretical model of Bagnoli and Bergstrom (1991).

Michael Keeley (1977) proposes to explain the pattern of ages at marriage, using a model based on the work of Gary Becker (1973, 1975). Keeley's theoretical discussion predicts a very different empirical relation between income and age-at-first-marriage for males than is predicted by Bagnoli and Bergstrom. Keeley argues that because high wage males stand to gain more from specialization of labor within the household, they are more likely than low wage males to enter the marriage market at early ages. He also argues that since high wage women stand to gain less from marriage, they will tend to marry later than lower wage women. Keeley proposes another interesting reason for the difference between the sexes in age-at-first-marriage. He suggests that the opportunity cost of postponing marriage is higher for women than for men, because "single women planning to marry are less efficient at accumulating home-specific-human-capital until they marry."

Keeley tests his predictions empirically, using a sample of 18,000 households from the 1967 Survey of Economic Opportunity to investigate the relation between age-at-first-marriage, age, education, and wage rates. He ran regressions separately for men and women, in which the dependent variable was age at first marriage[12] and the independent variables included current wage rate, current age and years of education. In his regression for men, he found a negative coefficient for wage rate, which would suggest that men with higher hourly wage rates have a statistically significant tendency to marry *earlier* than men with lower hourly wage rates. For women, on the other hand, he found this coefficient to be positive.

We used the 1980 census data to partially replicate Keeley's empirical results. Since we do not have hours of work, we must use annual wage income rather than wage rate. Although the data source is quite different, there is an impressive confirmation of Keeley's results. For the sample of once and currently married white men, aged 30 and older, we regressed age-at-first-marriage on wages, education, and on current age, age-squared, and age-cubed.[13] These results are reported in Table 2.

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[12] For unmarried persons, he used duration of unmarried status.

[13] Because Keeley wanted to use wage rate rather than wages, he chose to exclude from his sample all males who had no wage income. While this may be an appropriate procedure for persons of retirement age, it seems quite inappropriate to reject observations of younger males who earn zero wage income. Indeed one of the risks which a female should consider when confronted with a young suitor is the possibility that he will frequently be unemployed. To see whether excluding retired persons with no income would matter, we ran another regression in which we restricted the sample to males 40-55 years old. The results obtained using this sample are very similar to those obtained for males 30 and older.

As in Keeley's study, when one includes years of schooling in the regression, there is a significant negative coefficient on wages. How, then, are Keeley's results reconciled with our results which indicate that people who marry in their late 20's tend to earn more than those who marry in their teens? Part of the story is that when we do include schooling as an explanatory variable, both our results and Keeley's results show a positive relation between age-at-first-marriage and income. While we think it more appropriate *not* to use schooling as an explanatory variable for age-at-first marriage, since completed schooling is itself an indicator of future success, we found that even when controlling for schooling those who marry very early do worse than those who marry in their mid-twenties. This effect is masked by the linear specification that Keeley used. In Figures 8 and 9 of the appendix, we see the results of a nonlinear (cubic) specification in regressing respectively wage income on age-at-first-marriage and age-at-first-marriage on wage income but using education as an explanatory variable, much as Keeley did. [14] These results suggest that expected wages increase with age-at-first-marriage for those who marry in their teens and early 20's, but decrease with age-at-first-marriage for those who marry in their their 30's or later.

Frank Vella and Sean Collins (1990) propose another explanation for the distribution of age differences between marriage partners. They suggest that people prefer their marriage partners to be younger rather than older, but also richer rather than poorer. Individuals can gain wealth by postponing marriage and investing in human capital. Since males are more likely to do market work than females, the gains from doing so are larger for females. They also suggest that since males remain fertile to an older age than females, the cost of postponing marriage may be smaller for males than for females. For these reasons, males are likely to marry at older ages. Since individuals are willing to trade income for youth, Vella and Collins expect a positive correlation between income differences and age differences in marriages.

The approach taken by Vella and Collins, like that of Bagnoli and Bergstrom, is to view marriage as a matching equilibrium. Bagnoli and Bergstrom go further in spelling out the information available to each participant at each point in time and in building an explicit equilibrium model, in which the decision of each individual about when to marry is determined. This more detailed treatment of the information structure helps to clarify some of the issues left unexplained by Vella and Collins. For example, the argument that people can gain wealth by postponing marriage and acquiring human capital is problematic in an environment of full information. There is no obvious reason why people could not marry before acquiring human capital rather than afterwards. (This seems especially compelling in the light of the evidence offered by Kenny.) But if a male's ability to acquire an education and a high earnings capacity is only revealed to possible marriage partners after he has done so, then we have a reason for those males who expect to be successful to postpone their marriages.

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[14] For testing the Bergstrom-Bagnoli model, which concerns females' estimates of future earnings of males, it seems more natural to regress age-at-first-marriage on wages in later life rather than the other way around.

4. Conclusions and Remarks

Our motive for writing this paper was to test the Bagnoli-Bergstrom hypothesis that males who expect to do well in the labor market will tend to postpone marriage until their success is evident to potential partners. The evidence from the U.S. census data provides support for this hypothesis, since income in later life is largest for males who married in their late 20's. The data also indicates that males who married in their 30's and 40's or not at all tend to earn less than those who married in their late 20's. This effect was not predicted by the Bagnoli-Bergstrom model. While no simple single explanation is likely to explain the entire effect, there are some interesting partial explanations. Some of these males who marry very late in life or not at all may be persons whose successes in life have not met the expectations that led them to postpone marriage and who continue to postpone marriage until their true worth is recognized. There may also be a considerable number of males who are such poor marriage material that any female whom they would wish to marry would prefer being single to marrying one of these males.

Bagnoli and Bergstrom suggested that females tend to marry at an earlier age than males in part because the passage of time is likely to reveal less about the a female's capabilities for performing traditional marriage roles than it does for males. We examined the relation between age-at-first-marriage and the economic success of females in later life. Our data indicates that for females, age-at-first-marriage is not strongly related to future wage earnings. On the other hand, the relation between *family income* and age-at-first-marriage for females has a shape similar to that for males. Females who marry in their teens and early 20's tend to experience smaller family incomes in later life than those who marry in their mid to late twenties. The observed relation between age-at-first marriage and family income was not predicted by the Bagnoli-Bergstrom model in its simplest form, though we have suggested some possible explanations for this relation.

While we set out to test the hypothesis advanced by Bergstrom and Bagnoli, we would not want to deny that there are other important economic and social forces that influence labor markets and marriage markets, and other hypotheses that deserve exploration. The data reported here is likely to be of interest to those who wish to pursue alternative explanations.

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Table 1

Regressions Used to Construct Figures 1 and 2.
Dependent Variable: Total Family Income

| Explanatory Variables | Regression 1 | | Regression 2 | | | Standard |
| | Coefficient | | Coefficient | | | |
	Estimate	t-statistic	Estimate	t-statistic	Mean	Deviation
Age-At-First-Marriage(AFM)			3105	$(11.78)^x$	25.4	(6.25)
AFM Squared			-80.5	$(11.02)^x$		
AFM Cubed			.624	$(10.03)^x$		
AFM Dummies						
15-16	-4593	(3.14)			.005	(.073)
17	-3563	(3.34)			.011	(.103)
18	-2312	(3.07)			.024	(.154)
19	-2962	(5.10)			.049	(.217)
20	-2224	(4.26)			.070	(.256)
21 (Omitted Category)					.095	(.293)
22	410	(0.87)			.105	(.307)
23	597	(1.26)			.100	(.299)
24	1442	(2.94)			.088	(.284)
25	1133	(2.26)			.081	(.273)
26	1978	(3.77)			.069	(.254)
27	1983	(3.47)			.052	(.222)
28	1190	(1.97)			.044	(.205)
29	1151	(1.73)			.034	(.181)
30	1299	(1.80)			.027	(.163)
31	1452	(1.84)			.022	(.146)
32	-157	(0.18)			.018	(.135)
33	-232	(0.25)			.015	(.123)
34	358	(0.35)			.012	(.109)
35	824	(0.77)			.011	(.103)
36-37	-986	(1.11)			.016	(.127)
38-39	249	(0.26)			.014	(.116)
40 or later	-1790	(2.72)			.036	(.185)
Age	13382	$(19.57)^x$	13322	$(19.46)^x$	56.9	(11.10)
Age Squared	-221	$(19.06)^x$	-219	$(18.92)^x$		
Age Cubed	1.141	$(18.30)^x$	1.132	$(18.12)^x$		
Cohort Mean AFM	-283	(0.79)	-258	(0.72)	25.4	(1.51)
Constant	-220353	$(12.46)^x$	-256107	$(14.33)^x$		
F-Statistic	140^x		26.2^x			
R-Squared	.143		.005			
Number of observations	22002		22002			

Significance levels: x=.01 level, y=.05 level, z=.10 level. Family income has mean $26,029 and standard deviation 16,778.

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Table 2

Relationship Between Age-At-First-Marriage and Wages for Males.

Dependent Variable: Age-At-First-Marriage

Explanatory Variables	Regression 1		Regression 2	
	Coefficient Estimate	t-statistic	Coefficient Estimate	t-statistic
Wages	-1.34E-05	$(5.27)^x$	2.07E-05	$(1.88)^z$
Wages Squared			-1.62E-09	$(3.41)^x$
Wages Cubed			1.68E-14	$(3.41)^x$
Years of Schooling	.1803	$(19.09)^x$	.1845	$(19.38)^x$
Age	-.0661	(0.73)	-.0638	(0.71)
Age Squared	.0023	(1.33)	.0022	(1.30)
Age Cubed	-5.44E-06	(0.54)	-4.98E-06	(0.49)
Constant	20.396	$(13.11)^x$	20.15	$(12.94)^x$
F-Statistic	604.8^x		433.8^x	
R-Squared	.089		.090	
Number of observations	30632		30632	

Sample consists of those men 30 years of age or older who are once and currently married. Significance levels: x=.01 level, y=.05 level, z=.10 level.

Figure 2a. Predicted Wage Income for Males by Age-at-First-Marriage,
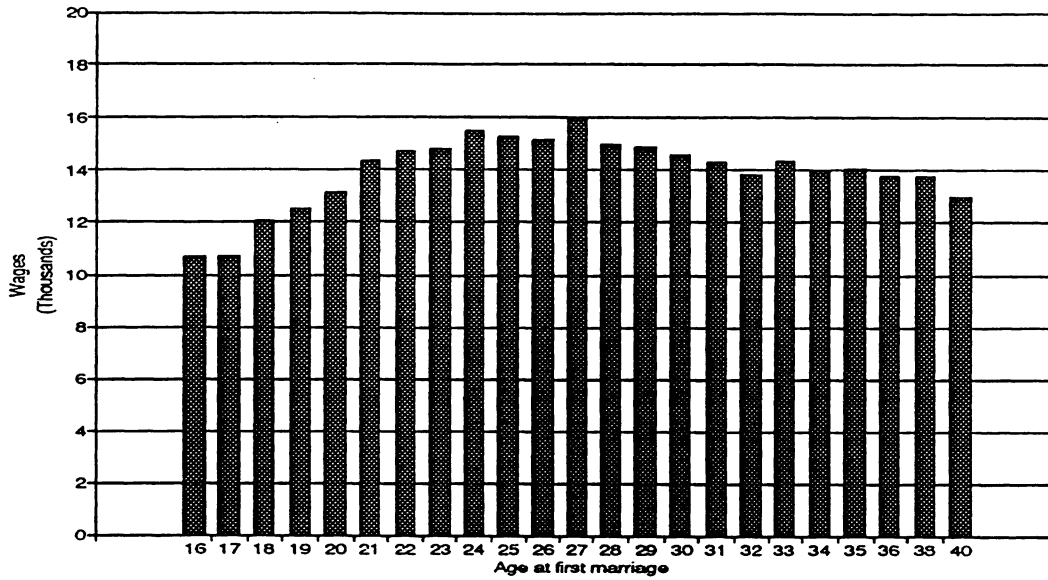Dummy Variable Specification

Figure 3a. Predicted Family Income by Age-At-First-Marriage of Male
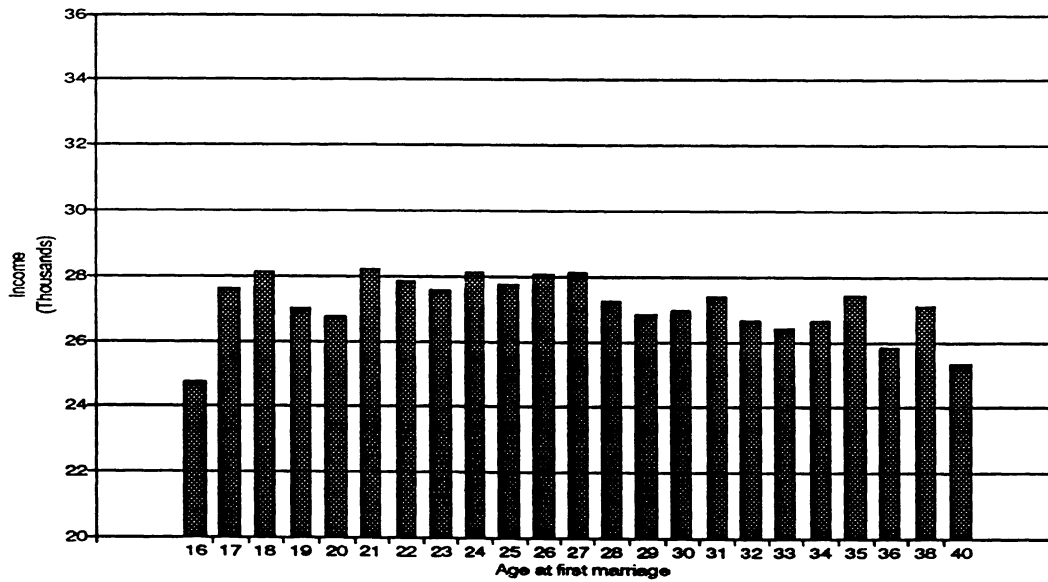Partner, with controls for Schooling, Dummy Variable Specification

Figure 4a. Predicted Annual Wage Earnings by Age-at-First Marriage
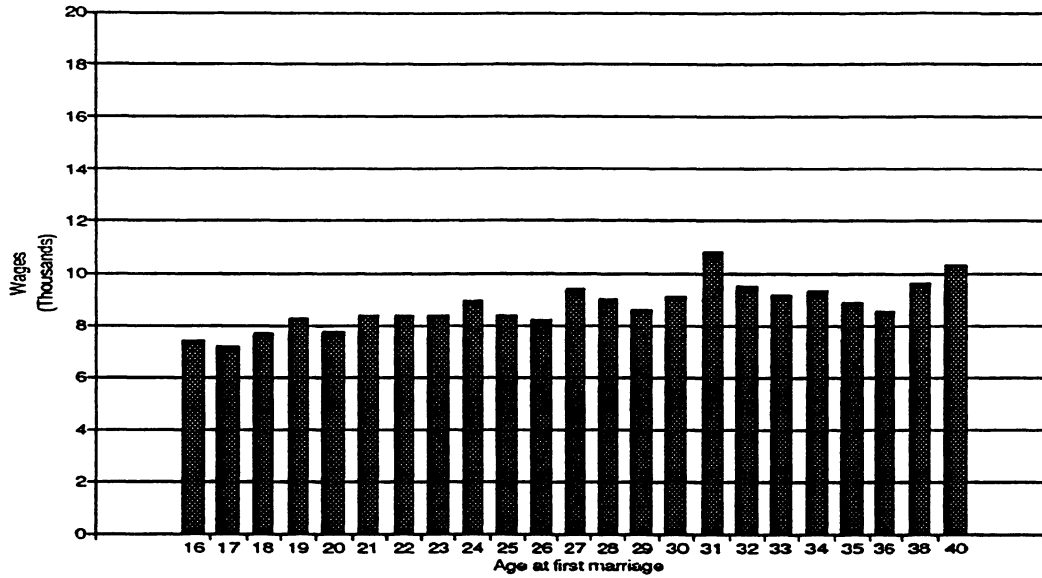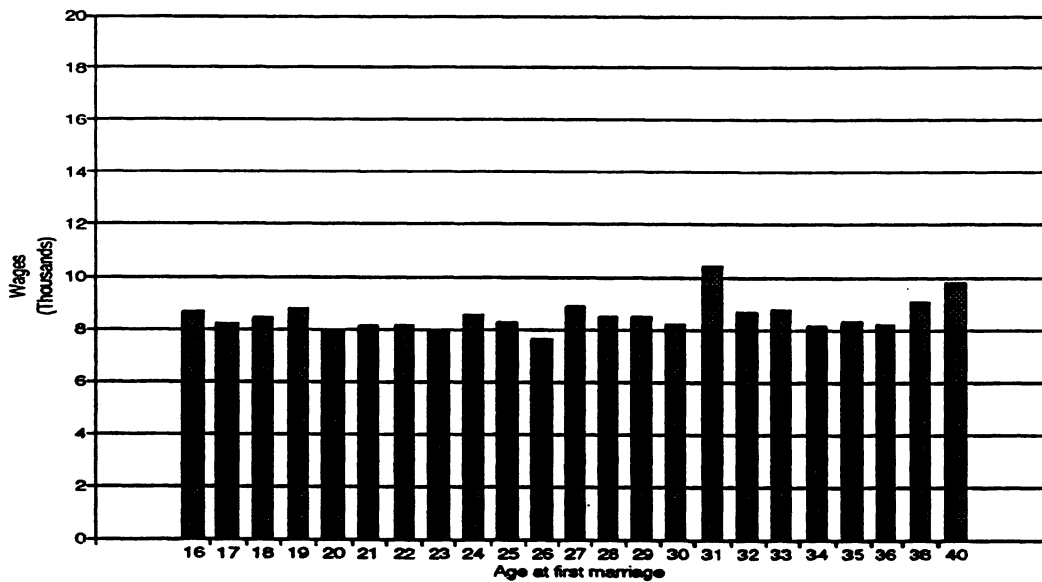for Females with Positive Wages, Dummy Variable Specification

Figure 5a. Predicted Annual Wage Earnings by Age-at-First Marriage
for Females with Positive Wages, with Controls for Schooling,
Dummy Variable Specification

Figure 6a. Predicted Family Income by Age-at-First-Marriage
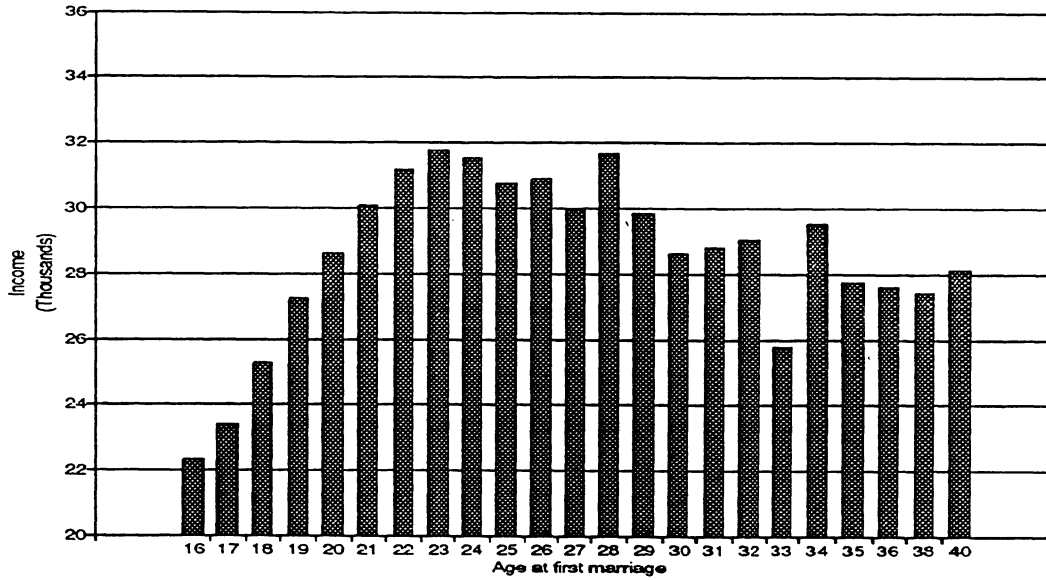of Female Partner, Dummy Variable Specification

Figure 7a. Predicted Family Income by Age-at-First-Marriage
of Female Partner with COntrols for Schooling,
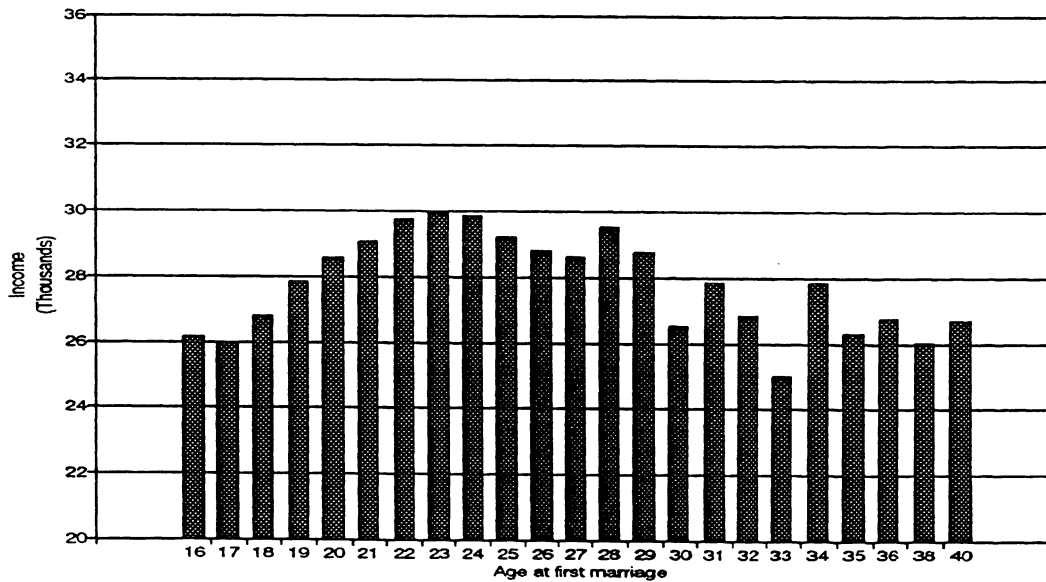Dummy Variable Specification

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Figure 8. Predicted Annual Wage Earnings by Age-at-First-Marriage, Men 30 or Older with Positive Wages, Controlling for Schooling.
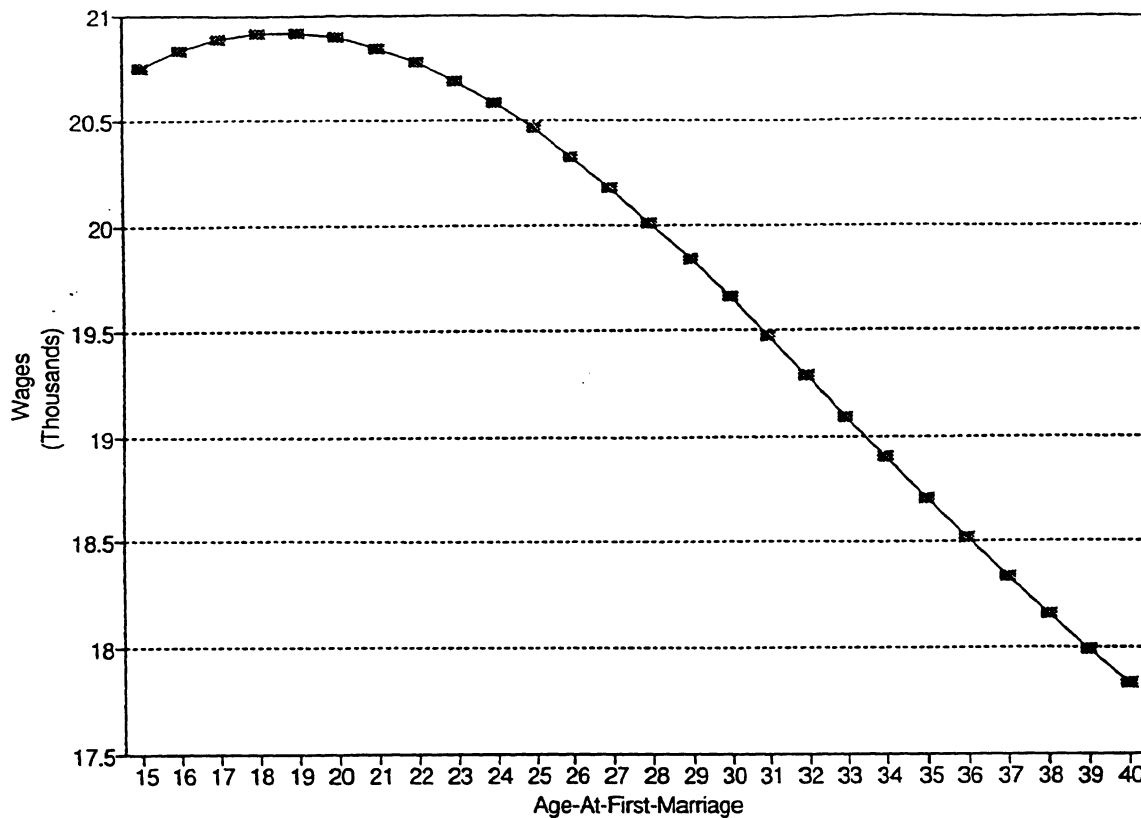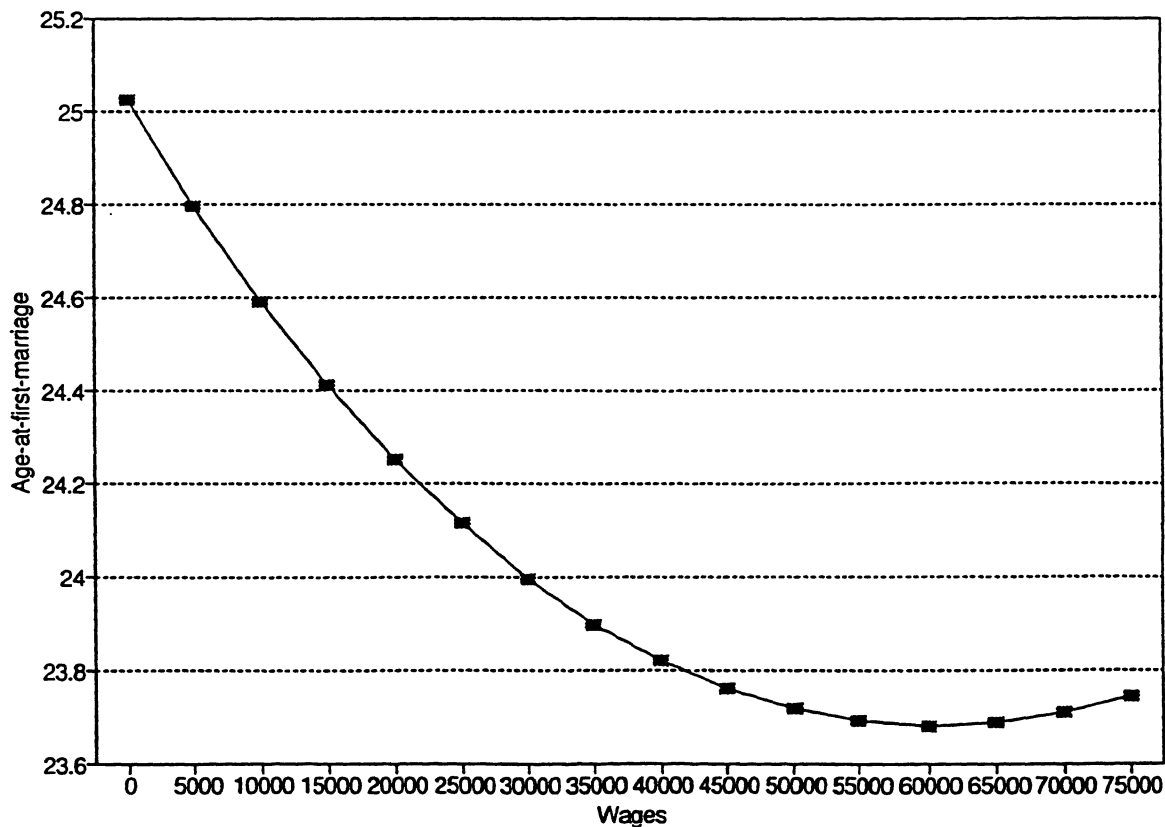

Figure 9. Predicted Age-at-First-Marriage by Annual Wage Earnings, Men 30 or Older with Positive Wages, Controlling for Schooling.

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