Modeling the Impact of Gender Imbalance on Marriage Markets

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ABSTRACT

This project examines the effects of gender imbalances in marriage markets. Examples of populations with gender imbalance are given, the effects of these demographics are explored, and recommendations for further research are given.

INTRODUCTION

Many people seem to approach finding a mate with the implicit assumption that there are an equal number of men and women within the population they are searching. The question arises, however, “what happens in marriage markets when there is an unequal number of men and women?” This paper seeks to provide a survey of examples of this type of environment and investigate the actual and theoretical implications of such gender imbalances.

When Gary Becker launched his seminal work on the economics of the family, he made a number of assumptions, including that there are costless matchings, perfect information, and that everyone gains from marriage. Becker also touches on what happens in markets with non-unitary sex ratios, but predicts that all members of the outnumbered gender will marry. While Becker’s insights have led to a number of useful predictions and insights, he describes conditions that do not match the reality of many marriage markets or those who are searching in them.

THE SEX RATIO

In the social sciences, researchers use a measurement called the sex ratio to indicate the total number of males relative to females in a given population.

\[
\text{SexRatio} = \frac{\sum \text{Males}}{\sum \text{Females}}
\]

This ratio is correlated with many significant social effects. Within marriage markets, this ratio refers to the number of males available for mating relative to the number of females available for mating. While more research needs to be done in this area, I expect that in populations where the ratio is high, women pursue less education since they are more likely to find economic support from a man. Where the ratio is low, women appear likely to pursue higher levels of education since they have a greater expectation to rely on themselves for economic wellbeing.

EXAMPLES OF POPULATIONS WITH GENDER IMBALANCES

3 Id at 838.
College Campuses

By 2015, the average college graduating class is expected to be 60-percent female. As this threshold is reached, women have been observed to become hypercompetitive for getting attention from men. Already, this can be seen occurring at universities with high female-to-male gender ratios, such as James Madison University (JMU) where the student body is currently 61% female. At JMU and other campuses with similar gender ratios, many women are found willing to compete against other women by lowering their standards to get male attention. “Hook-ups” and one night stands seem to be the rule of the day in these environments and it doesn’t look like it will be changing soon.

If current trends continue, it appears that more and more colleges will start seeing similar gender imbalances. Already, among every racial group, women are more likely to have an associate degree or higher. Men are not only attending colleges at lower rates, they are also performing more poorly academically and taking longer to graduate than women. Women now make-up 58 percent of those enrolled in two- and four-year colleges. If these demographics persist, this implies a shortage of college-educated men for college-educated women to marry.

Potential Implications of Gender Imbalance at Colleges

Evolutionary psychologists tell us that women prefer men of greater economic capacity, social status, ambition, and industriousness relative to themselves. This preference remains true even among highly successful women. If a college education serves as a proxy for these characteristics, there could be a shortage of college educated men in the future leading to high levels of competition among college educated women for these men. Already, this can be seen taking place in the African American population, where black women have higher education levels and salaries on average than men. As one commentator asks: “With women acting as both provider and procreator, what is left for the man to do?”

It is possible that as marriage rates decrease and women rely less on men for economic provision, men on the margin no longer feel the necessity to excel academically or professionally to gain sexual access to women. This may partially explain the differences in college attendance of men and women. However, it still remains true that when it comes to marriage, women tend to prefer men who are equal or higher in status to themselves in terms of education and financial earnings. If this trend continues, marriage-minded women will likely face a shortage of college educated men to marry. More research is needed in these areas.

Washington, D.C. and Other Regions Within the United States

In Washington, DC, there are currently 80 single men for every 100 single women. DC’s current population is 581,530 of which, approximately 48.5% are single. This translates into approximately 282,000 singles. Using these numbers, 156,670 are women and 125,330 are men. Among these figures,
there are 33,000 gay, lesbian, and bisexual couples living together within the DC city limits.$^{14}$ Of these, 73% are homosexual male couples, or 24,000 gay and 9,000 lesbian couples.$^{15}$ Subtracting the homosexual population from these figures leaves 101,330 single straight men for 147,670 single straight women, or a ratio of two single straight men for every three single straight women.

Similarly, other geographic areas within the US that have significant gender imbalances include New York City (with 210,820 more single women than men) and LA-Long Beach-Santa Ana (with 89,459 more single men than women).$^{16}$ Single women outnumber single men in many cities around the world. According to Richard Florida, “[o]ne reason young women in the prime marriage years – the 25-44 age range – flock to big cities is to compete for the most eligible men.”$^{17}$ If this gender imbalance in large cities causes similar effects to college campuses, greater sexual activity may result in cities where single women outnumber single men. Where men outnumber women, greater competition and possibly violence may result.

![Map of gender imbalances in the US](image)

(From Richard Florida’s Who’s Your City?$^{18}$)

**The Shortage of Black Men**

*For every 100 single black women, there are 70 single black men, according to recent U.S. Census Bureau figures, a number that does not take into account the prison population or men living in group homes.* – Krissah Williams, The Washington Post

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$^{15}$ Id.


$^{17}$ Id.

$^{18}$ Richard Florida, Who’s Your City?
In 2006, The Washington Post published a sobering article citing the impact of a severe shortage of available black men of marriageable age. Between high levels of incarceration of young black males, low male rates of high school and college graduation, and high rate of interracial marriages among black men (9.7 percent – higher than any other racial or gender group other than Asian women), black women face a severe shortage of eligible black men. Further sobering statistics for black women include:

- 42.3% of black women have never married.
- Black women in America are the most unpartnered group in America and possibly the world.
- Black women are 5 times more likely to be single at age 40 than a white woman.
- 70% of all new cases of AIDS/HIV are among black women.

Using data from the General Social Survey (GSS) 2000-2006, black women ages 29-39 were more than three times as likely as white women to have never married.

“Black women are less likely to marry, stay married, and remarry. Those who marry do so at an older age than do whites. The differences between blacks and whites... are greater than they were a generation ago. As a result, black women spend far less of their life in a marriage than do white women. ... white women now can expect to spend less than half of their lives married. But among black women, the corresponding figure has plunged from 40 percent to 22 percent – about the same proportion of life that the average college-educated person spends attending school. Marriage has become just a temporary stage of life for blacks, preceded by a lengthening period of singlehood and followed by a long period of living without a spouse. ... For blacks, even more so than for whites, a long, stable marriage is the exception rather than the rule.”

When it comes to the choice of motherhood, increasingly it seems the decision for many black women is not whether or not to wait until they get married to have a child, but whether to have a child out of wedlock or not at all. Welfare checks may not be the prime factor leading to so many out of wedlock births among blacks after all.

China

Perhaps the biggest demographic time-bomb in the world today is China. Because of the Chinese government’s one-child policy, China will soon face a severe shortage of girls of marriageable age. Chinese parents frequently attempt to discover the sex of their child before birth, choosing selective

20 Id.
21 Id.
22 A Sobering Statistic: http://thinkingonthemargin.blogspot.com/search/label/marriage
abortions for girls in what some have labeled “gendercide.” The Chinese preference for sons over daughters goes back thousands of years as is captured in the Chinese ‘Book of Songs’ (1000-700 B.C.):

“When a son is born,
Let him sleep on the bed,
Clothe him with fine clothes,
And give him jade to play...
When a daughter is born,
Let her sleep on the ground,
Wrap her in common wrappings,
And give broken tiles to play…”

On a macro-level, this is beginning to create a shortage of women of marriageable age. Currently, China has close to 120 boys born for every 100 girls. This has created an increase in human trafficking of “purchased brides”, with Chinese police reporting to have freed over 42,000 kidnapped women and children between 2001 and 2003. The sex-ratio in China is now close to 120 at birth, with some areas having even larger imbalances.

In addition to creating a shortage of girls for marriage, China’s one-child policy is also creating a market for kidnapping of young boys for those who have either lost a son or who never had a son. In a land where boys are more highly valued than girls, it seems some parents are willing to pay an unthinkable price to steal the sons of others for their own.

The full implications of China’s gender-imbalance have yet to be realized. With such a high sex-ratio at birth, it is bound to be much higher in the marriage market. To illustrate, consider at birth there are 120 boys for every 100 girls. By age 25, this ratio may have fallen to 1.15, but a number of marriages will also have occurred. Assuming 70% of the women have married at this point, that leaves 45 men for every 30 women in the marriage market, with a sex-ratio of 1.5.

With a shortage of women available for marriage, China may find itself with rising rates of violent crime and domestic unrest. Without wives and family responsibilities to direct the energies of men into more productive and responsible living, civil disorder may increase – particularly in more rural areas where men have less economic, educational, and relational opportunities. On the other hand, parents with only one child may teach that child to be more risk-averse than children who have one or more siblings. Further research is needed to study the current and future effects of these trends in China.

What About Religious Groups?

Sociologists of religion have long noted that across all cultures, all religions, and all times, women tend to exhibit higher levels of religiosity than men. Numerous theories exist to explain this phenomenon ranging from risk-aversion, opportunity costs (lower wages of women implying lower value of time), etc. What is important to concentrate on for this paper is the statistical regularity of higher commitment levels among women regardless of the underlying reason. This higher level of religiosity among women implies that among devoutly faithful people of any religion, there is a likely shortage of equally faithful men.

In Christianity, Islam, and Judaism, marrying within one’s religion is encouraged and is generally followed more closely the more devout an individual tends to be. (Religious differences play a significant role in increased divorce rates.) Additionally, each of these religions teaches high regard for marriage,

24 [Link](http://www.msnbc.msn.com/id/5953508)
25 Id.
26 Id.
discourages premarital sex, and discourages divorce. Ceteris paribus, this gives a greater incentive for devout believers to marry and to stay married. This would also imply an even greater gender imbalance among devout singles than among the devout. To illustrate this, consider a hypothetical group of 100 devout Christians with 55 women and 45 men. If 35 couples marry, that leaves 20 unpartnered women but only 10 unpartnered men. A sex-ratio of 0.5 among singles in the group.

As the demographics shift in favor of men, men are likely to become more choosy among the remaining women. Evolutionary psychologists have shown men worldwide prefer young women with waist to hip ratios between 0.70 to 0.85. Men also prefer women who exhibit physical (full lips, clear skin, smooth skin, clear eyes, lustrous hair, good muscle tone) and behavioral (bouncy/youthful gait, animated facial expressions, high energy level) standards of beauty, which have been demonstrated to correlate with fertility. What this means is that as the age of religiously devout increases, the age gap between men and women at the time of first marriage would also be expected to increase.

Empirical Data: Gender Imbalance Among College-Educated Christians

Examining data from the General Social Survey, it is clear that the gender imbalance is strong among college-educated men and women ages 30-39 who attend church on a weekly basis.

![Chart: Bachelor Degree+, Ages 30-39 Attend Church Weekly]

These figures actually underestimate the gender imbalance in religious groups. Among college-educated individuals ages 30-39, a total of 36.1% of women attend church on a weekly basis, while only 25.9% of men do. This leads to a sex-ratio of approximately 0.5, or two women for every man.

\[
\text{Sex ratio} = \frac{(0.167)(0.259)}{(0.244)(0.361)} = 0.49
\]

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30 Id.
A similar analysis for the general population yields a sex-ratio of 1.17 for college-educated individuals, ages 30-39. In the general population, college-educated men outnumber college-educated women. Amongst the devout\textsuperscript{31}, college-educated women outnumber college-educated men 2 to 1.

It is unclear whether education has a negative effect on the marketability of religious women in the marriage market, if higher education leads to greater opportunity costs for women to get married (strong gender norms tend to be greater among devout religious groups relative to the general population), or if women who accurately predict they will not get married tend to pursue higher levels of education. Anecdotal information from educated Mormon, Muslim, and Evangelical women seems to support the notion that education beyond a bachelor degree actually seems to reduce their “marketability” in marriage markets.

MODELING MARRIAGE MARKETS IN NETLOGO

Environmental Variables

In order to keep the model as simple as possible, we focused on only varying two environmental variables within the model.

- **Sex-Ratio**: The ratio of the number of unmarried men to the number of unmarried women at the beginning of the model. (At the start, all men and women are initially unmarried.)
- **Gender-Gap**: This is the ratio of the average female salary to the average male salary.

Agent Variables

- **Gender**: Male or female.
- **Age**: Randomly assigned values range from 20 to 40.
- **Income**:
  - **Men**: Randomly assigned an income using a normal distribution with a mean of \([100 + \text{age}]\) with a standard deviation of 10.

\textsuperscript{31}“Devout” in this context refers to those who attend church on a weekly basis.
Women: Randomly assigned an income using a normal distribution with a mean of \([100 + \text{age}] \times \text{[gender-gap]}\) with a standard deviation of \(10^* \text{[gender-gap]}\).

- **Marital Status:** Either married or unmarried. (All agents start off unmarried.)

### Rules

1) **Move.** Agents move each turn.

2) **Young Woman?** Each man will look randomly select an unmarried woman in his field of vision. If her age is less than or equal to his, he is attracted to her.

3) **Rich Man?** The woman the man is attracted to will check to see if his income is equal to or higher than her own. If it is, she is attracted to him.

4) **Marry?** If both the man and woman are attracted to each other they marry. Married women turn white (bride), stop moving, and stop looking. Married men turn black (groom), stop moving, and stop looking.

5) **Repeat.**

### Results

Below is a table of sample results for various populations after 100 rounds. The values of sex-ratios and gender-gaps are approximations to test out the NetLogo model. Future work will include more realistic numbers to better represent these populations.

<table>
<thead>
<tr>
<th></th>
<th>China</th>
<th>African-American</th>
<th>Religious Groups</th>
<th>College</th>
<th>Balanced</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex-Ratio</strong></td>
<td>1.2</td>
<td>.8</td>
<td>.72</td>
<td>.67</td>
<td>1</td>
</tr>
<tr>
<td><strong>Gender Gap</strong></td>
<td>0.75</td>
<td>1.05</td>
<td>.8</td>
<td>.9</td>
<td>.95</td>
</tr>
<tr>
<td><strong>% Men Single</strong></td>
<td>40%</td>
<td>39%</td>
<td>23%</td>
<td>23%</td>
<td>40%</td>
</tr>
<tr>
<td><strong>% Women Single</strong></td>
<td>28%</td>
<td>57%</td>
<td>44%</td>
<td>48%</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Average Age Married Male</strong></td>
<td>32</td>
<td>33</td>
<td>32</td>
<td>31</td>
<td>32</td>
</tr>
<tr>
<td><strong>Average Age Single Male</strong></td>
<td>24</td>
<td>23</td>
<td>24</td>
<td>21</td>
<td>25</td>
</tr>
<tr>
<td><strong>Average Age Married Female</strong></td>
<td>27</td>
<td>26</td>
<td>25</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td><strong>Average Age Single Female</strong></td>
<td>36</td>
<td>32</td>
<td>35</td>
<td>33</td>
<td>37</td>
</tr>
<tr>
<td><strong>Average Income Married Male</strong></td>
<td>132</td>
<td>135</td>
<td>132</td>
<td>132</td>
<td>135</td>
</tr>
<tr>
<td><strong>Average Income Single Male</strong></td>
<td>122</td>
<td>120</td>
<td>122</td>
<td>120</td>
<td>122</td>
</tr>
<tr>
<td><strong>Average Income Married Female</strong></td>
<td>96</td>
<td>125</td>
<td>100</td>
<td>112</td>
<td>117</td>
</tr>
<tr>
<td><strong>Average Income Single Female</strong></td>
<td>99</td>
<td>142</td>
<td>107</td>
<td>121</td>
<td>132</td>
</tr>
</tbody>
</table>
ANALYSIS

The largest variation in outcomes across the scenarios was the change in the percentage of men and women who remained single. In all but the African-American scenario, the gender in the minority had lower rates of singleness than when the sex-ratio was balanced.

Average age and income remained relatively constant for married men and single men across models – with married men being older and having a higher income than single men across all scenarios. Further investigation needs to be made to determine whether or not this is an artifact of the selection algorithm used, a factor related to statistical distributions for generating agents, or if there is something deeper going on.

Average age for married women and single women remained relatively constant across models as well – with the average age of married women being younger than that of married women. The average income of women varied from scenario to scenario as expected due to the effects of the changing gender-gap in pay.

In each case, married women had both lower average ages and lower average incomes than married men. In addition, single women had higher average ages than single men. The relationship of the average incomes of single men and single women varied across the different scenarios.

FUTURE EXTENSIONS

The algorithms in this model should be investigated in further detail and refined where needed in order provide a more accurate simulation of marriage markets in the real world. In addition, the data for sex-ratios and gender-gaps should reflect more accurate demographic data for the respective populations.

Other potential modifications of the model include:

- Agents having variable strength of preferences based on the sex-ratio.
- Introducing aging, divorce, death, widowhood, re-entry, and new-entry and exit into the model.
- Having agents select on more than one characteristic. (Beauty, social standing, education level, religious similarity, etc.) Each agent could have varying degrees of preference on each characteristic.
- Incorporating the effects of closed groups and social capital into the model to investigate the persistence of groups of unmarried people.
- Adding network effects to emulate the effects of married friends introducing single friends to one another.
- Improving the underlying algorithms by incorporating economic matching models into the program.

CONCLUSION

This project serves as a first step in modeling how marriage markets work. The questions raised by this model will give rise to additional areas of future exploration. It is our hope that this research will help provide an effective way to model the implications and social patterns of marriage markets with imbalanced sex-ratios and, in so doing, help unlock a deeper understanding of the mysteries of love.

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REFERENCES


