Marriage Markets Across Countries

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Abstract

The study of age at marriage and differential age at marriage between men and women is important for social security researchers and actuaries involved in the design of second-to-die life insurance policies and last survivor annuities, or in the pricing of healthcare policies such as nursing home and long-term care. Marriage patterns vary within and across regions; they have changed significantly across time and across countries. People today have more freedom in choosing marriage partners and may have more opportunities to dissolve marriage. The mean age at marriage is increasing in nearly all regions of the world. The difference between male and female age at marriage tends to decrease. The four main hypotheses for this trend are economic modernization, changes in demand and supply, in social and cultural influences, and in healthcare and longevity risk sharing. In this research, we test these four hypotheses. We perform a cross-country regression analysis of the timing and prevalence of marriage, using 54 explanatory variables from 156 countries in six regions. The main dependent variables are female mean age at marriage and gender difference in mean age at marriage[1].

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1. Introduction

The main reasons for marriage have long been believed to be love or compatibility. Marriage also brings financial stability, children, and social acceptance. In most cultures, remaining single beyond reproductive years often carries the stigma of being unwanted by the marriage markets. In traditional societies, women are valued as marriage partners for their ability to perform household work and have children, while men are valued for their earning ability. In these societies, women are then available for marriage earlier than men since they do not require long training. This may partially explain why women marry at younger ages than men, a phenomenon observed throughout the world. Indeed, data from the United Nations (2000) show a higher mean age at marriage for men in all countries but France. Forty years ago, the mean age at marriage was less than 30 for both males and females in every country. Marriage age patterns have changed since. People today tend to marry later than in the past. The most recent data from the United Nations show that men are marrying later than 30, on average, in 12 out of 156 countries. Female mean age at marriage now exceeds 30 in four countries—two from Northern Europe (Iceland and Sweden) and two from the Caribbean (Barbados and Jamaica). The data also show significant differences in mean age at marriage between males and females and between regions.

2. Literature Review

Hajnal (1953) develops a method to forecast the proportions of individuals remaining single and to estimate the mean age at marriage, using census data on marital status from 1930 to 1951, depending on the availability of the data in each country. He studies age at marriage and proportions marrying in 12 countries. Since the methods used in his paper depend entirely on the proportion of single people, he considers only 7 countries where the proportions of single people for both sexes substantially decreased over time. These are the United States, Australia, New Zealand, Denmark, England and Wales, Sweden, and Switzerland. He shows that more women than men remain single in the northwest European countries, but expects this to reverse in the future due to the age-sex composition of the populations and modern Western mortality conditions. In the United States, Australia and New Zealand, the proportion of women remaining single throughout life is likely to remain below the corresponding proportion for men because immigration has created a surplus of men at the marriageable ages. Analyzing the timing of

marriage, Hajnal finds that in the northwest European countries, the reduction in mean age at marriage has been greater among women than among men; in Australia, New Zealand, and the United States, it is the age at marriage of men which has fallen more. While the mean age at marriage is declining, the number of marriages is increasing, resulting in an temporary increase in birth rates.

Tietze and Lauriat (1955) compute mean age at first marriage by educational attainment, using 1940 and 1950 United States census data on marital status by age. They apply Hajnal's techniques to estimate mean age at marriage and projected proportions of single people in seven educational groups. They find that the highest ages at marriage occur in the best-educated groups and that women tend to marry earlier in life than men. The smallest difference in age at marriage is in the group with no school years completed. Surprisingly, comparing 1940 and 1950 data, they find the greatest decrease in mean age at marriage for both males and females completing high school and college. However, comparing across educational groups in the same year, both males and females completing college experience the highest mean age at marriage in 1940; whereas, in 1950, those with no school years completed have the greatest mean age at marriage. In addition, excluding the groups with no school years completed, age at first marriage decreases more for men than for women, within the first four educational groups—elementary school (1-4 years), elementary school (5-8 years), high school (1-3 years), and high school (4 years). Conversely, in both college groups—1-3 years and 4 years—the age at marriage decreases more for women than for men. Obviously, the results from Hajnal (1953) and Tietze and Lauriat (1955) are strongly influenced by the effects of World War II.

Dixon (1971) studies cross-cultural variations in marriage ages using age at first marriage and proportions of men and women never married in 57 countries around 1960 as data. She emphasizes the importance of three variables mediating the effects of social structure on observed marriage patterns: the availability, feasibility and desirability of marriage. The availability of marriage is determined primarily by the balance of the age-sex ratio of persons of marriageable age within endogamous groups and by the method of mate selection (arranged or free choice). The feasibility of marriage primarily refers to the financial and social conditions required for the newly married couple to establish a household, such as obtaining land and a source of income. When marriage is economically feasible, it does not imply that it is equally desirable in all societies. Desirability of marriage is determined not only by social rewards from

marriage, such as recognition for maintaining lineage, economic support, affection, and perceived happiness at old age, but also by social sanctions, such as social isolation and stigma for childlessness or remaining single beyond a certain age. Dixon finds that European marriage patterns for females differ from the rest of the world. European women appear to marry later in life than in other regions. In Western Europe, women tend to marry later in wealthier countries. Results for men are inconclusive. Although Asian women tend to marry earlier than in Europe especially in countries where the concept of an extended family is prevalent, there has been a pronounced trend toward later marriage after World War II. In another paper, Dixon (1978) studies the relationship between timing and prevalence of marriage and finds a negative relationship—a high age at marriage is associated with a low proportion of people who ever get married, with the exception of two countries—Japan and Ireland. In Japan, from 1920 to 1950 people tended to marry late but almost everyone got married before 45. In Ireland, between 1850 and 1950, the mean age at marriage for males varied little, but the proportions remaining single rose and then fell dramatically. In addition, European and non-European marriage patterns seem to converge toward the middle range.

Becker (1973) develops an economic model to explain marriage behavior. In Part I, he assumes that each person tries to do as well as possible and that the marriage market is in equilibrium. His crucial assumption is that marriage occurs if, and only if, both partners are made better off—that is, increase their utility. The gain of marriage is balanced against the costs, including legal fees and the cost of searching for a mate, to determine whether marriage is worthwhile. He shows that utility gains from marriage depend positively on income, human capital, and relative difference in wages between partners. His model also implies that the correlation between mates for traits that are complements in household production is positive, whereas the correlation for wage rates or for traits that are close substitutes tends to be negative. Traits are typically but not always complements. High values of different traits reinforce each other when they are complements, and offset each other when they are substitutes. The correlations between intelligence, education, age, race, nonhuman wealth, religion, ethnic origin, height, and geographical propinquity of spouses are positive and strong. Thus, these traits are good complements between spouses. On the other hand, the gain from marriage is greater when differentials between male and female wages rates are greater. A low-wage partner should spend more time in household production than a high-wage partner because the foregone value of the

time of a low-wage partner is lower. By complementing a low-wage partner with a high-wage one, the cheaper time of both spouses is used more extensively in household production, and the more expensive time of both spouses is used more extensively in market production. Therefore, negative assortative mating is optimal when maximizing total output by wage rates while nonmarket productivity is held constant. Becker extends his analysis in his Part II paper (1974) to include caring between mates, polygamous marital arrangements, genetic selection related to assortative mating, and separation, divorce, and remarriage. He shows that love and caring between two persons increase their chances of getting married in the optimal sorting. The optimal sorting must have the property that persons not married to each other could not marry and make one better off without making the other worse off. The incidence of polygamous family could be explained by inequality in various traits among men and women and by the degrees of sex ratios. Becker argues that polyandrists (women with several husband) have been much less common that polygamists (men with several wives) because the father's identity is doubtful under polyandry. Indeed, polygamy occurred even without an excess of women. The decline in polygamy over time is usually explained by religious and legislative structures, and partly explained by the declines in income inequality and the importance of agriculture.

Bergstrom and Schoeni (1996) provide an empirical investigation of a theoretical model of the marriage market. They use data on age at first marriage, family income, and individual earnings from a 1/1000 sample of white men and women and a 1/100 sample of black men and women from the 1980 U.S. Census. They find empirical support for their model, which predicts a positive correlation between male income and age at first marriage. However, they also find that this relationship becomes negative when males marry after age 30, which is not predicted by their model. They do not find a strong relationship between earnings and age at first marriage among females.

3. Data and Predictions

The data for the timing and prevalence of marriage are drawn from the United Nations (2000). The timing of marriage is determined by the singulate mean age at marriage (SMAM). SMAM was developed by Hajnal (1953) and defined as the mean age at first marriage of those ultimately marrying by age 50 for a hypothetical cohort experiencing the same age-specific

probabilities of remaining single that are represented in the cross-sectional proportions of those who never marry. It is computed as:

$$\sum_{x=15}^{49} \frac{p_x - p_{50}}{1 - p_{50}}$$

where p_x= the proportion of singles at age x

p_{50}= the proportion of singles at age 50

Variables to measure the prevalence of marriage are the proportion of ever-married persons aged 15-19, 20-24, and 40-49. We also consider variables that are possibly correlated with marriage patterns from 156 countries in six geographical regions. We use the database built by Lemaire (2000). Sources of data are the World Fact Book of the Central Intelligence Agency, the Encyclopedia Britannica (2000), the Food and Agriculture Organization, the United Nations, the World Bank's Development Indicators, and the World Health Organization.

3.1 Demand and Supply Theory

We can apply demand-supply theory in the mate selection process. This is the same concept as Dixon's availability of mates. While males and females are both "suppliers" and "demanders" in the marriage markets, assume for convenience of terminology that males are on the demand side and females are on the supply side. We believe that marriage patterns are affected by the imbalance of marriageable candidates. The ratio of males to females in marriage markets could influence both the timing and prevalence of marriage.

Marriageable candidate ratio = number of males age 15-40

number of females age 15-40

In this analysis, participants in marriage markets refer to available men and women during their reproductive years. We adopt 15 to 49 years of age as the reproductive period. To capture most potential candidates in marriage markets, we use the ratio of males to females in the 15-40 age range. Indeed in all countries the vast majority of people marry in that range. The minimum mean ages at marriage for males are greater than 20 for all regions. The maximum mean ages are greater than 30 for Africa, Asia, Europe, and Latin America and the Caribbean, but less than 30 in North America and Oceania. For females, the minimum SMAM is above 25 in North America, more than 20 but less than 25 in Europe and Oceania, and less than 20 in the

other regions. Therefore, we compute the marriageable candidate ratios for males and females from the 15-40 year old age group in all regions. The indicator for the imbalance of demand and supply in the marriage markets of each country is therefore the difference of 1.0 and the marriageable candidate ratio.

$$\text{Marriageable candidate imbalance} = 1 - \frac{\text{number of males age 15-40}}{\text{number of females age 15-40}}$$

In countries where the marriageable candidate ratios are less than 1, there are more available women than men in marriage markets. In other words, marriage markets are more competitive among women because supply is greater than demand. Given that men have more than one-to-one matching choices, we expect a higher proportion of men to marry during their reproductive years. If we assume that males prefer younger mates, and if supply is greater than demand, the marriage age gap between males and females will be larger than when there are equal numbers of males and females, because when men have more choices, they will choose marriage partners as young as possible. One obvious explanation for marriages between men and women lies in the desire to have own children. Sexual gratification, cleaning, feeding, and other services can be purchased, but not having children. It is scientifically proven that younger women can produce better quality and a higher quantity of children. Women are constrained by their biological clock, which partially explains why women marry at younger ages than men worldwide. There is a benefit for men in delaying marriage because they become more competitive socially and financially, as they grow older. Women may also prefer older men because older men are more likely to be more financially stable and more successful. In other words, the waiting cost is higher for women than for men. Therefore, there is a sorting process between older men and younger women, which leaves younger men and older women available in the marriage markets. These younger men may choose to enter or delay their marriage until they become more competitive at later ages, while older women may not be able to enter the marriage institution at all. Thus, we expect that the lower the ratios below 1.0, the larger the difference of mean age at marriage. Accordingly, when the marriageable candidate ratio is close to 1.0, the difference in mean age at marriage between males and females should become closer to zero.

If the marriageable candidate ratio is greater than 1.0, marriage markets are then more competitive among men than women. We expect that marriage will be more prevalent among females than males because demand is greater than supply. Becker's model assumes the sex ratio to be one—that there are *n* males and *n* females in the marriage market. However, our argument is consistent with his analysis of change in the sex ratio—that an increase in the sex ratio of men to women will decrease the fraction of men and increase the fraction of women marrying, if substitute men and women are considered. If the marriage market is in equilibrium, men will have to pay a higher price (marrying a woman older than they wish, in this case), shrinking the gender difference of mean age at marriage. Compared to cases where the marriageable candidate ratio is less than 1.0, younger men in this case are more likely to delay their marriages because they have fewer female partner choices, and older men are more likely to be successful. This will increase average male mean age at marriage in this market. The gender difference in mean age at marriage is expected to be smaller than the case when the marriageable candidate ratio is less than 1.0. Our variables to test the demand and supply hypothesis are:

1. Female SMAM (SMAMF)
2. Male SMAM (SMAMM)
3. SMAM difference, computed as difference between male and female SMAM (DIFFSMAM)
4. Proportions of ever-married persons aged 15-19, 20-24, and 45-49 for males (PERMARRM1519, PERMARRM2024, PERMARRM4049)
5. Proportions of ever-married persons aged 15-19, 20-24, and 45-49 for females (PERMARRF1519, PERMARRM2024, PERMARRM4549)
6. The difference of 1.0 and the marriageable candidate ratio, where the marriageable candidate ratio is the ratio of males to females from 15-40 years old in all regions (Z1-SRATIOS)

Prediction 1: Marriages will be more prevalent among males than females in countries with ratios of marriageable candidate below 1.0. The lower the ratios below 1.0, the more prevalent male marriages will be.

Prediction 2: Male SMAM is higher the greater the marriageable candidate ratio.

3.2 Economic Modernization Theory

The demand and supply hypothesis alone cannot explain age-at-marriage patterns. For example, in some extreme cases, we are not able to directly link prevalence to timing of marriage. Gambia is the most extreme case, where 100% of males and females are married by the age of 50, with the greatest SMAM difference of 9.2. Clearly, in this case prevalence of marriage does not help predict the timing of marriage. Therefore, we need other variables that can help explain marriage patterns.

If we consider marriage as a pure financial investment, each participant in marriage markets should select a mate as rich as possible to maximize their future investment return. However, one can argue that when everyone is seeking the richest marriage partner possible, wealthy people will get together first, then people with somewhat less wealth, etc. In equilibrium, marriage will involve partners with similar levels of education, financial and social status. Becker (1973) studies household behavior by assuming that utility depends not on the goods and services purchased in the market place, but on the commodities produced by each household. He shows that men differing in physical capital, education, height, race, and other traits tend to marry women with similar traits, whereas the correlation between marriage partners for wage rates (or other traits that are close substitutes in household production) tend to be negative. Those who cannot be competitive candidates are those who have lower financial and social status. In other words, married couples, on average, are more likely to have higher financial and social status than unmarried people.

3.2.1 Education

The difference in age at marriage tends to be larger in traditional societies than in modern industrial countries and has diminished over time in most industrial countries. Among the most important "modern forces" are the expansion of educational opportunities, changes in workforce and occupational activities, and urbanization. In the process of modernization, individuals with higher education and modern occupational roles want more independence and education time, and thus are expected to marry later in life. We consider eleven possible variables as measures of educational level:

7. Illiteracy rate (%) for women above the age of 15 (ILW)

8. Illiteracy rate (%) for men above 15 (ILM)

9. Difference between female and male illiteracy rates (ILW-ILM, %)

10. Enrollment ratio for women. Total school enrollment at first and second levels divided by the population of the corresponding age groups (EW)

11. Enrollment ratio for men (EM)

12. Difference between male and female enrollment ratios (EM-EW)

13. Expected number of years of education for females (FSCHOOL)

14. Expected number of years of education for males (MSCHOOL)

15. Difference in school life expectancies (SCHOOL)

16. Females per 100 males enrolled, second level (F2)

17. Females per 100 males enrolled, third level (F3)

Prediction 3: Countries where people are more educated tend to have higher mean age at marriage.

3.2.2 Labor Force Participation

Female labor force status also indicates the degree of gender discrimination. In countries where women working in industry outnumber those in agriculture, females have better occupational opportunities because gender bias is stronger in agricultural areas, and thus we expect that females in these countries will marry later in life. Occupational roles are represented by another three variables:

18. Females as a percentage of the labor force (LABOR)

19. Female contribution to the service industry—measured by percentage of females in the service industry (out of all working females) divided by percent of GDP from the service sector (FEM-SERV)

20. Percent of economic activity due to female labor (ECOACT)

21. Percentage of economically active females working in agriculture (AGRI)

Prediction 4: In countries where female labor force participation is greater, women marry later in life, and the mean-age-at-marriage gap is smaller.

3.2.3 Urbanization

We expect place of residence to be related to timing and prevalence of marriage, as people reared in urban areas have access to better education and occupations than those reared in rural areas or small towns. Moreover, urbanization is also a proxy for gender bias, as discrimination occurs mainly in rural areas, due to the perceived larger value of men in an agricultural setting. In predominantly agricultural societies, marriage is more rewarding for social acceptance and childbearing. In other words, women marrying late or never in agricultural areas carry more the stigmas of social isolation and childlessness, and the penalty of loss of economic support. Accordingly, we hypothesize that individuals growing up in or near large cities are more likely to marry later and less often than those living in rural areas. Our urbanization variable is

22. The percentage of population living in urban areas (URBAN)

3.2.4 Other economic modernization variables

Other variables that also measure economic modernization in our analysis are

23. Gross National Product per capita (GNP, $US)

24. Gross National Product per capita, converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power as a $US in the United States (PPP, $US)

25. Gross Domestic Product Per capita (GDP, $US)

26. Percent of GDP from the services sector (GDP-SER, $US)

27. Log (persons per car) (LNCAR)

28. Percentage of individuals who have access to safe water (WATER)

Prediction 5: The greater the percentage of population living in urban areas, the higher the mean age at marriage, but the lower the prevalence of marriage.

3.3 Healthcare and Longevity Risk Sharing

3.3.1 Healthcare Risk

There is strong evidence that married people are more likely to be healthier (Pienta, Hayward, and Jenkins [2000] and Trowbridge [1994]). Nevertheless, it is not clear that better health is a direct consequence of marriage. The direct consequences of marriage regarding health may include better mental health and the availability of a caring partner when ill. However, there might be indirect reasons for married people to be healthier. There is ample evidence that single individuals are more likely to have more dangerous lifestyles. Unhealthy people are not highly competitive candidates in marriage markets, just like defective products. They may also not have an interest in finding a mate because they are not physically or mentally ready. Thus, people who are more likely to be married are those who are already in good health. Moreover, people who meet the requirements to be marriageable candidates are more prone to achieve higher financial stability, and thus have access to better and more expensive healthcare. People in better health are more competitive and more likely to enter the marriage markets sooner and more often. Therefore, we expect that better healthcare quality will be related to earlier and more frequent marriages. We have also incorporated variables for the healthcare quality of each country.

29. Health care expenses, as a proportion of GNP (HEALTH)

30. Cost of health care per capita in international dollars (HCCOST)

31. Log (persons per physician) (LNDOC)

32. Log (persons per hospital bed) (LNBEDS)

33. Index measuring the overall performance of the healthcare system (INDEX)

Prediction 6: People in countries with better healthcare quality are more likely to marry more often and earlier.

3.3.2 Longevity Risk

The main sources of retirement income are government social security benefits, employer provided retirement income, savings, and family support. The desire to marry will vary across countries depending on the importance of family support as a protection for longevity risk—that is the risk of outliving retirement resources. In most developing countries, social security programs are not a very strong source of retirement income. Employer provided retirement income is also not well established. Financial development is closely related to government retirement programs. Furthermore, the rate of savings is usually low in most developing countries. Thus, retirees in most developing countries rely on family support for their consumption during retirement years. For this reason, a prevailing cause of the desire to marry in most developing countries is to have children as a source of future retirement income. Although having children is a cost to a couple, it may create positive net present value when other relevant retirement sources of income are considered. Capital markets in less developed countries seem to be incomplete and less efficient, and thus people have no access to efficient saving and investment tools. Therefore, childbearing is considered more rewarding, and possibly even an efficient investment tool in less developed and agricultural countries, creating a positive net present value of the benefits from having children. As a result, the penalties for marrying late or never in less developed countries are much stronger, due to both social isolation and lack of financial support in old age.

Mortality rate has been improving over time throughout the world, due to improvements in medical technology and other factors. The disparity of life expectancy between rich and poor, whites and non-whites, educated and less educated, has decreased dramatically. However, the difference in life expectancy between females and males, hereafter "female advantage" (FA), has become larger in most countries. The life expectancy differential is 4.51 years on average worldwide. Lemaire (2000) studies biological and behavioral causes of FA. He incorporates 50 potential explanatory variables, subdivided into 4 categories—11 variables measuring degree of economic modernization, 26 variables measuring social, cultural and religious differences, 8 variables measuring the quality of health care, and 5 dummy variables—from 169 countries in his model. His final regression model contains four variables: the logarithm of the number of persons per physician, the fertility rate, the percentage of people with Hindu or Buddhist beliefs,

and the dummy variable representing European countries that belonged to the Soviet Union. This result strongly supports the behavioral hypothesis for adults, as three of the four selected variables are based on social/cultural/religious values. In other words, people's economic behavior has a significant effect on mortality rate differences between sexes.

Johansen (2000) shows that people who have never married experience the highest mortality rates, while married people have significantly lower rates. Since women seem to live longer and marry older men, there are more widows than widowers in the old age group. This implies that married women face a higher risk of longevity than married men and unmarried people. Married women face not only higher longevity risk but also the greater healthcare risk of old age illness. Women in countries where FA is greater face higher longevity risk and higher risk of outliving their resources. They will have more incentives to seek longevity risk protection tools, such as children. When marriage is more desirable, marriage markets become more competitive among females. Consequently, women in countries with higher FA will face stronger social and financial constraints to be competitive candidates in marriage markets. To improve their chances of marriage, they will need a longer education time to achieve a better social and financial status; this will lead to later marriages among women. Longer female life expectancy implies that there will be fewer males in old age groups. So in countries where FA is greater, there will be fewer older men in the marriage markets. As a result, women in such countries will marry younger mates than in countries with lower FA, reducing the SMAM difference. We use the following variables as measures for longevity risk:

34. Female life expectancy (EXPECTF)

35. Male life expectancy (EXPECTM)

36. Female Advantage, computed as the difference between female and male life expectancy (FANEW)

Prediction 7: Countries where female advantage is greater will be associated with later marriage and smaller differences in mean age at marriage.

3.4 Social and Cultural Variables

Lower mean age at marriage means longer reproductive years, and as a result, higher fertility rates, though it is not clear whether the fertility rate affects mean age at marriage, or vice versa. On the one hand, higher mean age at marriage refers to shorter reproductive years, and lower fertility rates as a consequence. On the other hand, fertility rates could be a proxy for the country's celibacy level. A low celibacy level is associated with higher fertility rates and more unwanted pregnancies which lead to earlier marriages. Thus, it is not clear whether fertility rates explain marriage age patterns or mean age at marriage explains national fertility rates.

37. Number of children per childbearing woman (FERT)

Prediction 8: Countries where fertility rates are higher have lower female mean age at marriage

It may seem that people do not decide to enter marriage markets with divorce in mind. The predictions associated with divorce are less clear cut than those associated with the demand and supply theory. On the one hand, when divorce is more difficult for people to get, they may tend to be careful about making a commitment. People will spend a longer time searching than when divorce is easier. This results in delayed marriage in countries where divorce is more difficult. Freiden (1972) finds that, in the United States, a smaller fraction of women have been married in those states having more difficult divorce laws. On the other hand, people may enter marriage markets sooner when divorce is more difficult because of social pressure against family dissolution, meaning more security in marriages. Therefore, the hypothesis we try to test is whether the difficulty of divorce will increase or decrease the incentives to marry. It is difficult to compare the divorce laws of different countries. Moreover, there are some indirect social factors related to the difficulty of divorce. Countries where divorce is more difficult will have lower divorce rates. Thus, we use the divorce rate as a proxy for the difficulty of divorce in each country.

38. Divorce rate (DIV)

Since marriage is highly influenced by culture, we have added cultural variables into our model. Culture and religion are highly correlated. Religious beliefs have an important impact on

attitudes toward marriage, and therefore, on the availability of social and institutional alternatives to marriage and childbearing. We recognize six religious variables:

39. Percent of Muslims (ISLAM)

40. Percentage of Christians (ALLCH)

41. Percentage of Buddhists (BUDD)

42. Percentage of Hindus (HINDU)

43. Percentage of people with indigenous beliefs (Africa) (INDIG)

44. Percentage of non-religious people (NONREL)

Other measures of social difference are:

45. Percentage of smokers in the female population (SMOKW)

46. Percentage of smokers in the male population (SMOKM)

47. Difference between male and female smoking rates (SMOKDIFF)

3.5 Dummy Variables

We also created seven geographic dummy variables, defined as follows:

48. Dummy variable to characterize Asian and Pacific regions (Dum1)

49. Dummy variable to characterize Africa (Dum2)

50. Dummy variable to characterize Latin America and the Caribbean (Dum3)

51. Dummy variable to characterize Europe, North America, Israel, Australia, and New Zealand (Dum4)

52. Dummy variable to characterize the six European countries that belonged to the former Soviet Union: Belarus, Estonia, Latvia, Lithuania, Russia, and the Ukraine (Dum5)

53. Dummy variable to characterize Central America and the Caribbean (Dum6)

54. Dummy variable to characterize predominantly black African countries (Dum7)

4. Marriage Patterns

Each person decides not only whether to enter the marriage market but also when to enter. Timing of entering to the marriage markets is determined among others by the "searching cost." This searching cost can vary from individual to individual as well as from society to society. It depends on several determinants, which affect the marriage decision of each

individual: religious beliefs, legislative structures, education levels, social diversification, and social mobility. Since marriage patterns have implications for the status of women, their health and fertility, marriage could be considered an investment of resources for future consumption. Understanding marriage trends would provide us with interesting linkages to marriage decision factors and to public policy in broader terms: national saving and retirement security programs. For the insurance industry, understanding marriage patterns provides information for the design of insurance policies that meet particular needs in each society.

Many comments in this section are based on insights into cultural attitudes toward marriage resulting from email interviews conducted with several Penn students from each region. Table 1 presents an overview of average mean age at marriage and proportion of people who have ever been married by sexes and regions.

Table 1

| | Percentage ever married by age group | | | | | | SMAM | | |
| | 15-19 | | 20-24 | | 45-49 | | SMAM | | |
	male	female	male	female	male	Female	male	female	difference
Africa	4.131	**26.976***	24.747	**65.472***	**96.948***	97.865	26.586	*21.411**	**5.202***
Asia	**4.739***	18.652	**34.183***	64.562	96.784	**98.658***	*24.67**	21.453	3.217
Europe	1.630	6.490	22.506	40.591	92.495	94.460	27.185	24.677	*2.507**
Latin America and The Caribbean	4.591	17.005	32.610	53.041	92.422	*91.444**	25.434	22.555	2.852
North America	*0.21**	*0.671**	18.443	*32.384**	91.860	93.809	**28.72***	**26.02***	2.7
Oceania	0.957	5.414	*11.12**	32.655	*91.782**	95.697	28.259	25.699	2.560

All values are weighted by total population.
*minimum value **maximum value

The tradition of men marrying later than women exists throughout the world. The only exception is France, where the age at marriage is 26.0 and 27.2 for males and females respectively. The average female SMAM varies from 21.41 in Africa to 26.02 in North America, while the average male SMAM varies from 24.67 in Asia to 28.72 in North America. Twenty-three out of the 156 countries have a female SMAM under 20, while no single country has a male SMAM lower than 20. Of the 23 countries with the lowest mean age at marriage for females, 15 are in Africa, the rest are in Asia. The data also show a much larger proportion of women than men who have ever married in by 24 years old. More than 90% of people have already married before they are past their reproductive years in all regions. Twenty-eight out of the 156 countries have a SMAM difference in excess of 5 years. The average mean age at

marriage in developed regions is 27.9 for males and 25.2 for females, compared to 24.9 for males and 21.4 for females in less developed regions. We observe that there is less variability in gender difference in mean age at marriage in developed countries. In six of the countries, more than 20% of females remain single until the age of 50; these are Jamaica (45.8%), Barbados (41.2%), Botswana (22.4%), Cape Verde (22.3%), Belize (21.6%), and Trinidad and Tobago (20.7%). More than 20% of men remain single until 50 in five countries— Jamaica (48.2%), Barbados (37.2%), Belize (24.1%), Sweden (24%), and Trinidad and Tobago (21.2%).

4.1 Africa

Africa is the continent with the lowest average female age at marriage. Male SMAM ranges from 22 in Uganda to 32 in Libya, while female SMAM ranges from 17.6 in Niger to 29 in Libya. Africa has the greatest difference in mean age at marriage between males and females: 5.2. The SMAM difference is at least five years in more than half of all African countries. The highest age gap is 9.2, in Gambia. At least 30% of women aged 15-19 have married in half of African countries. In Congo and Niger, at least 55% of women aged 15-19 have ever been married. Thus, African women not only marry younger but also more often than women in other regions. Africa is very different from Western and Asian societies culturally, especially in terms of gender relationships. Sexual activity starts early and multiple partners are common. There is no stigma for having children outside of marriage. In fact, it is a desirable thing because it proves womanhood and fertility. A young woman without any children is looked down upon by her peers, and even shunned by potential boyfriends on the grounds of not being able to conceive, and hence not being a full woman.

4.2 Asia

In Asian families prior to the 1970s, marriage was an especially important matter, not only because of its perceived relationship to the lifetime happiness of the couple, but also because of its effect on the extended family and the kin network. Since 1970, however, Asia has experienced a trend towards later age at marriage and higher rates of celibacy. The average Asian female SMAM increased from under 15 in the early part of the century to close to 20 by the 1980s. The current Asian female SMAM ranges from about 18 in Afghanistan and Bangladesh to at least 27 in Japan, Hong Kong and Singapore. Men in Asia marry at a younger age compared to

all other regions, with the earliest age of 22 in Nepal. The maximum mean age at marriage for men is about 30 in Hong Kong, Japan, Kuwait, Korea and Singapore. Asia has the second largest average difference SMAM between males and females: 3.27. The proportion of men who have ever married in the 15-19 age group is below 10% in almost all Asian countries except Nepal. Japan and Korea have the lowest proportion of women ages 15-19 ever married—less than 1%. Afghanistan and Bangladesh have the highest—more than 50%.

4.3 Europe

In Europe, the mean age at marriage is at least 29 for both males and females in Finland, Germany, Iceland and Sweden; it is at most 25 in Belarus, Bulgaria, Estonia, Latvia, Lithuania, Moldova, Russia, and Ukraine. Female SMAM is greater than 30 in only two countries in Europe—Iceland and Sweden. Sweden has the highest SMAM among European countries: 34 for males and 31.8 for females. Europe has the lowest average marriage age gap: 2.507 years. The highest mean age at marriage difference is 4.9 in Greece, and the lowest is –1.2 in France. Four Northern European countries have male SMAM greater than 30—Finland, Iceland, Norway, and Sweden. In Eastern and Southern Europe, both male and female SMAMs are less than 30. Germany is the only country in Western Europe that has male SMAM greater than 30. It is also the only country in Western Europe that has a proportion of men who have ever been married by 50 of less than 90%, while that proportion of women is greater than 90% for all Western European countries. More than 90% of men and women in all Eastern European countries marry by 50. Six Northern European countries have a proportion of ever-married men under 90%. Three Southern European countries have a proportion of men who have ever been married of less than 90%, while Malta is the only country that has this proportion of women less than 90%. For all age groups, the percentage of married females is higher than the corresponding percentage of married males except in four countries—two in Eastern Europe (Moldova and Ukraine) and two in Southern Europe (Malta and Portugal). The lowest proportion of men ever married is 76% in Sweden, while the lowest proportion for women is 80.7% in Malta.

4.4 North America

On average, people in North America marry the latest among all regions—28.8 for males and 26.1 for females. The proportion of people who have ever been married from ages 15 to 19

in North America is also the lowest for both males and females. This could be because marriage occurs later and less often in wealthier nations.

4.5 Latin America and the Caribbean

Latin American and Caribbean countries have the highest proportion of women never married by age 50: 8.556%. It is the only region where the proportion of men married by age 50 is greater than that of women. In Cuba, Honduras and Nicaragua, at least 29% of women aged 15-19 have ever married. Mean age at marriage differences in Latin American and Caribbean countries range from 0.2 in Belize to 4.4 in Haiti. The average mean age at marriage gap is 2.852. Only about half of the population of Jamaica has ever been married by age 50: 51.8% for males and 54.2% for females, the lowest worldwide. Jamaica also has the world highest SMAM: 34.6 for males and 33.1 for females. Getting married in Jamaica is far less important than having a child. For men, having children is seen as a sign of virility and for women, a sign of fertility. Moreover, women try to have children from multiple fathers to increase the likelihood of financial support. Barbados has the second-lowest proportion ever married in the world (62.8% for males and 59.8% for females) and the second-highest mean ages at marriage (34.3 for males and 31.8 for females). Weddings in Barbados have traditionally been elaborate and expensive events, and some people (particularly those in the lower socio-economic bracket) would rather avoid the fanfare. Therefore, many people live as "common law" husbands and wives: their bond is still recognized as a marriage under the law. Even when there are children born out of wedlock, it is very common for the parents to remain unmarried, with the father providing some financial support. There does not seem to be pressure for persons to marry because of pregnancy.

Table 2 shows the summary data by dummy variables.

Table 2

| Dummy Variables | Percentage ever married by age group | | | | | | SMAM | | |
| | 15-19 | | 20-24 | | 45-49 | | | | |
	male	female	male	female	male	female	male	female	difference
Asian and Pacific	4.74	18.68	34.18	64.62	96.78	98.67**	24.67	21.45	3.22
Africa	4.13	26.98	24.75	65.47	96.95	97.86	26.59	21.41	5.20
Latin America and the Caribbean	4.59	17.01	32.61	53.04	92.42	*91.44**	25.43	22.55	2.85
Developed Countries	*1.22**	*4.68**	*21.12**	*37.79**	*92.32**	94.28	27.66**	25.12**	*2.55**
Former Soviet Union	3.41	14.13	40.55**	67.13	96.20	96.42	*24.24**	21.48	2.76
Central America and the Caribbean	5.47**	18.53	36.78	56.29	92.39	92.44	24.95	22.28	2.60
Predominantly black Africa	4.86	32.76**	28.80	72.96**	97.36**	98.38	26.05	*20.31**	5.80**

All values are weighted by total population.

*minimum value **maximum value

Men and women in Europe, North America, Israel, Australia, and New Zealand (Dum4) married the latest and have the smallest SMAM differences. This implies that people in economically modernized countries tend to marry later in life. The proportion of men marriages in every age group is lower than in any other regions. The African countries (Dum2) have the highest proportion of women married by age 19. The predominantly black African countries (Dum7) have the lowest female SMAM and the greatest SMAM difference. In European countries that belonged to the former Soviet Union (Dum5), men married at the earliest ages. Central America and the Caribbean (Dum6) have the highest proportion of men married by the age of 19. Asian and Pacific regions (Dum1) have the highest proportion of women ever married by the age of 50.

Social differences may have significant influence on differences in marriage patterns. Since religions are closely related to social differences, we conclude the summary data by religions in Table 3:

Table 3

Religious Variables	Percentage ever married by age group						SMAM		
	15-19		20-24		45-49				
	male	female	male	female	male	female	male	female	difference
Islam	3.74	23.75	25.53	63.11	**97.56****	**97.91****	26.35	21.78	4.58
Christianity	2.61	13.19	23.09	47.17	*91.11**	*92.28**	27.02	23.74	3.25
Buddhism	2.45	*8.39**	*19.54**	*38.21**	94.88	94.28	**27.78****	**25.14****	*2.25**
Hindu	**6.14****	24.61	**33.13****	63.90	94.49	94.80	*25.56**	21.93	3.63
Indigenous belief	4.04	**28.21****	26.41	**68.10****	95.38	96.18	26.31	*21.17**	**5.19****
Non-religion	*2.35**	10.98	25.60	48.87	92.54	93.63	26.62	23.69	2.87

All values are weighted by total population.
*minimum value **maximum value

Buddhists marry the latest: 27.78 for males and 25.14 for females, but with the smallest marriage age difference: 2.25. Male Hindus and females with indigenous belief marry at the youngest ages. People with indigenous belief have also the largest marriage age difference: 5.19. Muslims have the highest proportion of people ever married by the age of 50 (97.56 for males and 97.51 for females), while the lowest proportion is among Christians (91.11 for males and 92.28 for females).

5. Correlation

Table 4 represents the correlations between all explanatory variables and the variables measuring prevalence and timing of marriage.

Table 4

Variables	Percentage ever married by age group						SMAM		
	15-19		20-24		45-49				
	men	women	men	women	men	women	men	women	difference
smamf	-0.617	-0.830	-0.758	-0.966	-0.696	-0.634	0.833	1.000	-0.629
smamm	-0.551	-0.535	-0.918	-0.806	-0.614	-0.538	1.000	0.833	-0.094
difsmam	0.334	0.742	0.069	0.604	0.388	0.379	-0.094	-0.629	1.000
popu	0.104	0.011	0.144	0.083	0.097	0.129	-0.150	-0.085	-0.054
Z1_sratios	0.217	0.276	0.236	0.212	0.033	0.019	-0.217	-0.207	0.074
ILW	0.480	0.734	0.280	0.611	0.399	0.383	-0.258	-0.576	0.678
ILM	0.450	0.718	0.260	0.566	0.320	0.313	-0.221	-0.534	0.649
ILWILM	0.430	0.606	0.253	0.557	0.451	0.422	-0.268	-0.527	0.587
EW	-0.512	-0.757	-0.378	-0.671	-0.434	-0.392	0.334	0.634	-0.689
EM	-0.422	-0.706	-0.340	-0.623	-0.369	-0.331	0.306	0.586	-0.640

| Variables | Percentage ever married by age group | | | | | | SMAM | | |
| | 15-19 | | 20-24 | | 45-49 | | | | |
	men	women	men	women	men	women	men	women	difference
EMEW	0.471	0.519	0.289	0.466	0.377	0.338	-0.247	-0.445	0.488
FSCHOOL	-0.463	-0.779	-0.493	-0.727	-0.301	-0.159	0.439	0.650	-0.622
MSCHOOL	-0.421	-0.759	-0.504	-0.709	-0.225	-0.083	0.426	0.616	-0.565
SCHOOL	0.373	0.454	0.199	0.422	0.417	0.340	-0.260	-0.434	0.505
F2	-0.415	-0.616	-0.251	-0.520	-0.413	-0.401	0.212	0.495	-0.604
F3	-0.221	-0.426	-0.179	-0.373	-0.241	-0.291	0.195	0.380	-0.422
LABOR	-0.144	-0.031	0.088	0.043	-0.057	0.002	0.000	0.016	-0.018
FEMSERV	-0.312	-0.469	-0.265	-0.477	-0.401	-0.392	0.281	0.448	-0.449
ECOACT	0.070	0.277	0.228	0.300	0.085	0.129	-0.115	-0.210	0.222
AGRI	0.413	0.658	0.342	0.646	0.498	0.449	-0.347	-0.592	0.583
URBAN	-0.358	-0.539	-0.377	-0.570	-0.277	-0.231	0.350	0.499	-0.428
GNP	-0.449	-0.510	-0.490	-0.633	-0.254	-0.160	0.515	0.584	-0.333
PPP	-0.503	-0.593	-0.537	-0.724	-0.340	-0.238	0.564	0.670	-0.403
GDP	-0.484	-0.587	-0.520	-0.692	-0.298	-0.217	0.524	0.633	-0.411
GDPSER	-0.418	-0.503	-0.389	-0.567	-0.341	-0.331	0.374	0.506	-0.384
LNCAR	0.566	0.691	0.483	0.670	0.381	0.319	-0.440	-0.603	0.476
WATER	-0.436	-0.597	-0.523	-0.638	-0.391	-0.307	0.466	0.598	-0.425
HEALTH	-0.293	-0.306	-0.319	-0.423	-0.239	-0.158	0.341	0.376	-0.218
Hccost	-0.440	-0.533	-0.463	-0.639	-0.305	-0.208	0.487	0.587	-0.374
LNDOC	0.372	0.644	0.250	0.511	0.238	0.203	-0.192	-0.455	0.574
LNBEDS	0.462	0.650	0.231	0.472	0.269	0.191	-0.206	-0.461	0.536
Index	-0.442	-0.588	-0.437	-0.594	-0.335	-0.247	0.367	0.518	-0.452
expectf	-0.455	-0.686	-0.375	-0.633	-0.391	-0.339	0.341	0.572	-0.613
expectm	-0.448	-0.669	-0.410	-0.649	-0.390	-0.338	0.373	0.586	-0.589
fanew	-0.262	-0.449	-0.043	-0.278	-0.208	-0.189	0.041	0.250	-0.425
faneww	-0.267	-0.449	-0.033	-0.260	-0.167	-0.134	0.026	0.237	-0.424
FERT	0.440	0.695	0.291	0.584	0.359	0.308	-0.270	-0.548	0.625
DIV	-0.216	-0.209	-0.242	-0.298	-0.438	-0.376	0.386	0.331	0.070
ISLAMnew	0.182	0.356	0.066	0.333	0.443	0.390	-0.115	-0.300	0.393
ALLCHnew	-0.198	-0.316	-0.134	-0.342	-0.474	-0.412	0.152	0.281	-0.295
BUDD	-0.050	-0.146	-0.094	-0.170	0.054	0.001	0.105	0.169	-0.196
HINDU	0.241	0.122	0.150	0.109	0.035	0.018	-0.105	-0.081	0.001
INDIG	0.152	0.356	0.068	0.305	0.124	0.127	-0.077	-0.271	0.389
NONREL	-0.188	-0.308	0.078	-0.138	-0.106	-0.076	-0.040	0.151	-0.344
SMOKWMod	-0.279	-0.438	-0.141	-0.385	-0.330	-0.212	0.165	0.343	-0.410
SMOKM	0.107	0.173	0.315	0.341	0.275	0.256	-0.351	-0.334	0.073
SMOKDIFF	0.244	0.340	0.314	0.437	0.358	0.251	-0.357	-0.401	0.221
Dum1	0.109	-0.004	0.120	0.096	0.318	0.227	-0.157	-0.064	-0.113
Dum2	0.173	0.486	0.034	0.382	0.256	0.236	-0.044	-0.343	0.602
Dum3	0.134	-0.033	0.114	-0.112	-0.455	-0.484	-0.032	0.086	-0.234
Dum4	-0.400	-0.475	-0.252	-0.400	-0.189	-0.060	0.233	0.349	-0.305
Dum5	0.010	-0.071	0.227	0.101	0.024	0.028	-0.203	-0.088	-0.124
Dum6	0.085	-0.023	0.032	-0.118	-0.468	-0.459	0.077	0.132	-0.176
Dum7	0.223	0.570	0.130	0.450	0.236	0.214	-0.114	-0.421	0.652

In an independent sample, correlations exceeding 0.185 would be significant at the 1% level. However, any cross-sectional data may be subject to some degree of spatial correlation, which would make correlation coefficients less significant than they appear to be. Traditional correlation and regression analyses are based on the assumption that errors are independently distributed. In a cross-sectional study, errors between neighboring countries are often spatially correlated. This results from the influence of unobserved variables that exhibit spatial dependence. Spatial autocorrelation between errors in adjoining location results from a mismatch between the unit of observations (between the countries in this case), and the spatial extent of the variables being studied (marriage patterns for instance). Specific techniques have been designed to analyze spatial correlation. This technique will be applied in a subsequent version of this paper.

The correlation analysis shows that female SMAM is more highly correlated than male SMAM with all variables. The correlation of female SMAM with the proportion of people who have ever been married is negative and significant for all age groups. The female proportion of having ever been married is highly correlated with female SMAM and SMAM difference. The most significant correlation appears in the age range of 20-24 years old. Obviously, a higher percentage of people ever married in the lower age group results in lower female marriage age, widening the gap of mean age at marriage.

The difference between 1.0 and marriageable ratios is negatively correlated with both male and female SMAMs, but positively correlated with the SMAM difference. This result supports prediction (1) and (2), our *demand and supply hypothesis*. When the ratio is below 1.0 (women outnumber men in marriage markets), men have more choices of mates and will choose the youngest mate possible. The correlations imply that the excess of women in marriage market results in earlier marriage for both males and females but a wider marriage age gap. Thus, it is consistent with our hypothesis that men prefer a younger marriage partner and will choose the youngest mate possible.

Educational variables are all strongly correlated with mean age at marriage, though less so for male SMAM. The illiteracy rate is negatively correlated with both female and male SMAMs, but positively correlated with SMAM difference. People will enter marriage markets earlier in populations with higher illiteracy level of the population. The female illiteracy rate is more correlated than the male rate with both male and female SMAMs. The expected number of

school years for both males and females are positively correlated with mean ages at marriage. Obviously, longer education time results in later marriages. The female SMAM is more sensitive than the male SMAM to changes in all other educational variables. In sum, education has a significant impact in delaying marriages for both males and females. This is consistent with our prediction (3) that countries where people are more educated tend to have higher mean age at marriage.

As prediction (4) suggests, we find that in countries where female labor force participation is greater women marry later in life, and the mean-age-at-marriage gap is smaller. Female contribution to the service industry is highly correlated with the mean age at marriage, while female labor force participation is positively, but insignificantly, correlated with the mean age at marriage.

The urbanization variable is positively correlated with female SMAM, but negatively related to variables of marriage prevalence. These results support our prediction (5) that the greater the percentage of population living in urban areas, the higher the mean age at marriage, but the lower the prevalence of marriage. Women in urban areas may gain better opportunities in both education and career, partly because the degree of discrimination against women is lower in urban areas. This finding is inversed in rural areas where there is a negative relationship between the percentage of economically active females working in agriculture and mean age of marriage.

All other economic variables have a positive relationship with both male and female SMAM and a negative relationship with SMAM difference. This implies that in economically developed countries, people enter marriage markets later in life, and the marriage age gap is smaller. The correlations vary from -0.333 between GNP and SMAM difference to 0.67 between PPP and female SMAM. The number of persons per car appears to be a very powerful measure of economic development. This variable is strongly correlated with both male and female SMAMs.

Variables measuring quality of health are highly correlated with mean age at marriage. The cost of health care per capita exhibits the highest correlation with mean age at marriage. The index of overall performance of the health care system, health care expenses (as a proportion of GNP) and cost of health care per capita are all positively correlated with mean age at marriage,

whereas the logarithm of number of persons per physician and the logarithm of number of persons per hospital bed are both negatively correlated with mean age at marriage. Similar to education variables, all health care variables tend to have a significant relationship with delayed marriages for both males and females. These findings appear to contradict our prediction (6) that people in countries with better healthcare quality are more likely to marry more often and earlier. We will return to this prediction in section 6.

As our prediction (7) suggests, we find that both male and female life expectancies are positively correlated with female SMAM and negatively correlated with SMAM difference. This implies that in countries where women marry later in life, and where the marriage age gap is smaller, the life expectancy is greater, all the more so for women. The female advantage shows an insignificant correlation with male SMAM (0.0258), but its correlation with female SMAM is about 10 times higher (0.237). Therefore, women in countries where female advantage is greater tend to marry later in life.

We find a strong support for our prediction (8) that countries where fertility rates are higher have lower female mean age at marriage. The correlation analysis shows that fertility rate is negatively, and significantly, correlated with mean age at marriage. It is obvious that mean age at marriage is lower in countries that have a higher fertility rate because of a longer reproductive period.

Divorce rate is positively correlated with mean age at marriage, and positively but insignificantly correlated with SMAM difference. This shows that people in countries where divorce rates are higher enter marriage markets later in life. If the divorce rate is a proxy for the difficulty of getting a divorce in a country, divorce will be easier in countries with higher divorce rates. Thus, the correlation between divorce rate and female SMAM implies that people tend to marry later in countries where it is easier to get divorced. This may be because social pressure against marriage dissolution is lesser in countries where divorce rates are higher, meaning there is less security in the marriage institution. Therefore, people will be more careful in searching for a marriage partner, resulting in delayed marriages. The wealthier the countries is, the more likely it is that this is the case. Divorce rates tend to be higher in well developed countries where women are more likely to marry later in life. Women in countries where the percentage of smokers in the female population is higher tend to marry later on average. As with divorce rates,

this is no causal effect here, because women tend to smoke more in rich countries where women are also more likely to marry later in life.

6. Regression Results

In this study, we first perform a cross-country analysis on data from 156 countries at various stages of development focusing on female SMAM and SMAM difference. In general, the situation of women worldwide has changed more rapidly than that of men. For example, most countries experience a rapidly growing educated female population and workforce, while the male population is more stable over time. This is probably because discrimination against women has diminished over time. Female life expectancy has improved by a larger degree than male life expectancy. Therefore, we expect female marriage behavior to play a more important role in the marriage patterns of a population as a whole. Moreover, all explanatory variables are more correlated with female SMAM and SMAM difference than with male SMAM.

6.1 Female SMAM

Selection techniques of regression analysis were applied to identify the most significant factors explaining female SMAM. The selected regression model for female SMAM has four explanatory variables: Gross National Product per capita (converted to international dollars using purchasing power parity rates)—PPP; the school enrollment ratio for women—EW; number of females per 100 males enrolled (third level)—F3; and the logarithm of the number of persons per physician—LNDOC. These four variables explain about 61% of the variability of female SMAM. The p-values are less than 0.01% for both PPP and EW, 1.48% for LNDOC, and 2.07% for F3. The regression equation is:

$$\text{SMAMF} = 12.9227 + 0.00018 \cdot \text{PPP} + 0.0602 \cdot \text{EW} + 0.0092 \cdot \text{F3} + 0.4814 \cdot \text{LNDOC}$$

All four variables have positive parameter estimates, which signify later marriages among women. The most significant factors that influence the marriage decision among females are PPP and EW: economic modernization variables. PPP is the direct indicator referring to economic level of development of the countries; it has the most positive effect on female SMAM. This implies that people in more economically modernized countries are more likely to marry later in life. EW is the total school enrollment at first and second levels divided by the population of the corresponding age groups. Thus, women will marry later in countries where

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more women enroll in school. F3 is another educational variable selected that has a positive effect on female SMAM; it is the number of females per 100 males enrolled in the third school level. Therefore, the positive effect of F3 on female SMAM implies that women tend to marry later in life where this ratio is higher. This suggests that better educated people tend to delay their marriages. One obvious reason for this is the required study time. Moreover, more highly educated women are more financially and socially independent, and are willing to pay higher searching costs because they have less to lose from delaying their marriages. These findings are consistent with our prediction (3) that countries where people are more educated tend to have higher mean age at marriage. All these results support our economic modernization theory.

LNDOC has a positive effect on female SMAM. Higher LNDOC value indicates lower healthcare quality for a country because of a higher number of persons per physician. People in countries with higher healthcare quality will tend to have better health and are physically and mentally ready to enter marriage markets sooner than people in countries with lower healthcare quality. Thus, the positive effect of the LNDOC variable partly supports our prediction (6) that people in countries with lower healthcare quality are more likely to marry later in life.

6.2 SMAM difference

There are five variables selected in the regression model for SMAM difference: the school enrollment ratio for women—EW; the dummy variable to characterize predominantly black African countries—DUM7; the percentage of Muslims—ISLAM; the percentage of Hindus—HINDU; and the percentage of economically active females working in agriculture—AGRI. These five explanatory variables explain about 63% of the variability of SMAM difference. The regression equation for SMAM difference is:

$$DIFSMAM = 4.9967 - 0.0235 \cdot EW + 2.4744 \cdot DUM7 + 0.0135 \cdot ISLAM$$
$$+ 0.0194 \cdot HINDU - 0.0154 \cdot AGRI$$

The p-values are less than 0.01% for both DUM7 and ISLAM, 0.05% for EW, 0.46% for AGRI, and 2.29% for HINDU.

Two of the selected explanatory variables in this model are religious variables—ISLAM and HINDU, while none of social and cultural variables appears in the selected regression model for female SMAM. Thus, social and cultural factors have more influence on overall marriage

age difference than on female marriages. Both ISLAM and HINDU have a strong impact on the marriage age gap between males and females; both significantly widen this gap. ISLAM has a stronger influence than HINDU. This is due to a large degree of discrimination against women in Muslim countries where religious affiliation plays a key role in daily life, particularly in matters of birth, marriage, divorce, and death. Many of the laws enacted between the 10th and 12th centuries still influence contemporary marriage and divorce, which often place women at a distinct disadvantage. For example, family laws pertaining to marriage and divorce reinforce male supremacy and prevent women from taking control of their lives. Muslims who live as minorities in non-Islamic countries are also affected by the sexist and authoritarian attitudes that pervade their community, influence marriage and divorce, cause abuse and exclusion of women from the mosques, and restrict decision-making by women.

DUM7 is also the most important factor explaining SMAM difference. The parameter estimate of DUM7 shows that men in predominantly black African countries tend to marry significantly younger women. This is due to cultural influences in predominantly black African countries that cannot be captured by other variables. Discrimination or violence against women and children remain serious problems in Africa despite legal and constitutional protection, particularly in issues such as wages, extension of credit, and access to land. There is a high rate of violence against women in forms of rape, assault and battery. Entrenched patriarchal attitudes towards women are a significant factor in underreporting abuses. Abused women have difficulty getting their cases prosecuted effectively and also often are treated poorly by doctors, police, and judges. Obviously, our two most important variables—Islamic and predominantly black African countries—explaining marriage age difference are highly related to degrees of discrimination against women. In countries where such discrimination is higher, the marriage age gap tends to be larger. Thus, the marriage patterns are influenced by social factors that are responsible for degrees of discrimination against women.

The educational variable is the second most important factor with a negative effect on marriage age difference between males and females—that is, the marriage age gap is smaller when the school enrollment ratio for women (EW) is higher. This variable also shows up as a factor that delays female marriages in the female SMAM model. More highly educated women are more socially and financially independent. Therefore, they are more likely to marry later in life with men with like values—men with similar education and ages.

The percentage of economically active females working in agriculture, a proxy for discrimination against women, also has a significant effect on SMAM difference. We expect that women will marry at a very young age to gain social acceptance and financial support so that the marriage age gap will be larger in countries where there are more women working in agriculture. Men in agricultural societies also are less likely to delay their marriages because they do not need a long training period for agricultural skills. Men can be successful in an agricultural setting sooner than in industrial settings. Thus, both women and men enter marriage markets early in life in agricultural societies. Education and agricultural setting seem to have a similar effect in narrowing the marriage age gap, but on opposite ends of the most common marriage age range.

7. Conclusion

We find that the evidence supports our economic modernization theory. Education and purchasing power are two of the most important "modern forces." Educational variables appear in both female SMAM and SMAM difference models with similar effect: delaying marriages. One unarguable reason is that people with higher education need a longer education time until they enter marriage markets. As women are more educated, they are more likely to become financially independent. At least in traditional societies today, when couples decide to marry, they usually prefer to wait until they are out of high school. Many more wait until they are financially stable enough to make a commitment. Once people decide to marry, they are less likely to return to school to earn a higher degree of education. Another economically modernized variable that selected in the female SMAM model is PPP—Gross National Product per capita (converted to international dollars using purchasing power parity rates); this has the strongest effect of delaying marriages among females. Furthermore, we find support for our healthcare risk-sharing hypothesis. The LNDOC is one of the selected factors explaining female SMAM; women in countries with lower healthcare quality tend to enter the marriage market later.

When comparing marriage patterns between males and females, social and cultural variables play a more important role than economic modernization variables. Two economic modernization variables are selected in the SMAM difference model—EW and AGRI, while three out of five selected variables are social and cultural—ISLAM, HINDU, and DUM7. The

most important factors explaining SMAM difference are ISLAM and DUM7. These two variables are highly related to the country's degree of discrimination against women. Islam is clear on its prohibition of sexual relationships outside of marriage. In Islamic countries throughout the world, women who bring "dishonor" to their families because of sexual indiscretions face the "honor killings" or other forms of corporal punishment. The legal system and law enforcement agencies have been implicated in the perpetuation of the problem by their willful lenience towards men who have carried out an assault in the name of "honor" and by their abuse and denigration of women who stand accused. The discrimination against women is also pronounced in predominantly black African countries, although to a lesser degree. Women are viewed as nothing more than servants to the family, both physically and symbolically. Violence against women remains a serious problem throughout predominantly black African countries. All of these reasons tell us that women in Islamic or predominantly black African countries do not have many rights in making choices for their own lives. Men in these countries choose the youngest marriage partners possibly because young and non-educated women are easily controlled and dominated. Another possible reason for the positive effect of predominantly black African countries is AIDS or HIV. It has been argued that men choose the youngest women to reduce chances that their marriage partners were exposed to sexual activities and to AIDS/HIV.

Countries where the school enrollment ratio for women (EW) is higher have a smaller gap in marriage age between males and females. Moreover, the AGRI variable has a negative effect on marriage age difference; people in countries where there are more women working in agriculture tend to marry partners with similar ages. These two results seem to capture the boundary effects of marriage patterns. The well-educated population and the agricultural population appear to display similar negative effects on SMAM difference, but they enter marriage markets very far apart in age. Highly educated people tend marry later in life with marriage partners who are closer in age and have similar values. Although men in agricultural societies prefer the youngest mates possible, they themselves tend to marry early in life. Therefore, they cannot marry women too much younger than them because of societal norms and laws prohibiting under-age marriages.

Therefore, we find strong support for our economic modernization theory. At the aggregate level, we find a fairly strong relationship between level of education, degree of

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urbanization, and the likelihood of young women delaying their first marriage. In the long-term future, we expect world marriage patterns to converge and become more homogenous as the world becomes more globalized. Moreover, female labor force participation has increased dramatically in the past 40 years. From 1960 to 1998, the average increase of female workforce as a percentage of total workforce is 6% throughout the world, with the greatest increase in Kuwait of 26.92% [4]. All of these societal changes have an impact on female marriage decisions. In fact, an early marriage seems to cause stronger financial constraints because women might have to give up better opportunities for earning income or even choosing another mate. Marriage is no longer inevitable, no longer the only means for improvement in economic and social status. This is consistent with our observation of increasing female marriage age in the past 40 years. Perhaps all of these findings indicate that in the future there will be fewer stigmas against women remaining single and determining their own lives.

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