THE ECONOMIC DETERMINANTS OF AGE AT FIRST MARRIAGE: A CROSS COUNTRY ANALYSIS

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ABSTRACT

We employ a dataset for 56 nations to analyze the age at which men and women first marry. In separate equations for each gender, important effects are found for wages, labor force participation rates, educational attainment, and infant mortality rates in predicting the age at first marriage for males and females across nations. Seemingly Unrelated Regression (SUR) methods evince some gains in efficiency over ordinary least squares when the equations are estimated as a system.

INTRODUCTION

Perhaps surprisingly, there is no shortage of papers [see 6, 7, 8, 9, 10 and 11] that attempt to provide empirical economic explanations of the age at which people first marry. Most of these studies reference the analysis by Becker in his models of marriage [see 1 and 2] when choosing the variables that explain when people decide to marry. The extant research on age at first marriage places focus on marriage of individuals within a *single* nation, e.g., the determinants of the age at first marriage for men and women in the United States. Here we attempt to explain the age at first marriage by regression analysis for a cross section of 56 different nations. The remainder of the paper is organized as follows: first, we give a brief review of the economic explanation and empirical analysis of marriage and the "marriage market;" second, we describe the data utilized in the empirical work; third, the results of the estimations are presented; in the final section we offer conclusions.

ECONOMICS AND MARRIAGE

Theory

Becker [1] notes that since almost all marriages are voluntary, the economic theory of preferences can be applied. Persons agreeing to marry "… can be assumed to expect to raise their utility level above what it would be were they to remain single." [1, p. 814] Becker further argues that since many individuals compete for mates, a marriage market can be presumed to exist.

Friedman [3] devotes a full chapter (The Economics of Love and Marriage) to explaining marriage and its motivation. A marriage can be considered as a special type of a firm wherein individuals acting together take advantage of familiar economic concepts such as division of labor, economies of scale, and comparative advantage. In addition, as noted in Matsushita [7] and elsewhere, many of the goods produced in marriage have characteristics of *public goods*. For example, children, housing space, heat, light, landscaping, and the like are typically enjoyed jointly within marriages.

As far as the *market* for marriage, the general models of search theory (such as a job search) can be applied. The age at first marriage can be considered to be determined by the age at which one enters the market and the duration of the search for a mate [5, p. 528]. Individuals enter the market only if the expected benefits of marriage exceed the expected costs, and the search will extend until the expected additional benefits equal the additional (marginal) costs. The market participant determines an acceptance wage (here share of output produced in marriage), and accepts a marriage offer that equals or

exceeds the acceptance wage. Recognize (of course) that "proposals" regarding the share of output produced in marriage are likely to be more uncertain and less explicit than wage offers in the employment market. Nothing herein suggests than love and/or altruism are absent in marriage—love can be one of the goods produced in marriage and a husband (wife) can gain utility from his (her) mate's consumption or that of their children.

Empirical Analysis

The empirical determinants of marriage age identified in prior research include measures such as male and female wages, educational attainment levels, per capita income, infant mortality rates, and life expectancy. Based on economic theory, marriage is expected to be delayed with higher incomes, higher educational attainment levels, lower infant mortality rates, and greater life expectancy.

If male and female wages are measured separately, there is disagreement in both theory and empirical work on the effect of higher male wages on male age at first marriage. The Becker-Keely [6] hypothesis suggests (under certain assumptions) that higher male wages will result in earlier marriage age for males. The reasoning is that males with higher wages have comparative advantage in the labor market, and will thus seek a partner whose comparative advantage lies in home production. Such a male is therefore more likely to marry, and marries earlier than males not so advantaged. Put differently, a male with higher wages gains more by specializing in the labor market and also gains more from the marriage output in the home produced by a mate. In contrast, Bergstrom and Bagnoli [3], suggest that higher male wages are likely to cause marriage to be delayed. Their reasoning is that men who are more likely to be successful (and therefore start with higher wage rates) will postpone marriage because it takes time to "prove" their earning potential. As such proof is realized, higher wage males are able to appeal to more desirable women. Keely [6] finds support for the Becker-Keely prediction while others (Zhang [11] for example), find support for the Bergstrom-Bagnoli prediction.

We note one other interesting empirical result from Loughran [7]. He models a female marital search and finds that male wage *inequality* delays age at first marriage for females. Loughran argues that with greater male wage inequality, a female search participant will search longer because she is more likely to receive an offer from a higher male wage earner with extended search time. Stated in terms of search theory, a risk-neutral female facing a greater spread in male wages is more likely to receive offers above her minimum acceptance wage with additional search time.

DATA

We collected data for 56 nations[1], with the nations included in the sample chosen solely on the basis of available data. The data for each nation include age at first marriage for men and women, measures of male and female wages, labor force participation rates for each gender, infant mortality rates, life expectancy for males and females, educational attainment rates, and per capita income. The data sources include Eurostat, United Nations Statistics Division and the Encyclopedia of Nations. Table I contains descriptive statistics for the variables collected for the analysis.

[1]The nations represented in the sample are Armenia, Australia, Belgium, Belarus, Bolivia, Brazil, Bulgaria, Canada, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Egypt, El Salvador, Eritrea, Estonia, Finland, France, Georgia, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Iran, Italy, Japan, Kazakhstan, Kenya, Kyrgyzstan, Latvia, Lithuania, Malaysia, Malta, Mexico, Mongolia, Netherlands, New Zealand, Norway, Panama, Peru, Philippines, Poland, Qatar, Romania, Singapore, Slovakia, Slovenia, South Korea, Sweden, Switzerland, Turkey, Ukraine, United States.

The first two variables in Table I, female and male wages were computed by dividing per capita income into male and female components based on the ratio of male to female manufacturing wages. Such a calculation may not be fully appropriate, and we note and account for this in the empirical analysis to follow. Some of the summary statistics are particularly interesting (at least to us). The mean age at first marriage for women across these 56 countries is a little more than 25 years of age. The corresponding age for men averages just over 28. In every nation in the data set, women on average marry older men, with a smallest differential (Marry Age Diff. in the table is men's age at first marriage minus women's age) of 1.29 years (Ireland) and the largest differential of 5.71 years (Eritrea). The infant mortality rate (the number of deaths of infants under one year of age per 1,000 live births) varies widely for our sample of nations, with a maximum of 81 (Kenya) to a minimum of 2.5 (Singapore). The ratio of male-to-female wages reported also varies widely, from a low of .62 (Qatar) to a high of 2.46 (Armenia).

Table I: Descriptive Statistics for 56 Nations

Variable	Mean	Std. Dev.	Minimum	Maximum
Female Wages	$14,906	$18,446	$883	$127,705
Male Wages	$17,759	$14,906	$915	$79,295
Women Marry Age	25.28	3.28	19.56	32.34
Men Marry Age	28.19	2.83	24.00	34.50
Infant Mortality	18.51	18.86	2.50	81.00
Women LF	58.48	12.91	24.80	83.60
Men LF	79.58	5.80	66.80	92.80
Life Women	76.32	6.11	52.70	85.20
Life Men	70.03	6.10	51.20	78.60
Women Education	14.15	3.16	4.09	20.70
Men Education	13.75	2.64	5.68	20.50
Income Per Capita	$16,310	$16,199	$1,020	$103,500
Marry Age Diff.	2.90	0.95	1.29	5.71
Male/Female Wage	1.31	0.28	0.62	2.46

It is also interesting (though not surprising) to note that the labor force participation rates (Men LF, Women LF) for males are much higher than that for women, and that the males also have significantly lower variance for that measure across nations.

RESULTS

Linear regression methods are employed to test the empirical determinants of age at first marriage for this sample of nations. We choose to estimate separate equations for male and female marriage age. In general (and as stated above) we anticipate that marriage age is likely to depend on wages (or incomes), infant mortality rates, life expectancy, and labor force participation rates.

Several of the variables collected are highly correlated in this sample of nations. In particular, per capita income is very closely correlated with our measures of wages for each gender. The simple correlation coefficient between male wages and per capita income is .98 and that between female wages and per capita income is .97. Thus, even though there is fairly wide discrepancy across nations in the ratio of female to male wages in manufacturing, the levels of wages constructed for this research are dominated by differences in per capita income. As a practical matter, the regression results are similar regardless of whether the measure of income or wages enters as an explanatory variable. In the results reported in Table II, we choose to use the measures of male and female wages (results with per capita income are

available from the authors on request). Measures of the general level of heath, life expectancy and infant mortality rates also closely related, with simple correlation coefficients of -.93 for females and -.77 for males. We choose infant mortality rates as an explanatory variable in the regressions, based on economic theory as children are one of the goods produced in marriage.

Consider the first reported regression in Table II in the column "OLS Women's Age." We find statistically important effects for the measure of women's wages (higher wages for women delay marriage), education of women, women's labor force participation, and infant mortality rates. All signs are as anticipated and the equation explains two-thirds of the variance in women's age at first marriage across nations.

Table II: Regression Results

Explanatory Variable	OLS Women's Age	OLS Men's Age	SUR Women's Age	SUR Men's Age
Constant	16.52	22.36	17.89	24.20
Women's Wages	0.000045* (2.95)		0.000037* (3.22)	
Education Women	0.3659* (2.64)		0.2612* (3.03)	
LF% Women	0.0638* (2.74)	0.0542* (2.65)	0.0724* (3.52)	0.0620* (3.27)
Infant Mortality	-0.0440** (-2.09)	-0.0332** (-1.75)	-0.0588* (-3.54)	-0.0564* (-3.60)
Men's Wages		0.000083* (3.88)		0.000049* (3.06)
Education Men		0.1342 (1.04)		0.0398 (0.49)
SEE	1.880	1.821	1.81	1.79
Adjusted R^2	.671	.585	___	___

* indicates statistical significance at $\alpha < .01$, one-tailed tests.
** indicates statistical significance at $\alpha < .05$, one-tailed tests.
(t-statistics are in parentheses below the coefficient estimates.)

The second reported regression, "OLS Men's Age," includes a slightly different explanatory variable set. Higher men's wages across nations leads to later marriage, higher infant mortality rates imply earlier marriage age for men, consistent with the result for women, and men's educational rates are weakly related to later marriage for men. Notice that men's labor force participation is *not* included in the regression, but women's labor force participation is. We found no effect of male labor force participation, but we found that greater women's participation was associated with later marriage age for men, as well as women. Recall that men's labor force participation rates varies far less than that for women, and that the gap in marriage age (male – female) is narrow across nations. It is not, then, surprising that greater labor force participation for females delays marriage for both sexes. The OLS regression for male age at first marriage explains a smaller percentage of the variance in age, accounting for about 60% for this sample of nations.

Since the marriage age for each gender is clearly related across nations (males on average marry younger women with narrow differences), it is likely that the error terms of the two equations are correlated. In such instances, the *seemingly unrelated regression* (SUR) technique yields increased efficiency by estimating these equations as a system, accounting for the correlation across equations. The last two columns of Table II contain the regression results for SUR. Examining the results of the SUR

estimations, most of the t-scores are "improved," but more importantly, notice that the standard error of the estimate is reduced for each of the two equations. We conclude that the SUR technique is appropriate for this project.

We conducted several experiments to test for possible effects of the ratio of male to female wages, since some research suggests that higher male wages relative to females may have ambiguous effects on age at first marriage for men within a nation. We could find no case in any formulation that such effect is observed across nations, at least for this sample.

Note also that we did not include any measure of religion, status of women, form of government, or other social measures regarding marriage for the individual nations of this sample.

CONCLUSIONS

A data set for 56 nations yields estimates of the determinants of marriage age for men and women. We find that male and female marriage ages are positively related to income, negatively related to infant mortality rates, and positively related to female labor force participation rates. We also find that women's marriage age is positively related to their educational attainment, whereas men's marriage age is, at best, very weakly related to male educational attainment. Marriage age for males does not appear to be related to male labor force participation rates. We also conclude that the method of *seemingly unrelated regression* (SUR) yields increased efficiency in estimating male and female marriage age equations as a system.

As a future project we may utilize measures of income inequality, perhaps with GINI coefficients, to test to see if Loughran's [7] result (that with greater male wage inequality, women search longer and thus delay marriage) can be captured for a cross section of nations.

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