



On the age at marriage: theory and evidence from Jews and Moslems in Israel

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Abstract

In this paper we extend the Becker–Keeley and Bergstrom–Bagnoli theories of the optimal age at marriage and derive systematic cross-cultural differences in the marriage pattern. We then examine the empirical relevance of the hypotheses for Jewish and Moslem population groups in Israel. The empirical analysis is more detailed than previous studies by, for example, splitting the sample according to the wife's labor market status. The evidence supports the Becker–Keeley prediction about the effects of the spouses' wage rates, the Bergstrom–Bagnoli prediction about the effect of the husband's wage rate in a traditional society, and the additional hypotheses we propose. ©1999 Elsevier Science B.V. All rights reserved.

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A man should first study and then marry. But if he cannot live without a wife, he should first marry and then study.

Talmud: 'Kiddushin, p. 29b'

Young people, if you are capable of supporting a family you should marry.

Bukhari, Sahih, ed: Ahmad Muhammad Shakir, part 7, p. 3

Accordingly, we conclude that the appropriate age for marriage is about the eighteenth year for girls and the thirty seventh plus or minus for men.

Aristotle: 'Politics'

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*Then be not coy, but use your time;
And while ye may, go marry;
For having lost but once your prime,
You may for ever tarry.*

Herrick Robert: 'To the Virgins, to make much of Time'

It is a woman's business to get married as soon as possible, and a man's to keep unmarried as long as he can.

George Bernard Shaw: 'Man and Superman'

1. Introduction

In Becker's classic theory of marriage (Becker, 1973, 1974), household commodities such as love and child care cannot be purchased in the market and are most efficiently produced by combining the time inputs of two spouses. The benefits from marriage, therefore, increase with the extent to which the spouses' time inputs jointly produce the household commodities. Furthermore, if both spouses are working and the husband's wage rate exceeds the wife's wage rate, an increase in the husband's wage rate or a decrease in the wife's wage rate will increase the benefits from marriage since the husband will specialize more in market work and the wife more in household production.

In the absence of uncertainty and costs of marriage, each individual either marries the most desirable individual of the opposite sex who will agree to marriage, or stays single if the net gain from marriage to any potential spouse is negative. The ensuing equilibrium in the 'marriage market' maximizes the aggregate gain from all marriages.

Becker's theory of marriage is independent of any economies of scale that can be obtained by different individuals sharing the same household. As marriage is conducive to the production of love and own children, there are benefits to marriage, even if the household production function exhibits constant returns to scale.

There are, however, also costs of marriage. Since there is uncertainty about the characteristics of potential spouses, as well as about how much of the gain to marriage each spouse gets to appropriate, individuals spend time and other resources searching for the best attainable match. As a consequence, the marriage age depends both on the expected gains from marriage and on the costs of finding a suitable spouse.

The costs of marriage are modeled by Keeley (1977) who combines Becker's theory with search theory, and determines an individual's age at marriage as the sum of the age at which the individual starts to search and the length of the search. Keeley assumes that there is no feedback from search behavior to the distribution of the possible gains from marriage, and his analysis is, therefore, carried out in a partial-equilibrium setting. Nevertheless, his theoretical results suggest that larger gains from marriage induce people to marry younger. In particular, if wage rates are higher for men than for women, a man's optimal marriage age decreases with his wage rate, while a woman's optimal marriage age increases with her wage rate.

Bergstrom and Bagnoli (1993) propose an alternative explanation of what determines the optimal marriage ages. Their theory is particularly relevant for a traditional society in

which only the males earn incomes that support a family. In such a society marriages are often arranged by the couple's parents for whom the economic aspects of the marriage most likely play a pronounced role. Bergstrom and Bagnoli argue that it takes time before a male's income-earnings ability is revealed to others. Young men who believe they are likely to become economically successful, therefore, postpone marriage in order to prove their ability and increase their appeal to the more desirable women. Young men who do not think they are likely to command high earnings later in life choose to marry young. On the other hand a traditional society women earn no income. The value of a woman in the marriage market therefore depends on her efficiency in household production, including the bearing and rearing of children, in which she specializes and about which postponing marriage does not reveal much additional information. Hence in the Bergstrom–Bagnoli model all women marry young, with the more desirable women marrying the older successful men, and the less desirable women marrying the younger men who are less likely to command high earnings.

In contrast to Becker and Keeley, therefore, Bergstrom and Bagnoli obtain that a man's optimal marriage age increases with his wage rate. This is even though a basic premise in both theories is that the husband specializes in market work and the wife in household production. However, while Becker and Keeley allow for the possibility that the wife works in the market, Bergstrom and Bagnoli assume that the wife specializes fully in household production.

The empirical analysis in Keeley (1977) is based on the 1967 Survey of Economic Opportunity in the US. He considers the age at marriage for both men and women, but only as a function of the person's own variables. Overall, he finds that a man's marriage age decreases with his wage rate and a woman's marriage age increases with her wage rate, which supports his theoretical prediction. However, Keeley does not differentiate between couples with a working wife and couples with a non-working wife, and for the former, between the case where the husband's wage rate exceeds his wife's and the case where the wife's wage rate exceeds her husband's. We make these distinctions which provide richer information about how the wage rates affect the age at marriage. Keeley also finds that the age at marriage increases with education, more so for women than for men, and decreases with the number of children.¹

Zhang (1995) studies the 1989 Taiwan Women and Family Survey. He considers only men's age at marriage and uses only the husband's own variables, except that he divides the sample into men with non-working wives and men with working wives. He finds that the relationship between the husband's wage rate and his age at marriage is negative if his wife does not work, while the opposite is true if his wife works. Zhang obtains a positive coefficient of education on the age at marriage. He does not include the number of children, and emphasizes the importance of 'marriage year' as a control variable. We control for 'age' instead.

¹ However, Keeley (1979), which is based on aggregate data from the US, obtains that for both spouses the expected age at first marriage increases with the relative wage (female to male). Further, for both spouses the expected age at first marriage is not significantly affected by male education, but is positively affected by female education.

Bergstrom and Schoeni (1996) use data from the 1980 US Census. Excluding schooling as an explanatory variable, they find support for the Bergstrom–Bagnoli model in that the male age at marriage increases with his annual wage earnings if he marries before the age of 30, while there is only a weak relation between the female age at marriage and her annual wage earnings. They also find a positive relation for high annual wage earnings if schooling is included together with quadratic and cubic annual wage earnings. However, if only schooling and a linear wage term are included, they – like Keeley – arrive at a strong negative relation between a man's marriage age and his wage earnings.²

The wife's educational achievement is an asset in marriage beyond its direct effects on her earnings, on her ability to be an interesting and enriching companion, and on her efficiency at home production. Thus, Benham (1974) shows that in the US a wife's education has a positive cross-productivity effect on her husband's earnings capacity, and similar results have been obtained by Scully (1983) for Iran, by Wong (1986) for Hong Kong, and by Grossbard-Shechtman and Neuman (1991) for Israel. In the same vein, Benham shows that a wife's years of schooling prior to marriage and her years of schooling after marriage are equally related to her husband's earnings, and Kenny (1983) finds that married men not only earn more than single men, but also experience a faster earnings growth. These findings suggest that a married person's labor market productivity is an increasing function of the human capital of each marriage partner. Benham argues that the positive cross-productivity effects of education result from a transfer of benefits of education by association, and that marriage offers greater opportunities for attaining these benefits than other forms of non-market association.³

In this paper we first extend the Becker–Keeley and Bergstrom–Bagnoli theories for the determination of the optimal age at marriage to situations not covered in their original analyses and derive systematic cross-cultural differences in the marriage pattern as determined by wage rates, labor-market participation, and education. We then examine the empirical relevance of the various hypotheses for Jewish and Moslem population groups in Israel. Our empirical analysis is more detailed than previous studies in that it splits the sample according to whether the wife works in the market or not, and if she works in the market, according to whether the husband's or the wife's wage rate is bigger; compares the age at marriage for modern and traditional couples; and always estimates one spouse's marriage age as a function of both spouses' socio-economic variables.

² Keeley includes schooling as an explanatory variable, but Bergstrom and Schoeni argue, as do Bergstrom and Bagnoli, that this is inappropriate since schooling itself is a sign of high earnings so that its effect is subsumed by the earnings variables. We believe it is preferable to include schooling as a separate explanatory variable as it may affect the age at marriage directly, and not only via the earnings. This is in line with how schooling is usually treated in labor force participation equations and a logical consequence of the research mentioned in the next paragraph of the text. As we report later, our basic results do not change if schooling is excluded from our regressions.

³ Grossbard-Shechtman (1993) contains a pertinent discussion of how economic factors influence the optimal age at marriage. Among other things, she emphasizes the importance of the sex ratio. See also Matsushita (1989), who presents a lifecycle model of age at first marriage. The relevant sociological literature include Rockwell (1976); Oppenheimer (1988); Bennet et al. (1989); Mare (1991); Kalmijn (1991).

2. Hypotheses about the optimal age at marriage

According to the Becker–Keeley approach, the optimal age at marriage of both spouses decreases with the benefits from specialization. If only the husband works in the market, the benefits from specialization can be proxied by the husband's wage rate, and consequently

Hypothesis 1 (Becker–Keeley). *If only the husband works in the market, both spouses' optimal age at marriage decreases in the husband's wage rate.*

If both spouses work in the market and the husband's wage rate exceeds the wife's wage rate, the benefits from specialization can be proxied by the difference between the husband's and the wife's wage rates, and hence

Hypothesis 2 (Becker–Keeley). *If both spouses work in the market and the husband's wage rate exceeds the wife's wage rate, both spouses' optimal age at marriage decreases in the husband's wage rate and increases in the wife's wage rate.*⁴

Becker and Keeley do not consider the remaining case in which both the spouses work in the market and the husband's wage rate is less than the wife's wage rate. However, compared to the case in which the husband's wage rate exceeds the wife's wage rate, there would be less benefits from specialization in household production. Nevertheless, because of the role of social norms in determining the spouses' time allocation, many household duties remain the woman's responsibility even in families where the wife appears to have more success in the labor market than her husband. Hence we conjecture that

Hypothesis 3. *If both spouses work in the market and the husband's wage rate is less than the wife's wage rate, each spouse's wage rate has less effect on the optimal ages at marriage than if the husband's wage rate exceeds the wife's wage rate, and the effect might be negligible.*

The Bergstrom–Bagnoli approach is concerned with a traditional society in which only men work in the market and posits that it takes time for a desirable man to prove his worth while there is no similar need for a woman whose marriage age is biologically determined,

Hypothesis 4 (Bergstrom–Bagnoli). *In a traditional society the husband's optimal age at marriage increases with his wage rate while all women marry young.*

Their reasoning can be extended to also encompass a modern society since the insight that the wage rate serves to reveal success is relevant not only in a traditional society. As a society develops and becomes more modern, women may no longer specialize fully in household production, but start to work in the market. A woman's efficiency in household production then becomes relatively less important, and her market earnings become a more important determinant of her prospective husband. In a modern society one expects that just like successful males postpone marriage to prove their worth, women who anticipate success outside the home will also postpone marriage in order to prove their ability as income earners and afterwards get married to a desirable male. In a modern society, therefore, the

⁴ Keeley mentions only the negative affect of the husband's wage rate and the positive effect of wife's wage rate on the own age at marriage, and not the similar effects on the spouse's age at marriage.

revelation effect implies not only that a man's marriage age should increase with his wage rate, but also that a woman's marriage age should increase with her wage rate.

Hypothesis 5. *In a modern society in which both spouses work, in the market, their optimal age at marriage increases with the spouse's own wage rate.*

Thus, the revelation effect causes the relationship between the optimal age at marriage and own wage rate to be the opposite for the husband and the same for the wife of what the Becker–Keeley theory predicts for the case in which both spouses work in the market and the husband's wage rate exceeds the wife's wage rate (Hypothesis 2).⁵

The approach emphasizing the benefits from specialization and the approach emphasizing the revelation effect of the wage rates are of course not mutually exclusive. The overall relation between the optimal marriage age and the wage rates depends on the magnitude of the two effects and is in general ambiguous. However, considered cross-culturally, the revelation effect is presumably more important in the more traditional society, where marriages are often arranged by the couple's parents. This causes the effect of a man's wage rate on his optimal marriage age to be more pronounced than in a modern Western-type society; hence

Hypothesis 6. *In a traditional society the husband's optimal age at marriage increases more with his wage rate than in a modern society.*

A highly educated and hence desirable woman would, presumably, choose to marry a highly educated and desirable man, so following the Bergstrom–Bagnoli revelation principle one expects that a man's age at marriage is positively related to his wife's education.⁶ Analogously, a man's education is also a resource in marriage and should cause a similar relationship between a woman's age at marriage and her husband's education. Accordingly,

Hypothesis 7. *One spouse's optimal age at marriage increases with the other spouse's education.*

Finally, since a higher education for women is a rarity in a traditional society, it is likely valued less in such a society than in a modern environment, and therefore,

Hypothesis 8. *In a traditional society the wife's optimal age at marriage increases less with her education than in a modern society.*

3. The Israeli context

Israel provides an attractive setting for the empirical testing of the various hypotheses since Israeli Jews and Moslems differ significantly in terms of their modernity and have different cultural and religious norms. The majority of Israelis (82.9 per cent) are Jews with

⁵ However, the Becker–Keeley conclusions are based on a traditional division of labor and may, therefore, be sensitive to modernity.

⁶ Since the benefits to marriage increase with the wife's education, the Becker–Keeley approach would, conversely, imply that men marrying highly educated wives will do so at a relatively young age.

a modern Western outlook on marriage that gives women the opportunity to pursue their own career.⁷ Most Jews live in larger urban centers. There is also a sizeable minority of Moslems (13.2 per cent) who live a more traditional way of life with many restrictions on women's activities outside the home. Moslems mostly reside in smaller villages and towns (Lewin-Epstein, 1987), and there is a pronounced residential segregation between the Jewish and the Moslem populations. The social interaction is very limited and there is almost no intermarriage between Jews and Moslems.⁸

There is a conspicuous difference between the rates at which Jewish and Moslem women are active in the labor market. While almost half of Jewish wives work, very few of Moslem married women work. Specifically, the employment rate was 46.9 per cent for Jewish married women, and only 4.5 per cent for Moslem married women. Furthermore, while 23.9 per cent of the Jewish married women held a full-time job, this is true for only 1.6 per cent of the Moslem married women. This reflects the modern Western orientation of the Jewish population and, in contrast, the more traditional orientation of the Moslem population. In fact, the Moslem families with a wife who participates in the labor market are atypical in that their educational achievement is very high for both the spouses. More than half of the men and the women in these Moslem families have at least started a post-secondary education. This is substantially more education than for the Jewish families with a working wife, and is particularly striking on the background of the much lower average educational achievement for the Moslem population than for the Jewish population.⁹ Hence, the Moslem families with a non-working wife tend to follow a traditional way of life which in important aspects is significantly different from the modern life style of the Jews, while the relatively few Moslem families where the wife works are culturally affined to a modern life style that is similar to that of the Jews.

4. The data

The data are drawn from a 20 per cent sample of the 1983 Census of Population and Housing conducted by the Israeli Central Bureau of Statistics. This is the most recent census which was available at the time of the study.¹⁰ The sample includes only civilian wage earners. We focus on intact Jewish and Moslem families where both spouses are married for the first time and the husband works. Hence we do not consider individuals who remain

⁷ The population percentages in this section are from the full 1983 Census.

⁸ Israel also has small Christian and Druze minorities. The Jews are stratified into two ethnic subgroups: Westerners and Easterners. See Neuman (1994) for a socio-economic description of the different ethnic groups in Israel. Since the modernity-traditionalism contrast is clearest between Jews and Moslems, we concentrate on a comparison of these two groups.

⁹ Only 8.2% of the non-Jewish population has at least 13 years of schooling, compared to 23.0% of the Jewish population. Non-Jews and Jews have on average 4.6 and 10.3 years of schooling, respectively. See Grossbard-Shechtman and Neuman (1998).

¹⁰ See Israeli Central Bureau of Statistics (1987) for documentation of the Census. More recent Labor Force Surveys and Income Surveys are not suitable for our purpose due to their small number of observations. There is a later census from December 1995, but it was released after the completion of this paper.

Table 1
Sample characteristics: means and standard deviations (in parentheses), married couples, Israeli Census 1983

Characteristics	Non-working wife		Working wife		of which: Husband's wage rate exceeds wife's		Wife's age rate exceeds husband's	
	Jews	Moslems	Jews	Moslems	Jews	Moslems	Jews	Moslems
HUSBAND	24.92	22.79	24.73	25.69	24.67	25.40	24.88	26.15
Age at marriage	(4.46)	(4.33)	(4.04)	(4.53)	(3.97)	(4.09)	(4.17)	(5.14)
Hourly wage rate (shekel)	206.98	118.08	243.58	173.95	281.13	206.57	157.32	121.64
	(251.59)	(132.09)	(558.36)	(141.05)	(659.59)	(162.00)	(133.84)	(73.10)
Hours of work per week	45.51	43.73	47.24	41.04	46.48	38.46	48.99	45.17
	(12.12)	(10.89)	(11.08)	(12.18)	(10.48)	(12.10)	(12.16)	(11.15)
Schooling (years)	10.20	7.52	12.52	12.36	12.52	12.47	12.52	12.17
	(3.96)	(4.10)	(3.35)	(4.32)	(3.95)	(4.57)	(3.88)	(3.89)
0–8 years of schooling (%)	35.69	69.41	15.20	22.95	15.37	23.89	14.80	21.43
9–12 years of schooling (%)	45.40	21.00	43.17	26.93	42.85	20.24	43.91	37.66
13+ years of schooling (%)	18.91	9.59	41.63	50.12	41.78	55.87	41.29	40.91
Age (years)	45.20	35.06	40.57	33.84	40.86	34.09	39.90	33.43
	(13.65)	(9.82)	(11.00)	(7.96)	(10.85)	(8.16)	(11.33)	(7.64)
WIFE	21.14	19.13	21.33	21.93	21.18	21.34	21.67	22.88
Age at marriage	(3.91)	(3.13)	(3.35)	(3.89)	(3.30)	(3.38)	(3.42)	(4.45)
Hourly wage rate (shekel)	–	–	176.24	152.55	133.81	123.84	273.70	198.60
			(249.18)	(113.78)	(97.06)	(85.10)	(411.64)	(136.88)
Hours of work per week	–	–	33.21	31.43	34.35	33.02	30.60	28.90
			(11.83)	(10.33)	(11.52)	(10.23)	(12.12)	(10.02)
Schooling (years)	9.33	5.27	12.32	12.11	12.00	11.38	13.05	13.29
	(3.81)	(4.15)	(3.60)	(3.98)	(3.55)	(4.35)	(3.61)	(2.97)
0–8 years of schooling (%)	41.62	80.47	13.75	14.96	14.92	21.06	10.06	5.20
9–12 years of schooling (%)	45.87	17.88	44.62	27.93	48.40	28.74	35.93	26.62
13+ years of schooling (%)	12.51	1.65	41.63	57.11	36.68	50.20	54.01	68.18
Age (years)	41.41	31.38	37.16	30.07	37.36	30.02	36.69	30.14
	(13.34)	(9.23)	(10.06)	(6.97)	(10.01)	(7.02)	(10.17)	(6.91)
Number of children	3.04	4.74	2.38	2.76	2.42	3.02	2.28	2.34
	(1.96)	(3.37)	(1.46)	(2.37)	(1.47)	(2.59)	(1.42)	(1.91)
Sample size	31,198	6,704	33,476	401	23,322	247	10,154	154

single or the complications caused by family breakdowns. The sample is large, including 64 674 Jewish couples and 7105 Moslem couples.

In Table 1 the sample is divided into Jews and Moslems, and according to the wife's labor market status.¹¹ In our sample, 51.9 per cent of the Jewish wives work, and 23 322 (69.7 per cent) of the 33 476 working Jewish wives earn less than their husband. Only 5.6 per cent of the Moslem wives work, and 247 (61.6 per cent) of the 401 working Moslem wives earn less than their husband.

Men marry considerable older than women, with the age difference for both religious groups close to 3.5 years.¹² In general, people marry younger in a more traditional

¹¹ All variables (except for age at marriage) refer to the time of the survey.

¹² That men marry older than women is a universal phenomena in the more than 90 countries studied in United Nations (1990), as emphasized by Bergstrom and Bagnoli (1993).

society, and we, therefore, expect that Moslems will marry younger than Jews. This is indeed the case in our sample. Furthermore, the marriage ages for Jews are similar whether the wife works or not. The marriage ages for Moslems are significantly higher if the wife works than if not, and even higher than for their Jewish counterparts. This is another indication of the atypical nature of the Moslem couples where the wife works.

The marriage age is 24.92 years for Jewish men and 21.14 years for Jewish women if the wife does not work, and almost the same if the wife works. The marriage age is 22.79 years for Moslem men and 19.13 years for Moslem women if the wife does not work, and 2.90 years higher for men and 2.80 years higher for women if the wife works.

Jews earn more than their Moslem counterparts, men earn more than women, and men married to a working wife earn more than men married to a non-working wife.¹³ For instance, if the wife does not work, the wage rate is 58 per cent higher for Jewish men than for Moslem men, and if the wife works, the wage rate is 32 per cent higher for Jewish men than for Moslem men. The wage rate is 12 per cent higher for Jewish women than for Moslem women. If the wife works, the overall ratio of the female to male wage rate is 0.72 in Jewish families and 0.88 in Moslem families. In couples where the husband's wage rate exceeds the wife's, the respective ratios are 0.47 and 0.60, while in the couples where the wife's wage rate exceeds the husband's, the respective ratios are 1.74 and 1.63.¹⁴

Turning to education, if the wife does not work, Jewish men and women have significantly higher educational achievements on both the secondary and the post-secondary level than Moslem men and women. In fact, if the wife does not work, the average number of years of education is 10.20 for Jewish men and 9.33 for Jewish women, but only 7.52 for Moslem men and 5.27 for Moslem women. However, if the wife works, the percentage of men and women who have some post-secondary education is higher for Moslems than for Jews. The average number of years of education is almost the same for Jews and Moslems, namely 12.52 for Jewish men and 12.32 for Jewish women, and 12.36 for Moslem men and 12.11 for Moslem women.

Considering families where both the spouses work, men work longer hours than women. The difference is about 14 h per week for Jews and 10 h for Moslems. Jews work more than Moslems, namely about 6 h for men and 2 h for women.

The Moslem couples in our sample are younger than the Jewish couples. The families with a non-working wife are of an older cohort than the families where both spouses work, expressing a change in social norms and habits regarding women's participation in the labor force.

¹³ The Census contains no information about the couple's non-labor income.

¹⁴ Jacobson (1994) presents an international comparison of the ratio of women's to men's wage rates for industrialized capitalist societies in 1990–1991. It ranges from 0.51 in Japan to 0.91 in Australia. The ratio for Israel, US, West Germany, Ireland, Switzerland and the United Kingdom is around 0.70; for Sweden and Norway around 0.89; and Denmark, France and Greece around 0.80. In Canada, at the beginning of the 1990's, female full-time, full-year wage earners received about 65 per cent of their male counterparts (Gunderson and Riddell, 1993, p. 553).

Jews have smaller families than Moslems: the difference is minor in families where the wife works (2.38 and 2.76 children, respectively) and significant in families where the wife stays home (3.04 and 4.74 children, respectively).¹⁵

5. The empirical findings

Having examined the Jewish and Moslem samples and their breakdown according to the wife's employment status, we now test the various hypotheses regarding the age at marriage stated in Section 2. Couples with non-working and working wives are analyzed separately. Within the latter group, a distinction is made between couples where the husband has a higher wage rate than his wife, which means that he has a relative advantage in labor market activities, and families where the wife commands a higher wage rate, so that she has a relative advantage in labor market activities.¹⁶ We will explore how the wage rates, the levels of education, and the other explanatory variables influence the marriage age for men and women in each of the three cases, and our method will emphasize the differences between the Jews and the Moslems. This will be done by pooling the Jewish and Moslem samples and adding interaction terms capture the different effects of the various variables in the Moslem samples.

Table 2 presents results for the three sets of OLS regressions: the first set consists of regressions (1) and (2) which are run on the sample where the woman does not work. The second set consists of regressions (3) and (4) that refer to the sample of working men and women with the husband's wage rate exceeding his wife's. The third set consists of regressions (5) and (6) where the husband has a lower wage rate than his wife. Each set considers men and women separately, pools the data of the Jewish and Moslem samples, and uses interaction terms to distinguish the effects for the two ethnic group.¹⁷

The dependent variable is age at marriage. The main independent variables are the spouses' wage rates (in *ln*) and their educational achievements. The other independent variables, which are included mainly as controls, are: the respondent's own age,¹⁸ the number of children, and a dummy variable for Moslem. All our subsamples are large, with the smallest subsample exceeding 10 000 observations. The explained variance R^2 is quite large, ranging from 0.177 to 0.278, and is larger for men's marriage age than for women's marriage age.

¹⁵ As we have not limited the spouses' ages, not all couples have completed their fertility. The non-working Moslem wives are, on average, about 10 years younger than the non-working Jewish wives, so it is likely that the differences in completed fertility are larger than the fertility differences in Table 1.

¹⁶ As in the other empirical studies of the age of marriage, the wage rates refer to the time of the survey rather than to the time of marriage. We do not have information about the wage rates at the time of marriage, and in any case feel that it is more appropriate to use the wage rates at the time of the survey since they can be considered estimates of the spouses' future earning powers at the time of marriage.

¹⁷ There may be an endogeneity problem for schooling and the number of children. However, we have decided against a simultaneous estimation approach, since education need not be completed before marriage and the actual number of children may differ from the desired number.

¹⁸ We do not include the spouse's age in addition to the respondent's own age as the two are highly correlated.

Table 2
Age of marriage regressions, Jewish and Moslem Israeli couples, Israeli Census 1983^a

Independent variables	Couples with non-working wife		Couples with working wife of which			
	(1) Men	(2) Women	Husband's wage rate exceeds wife's		Wife's wage rate exceeds husband's	
			(3) Men	(4) Women	(5) Men	(6) Women
Own wage rate (<i>ln</i>)	-0.278 (8.53)	-	-0.284 (5.88)	0.114 (2.73)	-0.133 (1.83)	-0.028 (0.42)
Spouse's wage rate (<i>ln</i>)	-	-0.238 (8.45)	-0.014 (0.28)	-0.242 (5.82)	-0.062 (0.82)	-0.055 (0.86)
9–12 years of schooling	0.148 (2.68)	0.425 (8.92)	0.086 (1.12)	0.465 (6.75)	-0.180 (1.47)	0.682 (5.28)
13+ years of schooling	0.400 (5.19)	1.667 (22.28)	0.387 (4.40)	1.514 (18.65)	0.027 (0.20)	1.549 (11.13)
Spouse has 9–12 years of schooling	0.580 (10.54)	0.130 (2.73)	0.841 (10.50)	0.247 (3.74)	0.923 (6.26)	0.194 (1.81)
Spouse has 13+ years of schooling	1.324 (15.26)	0.490 (7.35)	1.537 (16.25)	0.778 (10.30)	1.593 (10.01)	0.704 (5.90)
Age	0.150 (87.41)	0.120 (79.72)	0.185 (79.33)	0.098 (45.32)	0.205 (59.06)	0.102 (30.45)
Number of children	-0.447 (37.70)	-0.538 (52.62)	-0.654 (37.75)	-0.647 (43.50)	-0.707 (25.75)	-0.717 (29.86)
Moslem	-7.028 (16.40)	-3.643 (9.84)	-9.644 (4.46)	-2.541 (1.27)	-5.795 (1.88)	-5.363 (1.95)
Moslem* own wage rate (<i>ln</i>)	0.217 (2.60)	-	0.492 (0.89)	-0.163 (0.40)	-1.109 (1.40)	-0.933 (1.38)
Moslem* spouse's wage rate (<i>ln</i>)	-	0.159 (2.20)	0.014 (0.03)	-0.315 (0.66)	-0.584 (0.76)	-0.982 (1.41)
Moslem* 9–12 years of schooling	-0.212 (1.54)	-0.524 (4.11)	0.773 (0.96)	0.159 (0.23)	1.454 (1.71)	1.925 (1.33)
Moslem* 13+ years of schooling	0.801 (3.97)	-0.280 (0.81)	0.422 (0.53)	1.071 (1.45)	2.520 (2.77)	2.692 (1.81)
Moslem* spouse has 9–12 years of schooling	0.503 (3.43)	-0.099 (0.84)	1.289 (1.60)	0.924 (1.34)	1.847 (1.11)	1.214 (1.63)
Moslem* spouse has 13+ years of schooling	0.598 (1.50)	-0.240 (1.38)	1.833 (2.16)	0.140 (0.20)	2.484 (1.46)	0.862 (1.09)
Moslem* age	0.226 (32.26)	0.115 (16.96)	0.230 (6.32)	0.171 (4.49)	0.421 (9.02)	0.486 (10.60)
Moslem* number of children	-0.343 (14.62)	-0.035 (1.71)	-0.077 (0.65)	-0.006 (0.06)	-0.615 (3.17)	-0.564 (3.26)
Intercept	20.337 (111.57)	18.439 (118.27)	19.102 (78.91)	18.632 (89.80)	18.161 (53.17)	18.512 (61.98)
R ²	0.269	0.255	0.235	0.182	0.278	0.177
Sample size	37,902	37,902	23,569	23,569	10,308	10,302

^a Absolute *t*-statistics in parentheses.

It is expected that in regressions (3) and (4) where both spouses work and the husband's wage rate exceeds the wife's, the Becker–Keeley effect dominates, and according to Hypothesis 2, that both spouses' marriage age decreases with his wage rate and increases with her wage rate. This is confirmed by the regression results, except that the wife's wage rate

has no significant effect on his age at marriage. Thus, we find that the husband's wage rate has a negative significant coefficient of -0.284 on his own age at marriage and of -0.242 on her age at marriage, and that the wife's wage rate has a positive significant coefficient of 0.114 on her own age at marriage. The reason that the wife's wage rate has a smaller effect than the husband's wage rate is presumably that social norms and attitudes are less restrictive for men than for women. The evidence is thus inconsistent with the part of the Bergstrom–Bagnoli revelation effect for a modern society (Hypothesis 5) which predicts that the husband's optimal age at marriage increases with his wage rate.

Regressions (1) and (2) present results for couples where the wife does not work. In this case, too, it is expected that the Becker–Keeley effect is decisive, and according to Hypothesis 1, that both spouses' age at marriage decreases with the husband's wage rate. This is again confirmed by the regression results: the coefficients of the husband's wage rate on his own and his wife's marriage ages are negative and very similar to the coefficients in regressions (3) and (4). This is likely because the socio-economic characteristics of the Jewish couples in the two sets of regressions are similar.

In a traditional society the Bergstrom–Bagnoli revelation effect counters the negative relationship between the husband's wage rate and his age at marriage. The most traditional group in the Israeli context are Moslem families with non-working wives. This group has very low educational attainments and large families (see Table 1). Indeed, in regressions (1) and (2), the coefficient of the interaction term Moslem* own wage rate is 0.217 , which almost neutralizes the -0.278 coefficient of the own wage rate that relates to the entire sample. The coefficient of the interaction term Moslem* husband's wage rate in the regression of the woman's age at marriage is 0.159 . This implies that the coefficient for a Moslem husband's wage rate is -0.079 and hence much smaller (in absolute value) than the coefficient of -0.238 for a Jewish husband's wage rate. Both of these findings are evidence in favor of Hypotheses 4 and 6. The positive coefficient in regression (1) of the interaction term Moslem* 13+ years of schooling for Moslem men also indicates that the Moslem men who seek an academic education tend to postpone marrying, and further supports the relevance of the revelation theory for the Moslems.¹⁹ The fact that in regression (3) the coefficient of the interaction term Moslem* own wage rate is insignificant indicates that the effects of the spouse's own wage rate is similar for Jews and Moslems, and hence that the revelation effect is not more relevant for the (relatively few) modern Moslem couples where the wife works in the labor market than for the similar Jewish couples.

In regressions (5) and (6) both the spouses work, but the husband's wage rate is less than his wife's.²⁰ All the wage rate coefficients are insignificant, which supports Hypothesis 3. This is similar for the Moslem sample as well.

Following Bergstrom and Schoeni (1996) we experimented with the age at marriage being a nonlinear function of the wage rates. We first added the squared wage rates. Nine of the twelve squared variables (in the six regressions) turned out to be insignificant, but

¹⁹ We would not expect the coefficient of the interaction term Moslem* 9–12 years of schooling to be significant since marriages usually take place at ages where 12 years of schooling could have been completed.

²⁰ This is partly as a result of her higher education by about half a year for Jews and over one year for Moslems – see Table 1.

even in the three cases where the squared variables were significant, the basic relationships were unchanged. For instance, in regression (1) augmented with a squared wage rate, the negative coefficient of the own wage rate was replaced by an insignificant coefficient of the own wage rate (0.174, $t=0.88$) and a significant negative coefficient of the squared own wage rate (-0.045 , $t=2.33$). However, the relationship is still downward sloping for all wage rates in our sample. The pattern is similar in the augmented regressions (4) and (5) where the squared wage rates turned out to be significant. We then included both squared and cubed wage rates. In the few cases where they were significant, the basic predicted pattern did not change.

In accordance with Hypothesis 7 we find that the marriage age of both sexes increases with the educational achievements of both the spouses, and most for the wife. Furthermore, in accordance with Hypothesis 8 the interaction term Moslem* 9–12 years of schooling for the wife has a negative coefficient. While Jewish women who have at least some high-school education marry about half a year later than women with less than 9 years of schooling, and the attainment of a higher education results in the delay of another year (see regressions (2), (4), and (6)), this is not the case for the traditional non-working Moslem women. For them, having 9–12 years of schooling causes a drop of 0.524 in the age at marriage and more that outweighs the positive effect of 0.245 for non-working Jewish women (regression (2)). The very small number of Moslem women with a higher education leads to a non-significant coefficient for the interaction term Moslem* 13+ years of schooling.²¹

The coefficients of the respondent's age are positive, and more so for Moslems than for Jews. The correlation between the number of children and age at marriage is negative for both spouses for all subgroups. The reason here might be that couples who wish to have large families marry earlier. Compared to the Jews, the effects of the number of children is either the same or more negative for Moslems. Finally, the coefficient on the Moslem dummy variable is significantly negative, ranging from -2.541 years to -9.644 years, indicating that Moslems marry earlier than Jews. Note that the age differences obtained from the regressions are even more pronounced than the simple differences in Table 1.

6. Summary and conclusions

Becker's theory of marriage posits that the benefits from marriage increase with the extent to which the spouses' time inputs complement each other in the joint production of household commodities. By combining Becker's theory with optimal search behavior, Keeley shows that the age at marriage decreases with the benefits from marriage. If only the husband works, there are considerable benefits to his specialization in labor market activities and her specialization in household activities, and the Becker–Keeley theory predicts that the age at marriage for both sexes decreases with the husband's wage rate.

²¹ We believe that schooling is a key variable in explaining the age at marriage. However, since Bergstrom and Bagnoli (1993) and Bergstrom and Schoeni (1996) argue that schooling should not be included as a separate explanatory variable in addition to the wage rate, we tried to omit the schooling variables from the regressions. This did not change the basic pattern of how the wage rates affect the age at marriage. Zhang (1995) also obtains similar results with and without schooling in his regressions.

Our empirical evidence from Israel confirms this. If both spouses work and the husband's wage rate exceeds the wife's wage rate, the benefits increase with the difference between the husband's and the wife's wage rates. Hence, the Becker–Keeley theory predicts that the marriage age of both spouses decreases in the husband's wage rate and increases in the wife's wage rate. For the case in which the husband's wage rate is less than the wife's wage rate we conjectured that because social norms still make many household chores a woman's duty even when her market productivity exceeds her husband's, the wage rates would have less effects than in the previous case, and that the effects might be negligible. Again, the predictions are supported by the empirical findings.

According to the Bergstrom and Bagnoli theory of marriage, it takes time to establish economic success. As a result, individuals who expect to prosper postpone marriage until their high incomes are revealed, making them desirable mates. Individuals who do not expect to do well economically are less desirable and marry younger. The Bergstrom–Bagnoli revelation effect is presumably strongest in a traditional society in which the wife does not work, and it counters the negative effect of the husband's wage rate on the marriage age of both sexes caused by the Becker–Keeley complementarity effect. Empirically, this is supported by our finding that for both spouses the negative coefficient for a Moslem husband's wage rate on the age at marriage is much closer to zero than the negative coefficient for a Jewish husband's wage rate.

We include the spouses' education as explanatory variables and find that the marriage ages tend to increase in both spouses' education, and more so for women than for men. While education increases the age at marriage for non-working Jewish women, this is not the case for non-working Moslem women for whom education decreases the age at marriage.

There are still only a handful economic studies of the age of marriage. Further exploration of this issue is desirable, both to examine the robustness of the existing empirical results and to widen the set of socio-economic explanatory variables. In particular, our knowledge can be enriched by investigations of subsequent generations in the same country, of countries with different socio-economic and cultural setups, and of countries whose social stratification has been changed by immigration or population transfers.²²

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²² Israel is a good candidate for this since the massive immigration from the former USSR during 1989–1994 resulted in a 12 per cent increase in the population. It would also be interesting to investigate the effects of the significant ideological and political changes caused by the unification of Germany and the breakup of the USSR.

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