INCOMPLETE

Gender, Markets and Families

Aloysius Siow[1]
University of Toronto
Department of Economics

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Abstract

This paper summarize some recent research in economics which seeks to explain gender differences in marriage and labor markets. This research is guided by two principles: First, gender differences in reproductive technology matter. Second, general equilibrium effects are important in determining gender differences in behavior and for evaluating their welfare consequences.

There are significant differences in behavior between men and women in the marriage and labor markets. Most of these differences appear both developed and undeveloped societies, historical and contemporary societies. In the labor market,

- Men have higher wages than women.[1]
- Married men have more labor market experience than married women.[2]

In the marriage market,

- The mean age of first marriage is higher for men than for women.[3]
- There are more never married men than women.[4]
- For many industrial societies since the seventies, there has been a significant rise in the share of births out-of-wedlock.

Although not exhaustive, the above gender differences are widespread and well known. The objective of this paper is to summarize some recent research in economics which seeks to explain these differences. This research is guided by two principles: First, gender differences in reproductive technology matter. Second, general equilibrium effects are important in determining gender differences in behavior and for evaluating their welfare consequences.[5] A caveat is necessary. I do not claim that these two principles alone explain the gender differences presented above. There are other factors which are also important but they are not the focus of this survey.[6]

[1] In all 11 countries, after controlling for age, education in some cases, and hours of work, married men earnings are higher than that of single men (Schoeni 1995).

[2] In 8 OECD countries, the labor force participation rates of married men are higher than married women (Blau and Ferber 1986: Chapter 10; Blau and Kahn 1995).

[3] In 91 countries, the mean age at first marriage is higher for men than for women (Bergstrom and Bagnoli 1993).

[4] In 89 out of 138 countries, there are more never married 45-49 year old men than women (United Nations 1992). Haines (1996) showed similar results for 5 western countries since 1840.

[5] While new to economists, these two principles have been used by anthropologists and psychologists since the seventies to explain differences in gender behavior.The classic reference is Trivers (1972). For recent surveys, see Betzig 1997; Blaffer Hrdy 1999.

[6] The economic literature provides two standard non-mutually exclusive explanations for gender differences. First, gender differences are caused by inherent gender differences

The primary gender difference in reproductive technology discussed in this paper is differential fecundity. That is, women are fecund for a shorter period of their lives than men. If children are a primary output of marriage, differential fecundity should lead to differences in behavior between men and women.

The papers discussed here build upon the literature on the economics of the family. The classic reference is Becker 1991. Recent surveys include Bergstrom (1997) and Weiss (1997). An important feature of most of the models discussed here is search friction in the marriage market, first introduced by Mortensen (1985).[7]

1 A basic model

Consider a society in which an equal number of men and women enter the marriage market in each period. We normalize the number of new entrants of each gender to 1. For every individual, the death hazard is $1-\delta$. All women are fecund when they enter the marriage market. For every woman, the menopausal hazard is $1-\mu$. Marriage only occurs between men and fecund women. An unmarried woman who becomes menopausal will leave the marriage market.

The per period return to a single individual is zero. The per period return to a single menopausal woman is also zero. When a single man and a fecund single woman meets in the marriage market, they will draw an idiosyncratic match value ε from the cumulative distribution $F(.)$. ε is the expected present value of marriage for that couple. If they agree to marry, they will each receive ε and leave the marriage market forever. There is no re-entry into the marriage market.

Since married individuals and menopausal women leave the marriage market, for expositional ease, men and women refer to individuals who are active in the marriage market. Since all women are ex-ante identical, let a woman's reservation match value be ε_w. Similarly, let a man's reservation match value

in child rearing productivities, that is comparative advantage across gender in household production. Second, gender differences in the labor market and family setting often are due to self enforcing social norms and not inherent difference across gender. See Altonji and Blank (1999) for a recent survey of gender differences in the labor market using these two explanations.

[7] Also see Burdett and Cole 1997; Shimer and Smith 2000.

be ε_m. In order for a couple to marry, the binding reservation match value, $\underline{\varepsilon}$, is

$$\underline{\varepsilon} = \max(\varepsilon_w, \varepsilon_m)$$

The probability that a random match between a man and a woman will not result in a marriage is $F(\underline{\varepsilon})$.

Since women are scarce in the marriage market, I assume that every woman will meet a man in every period. In any period, let p be the probability that a man will meet a woman. Then the stock of women in the marriage market is:

$$n_w = \sum_{i=0}^{\infty} (\delta \mu F(\underline{\varepsilon}))^i = \frac{1}{1 - \delta \mu F(\underline{\varepsilon})}$$

The stock of men in the marriage market is:

$$n_m = \sum_{i=0}^{\infty} [\delta(pF(\underline{\varepsilon}) + (1-p))]^i = \frac{1}{1 - \delta p F(\underline{\varepsilon}) - \delta(1-p)}$$

Assume that p is equal to the ratio of women to men,

$$p = \frac{n_w}{n_m}$$

Now let a man and a woman meet and draw a match value of ε. If they both agree to marry, they will each get will get ε. Let E be the expectations operator. If she decides not to marry, she will get in expected present value:

$$\begin{aligned} v_w &= 0 + \delta\mu(F(\underline{\varepsilon})v_w + (1 - F(\underline{\varepsilon}))E(\varepsilon|\varepsilon > \underline{\varepsilon})) \\ &= \frac{\delta\mu(1 - F(\underline{\varepsilon}))E(\varepsilon|\varepsilon > \underline{\varepsilon})}{1 - \delta\mu F(\underline{\varepsilon})} = \delta\mu(1 - F(\underline{\varepsilon}))E(\varepsilon|\varepsilon > \underline{\varepsilon})n_w \end{aligned} \tag{1}$$

Note that $\varepsilon_w = v_w$.

If he chooses not to marry, he will get in expected present value:

$$\begin{aligned} v_m &= 0 + \delta((pF(\underline{\varepsilon}) + (1-p))v_m + p(1 - F(\underline{\varepsilon}))E(\varepsilon|\varepsilon > \underline{\varepsilon})) \\ &= \frac{\delta p(1 - F(\underline{\varepsilon}))E(\varepsilon|\varepsilon > \underline{\varepsilon})}{1 - \delta p\underline{\varepsilon} - \delta(1-p)} = \delta p(1 - F(\underline{\varepsilon}))E(\varepsilon|\varepsilon > \underline{\varepsilon}))n_m \end{aligned} \tag{2}$$

Note that $\varepsilon_m = v_m$. Thus:

$$\frac{\varepsilon_w}{\varepsilon_m} = \frac{v_w}{v_m} = \mu \tag{3}$$

(3) says that the reservation match value for women is lower than the reservation match value for men. Thus the binding reservation value $\underline{\varepsilon}$ is equal to ε_m. $\underline{\varepsilon}$ is not efficient. Women will be willing to transfer resources to men to obtain a lower binding reservation match value.

The expected return for a new female entrant to the marriage market is:

$$R_w = F(\underline{\varepsilon})v_w + (1 - F(\underline{\varepsilon}))E(\varepsilon|\varepsilon > \underline{\varepsilon}) = \frac{v_w}{\delta\mu} \tag{4}$$

The expected return for a new male entrant to the marriage market is:

$$R_m = (pF(\underline{\varepsilon}) + (1-p))v_m + p(1 - F(\underline{\varepsilon}))E(\varepsilon|\varepsilon > \underline{\varepsilon}) = \frac{v_m}{\delta} \tag{5}$$

Together, (3), (4) and (5) show that:

$$R_w = R_m \tag{6}$$

The expected return for a new female entrant to the marriage market is equal to the expected return for a new male entrant. So even though women suffer from impending menopause, their lifetime expected utility is the same as that of men. This equality is a market equilibrium result. The economic intuition is as follows. The same number of men and women enter the marriage market in each period. Each individual marry at most once. In steady state equilibrium, even though women are leaving the marriage market earlier through menopause, men and women in the same cohort are implicitly marrying each other. Every married couple receives the same utility within marriage. Thus from an ex-ante perspective, men cannot obtain a higher return from entering the marriage market than women.

This marriage market is socially inefficient. Upon meeting a woman, since a man is always fecund, he is privately willing to have a higher reservation match value than the woman. If he turns the match down, he does not take into account the probability that his potential partner may become menopausal and not re-enter the marriage market. If his potential partner

becomes menopausal and he returns to the marriage market, there will now be a gender imbalance in the marriage market. If he successfully marries subsequently, that means that another man must be unsuccessful since there is one less woman in the marriage market. The higher reservation match value of men creates a negative externality for the society. The inefficiency is not due to the non-transferable utility assumption. When a man and a woman meets, if she can transfer resources to him to induce him to have a lower reservation match value, then their decision to marry or not will be bilaterally efficient. It does not completely eliminate the private option value he gets from being always fecund. As long as he gets a strictly positive option value from being always fecund, he will turn down too many matches to be socially efficient.

Since men do not meet women in every period and men do not leave the marriage market, the average age of first marriage for men is higher than that for women.

The marriage rate for men and women are the same.

Differential fecundity by itself is not sufficient to generate gender differences in the marriage market. Search friction is an integral part of the model. If there is no search friction and any man and fecund woman obtain the same payoff from marriage, there will be no reason for delay in marriage. In this case, all men and women will marry in the first period and there will be no gender difference in the mean age of first marriage. Heterogeneity across men and women is necessary to generate gender differences in the marriage market.

As will be shown below, neither the lower reservation match value of women nor the equality of expected returns from entering the marriage market are robust predictions of this class of models. The rationale for presenting this basic model is to show how this class of models work and to build on it.

2 Remarriage & assortative matching

The basic model makes the counterfactual prediction that the never married rates for men and women are the same. The reason for this counterfactual prediction is that individuals are allowed to marry at most once. If remarriage is feasible upon divorce or death of a spouse, and widows or divorced women have a lower remarriage rate than widowers or divorced men, then the never married rate will be different across gender. For example in North America,

at least 30% of first marriages fail. 20% and 60% of divorced women and men will remarry respectively. This differential in remarriage rates suggest that 12% of women who marry for the first time will marry divorced men. There is at least 12% fewer never married women to match with never married men. As a result the never married rate for men will exceed that of women. There is nothing unusual about North American behavior. Differential remarriage rates are the norm across societies.[8]

Differential fecundity provides a reason why the remarriage rate is higher for men than women. Thus this class of models provide an explanation for why the never married rate is higher for men than women.

Hamilton and Siow (2000; hereafter HS) use the above framework to explain marriage patterns in 18th century Quebec. We divide the population into two groups, high and low status. High status individuals comprised of 5.8% of the population. The never married rate of high status males and females were 41% and 36% respectively. The never married rate of low status males and females were 18% and 12% respectively. Males had a higher never married rate than females. In that time period, there was no divorce. 45% of widowers remarried and 27% of widows remarried.

The number of high status individuals who married each other was approximately the same as the number of high status males who married low status females, which was also approximately the same as the number of high status females who married low status males.

The mean age of first marriage for high and low status females were 22 and 21 respectively. The mean age of first marriage for high and low status males were 31 and 28 respectively.

Our objective was to construct a model of marriage which included differential fecundity, search frictions in marriage and assortative matching to see how well it can explain the above data. In every period, new individuals enter the marriage market. Individuals may leave the market in three ways. First, two single individuals who meet in the marriage market leave temporarily if they marry. Second, individuals may die. Third, women exogenously leave the market at a higher rate than men. Married individuals may return to the marriage market when their spouses die. Widows may return to the marriage market at a lower rate than widowers. Participants

[8]Chamie and Nsuly (1981) showed that divorced men were more likely to remarry than divorced women in all forty seven countries that they had data for. Dupâquier, et al. (1981) has similar historical data from Europe.

in the marriage market do not distinguish between never married individuals and reentrants. Following the custom in 18th century Quebec, we assume that there is no divorce.

To address heterogeneity within the marriage market, we assume that there are two types of individuals: high status (h) and low status (l). Equal numbers of males and females are born each period. We normalize the number of new entrants of each gender to 1, a_h fraction of these adults, equally divided between men and women, are high status and the rest are low status.

Individuals are potentially infinitely lived. Each h individual who is alive in the current period will live in the next period with probability p_h. Each l individual who is alive in the current period will live in the next period with probability p_l. A person may re-enter the marriage market when his or her spouse dies.

In order to accommodate the fact that there are more unmarried men than women, we assume that women leave the marriage market at a faster rate than men. Each woman in a current period will remain in the marriage market in the next period with probability η. Married women will also "leave" the marriage market at a rate of $1-\eta$. Married women who leave will not re-enter the marriage market when they are widowed.[9] This is the only distinction between men and women.

We assume that there is random matching in the marriage market. Each individual may meet at most one other individual of the opposite sex per period. Since women are scarce in the marriage market, we assume that in every period, a woman meet a man of status s with probability equal to the proportion of men of type s in the marriage market. A man meets a woman of status S with probability equal to the number of woman of type S divided by the total number of men. When an eligible man of status s and a woman of status S meet, they will fail to marry with probability $\lambda(S,s)$.[10] With probability $\overline{\lambda(S,s)}$, an Ss pair that meets will marry (for any variable α, $\overline{\alpha}$ is $1-\alpha$). When they do not marry, they may return to the marriage market in the next period.

We estimate a just identified model. By construction, we match the never married rates in the data exactly. The length of a period was estimated as

[9] Marriages do not end when a women 'leaves' the marriage market–the exit rate determines whether she will re-enter the market if she is widowed.

[10] We use upper case letters for women, small case letters for men. Note, however, that there is no theoretic distinction between men and women of a given status (apart from the higher exit rate for women, which is not status dependent).

1.4 years. Our estimate for η is 0.988. This implies that in any period, a man met a woman with probability 0.66. That is, with probability 0.34, a man did not meet any woman.

The point estimates for $\lambda(H,h)$, $\lambda(H,l)$, $\lambda(L,H)$, and $\lambda(L,l)$ are 0.67, 0.94, 0.94 and 0.73 respectively. High status individuals that met each other were more likely to marry than other type of matches.

We used only the mean age of first marriage for low status women, 21, in the estimation. The predicted mean age of first marriage for high status women was 24. The predicted mean ages of first marriage for high and low status men were 26 and 24 respectively. The model is able to predict that high status individuals will marry later than low status individuals. Although our model predicted that men would on average marry at a later age than women, we under predict the average age of marriage for men by about five years.

We also estimate the parameters of a structural model from the estimated reduced form parameters. The structural model is similar to the basic model presented in the previous section with three modifications. First, men and women could transfer resources between them when they met to facilitate a marriage. Second, the returns to marriage varied systematically according to the statuses of the individuals who formed a match. Third, remarriage was feasible.

With the structural estimates, we find that high status individuals derived substantially higher lifetime discounted utility than low status individuals. On average, men transferred a small amout of resources to women. Controlling for status, women had a slightly higher lifetime discounted utility than men. Since men transferred resources to women in order to persuade the women to marry them, absent transfers, men had lower reservation match values than women. Thus we provide a new interpretation of women's lower average age of first marriage. A standard argument is that women feel the need to marry earlier because they face menopause.[11] Thus, they have lower reservation match values. This argument is incomplete. Impending menopause will lower women's reservation match value (ceteris paribus), but it also makes women relatively scarce in the marriage market. This improves their chances of meeting a mate and allows them to be more discriminating (thus raising their reservation match values). Thus, whether differential

[11]Social norms is also often invoked in empirical models of the marriage market (e.g. Fossett and Kiecolt (1991), Rao (1993), South and Lloyd (1992)).

fecundity lowers women's average age of first marriage (relative to men) is ambiguous. Our structural estimates show that 18th century Quebec women were more discriminating than men in the marriage market, but because the chances of meeting a spouse were higher for eligible women, they tended to spend less time searching and married at a younger age.

In summary, a marriage model with differential fecundity, search frictions in the marriage market and assortative matching can largely rationalize the marital behavior of 18th century Quebecers. The most glaring deficiency of the model is its under prediction of the mean age of first marriage for men.

3 Labor supply & wealth accumulation

Differential fecundity has two effects on the labor market. First, men may delay marriage and its attendant benefits to accumulate wealth. Women will face a higher cost of delay. Second, differential fecundity makes fecund women scarce. Men may invest in wealth accumulation to make themselves more attractive in the marriage market. As discussed in the previous section, HS under predicts the mean age of first marriage for men. If some men delay entry into the marriage market to acquire wealth, allowing for wealth accumulation may raise the mean age of first marriage for men.

Bergstrom and Bagnoli (1993) present a model where men of higher labor market abilities marry later than men with lower abilities. In their overlapping generations model, adults can choose to marry in either the first or second period of their lives. There is no search friction in the marriage market. Ceteris paribus, individuals prefer to marry earlier. Women's contribution to a marriage are observed in the first period. Men's contribution to a marriage (their labor market abilities), although known to themselves, are unobserved by others in the first period. In the second period, the men's labor market abilities are observed. In equilibrium, all women marry in the first period. Low ability men will marry in the first period whereas high ability men will delay marriage to show their high ability. High ability women will marry high ability men. A rationalization of their assumption of a minimal benefit or a larger cost for women to delay marriage is differential fecundity.

Siow (1998) presents a overlapping generations model of marriage with differential fecundity, divorce and remarriage. Women are fecund only in the first period whereas men are fecund in both periods. An adult may marry when young, divorce and remarry another person when old. I assume the

only role of marriage is to procreate. So old single and divorced women will not marry or remarry respectively.

Eligible men must offer the same reservation utility to prospective spouses (young women) if they wish to marry.

In a stationary equilibrium without population growth and with an equal number of young men and women, some young men must remain single when some divorced men remarry. Some of these single young men will remain unmarried when they are old. If all single young men marry when old, then divorced men cannot remarry since there will not be enough eligible women. Thus when some divorced men remarry, some men will always be single. Since all young women marry, there are proportionately less never married women than men. While some men will always remain single, some single young men will marry when they become old. Thus the average age of first marriage is lower for women than men.

All young adults have the same labor market opportunities. Time at work produces current income and increases the expected future wage of the individual. Due to uncertainty in human capital accumulation, only some old adults will be successful in obtaining a higher wage. Single old men who marry have higher wages than young married men. They use this higher wage to compensate their spouses for marrying older men (Vella and Collins 1990). Single old men who marry will also have higher wages than unlucky single old men who do not marry.

When a young couple marry, they each have to decide how much time to spend in the labor market and how much time to spend with their children. The mother can use her future labor earnings to buy only private consumption when old. The father can use his future labor earnings to buy future private consumption and to compete for a new wife (and have another child) if his current marriage fails. Thus the young father has a potential additional use for future labor income which is not available to the mother. The cost of working, time spent with their child, is the same for both parents. With an additional benefit but the same cost, the father will choose to spend more time at work and acquire more labor market experience than the mother. His future wage will also be higher. The mother is spending more time with her child relative to the father.

The positive correlation between the level of future labor earnings and the incidence of remarriage is critical in generating current differences in time

use between husbands and wives.[12] Divorced men who remarry must outbid some old single men for spouses. In this particular model, human capital uncertainty allows some lucky divorced men to outbid unlucky single old men for spouses. In general, if young men have different labor market abilities, then a non-stochastic human accumulation process may be sufficient for some divorced high ability men to outbid low ability young men for spouses.

In this model, young men delay marriage with its attendant benefits to accumulate wealth which increase their lifetime consumption. Due to differential fecundity, young women face a larger cost from delaying marriage.

The gender difference in time spent with the child is based on the tradeoff between the quantity and quality of children. From the mother's perspective, there is little substitution between quantity and quality. From the father's perspective, he is substituting between the quality of the current child for potentially another child.

4 Out of wedlock child bearing

In both Canada and the United States, the proportions of births out-of-wedlock and lone parenthood by teenage and young women have been increasing since the sixties with some leveling off in the late nineties. Among White teenager women (15-19) in the US, 7.6% of their child bearing were out-of-wedlock in 1960. In 1990, 55.9% of their child bearing were out-of-wedlock (Blank (1997)).[13] In Canada, 24% of mothers between the ages of 16-25 were lone parents in 1981-1985. By 1990-1993, 36% of mothers in the same age group were lone parents (Dooley, Lefebvre & Merrigan (forthcoming)).[14]

From an accounting perspective, this increase in out-of-wedlock rates can be accounted by three factors: (1) A change in the fertility behavior of married women. (2) A change in the fertility behavior of single women. (3) A change in the proportion of married versus single women.

In the US, the fertility rate of married White teenagers has fallen by 20% between 1960 and 1990. On the other hand, the fertility rate of single White teenagers has increase from 6.6 births per thousand women to 30.6 births per

[12] Becker, et al. (1977), Wolf and MacDonald (1979) provide evidence of this correlation in US data.

[13] The rates for Blacks were higher.

[14] Non-married cohabitating mothers are not counted as lone parents.

thousand women over the same period. The ratios of single to married White teenagers were 6.4 and 17.2 in 1960 and 1990 respectively (Blank). Thus the primary causes of the increase in the share of out-of-wedlock births to teenage and young women were changes in their fertility and marital behavior.

In Canada, the fertility rate of never married teenage women (15-19) increased from 14.3 per thousand in 1975 to 17.7 in 1986. The fertility rate of never married young women (20-24) increased from 17.9 per thousand in 1975 to 37.2 in 1986. While Quebec is an outlier, the marriage rate of teenage women in Quebec in 1960 was 42%. It fell to 2.7% in 1998. The marriage rate of young women in Quebec fell from 92% in 1960 to 20.4% in 1998 (Institut de la statistique du Québec). Thus as in the US, the increase in the share of out-of-wedlock births to teenage and young women is due primarily to changes in their fertility and marital behavior.

There is a marked difference in the socioeconomic circumstances of teenage and young women who have out-of-wedlock births versus those who do not. Teenage and young women who are doing poorly in school, acquired less schooling and have low wages are more likely to children out-of-wedlock (Blank; Bachrach 1998). While there is little systematic evidence on the fathers of these children, anecdotal evidence suggests that the fathers also come from similarly disadvantaged socioeconomic background.

Thus the stylized facts to be explained are:

- The recent increase in the fertility rate of never married teenage and young women.
- The fall in the marital rate of teenage and young women.
- The disadvantaged socioeconomic background of mothers (and fathers?) with out-of-wedlock children.

5 What can changes in welfare benefits explain?

In the US, many researchers suspected that the rise in welfare benefits (AFDC) to single mothers since the sixties may have caused much of the increase in single parenthood. There have been many studies based on both micro and macro data to study the impact of changing welfare benefits and

the incidence of single parenthood. Different studies using different data sets and methodologies have found different results. In his survey of these studies, Moffitt (1998) concluded that there is no significant evidence that increases in welfare benefits cause quantitatively significant increases in the incidence of single parenthood. The related literature in Canada is smaller and equally mixed (Dooley, Lefebvre & Merrigan).

Part of the difficulty of finding a quantitatively significant impact of increasing welfare benefits on increasing the incidence of single parenthood in the US may be due to the fact that real AFDC benefits increased until mid seventies and then have declined since then. However the fraction of children living with a single mother has continue to rise past the seventies albeit at a slower rate. These two contrasting trends may explain the difficulty of detecting a quantitatively significant impact of increasing welfare benefits on decreasing the incidence of single parenthood in the US. Greenwood, Guner and Knowles (2000) argues that, although an increase in welfare benefits will lead to a quantitatively significant increase in the incidence of single parenthood, this effect is a long run effect and difficult to detect in short panel data sets.

6 Differential fecundity and the rise in out-of-wedlock births

Willis (2000) proposes a model of out-of-wedlock births based on differential fecundity. He assumes that each woman may have only one child. Then in a monogamous society, men may have more children by having children with different women out of wedlock. In a marriage, the parents cooperate and invest in their child efficiently. With multiple out-of-wedlock children, the parents may not live together and therefore are more likely to engage in non-cooperative behavior. Investment in out-of-wedlock children will be inefficient and as a consequence, these children will have lower investments. On the other hand, a man may have multiple children if he is willing to have them with different women.

Consider a society where men are poor and also scarce relative to women. Some men may find it advantageous to have children out-of-wedlock. That is, men who have out-of-wedlock children will have multiple low investment children with different women. Men who remain monogamous will have high

investment children within marriage. Willis argues that this model may rationalize Wilson's 1987 hypothesis that the rise in out-of-wedlock births among disadvantaged groups is due to the fall in marriageble (high wage) men in those communities.

Implicit in Willis' analysis is that the marriage markets for individuals in different socioeconomic statuses are segregated. If marriage markets are not segregated by socioeconomic status, differential fecundity should predict that wealthy men should be most likely to have children out-of-wedlock. Wealthy men are less concerned about inefficient investment in their children because the absolute level of investment is already high. Thus wealthy men should be more willing to have children out-of-wedlock so that they can substitute quantity for quality. Poorer men should prefer to have children in marriage to conserve the little investment that they make.

If there are large gains from assortative matching in marriage, wealthier men may not be willing to have children with poorer women when wealthier women can demand monogamy. Without apriori segregation of the marriage market by socioeconomic status, whether the gains from assortative matching in marriage can preserve Willis' prediction that poor women are likely to have children out-of-wedlock with poor men remains to be investigated.

7 Effects of changes in reproductive technologies

Akerlof, Yellin and Katz (1996; hereafter AYK) present a novel theory for the recent rise in out-of-wedlock child bearing. They argue that before the seventies, abortions were not readily available. The legalization of abortion occurred in the early seventies. Birth control pills also became widely available to unmarried women in the seventies. AYK analyzes how these change in reproductive technologies affected out-of-wedlock child bearing. I will discuss one of their two models.

In their model, most young men and young women would like to engage in pre-marital sexual activities. However without effective birth prevention techniques, most women would be unwilling to engage in pre-marital sexual activities unless they had marital commitments from their partners if a pregnancy should occur (i.e. a shotgun marital commitment). Some women are willing to engage in pre-marital sexual activities without shotgun marital

commitments. If pregnant, these women will carry the fetus to term without a spouse. If most women are unwilling to engage in pre-marital sexual activities without a shotgun marital commitment, then women who are willing to engage in sexual activities without commitment may also demand comittments. Men will be willing to give these commitments because there will be few women available that will not demand commitment. So in this equilibrium without effective birth prevention techniques, young men and women may engage in pre-marital sexual activities. If a woman becomes pregnant, a shotgun marriage occurs. There is no out-of-wedlock birth.

When effective birth prevention techniques become available, the equilibrium changes. Now young women who would like to engage in pre-martial sexual activities without giving birth may do so. They can prevent accidental births by themselves. As such, these women need not demand shotgun marital commitments before engaging in pre-marital sexual activities. What about the women who were previously willing to engage in pre-marital sexual activities without commitments? These women have lost bargaining power in their negotiations with their partners. If they continue to demand commitments, their partners may leave since there are now many women who will engage in pre-marital sexual activities without commitment. If these women continue to engage in pre-marital sexual activities without commitment, some of them will become pregnant and have children out-of-wedlock. In this equilibrium with effective birth prevention techniques, young men and women will engage in pre-marital sexual acitivities. Most of these young women who become pregnant will abort their pregnancy. Some young women will not and have their children out-of-wedlock. There will be no shotgun marriages.

In support of their model, AYK show that the number of abortions to unmarried women was about 100,000 in the late sixties and rose to over 1.2 million in the early eighties. The shotgun marriage ratio (number of births by unmarried mothers who married less than seven months before the birth of the child divided by the number of births by unmarried mothers) dropped from a peak of 0.61 in 1969 to 0.085 in the late eighties.

For each individual woman, the availability of abortion and birth control pills increased her options and therefore her welfare. That these changes in reproductive technologies may make a subgroup of women worse off is a market equilibrium phenomenon.

An implict assumption in AYK's model is that more teenage and young women prefer to have children than their male peers. This gender difference

in preferences remains to be explained. A possible explanation is that a child in marriage reduces the future labor market opportunities of young fathers more than mothers. The majority of studies suggest that teenage childbearing reduces years of formal education and early adult work experience of the mother (Klepinger, Lundberg and Plotnick 1999). On the other hand, although smaller in recent years, there is a positive wage premium for men when they marry (Akerlof 1998). However the evidence is not conclusive because the research is based on studies of men in wide age groups and not concentrated on young and teenage men.

Goldin and Katz (2000) show that the fraction of US college graduate women entering professional programs increased substantially around 1970 and the age at first marriage among all US college graduate women soared just after 1972. They argue that these changes were due to the diffusion birth control pills which allowed women who wanted a professional career to have intimate relationships with men without unwanted pregnancy. They also argue that there is a thick market externality. As more professional women postpone marriage, the marriage market is thicker for women at older ages which makes a woman more willing to postpone marriage.[15] In this instance, the diffusion of the pill worked to narrow the difference between men and women in the labor market.

While the availability of the pill and abortion may have allowed professional oriented women to delay childbearing, out-of-wedlock childbearing also increased for this class of women (Bachrach). Although the increase in out-of-wedlock fertility is higher for women in lower socioeconomic circumstances, there are significant increases for women of all socioeconomic circumstances.

In the nineties, White females overtook White males in college enrollment rates. Black females overtook Black males' college enrollment rates earlier. A potential explanation for this relative increase in female college enrollment rate may be the increase in time spent outside marriage. If a woman expects to spend less time in marriage, she may find it more profitable to acquire more human capital (Johnson and Skinner 1986). If men expect do not expect to have to support a family as much, they may also invest less in human capital. This effect of expected marital instability on gender differences in college enrollment rates remains to be investigated. How this effect interacts

[15]Thick market externatilies in the marriage market is discussed in Chiappori and Weiss 1999.

with the relative scarcity of fecund women is unclear.

8 Conclusion

Differential fecundity potentially provides a unified explanation of some widely recognized gender differences in marriage and labor markets. This paper has not explored all the implications of differential fecundity. For example, differential fecundity also promotes gender biased parental investments.[16] Edlund (2000), Edlund and Korn (2000) pursue other interesting implications of the relative scarcity of fecund women.

Changes in reproductive technologies are likely important in explaining the recent rise in out-of-wedlock childbearing and the increase in the fraction of women to pursue professional careers. Other implications of these changes remain to be investigated.

Each man is privately better off by being always fecund. Each woman is privately better off with the availability of abortion and effective birth control technologies. As shown in the paper, the change in social welfare from these options are more ambiguous. It is important to study the equilibrium consequences of these options to be able to fully evaluate their social consequences.

The demographic structure in most of the models discussed in this paper is very stylized. The effects of more realistic demographic structures on gender differences in the the marriage and labor markets remain to be investigated.

So far, the theoretical and empirical analyses in this area of research have been proceeding simultaneously albeit loosely. The data for empirical work is readily available. Econometric techniques for estimating marriage market models are becoming available (Seitz 2000; Wong 2000). Thus there is room for sharper empirical analysis of many of the theoretical issues discussed here.

9 References

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[16] The classic reference is Trivers and Willard 1973. See Edlund (1999), Siow and Zhu (1999) for economic applications.

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