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QUALITATIVE ASPECTS OF MATE AVAILABILITY AND THEIR EFFECTS ON INTRA-HOUSEHOLD BARGAINING POWER

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QUALITATIVE ASPECTS OF MATE AVAILABILITY AND THEIR EFFECTS ON INTRA-HOUSEHOLD BARGAINING POWER

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ABSTRACT

This dissertation studies the impact of changes in outside marriage market opportunities on intra-household bargaining power. In the first chapter, I analyze the impact of the availability of healthy mates on intra-household bargaining power. I specify a marriage market matching model and test the main prediction that in marriage markets in which both healthy and frail men marry, an increase in the relative scarcity of healthy women enhances wives' bargaining power. This effect is estimated in a collective labor supply framework in which spousal bargaining power and labor supply are inversely related. I use CPS data and Census data on disability and construct a sex ratio by health status at the metropolitan level. I estimate labor supplies for white married couples and find that a higher relative scarcity of healthy women in the couple's metropolitan area reduces wives' labor supply and increases their husbands'. The role of sex ratios on spouses' bargaining power is further explored in the second chapter. Using Census and CPS data for U.S. metropolitan areas in years 2000, 1990 and 1980, we construct a quality sex ratio by education brackets. We argue that a relative shortage of suitably educated women in the spouse's potential marriage market increases wives' bargaining power and it lowers their husbands'. We further check the prediction that this effect is greater as the assortative rank of couples by education increases. We find that higher relative shortage of comparably educated women in the couple's metropolitan area reduces wives' labor supply and increases their husbands'. The impact is stronger for couples in higher education groups. Consistent with bargaining theory, no such effects are found for unmarried individuals.

DEDICATION

I dedicate this work to my family: my Mom, Dad, Natalia and Adina.

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CHAPTER ONE

IN SICKNESS AND IN HEALTH: THE EFFECTS OF MATE AVAILABILITY ON INTRA-HOUSEHOLD BARGAINING POWER

1. Introduction

In the U.S., women live longer and survive in higher numbers at any age than men. This gender differential persists and varies over time (Verbrugge 1985, Kinsella and Gist 1998). As both life expectancy and survival rates are considered fundamental health indicators (Cutler and Richardson 1997), it follows that more women are healthy across time and age than men.[1]

The relationship between own health and labor market performance is well documented in the literature. Empirical studies show that own poor health is associated with decreased earnings and participation in the labor market (Baldwin et al. 1994, Costa 1996, Kahn 1998). Furthermore, Parsons (1977) and Berger and Fleisher (1984) show that own poor health also affects spousal labor supply while Schulz et al. (1995) find that caring for an unhealthy spouse may have direct negative effects on the own health of the caregiver. Therefore, good health is valuable in the labor market as well as in the marriage market.

This paper examines the marriage market effects of the availability of healthy mates on intra-household bargaining power. Intra-marital allocations are affected by changes in

[1] For a detailed discussion of measures and trends in healthy life expectancy across gender, the reader is referred to Verbrugge (1997) and Crimmins, Hayward and Saito (1996).

marriage market outside opportunities, such as divorce laws and sex ratios (Chiappori et al. 2002, Chiappori et al. 2005).

I construct a simple matching marriage model to formally assess whether healthy and frail individuals marry and how spouses allocate their resources. There are companionship benefits generated by marriage, but marriage to a frail spouse entails a cost. For simplicity, women are assumed to be all healthy, while men vary according to their health status—healthy, frail and very frail. The property of the equilibrium depends on the relative number of women and men in the marriage market, i.e. whether frail men marry also. Several predictions are generated by this simple model. Healthy women are better off in marriage markets where they are fewer in number than healthy men compared to marriage markets where there are not enough healthy men and some women marry frail men. Moreover, depending on how seriously frail the last married man is, healthy women gain less and less from marriage.

I use CPS and Census data for the year 2000 to test for the impact of healthy mate availability on intra-household bargaining power. I focus on white married couples and use single individuals as a control group. I construct sex ratios by health status to measure mate availability and consider local marriage markets at the metropolitan level. According to the model, if some frail men marry, an increase in the health ratio (less healthy women relative to healthy men) favors wives. Also, according to models of collective household behavior, increased female intra-household bargaining power generates a reduction in wives' labor supply and an increase in husbands' labor supply.

I find empirical support for the above prediction. Specifically, wives decrease their labor supply significantly as a response to an increase in the health ratio, while husbands increase theirs. Additionally, the effect is stronger for couples where the spousal age gap is

larger. As expected, the health ratio has no effect on the labor supplies of unmarried individuals of either gender.

2. Related Literature

Three strands of literature are related to this study. The first strand includes studies that focus on the relationship between outside marriage market opportunities and intra-marital allocations (Chiappori et al. 2002, Chiappori et al. 2005). These studies extend the collective household model to allow and test for the effects of variations in outside marriage market opportunities, such as mate availability, on intra-household bargaining power. A relevant result that emerges from this strand is that changes favoring one spouse increase his or her bargaining power in the household and the share of resources he or she controls. This income effect is measured as a reduction in the labor supply of the favored spouse and an increase for the other. Chiappori et al. (2002) use 1990 Census data by state and PSID data on working couples and find that higher sex ratios reduce wives' labor supply and increase the husbands'.

A second strand of literature analyzes the gains to marriage from health and spousal sorting by health status. Grossman (1972) first modeled health as an input in both home and market production. Since then, empirical studies have repeatedly shown that poor health is associated with decreased earnings and lower labor force participation (Baldwin et al. 1994, Costa 1996, Kahn 1998). Furthermore, the poor health of a spouse may have direct negative effects on the own health of the other spouse, i.e. the caregiver (Schulz et al. 1995, Schulz et al. 1999). Wilson (2002) finds a positive inter-spousal correlation in health status among older married couples for the U.S. in 1992. Finally, using Swedish data, Nakosteen et al. (2005) document nonrandom matching into marriage on the basis of disability status.

The theoretical section of this study is fundamentally related to a strand of literature developing models in which the intra-household allocation of resources is the outcome of a matching equilibrium. Earlier work by Neal (2004) models marriage and fertility choices as completely determined by the economic surplus in different family structures. The economic surplus differs across matches due to individuals' endowments heterogeneity. Recently, Chiappori and Oreffice (2007) emphasize differences in tastes for children in their analysis of marriage and fertility choices. The properties of the stable match depend on the respective number of available mates in the marriage market. My approach differs from these studies in that I focus rather on the marriage decision and do not consider fertility choices. Moreover, the heterogeneity of health status as the decisive factor in determining match-specific marital surplus.

None of these studies, however, models the impact of the availability of healthy mates in the marriage market on intra-household bargaining power or estimates the magnitude of such an effect on the labor supply decisions of the spouses.

3. The Basic Model

In this section I develop a simple marriage market matching model. Marriage is the outcome of a frictionless process, and in equilibrium (or stable assignment), there is no married person who would rather be single, and there are no two persons, married or unmarried, who would prefer to form a new union. Utility is transferable, so couples in equilibrium maximize total surplus. Assume a world of identical, healthy women (W) and heterogeneous men: healthy men (HM), frail men (FM) and very frail men (VFM).

Single, healthy men earn income *Y*. There is a cost to being frail, *C*, so that single frail men earn *Y-C*. Unmarried women enjoy income *Z*. The parameter θ denotes a

"companionship" benefit realized by each spouse upon marriage while γ represents the fraction of the cost *C*, borne by the wife of a frail man. Additionally, *X* is the extra cost borne by the caregiver, and it is increasing with the seriousness of the condition of the husband. For instance, this could be the negative care-giving effect on the spouse's own health.

The cost *X*, defined on a continuous support, is zero for healthy men, takes values in the interval $(0, \overline{X})$ for frail men and is greater than $\overline{X}$ for very frail men. The threshold $\overline{X}$ is the value of *X* for which the marriage surplus is zero, i.e. $\overline{X} = 2\theta$.

If a woman marries a healthy man, the payoffs of the two spouses become, respectively:

$$P_W = Z + \theta \tag{1}$$

$$P_{HM} = Y + \theta \tag{2}$$

The total outcome of the marriage is $Z + Y + 2\theta$, corresponding to a marriage surplus of 2θ. If the woman marries a frail man, the marriage surplus is $2\theta - X$ and decreasing in *X*, where $X \in (0, \overline{X})$:

$$P_W = Z + \theta - \gamma C - X \tag{3}$$

$$P_{FM} = Y + \theta - (1 - \gamma)C \tag{4}$$

$$Total:\ Z + Y - C + 2\theta - X \tag{5}$$

The payoffs resulting from a marriage to a very frail man are the same as above, with X above the threshold $\overline{X}$. This means that the marriage surplus is negative. Thus, women never marry very frail men because upon marriage, they would consume less than their single income Z.

3.1. Possible scenarios in the marriage market

The division of the marital surplus between the two spouses depends on the relative scarcity of each spouse in the marriage market. We can thus distinguish the following distinct marriage market scenarios.

First consider the case of an **excess supply of men**. Since women are scarcer than men, the latter have to compete for a wife on the marriage market. This means that whichever men generate a larger surplus for their wives marry first. Thus, if it is the case that a frail man is married it must be that all healthy men are already married. Healthy men generate a higher total marriage surplus and thus are strictly preferred by women in the marriage market. The division of the marital surplus between spouses depends on the identity of the marginal spouse, i.e. the last man to marry. Depending on whether the last married man is healthy or frail, I distinguish the following cases.

Excess supply of healthy men (ESHM)

This case includes marriage markets in which the number of women is smaller than the number of healthy men. As illustrated in **Figure 1**, the last man to marry is healthy. All women marry, and since healthy men are in excess, they will compete for the women and bid away their own gains from marriage. The last man to get married will be indifferent between getting married and being single and will accept a payoff of Y, leaving the entire marital

surplus to the wife. Women are identical and so stability requires that each woman gains the same payoff upon marriage. Frail men remain single and enjoy *Y-C*.

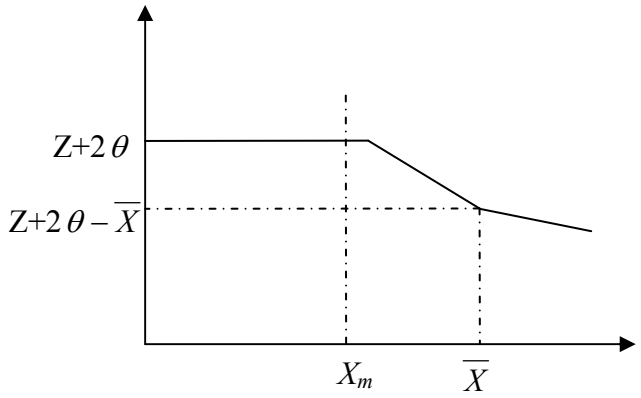

Figure 1. Maximum wife's payoff as a function of X if healthy men are in excess supply (ESHM).

Excess supply of frail men (ESFM)

In this case women are more numerous than healthy men but less numerous than healthy and frail men together. Under these circumstances, all women marry and they marry both healthy and frail men. **Figure 2** provides a graphical description of this scenario.

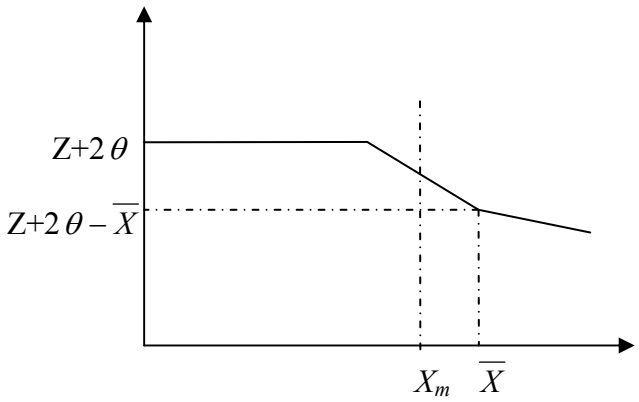

Figure 2. Maximum wife's payoff as a function of X if frail men are in excess supply (ESFM).

The last man to marry is frail; the X that corresponds to the marginal man to marry will be referred to as X_m. Frail men compete for a spouse and bid away their gains from marriage and the marginal man remains with his "single" payoff. Women also compete for healthy men, meaning that the last woman to marry is indifferent between marrying a healthy man or a frail man.[2] The payoffs of the married men, except the marginal man, are increasing in X_m. Conversely, the payoff of wives is decreasing in X_m:

$$P_W = Z + 2\theta - X_m \tag{6}$$

$$P_{HM} = Y + X_m \tag{7}$$

Marginal man: $$P_{FM} = Y - C \tag{8}$$

Other married frail men: $P_{FM} = Y - C + (X_m - X)$, and $X_m - X > 0$ (9)

[2] If $\theta \geq \gamma C + X_m$ or $\theta < \gamma C + X_m$ it is still the case that marriage surplus is positive.

Excess supply of very frail men (ESVF)

In this case women are more numerous than healthy and frail men together but fewer in number than the total number of men. As **Figure 3** shows, there are enough women in the marriage market so that some very frail men could marry. But very frail men cannot afford to compensate women since for them $2\theta - X \leq 0$, and thus the total surplus is at most zero. As a result, all very frail men remain single.

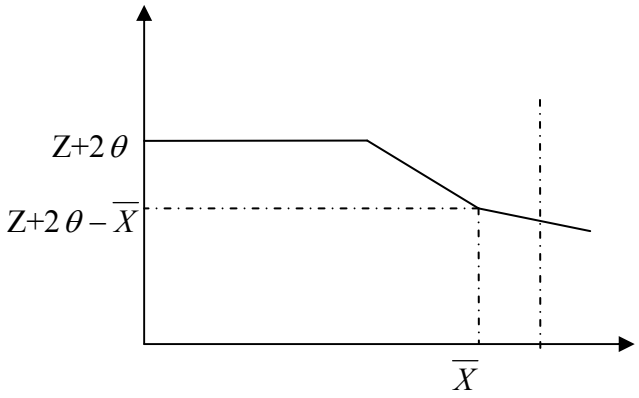

Figure 3. Maximum wife's payoff as a function of X if very frail men are in excess supply (ESVF).

The last woman to marry is indifferent between marrying a healthy man, a frail man and being single. In this case, not all women marry in equilibrium. The husbands, both healthy and frail, extract all marriage surplus:

$$P_W = Z \tag{10}$$

$$P_{HM} = Y + 2\theta \tag{11}$$

$$P_{FM} = Y - C + (2\theta - X) \tag{12}$$

In the case of **excess supply of women,** the number of women is larger than that of all men, and thus all men could marry. However, since very frail men always remain single, the case of excess supply of women is equivalent to the situation in which there is an excess supply of very frail men. Moreover, any match from which the woman obtains more than the payoff of being single cannot be stable, since women are identical.

3.2. Testable Implications

A reduction in the number of healthy women

A variation large enough to produce a regime switch from an excess supply of women to an excess supply of frail men will favor women and cost husbands. As **Table 1** indicates, a result of the switch is that not all frail men marry anymore. Also, all husbands receive a lower share of the marital surplus.

Next, assume the number of women is reduced even more, so that we are in the case where there are more healthy men than women, and frail and very frail men remain single. The welfare of all married men is decreased to their reservation utility. In other words, wives get the entire marriage surplus.[3]

Excess supply of frail men is the most common regime found in the data. Therefore, changes that occur within this regime generate relevant implications from an empirical standpoint. Assume, for instance, that initially we are at point where marital surplus is positive and the marginal man to marry has a certain X_m. All married men, except for the marginal one, receive a share of the surplus generated by marriage. A *ceteris paribus* reduction in the female population, assuming that the equilibrium remains in the scenario where healthy men are fewer than women, moves the marginal man toward the smaller X_m' and a

[3] A switch from an excess supply of very frail men to an excess supply of frail men generates the same implications.

Table 1. Equilibrium Payoffs in Different Cases

	Excess Supply Men			
	ESHM	**ESFM**	**ESVF**	**ESW**
Marriage*	HM marry $X_m=0$	Some FM marry , $0<X_m<\overline{X}$	$X_m<\overline{X}$	$X_m<\overline{X}$
		$2\theta-X > 0$	$2\theta-X \leq 0$	$2\theta-X \leq 0$
Healthy men (HM)	Y	$Y+X_m$	$Y+2\theta$	$Y+2\theta$
Frail men (FM)	Single: Y-C	Married: $Y-C+(X_m-X)$ Single: $Y-C$	$Y-C+(2\theta-X)$	$Y-C+(2\theta-X)$
Very frail men (VFM)	Single: Y-C	Single: Y-C	Single: Y-C	Single: Y-C
Women	$Z+2\theta$	$Z+2\theta-X_m$	Z	Z

*Marriage denotes the parameter of the marginal man to marry X_m with married men those with $X \leq X_m$

larger marital surplus. **Figure 4** depicts the changes generated by a decrease in the female population. Some frail men who were previously married are now single. All married men receive a smaller share of the surplus while wives enjoy an increased payoff. Therefore, when frail men are in excess, the greater the scarcity of women, the less frail the marginal man to marry and thus the better off the wives. Symmetrically, all husbands are worse off. Therefore, if we compare two marriage markets in the above situations, we should observe that the wives in the market with relatively fewer women control more resources relative to the ones in the other marriage market.

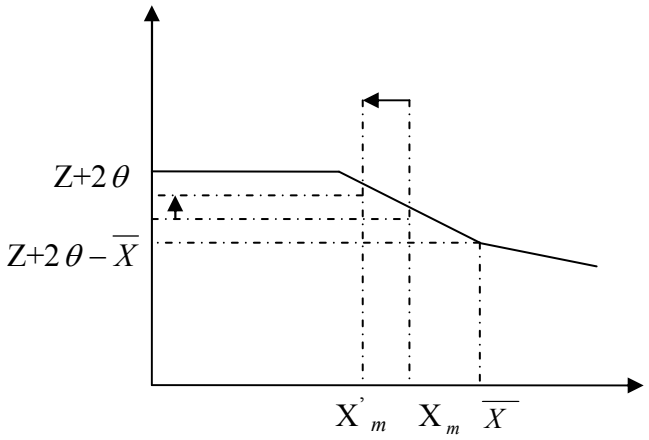

Figure 4. Changes in maximum wife's payoff due to a decrease in the female population (ESFM).

A general improvement in the health of men

In the case of excess supply of frail men, if the frail men competing for women become less frail (a decrease in X) due for example to a general increase in the health of frail men, then wives' welfare increases while all husbands are worse off. In contrast, the same

increase in the health of frail men, due probably to a medical technological improvement, benefits frail husbands provided that women are more numerous than all frail men.

Another interesting implication concerns the very frail men. An large enough improvement in their health may render them attractive as mates in the marriage market. As a result, the very frail can compete with the frail men for a wife. This has a direct effect in marriage markets where healthy women outnumber the population of healthy and frail men, so that some women remain unmarried. Specifically, women that remained single previously can now marry the very frail men that became healthier. Marriage rates are thus expected to increase.

Policy Implications

From the previous results, frail men emerge as an important factor in the marriage market, especially when they compete for a wife. Consider the case when women are more numerous than healthy men, but there still is an excess of frail men. If frail men were to receive a disability benefit, conditional on being married, then the last frail man to marry can generate a larger marital surplus than before the policy. The consequences of this policy-driven shift are that married women's welfare increases; healthy married men are worse off; and frail men get to enjoy their pre-policy payoff. Therefore, a policy targeted toward helping the frail in metropolitan areas where women are more numerous than healthy men will result in helping married women. We should observe married women work less as a result of such a policy, and healthy husbands work more. Conversely, in metropolitan areas where there are not enough frail men and some healthy women remain single, such a policy would benefit the frail men and would have no welfare effects on healthy wives and

husbands. In such metropolitan areas one expects frail married men to work less as a result of the policy.

Additionally, consider the case where the number of women is larger than the total number of healthy and frail men together. In this case, some women remain single because marriage to a very frail man makes them worse off than being single. Very frail men could receive a disability benefit, conditional on being married, and thus afford to marry. The effects of such a policy are that the number of marriages increases; married women experience no welfare change; healthy and frail married men have no change in welfare; and very frail men are better off. Therefore, a policy aimed toward helping the very frail in marriage markets where women are more numerous than healthy and frail men will result in an increase in welfare for the very frail men. The expected effect is that married very frail men work less as a result of such a policy.

4. Empirical Strategy

One of the implications of the model developed above is that in marriage markets where women marry frail men, an increased scarcity of healthy women enables them to control a higher share of marital resources, making wives better off. To test for this increase in relative bargaining power of wives, I consider a collective model labor supply framework. When women's bargaining power in the household increases, the labor supply of wives should decline, and the labor supply of their husbands should rise.

My main sample consists of married couples with ages between 20 and 60 years. I focus on white couples due to CPS large under-sampling. I consider local marriage markets at the metropolitan level. I also consider men and women that have never been married and are head of their own household and in the same age bracket as the couples. The labor

supply of unmarried individuals should not be affected by changes in intra-household bargaining power. I exclude widowed and separated couples and include intact couples only if both spouses are actually present.

I estimate the following labor supply equations separately for wives and husbands:

$$h^f = h^f(\ln w^f,\ \ln w^m,\ y,\ X,\ \textit{Health Ratio}) + \varepsilon^f \tag{13}$$

$$h^m = h^m(\ln w^f,\ \ln w^m,\ y,\ X,\ \textit{Health Ratio}) + \varepsilon^m \tag{14}$$

I also estimate a corresponding labor supply equation for unmarried women and men, using the same specification except for the spousal variables.

Health Ratio is a measure of mate availability in the marriage market. It is a sex ratio type measure, computed as the number of healthy men over the number of healthy women. I construct this variable for Whites by metropolitan area. There is evidence in the literature that there is relatively little benefit from computing sex ratios separately by marital status, while the exclusion of both institutionalized individuals and homosexuals is recommended (Fosset and Kiecolt 1991, Freiden 1974). My measure is derived for the civilian non-institutionalized population. For the group of homosexuals I construct the variable named same-sex unmarried households ratio. This ratio is computed as the total number of male and female same-sex unions divided by the total number of households in a metropolitan area. Thus, provided that the sizes of the male and female homosexual populations vary together, their impact on the accuracy of the health sex ratio would be reduced (Fosset and Kiecolt 1991). Finally, each individual is assigned the corresponding ratio in the metropolitan area of residence. I focus on White individuals and racially homogeneous couples, assuming that the relevant marriage market is limited to one's own race. The impact of the health ratio

on the labor supply of spouses is captured by the coefficient on Health Ratio. I consider the following health categories: healthy, frail and very frail. Healthy includes people with no disability; frail includes individuals with only one disability; and very frail refers to two or more types of disability. The next subsection defines these health conditions in detail. In all my regressions I include only those marriage markets where healthy women are more numerous than healthy men (Health Ratio<1), but less numerous than healthy and frail men together. Additionally, I include the number of very frail men, total men and the ratio of healthy men to frail men to control for the health distribution of men.[4]

Other covariates include the own wage rate w, the spouse's wage rate and household non-labor income y. These covariates include individual-level characteristics such as age, education and health status of each spouse, number of members and number of young children in the family. I use the health status covariate and an indicator variable for the presence of work-limiting disabilities to identify healthy wives and exclude women that report fair or poor health. State and metropolitan level variables such as state unemployment rate, state female labor force participation, population density and per capita income are included to account for local differences in employment opportunities and the level of economic activity. The dependent variable in the labor supply regressions is annual hours worked, defined as total annual hours worked on the longest job held in 1999. The sample includes only households in which men have positive hours of work. Labor supply regressions for married and single women are run with Heckman MLE to correct for sample selection. However, the results for women remain unchanged when I exclude the non-participants. The labor supply regressions are estimated using robust standard errors

[4] These conditions insure the ceteris paribus reduction in the female population. An increase in the Health Ratio due to simultaneous changes in the number of men and women would have ambiguous welfare effects.

clustered by metropolitan area, which allow for correlation of households' observations within metropolitan areas.

I also estimate the same specification allowing for non-participation for both wives and husbands. The own and spouse's hourly wage is replaced for all observations by the fitted values derived from a conventional wage equation estimated for participating wives and husbands with a correction for selection bias. Health Ratio effects are robust to this specification.

5. Data

Estimation is carried out on the March Supplement of the Current Population Survey (CPS) for the year 2000. U.S. Census data are used to construct the health sex ratio by health status, race and age group. Husbands and wives from single-family households were extracted from the CPS into separate files. Records in these files were then matched on the household ID code to create a single observation for each married couple. Data on labor force activity, income, self reported health status and other household level variables come from the March Supplement, to which I merge data on health ratios from the Summary File 4 of the Census. Summary File 4 (SF4) contains information compiled from the questions asked to a sample of all people and housing units and is released as individual files for each of the 50 states, the District of Columbia, Puerto Rico and for the United States overall. I use the cross-tabulations by sex, age, race and disability status to construct separate health ratios for the white population, aged 21 to 64 by metropolitan area.[5]

Specifically, disability types are defined as follows: (a) blindness, deafness or a severe vision or hearing impairment (sensory disability); (b) a condition that substantially limits one

[5] I also construct ratios for the Black population but given CPS large under-sampling I have too few couples to use them. The age brackets in SF4 (PCT69) are 5-15; 16-20; 21-64 and above 65.

or more basic physical activities, such as walking, climbing stairs, reaching, lifting or carrying (physical disability) and if the individual had a physical, mental or emotional condition lasting six months or more that made difficult; (c) learning, remembering or concentrating (mental disability); (d) dressing, bathing or getting around inside the home (self-care disability); (e) going outside the home alone to shop or visit a doctor's office (going outside the home disability); (f) working at a job or business (employment disability). Throughout the analysis, the term frail refers to people that suffer from only one of these disabling conditions while very frail refers to individuals that have at least two of these conditions.

The total number of U.S. metropolitan areas is 276 (excluding Puerto Rico). Merging the Census and CPS data reduces the number of metropolitan areas to 191. Nineteen metropolitan areas are lost after keeping only the relevant marriage markets. The remaining 172 metropolitan areas comprise approximately 95 percent of the total number of White couples. The state unemployment rate and state female labor force participation are retrieved from the Bureau of Labor Statistics, while the measure of the prevalence of same-sex unmarried households by metropolitan area comes from the U.S. Census 2000, Summary File 4 (table PCT21). The Census records a household as a same-sex union if the relationship to the householder is specified as "unmarried partner". I construct one measure for the prevalence of same sex households as the total number of homosexual and lesbian unions out of the total number of households in a metropolitan area. In my sample, the covariate health dummies are derived from the self-reported health status information that the CPS provides.[6] Finally, CPS weights are used to make the sample representative of the U.S. population and economy.

[6] Those are: excellent health, very good, good fair and poor health. The excluded category in the specifications is excellent health.

Descriptive statistics for the main demographic groups and variables are presented in **Table 2**. In my sample, men work more annual hours than women on average and earn a higher hourly wage. Husbands are, on average, two years older than wives, and they have similar levels of education. The health sex ratio by metropolitan area is already restricted to local marriage markets where the number of healthy women is larger than the number of healthy men.

6. Results

The main results are shown in **Table 3**. The estimated effects of the health ratio are positive for husbands and negative for wives, as predicted by the theory. The point estimates in my sample indicate that a 10 percentage point increase in the health sex ratio reduces wives' annual labor supply by about 94.4 hours, while their husbands' is increased by 68.5 hours per year.

The health ratio effects correspond to a 5.1 percentage point reduction of the average annual hours worked by healthy married women and to a 3 percentage point increase for their corresponding husbands. The elasticity of the response (calculated at the means of the data) for wives has the value of -0.49. Husbands' labor supply elasticity with respect to the health ratio is 0.28.

The health ratio effect is also estimated for unmarried individuals, separately for men and women. As the model predicts, their labor supply regressions show no significant impact of the health sex ratio (**Table 4**). Moreover, the fact that both coefficients do not have negligible magnitudes is counterbalanced by their sign, i.e. opposite to the predicted direction for wives and husbands. However, the coefficients are systematically insignificant. The small size of the sample of unmarried individuals may contribute to the lack of precision

Table 2. Summary Statistics

	All Couples	
Variable	mean	std. dev
Hours worked by wife*	1786.00	632.94
Hours worked by husband*	2277.40	462.36
Log of wage of wife*	2.52	0.69
Log of wage of husband*	2.92	0.59
Age of husband	41.90	7.98
Age of wife	39.76	7.86
Education of husband	13.91	2.83
Education of wife	13.85	2.60
Household non-labor income	5378.42	13580.67
Number of children aged ≤ 6	0.32	0.62
Number of family members	3.42	1.17
Husband's health status		
Very good	0.37	0.48
Good	0.19	0.39
Fair	0.02	0.14
Poor	0.003	0.06
Wife's health status		
Very good	0.39	0.48
Good	0.21	0.4
Health ratio**	0.93	0.02
Number of observations	5325	

	Single Women		Single Men	
Variable	mean	std. dev	mean	std. dev
Hours worked*	1828.78	546.87	2011.90	487.73
Log of wage*	2.23	0.64	2.47	0.61
Age	31.80	8.12	32.38	9.13
Education	12.28	2.95	12.73	3.38
Household non-labor income	3698.33	6149.04	4004.57	9749.15
Number of children aged ≤6	0.57	0.74	0.12	0.43
Number of family members	2.71	1.09	2.52	0.95
Health status				
Very good	0.42	0.49	0.31	0.46
Good	0.31	0.46	0.22	0.42
Fair			0.06	0.24
Poor			0.02	0.14
Number of observations	323		80	

The sample contains data from the March supplement year 2000 and U.S. Census 2000.
*For women and men with positive hours of work.
Single individuals are defined as those with marital status "never married".
**Statistics for the 171 metropolitan areas

The small size of the sample of unmarried individuals may contribute to the lack of precision in estimation.[7] These results lend empirical support for the bargaining power effect of mate availability as a measure of outside marriage market opportunities on husbands and wives.

Additionally, I find that spousal labor supply is decreasing with own health deterioration and that wives, in particular, work more as the health of their spouse declines. The latter result is in line with previous empirical studies that document increases in wives' labor supply as husbands' health deteriorates (Berger and Fleisher 1984, Berger 1983 and Parsons 1977). This finding addresses the possibility that the estimated negative health ratio effect on wives' labor supply reflects women's decision to reduce their market work and provide care to their spouse. Couples containing frail spouses might gain from specializing in home care provision. For instance wives could specialize and provide care to their spouses by reducing their amount of labor market work. These results actually show that healthy wives increase their market work most probably to compensate for the loss in household earnings. Thus, controlling for the health status of spouses should account for any effects of the health gap within the couple on the labor supplies of spouses.

I also estimate the impact of the health ratio on a sample of couples that included the few Black couples that lived in metropolitan areas where men, both healthy and frail, exceeded the number of healthy women. I find a similar pattern of results as in the main specification.

[7] I also estimate labor supplies for the broader category of single people that includes widows and divorcees and, while the sample size more than triples, the coefficients drop dramatically in magnitude and remain insignificant.

Table 3. Labor Supply Regressions (Annual Hours)

	Wives		Husbands	
Health Ratio	**-944.59**	*	**685.54**	*
	(519.48)		**(381.51)**	
Log of wage of wife	140.19	***	-27.17	
	(19.73)		(17.30)	
Log of wage of husband	-114.20	***	-10.27	
	(16.66)		(14.60)	
Log of wage of wife*Log of wage of husband	5.03		2.27	
	(4.37)		(5.52)	
Age of husband	2.72		-1.70	
	(2.42)		(1.7)	
Age of wife	-1.97		0.89	
	(2.53)		(1.69)	
Education of husband	-20.12	***	15.58	***
	(4.50)		(3.38)	
Education of wife	24.58	***	9.68	***
	(4.15)		(3.53)	
Household non-labor income	-2.60	***	1.50	***
	(0.6)		(0.6)	
Number of children aged<6	-138.93	***	-15.55	
	(18.79)		(12.67)	
Number of household members	-84.81	***	4.19	
	(10.45)		(6.99)	
Husband's health status (Excellent- excluded)				
Very good	66.12	**	-16.14	
	(34.10)		(18.11)	
Good	134.2	***	-88.53	**
	(37.64)		(27.74)	
Fair	126.49	**	-244.57	***
	(63.96)		(57.83)	
Poor	137.22		-560.31	***
	(117.36)		(196.32)	
Wife's health status (Excellent -excluded)				
Very good	-15.92		16.95	
	(33.14)		(21.08)	
Good	-120.3	***	-10.06	
	(35.04)		(30.08)	
Inverse Mill's ratio	17.21			
	(16.01)			
Observations	6761		5325	

Data from March CPS year 2000. ***, **, * denote 1, 5 and 10-percent significance levels
Wives' supply is estimated using Heckman MLE. Robust standard errors in paranthesis

Table 4. Effect of Health Ratio on Annual Hours Worked, by Demographic Group

	All Couples	Staggered Age Couples		Singles
Wives	**-944.59** *	**-1289.70** **	Women	2265.50
	(523.23)	**(616.4)**		(1618)
	6,761	5,070		323
Husbands	**685.54** *	**932.67** **	Men	-3363.00
	(381.51)	**(471.34)**		(0.206)
	5,325	3,904		80

The sample contains data from the March supplement year 2000.
All tables report regressions run on the same set of covariates described in Section 4.
All couples are those with wives 55 years old or younger and husbands at most 58
Staggered age couples are defined as those with wives 45 years old or younger.
Women's labor supply is estimated using Heckman's Selection Model
Single individuals are defined as those with marital status "all but separated".

The bargaining power effect of the health ratio is also estimated on a sub-sample of couples in which wives are younger than their husbands, using the same specification as above. As **Table 4** shows, wives in their mid-forties and younger exhibit a stronger impact of the health sex ratio compared to the entire sample. A ten percentage point increase in the health ratio is associated with a decline in wives' annual labor supply of 128 hours (p-value =.05) and a corresponding increase for husbands of 93.2 hours (p-value =.04). Furthermore, the magnitude of the differential impact is sizable, as wives married to older men reduce their labor supply by an extra 30 percent compared to the ones married to more similarly aged husbands. Also, single women in this age bracket experience no bargaining effect. This highlights the fact that the information embedded in the health status gains more significance with age. Women married to older men are affected by an increase in the availability of healthy mates in two ways: (1) their outside marriage market opportunities are improved since there are more men similar to their husbands, and (2) there are also more of the younger, healthy men available. Thus, one would expect older husbands' labor supply response to be stronger relative to all the other husbands (36 percent more annual hours). Moreover, older husbands might work more so that they can save more, and thus offer more in terms of bequests. This result is in line with recent evidence showing that couples where the wife has more relative bargaining power save more (Lundberg, Ward-Batts 2004).

I also estimate the same specification allowing for non-participation for both wives and husbands. The own and spouse's hourly wage is replaced for all observations by the fitted values derived from a conventional wage equation estimated for participating wives and husbands with a correction for selection bias. Health Ratio effects are robust to this specification. As **Table 5** shows, the specification described above yields similar results to the specification in **Table 4**. For a complete comparison I also report the results of a simple

OLS model of labor supply. However, the latter specification is not recommended for the estimation of female labor supply because of the selection bias issues caused by non-participating women.

The empirical results support the predictions of the model developed in Section 3. For metropolitan areas characterized by a shortage of healthy women relative to healthy and frail men together, an increase in the health ratio enables wives to work less. Husbands, both healthy and frail, experience an increase in their annual labor supply.

Table 5. Effect of Health Ratio on Annual Hours Worked, Different Specifications

	OLS	Sample Selection (Wives)	Sample Selection (All)
Wives	**-912.5 ***	**-944.59 ***	**-1183.7 ****
	(523.23)	**(519.48)**	**(504.46)**
	5,325	6,761	7,027
Husbands	**685.54 ***	**685.54 ***	**670.6 ****
	(381.51)	**(381.51)**	**(349.10)**
	5,325	5,325	7,027

The sample contains data from the March supplement year 2000.
All tables report regressions run on the same set of covariates described in Section 4.
All couples are those with wives 55 years old or younger and husbands at most 58
Staggered age couples are defined as those with wives 45 years old or younger.
Women's labor supply is estimated using Heckman's Selection Model
Single individuals are defined as those with marital status "all but separated".

7. Conclusions

This paper models the impact of the availability of healthy mates in the marriage market on intra-household bargaining power. The scarcity of healthy wives generates an increase in their bargaining power, provided that frail men marry, while both healthy and frail husbands experience a decrease in their welfare. I test this prediction empirically, relying on the result of the collective model that an increase in intra-household bargaining power reduces labor supply. Using CPS and Census data for year 2000, I construct a health sex ratio to measure mate availability. My findings indicate that if the corresponding health sex ratio becomes more favorable to women, married women significantly reduce their supply of labor, while their husbands increase theirs. Consistent with the model's predictions, unmarried men and women exhibit no significant impact of the health sex ratio on their labor supply. This study provides a first empirical support of the bargaining power effect of the availability of healthy mates in the marriage market.

The theoretical model developed in Section 3 provides a framework for studies of mate availability effects on intra-household bargaining power and also generates testable policy implications. Dimensions other than disability can be used to empirically describe population health status, e.g. obesity, alcoholism etc. More generally, other qualitative aspects of mate availability can be analyzed using this framework in order to investigate their impact on intra-household allocations.

CHAPTER TWO

QUALITY OF AVAILABLE MATES, EDUCATION AND HOUSEHOLD LABOR SUPPLY

1. Introduction

This paper examines the effects of local quality sex ratios by metropolitan area and educational attainment on spouses' labor supply and bargaining power, using individual level data from 2000, 1990 and 1980. There is evidence in the literature that the availability of potential mates affects the labor market decisions of married individuals, with mate availability measured as the raw number of men relative to the number of women in aggregate marriage markets (e.g. Chiappori, Fortin, Lacroix, 2002; Angrist, 2002). However, the literature on sex ratios emphasizes that both the local dimension of spouse availability and the economic attractiveness of mates play a large role in marital behavior in the U.S. (Fossett and Kielcolt, 1991; Lichter, LeClere and McLaughlin, 1991).

In this study, we further explore the role of sex ratios on bargaining power and spouses' labor supplies by constructing a refined availability measure which reflects both the local nature of marriage market conditions and their quality. We focus on educational attainment as our qualitative indicator. Education is commonly regarded as a valuable trait in marriage by which individuals assortatively match (Weiss and Willis, 1997; Qian 1998). We consider local marriage markets at the metropolitan level and construct a sex ratio by three education brackets (high-school graduates, some college and college-college plus), within which individuals usually sort. In the framework of a collective labor supply household model, we test whether this quality sex ratio affects the intra-household bargaining power of

couples in the corresponding education bracket. Specifically, when the sex ratio is favorable to the wife, (i.e. there is a relative scarcity of women in her education bracket) the distribution of gains from marriage is shifted in her favor, generating opposite income effects on spouses. In particular, according to collective models, if a higher number of qualified men in the wife's marriage group of reference increases female intra-household bargaining power, then one would expect a reduction in wives' labor supply, and an increase in husbands' labor supply (Chiappori et al., 2002). We also test the prediction that the bargaining power effect of such a sex ratio is greater as the assortative mating order by education increases (Iyigun and Walsh, 2007).

We use Census data at the metropolitan level for the recent decades of 2000, 1990 and 1980 to build our sex ratios. We add data from the March Supplement of the Current Population Survey (CPS) for the same years to test our labor supply prediction on married couples, using unmarried individuals as control group. Our identification strategy consists of estimating the effects of education sex ratios on husbands' and wives' labor supply and comparing changes in their labor supply behavior cross-sectionally across the U.S. metropolitan areas.

Our empirical analysis reveals that married women significantly reduce their supply of market labor, while their husbands increase theirs, as the corresponding education sex ratio becomes more favorable to women. Results are similar across decades, with a stronger impact in 1980. For instance, in 2000 we find that a 10 percentage point increase in the education sex ratio decreases annual hours worked of "some college" and "college-college plus" wives by 10 and 26.3, respectively, and increases their husbands' by 4 and 9.6, while high-school graduates do not exhibit any significant impact. Consistent with the hypothesis of a stronger effect for higher education brackets, we also find that couples with "college-

college plus" wives exhibit a significantly stronger impact of the quality sex ratio on their bargaining power than couples with "some college" wives, whose estimated quality sex ratio coefficient is in turn larger than that for high school graduates. Our bargaining power interpretation is strengthened by the fact that unmarried men and women do not exhibit any significant reaction to the quality sex ratio on their labor supply.

The findings presented here are consistent with theories which predict that higher sex ratios in the marriage market increase female bargaining power. Moreover, this study represents the first empirical support for the bargaining power effect of a local quality sex ratio by education, and for its stronger impact on couples with higher levels of educational attainment. Our results clearly indicate that local area variations in couples' labor supply are directly linked to the relative scarcity of economically attractive mates. Both the local and quality dimensions of sex ratios are relevant to explaining household behavior.

A number of alternative explanations are considered. The geographical variation in the relative number of men and women by education may capture differences in local labor market opportunities for women, in marital gains from specialization and in welfare programs or in the prevalence of married and same-sex partners who do not represent available mates. We argue that these phenomena cannot consistently explain our results, given our intra-household bargaining predictions and empirical evidence.

The paper is organized as follows. Section 2 describes the theoretical framework. Section 3 describes the empirical specification and data. Section 4 presents the empirical results. Section 5 considers alternative explanations for the findings. Section 6 concludes the paper.

2. Theoretical Background

There are two strands of economic literature related to our study. One strand focuses on the impact of the sex ratio on marriage markets, spouses' bargaining power and labor supply behavior. Specifically, studies such as Chiappori et al. (2002) and Chiappori et al. (2005) develop a collective household model and demonstrate that favorable outside marriage market opportunities increase a spouse's bargaining power through an income effect, measured as a reduction in labor supply. The opposite effect occurs for the other spouse. This is due to the fact that married men and women have the option of seeking a divorce and re-marrying. Therefore, more numerous potential mates in the marriage market of reference should affect the bargaining power of those already married, to the extent that this affects their opportunities outside the marriage. It is widely acknowledged in the literature that married people are responsive to shifts in outside factors, which can lead to income and bargaining power redistribution between spouses and changes in labor supply (Chiappori et al., 2002, Grossbard-Shechtman, 1984, Lundberg and Pollak, 1996). Our paper specifically refers to this theoretical framework. Finally, a relevant theoretical result is provided by Iyigun and Walsh (2007), who incorporate assortative spousal matching into the collective household model and find that sex ratios have a stronger impact on intra-household allocations as the assortative rank of couples rises.

The literature also provides empirical evidence about the effects of quantity sex ratios on labor supply. Chiappori et al. (2002) find that higher sex ratios reduce wives' labor supply and increase the husbands', using 1990 state Census and PSID data. In a study about immigrants to the United States, Angrist (2002) finds that higher sex ratios by ethnicity affect female labor market decisions. He argues that these empirical results are consistent with theories which predict that higher sex ratios increase female bargaining power in the

marriage market. Using data at both household and aggregate level, Grossbard-Shechtman and Neideffer (1997) and Grossbard-Shechtman (1993) show that increases in local and aggregate quantity sex ratios reduce the labor force participation and hours worked of married women. However, both the local dimension of spouse availability and the economic attractiveness of mates are relevant marriage market conditions (Fossett and Kielcolt, 1991; Lichter et al., 1991). Our analysis takes into account both of these aspects simultaneously.

The second strand of literature that is related to our paper concerns the spousal sorting by educational attainment and the gains to marriage from education. Spouses have increasingly similar educational attainment, especially among highly educated people (Qian, 1998). Specifically, sorting has mainly increased from 1960 to late 1980s, when gender roles have become more egalitarian and social distance between education groups increased (Mare and Schwartz, 2005). In this respect the years 1990 and 2000 are similar. Mare and Schwartz (2005) also report that today husbands and wives are roughly four times as likely to have a spouse who shares their educational background as they are to be married to someone who does not, educational homogamy being particularly strong for college graduates. Strong sorting based on educational attainment is also documented by Weiss and Willis (1997), with the additional finding that similarity in schooling increases marriage stability. Schooling also has cross-productivity effects on spouses in the sense that wives' education is found to increase the productivity and wages of their husbands and vice-versa (Chiappori et al., 2005; Tiefenthaler, 1997; Benham, 1974).

However, none of these studies explores how the distribution of educational attainment of men and women in local marriage markets affects intra-household bargaining power. There is also no evidence on whether this impact is increasing with higher

educational rank of couples. Analyzing these effects of *quality* sex ratios by education is the focus of our paper.

3. Empirical Specification and Data

3.1 Identification Strategy

Our main sample consists of married couples with both spouses between 22 and 60 years of age. According to the theory, if the scarcity of educated women in the local marriage market enhances women's bargaining power in the household, then the labor supply of wives should decline and the labor supply of their husbands should rise. Additionally, couples in higher education categories should experience a stronger impact on their labor supplies relative to other education categories. We also consider unmarried men and women in the same age bracket, focusing on singles as a "control" group. In principle, singles' labor supplies should not be affected by changes in intra-household bargaining power. They may experience expected marital gains or losses, if they plan to marry in the future. However, in our analysis the source of variation of bargaining power is the sex ratio, which is time variant and not an acquired right. Singles should not perceive its current fluctuations as certain future bargaining power shifts, as it would happen with divorce or abortion laws lasting over time. Therefore, consistent with Chiappori et al. (2002) we do not predict any effect on singles' labor supply. We include intact couples only if both spouses are actually present. We exclude widowed and separated couples, in order to keep a clear distinction between multiple and one decision maker households[8].

[8] For the same reason, we exclude singles that are not the head of their own household, even though their sample size is reduced. However, the sample size for a cross-section is comparable to the number of observations of singles in Chiappori et al. (2002).

The following equations for labor supply are estimated separately for wives and husbands:

$$h^f = \alpha_1 \ln w^f + \alpha_2 \ln w^m + \alpha_3 y + \gamma_1 EdR + \gamma_2 (EdR * SC) + \gamma_3 (EdR * CC) + \delta X + \varepsilon^f$$

$$h^m = \beta_1 \ln w^f + \beta_2 \ln w^m + \beta_3 y + \lambda_1 EdR + \lambda_2 (EdR * SC) + \lambda_3 (EdR * CC) + \varphi X + \varepsilon^m$$

We also estimate a corresponding labor supply equation for unmarried women and men, using the same specification except for spousal variables:

$$h^u = \nu_1 \ln w^u + \nu_2 y + \theta_1 EdR + \theta_2 (EdR * SC) + \theta_3 (EdR * CC) + \upsilon X + \varepsilon^u$$

EdR is our sex ratio, which is constructed by three education brackets, two races and by metropolitan area, in order to capture the economic attractiveness of local mates. We assign to each individual the corresponding ratio of the number of men over the number of women of his/her race, educational category and that live in his/her metropolitan area. For couples, our sex ratio EdR corresponds to the number of men over women that are of the same race and education category as the wife of each household. As to race, we focus on black and white individuals and on couples where spouses are of the same race, assuming that the relevant marriage market is limited to one's own race. The coefficient of EdR is common to both races. We consider the following education categories: high-school graduates (HS), some college (SC) and college graduate- college plus (CC). HS includes people with high-school diploma, or equivalent; SC includes individuals with some college, with or without an associate degree; and CC refers to bachelor's degree and above. We exclude high-school dropouts from our analysis to keep our sample homogeneous, since high-school dropouts are characterized by traits, socioeconomic characteristics and marriage market prospects that are different from those of graduates (Eckstein and Wolpin, 1999; Rumberger, 1983). We

compute our sex ratio including men and women aged 18 to 64 following Fossett and Kiecolt, (1991) who find that measures of the sex ratio based on broad age ranges are satisfactory and may be preferable to sex ratios computed for narrower age ranges[9].

The interactions of EdR with the dummy variables for the education brackets SC and CC, capture the differential effect of our sex ratio for higher education categories. The education dummies refer to the education of the wife and our omitted category is high-school graduates. Our identification strategy of the bargaining power effect consists of estimating $\gamma_1, \gamma_2, \gamma_3$ for wives and $\lambda_1, \lambda_2, \lambda_3$ for husbands. The impact of the education sex ratio on the labor supply of high-school graduate wives and their husbands is captured by γ_1 and λ_1 respectively. The terms $(\gamma_1 + \gamma_2)$ and $(\gamma_1 + \gamma_3)$ measure the impact of the education sex ratio on the labor supply of some-college and college-college plus wives. The corresponding impacts for husbands is measured by the terms $(\lambda_1 + \lambda_2)$ and $(\lambda_1 + \lambda_3)$, respectively.

The other regressors are the wage rate w^i (of spouse *i* or of unmarried individual *u)*, household non-labor income y, and a vector of covariates X. X includes age, experience, education of each spouse, a dummy variable for race, number of household members and number of (young) children in the family. X also includes state unemployment rate, state total labor force participation and female labor force participation, to control for the level of economic activity in a state and especially for employment opportunities. We add two

[9] Research shows that people consider mates drawn from relatively broad age ranges. While mean age differences between husbands and wives are relatively small, there is considerable variation around this central tendency as many marriages involve larger age differences. Competition and substitution across age categories is considerable (Fosset and Kiecolt, 1993). Sex ratios accounting for wives being younger than husbands are reported to have the same impact (Chiappori et al., 2002). We also compute the sex ratio for the age bracket 18 to 44 and obtain similar results.

measures of the prevalence of same-sex unmarried households by metropolitan area, for homosexuals and lesbians in 2000 and 1990 only, as same-sex households were not recorded in 1980. The purpose of including these two variables is to keep our education sex ratio as closely related to the heterosexual marriage markets as possible.

The dependent variable in our labor supply regressions is annual hours worked, defined as total annual hours worked on the longest job held in the previous year. Households in which the wife or the husband does not work are also included in our samples and we account for a possible selection bias toward working men and women by correcting for sample selection with Heckman MLE[10]. As source of identification, we use distributional assumptions on the first step residuals alone or exclusion restrictions[11]. Both procedures yield similar robust results. All female and male labor supply regressions exhibit the same results when estimated without selection correction. We use predicted wages to measure the non-working spouses' wages and to address the possible endogeneity of individuals' observed wages. To predict individuals' wages, we take a standard human capital approach, also implemented in the collective labor supply literature (e.g., Donni, 2005), and consider a wage equation in which wage depends on the individual's age, race, education, education squared and cubed, but does not depend on his/her spouse's characteristics. This equation is then estimated separately for participating wives, husbands, single men,\ and single women, with a correction for selection bias[12]. The generated fitted values then replace

[10] We only exclude household observations where neither spouse works, given that this analysis measures bargaining power changes through labor supply. The inclusion of non-working men is relevant given the decrease in male labor force participation rates in the past 30 years.

[11] The latter are presence of young children or number of family members only affecting the participation decision but not labor supply. Tables report estimation with identification from statistical distribution assumptions.

[12] The participation decision depends on the number of children, dummies for age brackets, education, race and measures of local economy.

the wage observations of the corresponding individuals in our samples[13]. Finally, Wald tests of overall statistical significance performed on the above labor supply regressions do not reject the validity of the framework we use.

We run our labor supply regressions using robust standard errors clustered by metropolitan area, which allows for correlation of household observations within metropolitan areas. Our specifications do not use a differences-in-differences estimator: husbands' and wives' regressions, as well as singles', are estimated separately from one another. As such, they should not suffer from the understated standard errors highlighted by Bertrand, Duflo and Mullainathan (2004). At any rate, clustering by metropolitan area should rectify such an underestimation, if it is present.

We assume sorting within education brackets. We compute the extent of sorting in our own sample, and find that the percentage of couples who have spouses with education levels in the same bracket (high-school graduates, some college and college-college plus) is 58.5 % in 2000, 57.5 % in 1990 and 55 % in 1980. The correlation of spouses' education across education brackets is about .52 for all three decades. These figures are very similar to those reported by the literature acknowledging education assortative mating. Specifically, Chiappori et al. (2007) state that the proportion of spouses who have the same level of education remained fairly constant over time at about 50 %. Weiss and Willis (1997) find that the correlation in educational attainments of spouses is on average .57 (around year 1980) and report that this strong correlation is similar in magnitude to the correlations found in many other samples in the United States and other countries.

[13] Tables report estimation with the predicted spouse's and own wages.

3.2 Data

Estimation is carried out on the March Supplements of the Current Population Survey (CPS), for the years 2000, 1990 and 1980. The U.S. Census data for the corresponding years is used to construct our education sex ratio by education brackets, race and age groups. Unmarried individuals and husbands and wives from one-family households were extracted from the CPS into separate files. Records in these files were then matched on the household identification code to create a single observation for each married couple. Data on labor force activity, income and any variable of interest at the household level are taken from the March Supplements. In particular, the covariate education is derived from the education categories that the CPS provides[14]. CPS weights are used to make the sample representative of the U.S. population and economy. To this sample we merge data on education ratios from the Summary Files 4 of the Census for 2000 and 1990 and from Chapter C of Volume 1 of the Census for 1980. Summary File 4 (SF4) and Chapter C contain information compiled from the questions asked to a sample of all people and housing units and is released as individual files for each of the 50 states, the District of Columbia, Puerto Rico and for the United States overall. We use the cross-tabulations by sex, age, race and educational attainment to construct separate education ratios for the black and white population aged 18 to 64, by metropolitan area[15]. In 2000, the Census identifies 276 U.S. metropolitan areas excluding Puerto Rico; in 1990 and 1980, the total identified areas are 284 and 288, respectively. We merge these to the CPS data and keep the metropolitan areas present in both data sets. We also exclude the top and bottom 2 %

[14] In CPS 2000, education is recorded as degrees attained rather than years of schooling completed as in 1990 and 1980. We thus assigned number of years of schooling to the corresponding degrees.

[15] In 1980, the available cross-tabulations only provide the age bracket "25 and older". Also, the education brackets in Census are focused on years of schooling rather than degrees obtained as is the case of the following decades. However, the broad education categories and age ranges used to construct our education ratio are not affected.

metropolitan ratios' outliers. This leaves us with 173 metropolitan areas in 2000, 181 in 1990 and 34 in 1980[16]. The state unemployment rate, state total labor force participation and female labor force participation are retrieved from the Bureau of Labor Statistics. The two measures of the prevalence of same-sex unmarried households come from tabulations in SF4 and are computed at the metropolitan level. In 2000 and 1990, the Census records a household as a same-sex union if the relationship to the householder is specified as "unmarried partner". We construct two ratios, the number of homosexual unions out of the total number of households and the number of lesbian unions out of the total number of households.

Table 1 presents the descriptive statistics for the main variables by year and demographic group. In our samples, men on average work more annual hours than women and earn a higher hourly wage, while they have similar levels of education. On average, husbands are two years older than wives. As to our education sex ratio by metropolitan area, there are more white women graduating from high school, or having some college education, than white men. On the other hand, there are more white men than women holding a college degree or above, but the gap has been decreasing over time. The pattern is somewhat different for the black population: fewer black women hold a high school diploma relative to black men but they are more numerous in the "some college" category.

[16] The available number in 1980 is so small due to the fact that the CPS identifies only 44 metropolitan areas in 1980.

Table 1. Summary Statistics

	2000				1990				1980			
	White		Black		White		Black		White		Black	
Variable	mean	std. dev	mean	std. dev	mean	std. dev	mean	std. dev	mean	std. dev	mean	std. dev
Education Ratio HS graduates	0.98	0.06	1.22	0.63	0.86	0.07	1.03	0.41	0.7	0.04	0.78	0.09
Education Ratio Some College	0.89	0.05	0.94	0.43	0.92	0.06	0.95	0.47	0.96	0.08	0.9	0.14
Education Ratio College & above	1.02	0.07	0.95	0.48	1.21	0.09	1.06	0.53	1.5	0.08	0.95	0.25
Number of observations*	173		173		181		181		34		34	
	Wives		**Husbands**		**Wives**		**Husbands**		**Wives**		**Husbands**	
Variable	mean	std. dev	mean	std. dev	mean	std. dev	mean	std. dev	mean	std. dev	mean	std. dev
Hours worked**	1745.5	713.46	2309.25	547.44	1638.4	722.51	2223.85	568.64	1464.74	743.14	2211.3	492
Log of wage**	2.59	0.72	3.01	0.64	2.19	0.67	2.69	0.61	1.57	0.75	2.21	0.59
Age	39.18	7.88	41.2	8	40.49	9.75	42.88	10.13	36.33	8.87	39.17	9.42
Education	14.19	2.16	14.44	2.37	13.8	2.03	14.33	2.22	13.44	1.9	13.44	1.9
Household non-labor income	6153	14748	6153	14748	5154	12569	5154	12569	1810	5572	1810	5572
Number of children below age 6	0.415	0.7	0.415	0.7	0.37	0.68	0.37	0.68	0.42	0.69	0.42	0.69
Number of family members	3.5	1.19	3.5	1.19	3.4	1.19	3.4	1.19	3.66	1.31	3.66	1.31
Dummy for black	0.088	0.28	0.088	0.28	0.07	0.25	0.07	0.25	0.075	0.29	0.075	0.29
Number of observations	9235		9235		11894		11894		4597		4597	
	Single Women		**Single Men**		**Single Women**		**Single Men**		**Single Women**		**Single Men**	
Variable	mean	std. dev	mean	std. dev	mean	std. dev	mean	std. dev	mean	std. dev	mean	std. dev
Hours worked**	1759.2	652.6	2098.87	583.45	1775.8	632.01	2057.73	525.43	1670.07	629.77	2001.4	528.29
Log of wage**	2.24	0.77	2.66	0.58	1.98	0.63	2.34	0.65	1.55	0.62	2.02	0.54
Age	32.81	8.88	37.92	8.44	32.21	8.08	34.59	10.3	34.98	9.88	35.61	10.43
Education	13.17	1.68	13.68	2.15	12.96	1.68	13.71	2.04	12.9	1.57	13.87	1.92
Household non-labor income	3601	5971	6885	13938	3634	5433	5352	9264	3076	4907	2923	4657
Number of children below age 6	0.53	0.71	0.094	0.36	0.58	0.77	0.11	0.43	0.45	0.68	0.072	0.26
Number of family members	2.75	1.02	2.36	0.8	2.76	1.05	2.46	0.8	2.97	1.13	2.62	0.94
Dummy for black	0.6	0.48	0.3	0.46	0.62	0.48	0.19	0.39	0.47	0.49	0.19	0.39
Number of observations	696		153		562		185		548		107	

The sample contains data from the CPS March supplement and U.S. Census years 2000, 1990 and 1980.

*Number of Census metropolitan areas present in the CPS sample.

**For women and men with positive hours of work.

4. Results

4.1 Main evidence

The main results are shown in **Tables 2** and **3**. In all the three decades, the estimated effects of our quality sex ratio are positive for husbands and negative for wives, as predicted by the theory. Additionally, couples with CC wives exhibit a stronger response to the quality sex ratio on their bargaining power than couples with "some college" wives. In turn, SC wives estimated quality sex ratio coefficient is larger than for high school graduates wives. The point estimates in our samples indicate that in 2000 (columns 1 and 2 of **Table 2**) a 10 percentage point increase in the education sex ratio reduces SC wives' annual labor supply by about 10 hours (P value = .001), while their husbands' is increased by 4 hours (P value = .06). As to couples with CC wives, their coefficients for the education sex ratio show a decline in wives' labor supply by 26.3 hours (P value = .001), and an increase in their husbands' by 9.6 hours per year (P value = .05). 1990 exhibits a similar impact (columns 3 and 4 of **Table 2**). The evidence clearly shows that in recent years for both husbands and wives the estimates for the "college-college plus" are greater than for "some college", the coefficients being statistically different from each other for each spouse. This suggests that changes in the sex ratio of one's education group have a stronger effect on bargaining power if one is highly educated. High-school graduates do not show any significant response to changing ratios[17]. As reported in columns 5 and 6 of **Table 2** the 1980 sample exhibits a similar pattern of effects between spouses and across education brackets, although their magnitude is larger than in 1990 and 2000. Most notable is the strong impact for the highest education bracket.

[17] The absence of such a bargaining power effect may be due to strong rigidities in the labor supply schedules of such low-educated couples, or to the lack of sorting behavior by this demographic group. See subsection 4.4 for a more detailed discussion.

Table 2. Estimation of the Labor Supply Regressions of Wives and Husbands

	2000		1990		1980	
	Wives	**Husbands**	**Wives**	**Husbands**	**Wives**	**Husbands**
	(1)	(2)	(3)	(4)	(5)	(6)
Education Ratio	-59.47	-31.77	169.41	-78.48	336.75	-187.09
	(102.25)	(92.61)	(118.95)	(85.21)	(229.46)	(176.25)
Education Ratio x dummy SC	**-100.70 *****	**40.27 ***	**-102.59 ****	**56.38 ***	**-192.50 ***	**118.33 ***
	(31.38)	**(22.18)**	**(42.72)**	**(29.67)**	**(108.84)**	**(69.88)**
Education Ratio x dummy CC	**-263.44 *****	**96.74 ****	**-175.17 ****	**131.48 *****	**-363.75 ****	**183.50 ***
	(71.65)	**(50.88)**	**(73.23)**	**(53.28)**	**(188.52)**	**(114.04)**
Log of wage of wife	694.59 *	313.17	1617.47 *	-223.51	311.13	385.57
	(375.90)	(336.22)	(945.66)	(685.21)	(1211.88)	(875.13)
Log of wage of husband	738.83	126.76	387.23	1346.66 ***	2147.05 ***	-1328.39 ***
	(463.87)	(197.89)	(371.11)	(339.68)	(817.68)	(514.13)
Age of husband	-17.43	5.11	-4.31	15.54 ***	-1.14	3.91 *
	(13.64)	(6.33)	(4.1)	(5.31)	(5.05)	(2.09)
Age of wife	11.83	5.65	4.47	-5.05	-7.62	-0.66
	(8.77)	(5.45)	(6.73)	(4.59)	(7.85)	(5.70)
Education of husband	-99.52 ***	9.34	-46.86 *	-217.06 ***	-155.44 ***	113.57 ***
	(38.09)	(19.64)	(28.08)	(57.63)	(56.22)	(35.62)
Education of wife	36.10	-39.10 *	-130.71	-8.42	56.91	-45.91
	(31.73)	(24.03)	(98.00)	(69.94)	(118.27)	(84.24)
Household non-labor income	-1.44 ***	0.02	-3.59 ***	-3.10 ***	-1.90	-4.10 ***
	(0.59)	(0.58)	(0.82)	(0.77)	(1.9)	(1.7)
Number of children aged<6	-149.48 ***	3.12	-170.84 ***	5.29	-270.4 ***	27.95 **
	(16.43)	(10.99)	(20.27)	(9.75)	(24.27)	(12.30)
Number of household members	-106.95 ***	20.84 ***	-121.54 ***	1.9	-100.02 ***	13.21
	(8.70)	(5.26)	(9.8)	(5.33)	(12.33)	(3.80)
Dummy for Black	244.52 **	-133.97 **	356.63 ***	-19.91	428.53 ***	-213.41 ***
	(102.66)	(68.06)	(62.4)	(53.27)	(69.18)	(66.56)
Inverse Mill's ratio	23.33	12.91	60.45	-0.12	85.79	101.49
	(12.08)	(13.05)	(14.21)	(9.47)	(17.80)	(18.59)
Observations	9235	9235	11894	11894	4597	4597

Data from the the CPS March supplement and U.S. Census years 2000, 1990 and 1980.
* significant at 10 %; ** significant at 5 %; *** significant at 1 %. Estimated coefficients, and standard errors (in parenthesis) are clustered by metropolitan area.
All tables report regressions with the same set of covariates described in Section 3. Regressions are corrected for sample selection with Heckman MLE.
Parameters for household non labor income are multiplied by 1,000.

Table 3. Effect of Education Ratio on Annual Hours Worked of Couples and Singles

	2000		1990		1980	
	Wives (1)	**Husbands** (2)	**Wives** (3)	**Husbands** (4)	**Wives** (5)	**Husbands** (6)
Education Ratio	-59.47	-31.77	169.41	-78.48	336.75	-187.09
	(102.25)	(92.61)	(118.95)	(85.21)	(229.46)	(176.25)
Edu Ratio*dy SC	**-100.70 *** **	**40.27 * **	**-102.59 ** **	**56.38 * **	**-192.50 * **	**118.33**
	(31.38)	**(22.18)**	**(42.72)**	**(29.67)**	**(108.84)**	**(69.88)**
Edu Ratio*dy CC	**-263.44 *** **	**96.74 ** **	**-175.17 ** **	**131.48 *** **	**-363.75 ** **	**183.50**
	(71.65)	**(50.88)**	**(73.23)**	**(53.28)**	**(188.52)**	**(114.04)**
Number of observations	9235	9235	11894	11894	4597	4597
	Single Women (7)	**Single Men** (8)	**Single Women** (9)	**Single Men** (10)	**Single Women** (11)	**Single Men** (12)
Education Ratio	-93.49	793.40	49.40	364.53	-130.14	-1005.82
	(312.81)	(678.12)	(256.50)	(590.63)	(473.75)	(865.94)
Edu Ratio*dy SC	-95.46	-343.37	-61.76	-212.91	65.98	1.90
	(149.94)	(439.32)	(184.88)	(229.04)	(200.60)	(385.56)
Edu Ratio*dy CC	32.02	-535.88	214.63	-264.91	208.15	417.66
	(225.08)	(613.58)	(297.43)	(408.08)	(325.33)	(522.43)
Number of observations	696	153	562	185	548	107

Data from the the CPS March supplement and U.S. Census years 2000, 1990 and 1980.

* ; **; *** significant at 10 %, 5 % and 1 %. Estimated coefficients, standard errors (in parenthesis) are clustered by metropolitan area.

All tables report regressions with the same covariates described in Section 3. Regressions are corrected for sample selection with Heckman MLE.

Singles defined as "never married". In 1980 non-separated unmarried individuals were included due to scarcity of observations.

We suggest that for CC women the availability of suitable mates was really restricted to the highly educated pool, given that it was uncommon for CC women to marry down. Thus, variations in the CC sex ratio had a larger bargaining power effect back in the 1980 than in recent years, when marrying down became more socially acceptable for women (Chiappori et al. 2007). Also, wives' attachment to market work has increased since 1980, especially for highly educated women (Pencavel 1998). It may be that in 1980s wives' labor supply was more responsive to sex ratio changes because their work attachment was weaker. Finally, divorce rates were at a record high around 1980, so that the higher likelihood of divorce would make couples more responsive to outside marriage market opportunities. The findings from 1980, though, have to be interpreted with caution. The very small number of metropolitan areas (44) identified in that year in CPS and their consequently modest cross-sectional variation in sex ratios are likely to make our 1980 sample not representative. As such, in our following analysis we will focus on the decades of 1990 and 2000.

As to the size of our sex ratio effects, the changes for 2000 correspond to a 5.7 (15.06) percent reduction of the average annual hours worked by "some college" ("college-college plus") married women and to a 1.7 (4.1) percent increase for their corresponding husbands'. Similarly, in 1990 the education ratio effects amount to a 6.2 (10.69) percent reduction of the average annual hours worked by "some college" ("college-college plus") married women[18] and to a 2.53 (5.9) percent increase of their husbands'. These effects are sizable, given the acknowledged rigidities in the husbands' labor supply (e.g. Donni, 2005) and the frequency of the reported labor supply peaking around 40 hours of work per week. In particular, the impact on husbands is remarkable since traditional analyses do not emphasize their response to the sex ratio, let alone their labor supply increasing with it. The

[18] Probit regressions of female labor market participation using our education ratios show a negative effect (although not always significant), in accord with the literature.

direction of those effects is also the same as in the labor supply impact of the quantity sex ratio found by Chiappori et al. (2002).[19]

As to the other covariates in the spouses' labor supply equations, most parameter estimates are comparable to the literature. In particular, the wives' own wage response is always positive significant, while the husbands' own wage coefficient is negative only in 1980 and the effects are sizable (**Table 2**). Also the husband's negative estimate is in accord with previous empirical findings in the family labor supply literature. In fact, Chiappori et al. (2002) run similar spouses' labor supply equations and show negative own wage estimates for husbands. Furthermore, we find a positive significant cross-wage effect of husbands' wages on wives' labor supply, as documented in Chiappori et al. (2002) and Blundell et al. (2002).

The signal conveyed by the education sex ratio about the quality of outside marriage market opportunities is increasingly more relevant for highly educated wives and husbands, due to the fact that education is positively related to important mate attributes such as wealth, income and success in life. In other words, the availability of valuable mates in the marriage market represents a more desirable outside opportunity, and a more credible threat, for spouses that are per se high-quality mates than for the ones in the lower education brackets. This is in line with the prediction by Iyigun and Walsh (2007), according to which imbalances in the sex ratios become more relevant for intra-household allocations as the rank of couples in the assortative order rises, measured here by educational attainment. Moreover, our results also match evidence in the literature of stronger educational homogamy for highly educated men and women (Qian 1998). The probability of having a

[19] We also estimate the impact of our quality sex ratio on a sub-sample of couples that actually sort in marriage by education bracket, i.e. on couples where wives' education belongs to the same education bracket as their husbands'. We find a similar pattern of results as in our main specification.

spouse with the same educational background is four times higher than the possibility of marrying to someone who does not (Mare and Schwartz, 2005).

The bargaining power effect is also estimated on unmarried individuals, separately for men and women. The results are detailed in columns 7 through 12 of **Table 3**. Their labor supply regressions show no significant impact of the education sex ratio in any decade, as theory predicts. Both men and women exhibit economically negligible and statistically insignificant coefficients of the sex ratio by education brackets and of its interactions. No additional impact is found for "some college" and "college-college plus". Furthermore, all their coefficients are different from the couples' sample, which emphasizes the bargaining power effect on husbands and wives. Only the coefficient reflecting the impact on high-school graduates has a large magnitude for single men. However, the coefficients are never significant and the single men's very small sample size, especially in 1980, may explain the imprecise estimate. This lack of impact on singles is also consistent with the findings of Chiappori et al. (2002).

Our empirical results emphasize that both the local dimension of spouse availability and the economic attractiveness of mates affect spouses' bargaining power and labor supply. This evidence represents the first empirical support for the bargaining power effect of a quality sex ratio by education and for its stronger impact at higher levels of educational attainment. Further evidence presented below, together with the discussion of various alternative explanations, should help making this claim convincing.

4.2 Impact on older couples

The bargaining power effect of our sex ratio by education is also estimated on sub-samples of older couples, using the same specification as above. We report the results in

Table 4. Couples in their mid-thirties and above exhibit a stronger impact of the education sex ratios than the entire sample, especially for the "college-college plus" category. With a 10 percentage point increase in the education ratio, the associated decline in wives' labor supply is 34.2 annual hours for CC in 2000 and 23.6 annual hours in 1990 (columns 1 and 3), while for husbands the increase is of 15.7 and 15.9 annual hours, respectively (columns 2 and 4). The impact for SC is about – 10 hours for wives and 7 for husbands in both decades as seen in columns 2 and 4. The role of high-school graduates' sex ratio is still negligible. We believe that these results reflect different informational values about the quality of potential mates that educational attainment conveys at different stages of life. At older ages education is a better predictor of mate quality and economic prosperity because enough time elapsed to establish social status and wealth. Especially if one has a high educational attainment, the signal given by the education sex ratio is very quality-informative, so that the effect of such outside marriage market opportunities on bargaining power is very strong. Education matters more in marriage choices when prosperity is directly at stake: this is the case for "older" couples looking at their marriage prospects, since the returns to education are already realized. Evidence from the literature actually suggests that later age at union promotes stronger educational homogamy. In particular, men and women aged thirty or above are less likely to be with partners with a different level of educational attainment than are persons in their twenties (Qian, 1998).

4.3 Race

Running our main labor supply specification on the sub-sample of white couples yields the same results as the full sample regressions (**Table 5**). The education sex ratio[20] has

[20] For the white sub-sample, EdR is computed using data only for white men and women.

a negative effect on wives' labor supply and positive effects on husbands', with a significantly stronger impact for the "college-college plus" than for "some college". The coefficient of high-school graduates is not significant. As reported in columns 1 and 2, in 2000 with a 10 percentage point increase in the education ratio, "some college" wives experience a reduction in their annual hours of 8.3 (P value = 0.02) while their spouses increase theirs by 3.8 (P value = 0.1). Moreover, wives in the highest education category reduce their annual hours worked by 25.6 hours (P value = 0.001), and their spouses experience an increase of 12 annual hours (P value = 0.03). Because of the very small black population present in the CPS we could not estimate meaningful regressions for only black couples. However, comparing the findings for white couples to those for the entire sample, it seems that blacks and whites respond to bargaining power effects of the education sex ratio in a similar manner. In any case, in our full sample we run a similar regression to check whether the bargaining power effect of our within-race quality sex ratio varies across races. Each of the three variables concerning the education sex ratio is interacted with a dummy variable for race, in order to capture a possible differential effect. No evidence of a different impact across races was detected.

Table 4. Effect of Education Ratio on Annual Hours Worked of Older Couples

	2000		1990	
	Wives (1)	**Husbands** (2)	**Wives** (3)	**Husbands** (4)
Education Ratio	59.05	-6.96	278.6	-160.57
	(97.94)	(103.62)	(182.10)	(117.94)
Edu Ratio*dy SC	**-98.23** ***	**71.10** ***	**-126.15** **	**66.30** *
	(38.70)	**(28.87)**	**(62.33)**	**(38.25)**
Edu Ratio*dy CC	**-341.92** ***	**157.02** **	**-236.28** **	**159.10** **
	(95.23)	**(57.78)**	**(101.01)**	**(69.09)**
Number of observations	6166	6166	6501	6501

Data from the the CPS March supplement and U.S. Census years 2000 and 1990.
* ; ** ; *** significant at 10 %, 5% and 1 %. Estimated coefficients, standard errors (in parenthesis) clustered by metro area.
Regressions with the same covariates described in Section 3. Regressions corrected for sample selection with Heckman MLE.
Old couples are those with wives aged 34 to 65 and husbands aged 38 to 65.

Table 5. Effect of Education Ratio on Annual Hours Worked of White Couples

	2000		1990	
	Wives	**Husbands**	**Wives**	**Husbands**
	(1)	(2)	(3)	(4)
Edu Ratio	119.31	-109.29	15.45	-141.51
	(183.82)	(133.66)	(157.73)	(100.67)
Edu Ratio*dy SC	**-83.45** **	**38.27** *	**-83.24** **	**53.75**
	(37.81)	**(24.11)**	**(42.96)**	**(32.65)**
Edu Ratio*dy CC	**-256.03** ***	**120.78** **	**-139.40** *	**136.38** **
	(78.19)	**(57.51)**	**(75.83)**	**(58.27)**
Number of observations	8546	8546	11167	11167

Data from the the CPS March supplement and U.S. Census years 2000 and 1990.
* ; ** ; *** significant at 10 %, 5% and 1 %. Estimated coefficients, standard errors (in parenthesis) clustered by metro area.
Regressions with the same covariates described in Section 3. Regressions corrected for sample selection with Heckman MLE.

4.4 High-school graduates

Bargaining power in high-school graduate households does not seem to be affected by the relative number of men and women that are high-school graduates in a metropolitan area. We suggest that the lack of an effect at this relatively low level of education could be due to individuals not deriving significant marital gains in terms of their educational attainment, so that they are not affected by the mate quality dimension "education". Another force driving this result could be that high school graduates, the black ones in particular, have a lower remarriage rate than higher educated individuals (Smock, 1990). If chances of remarriage are low, high school graduate couples may not respond to variations in remarriage market opportunities such as fluctuations in the sex ratio. Moreover, high school graduate couples exhibit more rigid labor supplies than higher educated spouses. Wives especially work more hours and are less flexible in specializing in non-market activities than college graduates (Pencavel, 1998). Low educated couples are likely to hold jobs with fixed amount of hours to supply and they may not be able to respond to bargaining power shifts in terms of labor supply.

We also consider the hypothesis that these individuals do not exhibit strong assortative mating behavior by education because the bracket is too narrow and they may also look for mates "above", in the "some college" pool. We thus construct a modified quality sex ratio, in which couples with a high-school graduate wife are associated with the sex ratio of high-school graduates plus "some college" men and women. There is no evidence to support the hypothesis. The bargaining power effect for them is not significant for husband or wife, while for "some college" and "college-college plus" couples it remains significant, and with an increasing impact across educational brackets.

5. Alternative explanations

5.1 Sex ratios as proxy of local labor market opportunities

It may be possible that the labor supply of married women falls not as a result of the bargaining power effect of mate availability by education brackets, but due to poor local economic opportunities for women. High values of our quality sex ratio by metropolitan area may suggest male workers outnumbering female workers because of a local labor market with gloomy perspectives for women. Similarly, it could be that more educated women, whose labor supply is high, live in metropolitan areas where there are better job opportunities for them, so that the negative coefficient of our education ratio represents labor market instead of bargaining power fluctuations. There are at least three reasons to believe that the local economy hypothesis does not provide a plausible alternative explanation for our findings. First, our labor supply regressions include individuals' wages and experience, state unemployment rate, total and female labor force participation rate, which account for the effects of variation in labor market opportunities, specifically for women. Second, it is difficult to understand why the labor supply of men married to these women, but not other men, should be higher in those metropolitan areas if it were just a labor market fluctuation. Third, single women with similar demographic and labor market characteristics did not experience the same impact of the sex ratios as married women.

5.2 Sex ratio including married and same-sex partners

It may seem that our education sex ratio does not capture the actual availability of mates in a local marriage market because both married individuals and same-sex partners are included in the computation of our variable. Its lack of significance in our unmarried

samples may be attributed to large percentages of unmarried men or women having same-sex partners. We believe that our ratio of the total number of men and women present in a metropolitan area does represent a reliable sex-ratio for three main reasons. First, there is considerable evidence in the literature that relatively little benefit is realized from refinements such as computing sex ratios separately by marital status (Fossett and Kiecolt, 1991; Freiden, 1974). Second, we control for the prevalence of same-sex unmarried households in 2000 and 1990, the only two decades when the Census provides this information, constructing two ratios: the number of homosexual relationships out of the total number of households and the number of lesbian relationships out of the total number of households. These metropolitan level controls ensure that our education sex ratio is an index of the tightness of the heterosexual marriage markets. Finally, to the extent that the sizes of the male and female homosexual populations vary together, their impact on the validity of the sex ratio would be reduced (Fosset and Kiecolt, 1991).

5.3 Marital gains from specialization

It is known that if the education of the husband is higher than the wife's, there are gains from the wife specializing in household production and thus working less in the labor market (Becker 1991; Chiappori et al., 2006). Our quality sex ratio may capture the presence of these gains, showing that when the education gap of married couples increases (i.e. the number of highly educated men increases) married women's labor supply decreases and their husbands' increases. However, this link cannot represent an alternative explanation to our bargaining power interpretation for three reasons. First, our sample consists of already married couples while the specialization effect should be present only for couples formed

after any sex ratio change. When we restrict our sample to "older" couples, who are likely to have gotten married many years prior to the decade under analysis, our bargaining power interpretation still holds. Second, when we focus on a sub-sample of couples who did indeed perfectly sort by education brackets, (i.e. no peculiar gain from specialization should be present for them) our results still hold. Third, we consider positive assortative mating within education brackets, so that men and women are affected by fluctuations in the sex ratio only in their own education group. In this case, the education gap of potential spouses and the corresponding gains from specialization are small.

5.4 Welfare programs for women

Welfare programs favorable to women may discourage female labor supply or increase the bargaining power of married women by enhancing the value of single motherhood. However, by definition, welfare programs benefit only low-income households, while our results hold for all levels of income. Additionally, there is no reason why the pattern of the main welfare benefits such as AFDC (TANF), EITC and mandated benefits should vary across metropolitan areas to be more favorable to women where women are relatively scarce.

6. Conclusions

This chapter further explores the role of sex ratios on intra-household bargaining power and spouses' labor supplies, by constructing a quality sex ratio by metropolitan area and education brackets. We test whether this education ratio affects the balance of power of couples in the corresponding education brackets, within the framework of a collective labor

supply household model. We also test that the bargaining power effect of our sex ratio is greater as the assortative mating order by education increases. We use CPS and Census data for 2000, 1990 and 1980 at the metropolitan level, and find that married women significantly reduce their supply of market labor, while their husbands increase theirs as the corresponding education sex ratio becomes more favorable to women. Couples with "college-college plus" wives exhibit a stronger impact of the quality sex ratio on their bargaining power than couples with "some college" wives, whose estimated quality sex ratio coefficient is in turn larger than for high-school graduates. Our bargaining power interpretation is strengthened by the fact that unmarried men and women do not exhibit any significant impact of the education ratio on their labor supply. Alternative explanations such as local labor market opportunities, marital gains from specialization, welfare programs, and inclusion of married and same-sex partners in the sex ratio, are rejected.

The findings presented here are consistent with theories where favorable sex ratios increase female bargaining power in the marriage market. Furthermore, our results indicate that both the local and quality dimensions of sex ratios are relevant to explaining household behavior. Our evidence represents the first empirical support for the bargaining power effect of a quality sex ratio by education and for its stronger impact as higher levels of educational attainment are considered.

CHAPTER THREE

CONCLUSIONS

This dissertation studies the impact of changes in outside marriage market opportunities on intra-household bargaining power. In the first chapter I specify a marriage market matching model to analyze the impact of the availability of healthy mates on intra-household bargaining power. The main prediction of the model is that in marriage markets in which both healthy and frail men marry, an increase in the relative scarcity of healthy women enhances wives' bargaining power. This effect is estimated in a collective labor supply framework in which spousal bargaining power and labor supply are inversely related. I use CPS data and Census data on disability and construct a sex ratio type measure of mate availability at the metropolitan level. I estimate labor supplies for white married couples and find that a higher relative scarcity of healthy women in the couple's metropolitan area reduces wives' labor supply and increases their husbands'. The role of sex ratios on spouses' bargaining power is further explored in the second chapter. Using Census and CPS data for U.S. metropolitan areas in years 2000, 1990 and 1980, we construct a quality sex ratio by education brackets. We argue that a relative shortage of suitably educated women in the spouse's potential marriage market increases wives' bargaining power and it lowers their husbands'. We further check the prediction that this effect is greater as the assortative mating order by education increases. We find that higher relative shortage of comparably educated women in the couple's metropolitan area reduces wives' labor supply and increases their

husbands'. The impact is stronger for couples in higher education groups. Consistent with bargaining theory, no such effects are found for unmarried individuals.

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