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Gender differentiation in risk-taking behavior: On the relative risk aversion of single men and single women

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Abstract

We relate an observed difference between single men (SM) and single women (SW) in attitudes towards risk to the higher value assigned to social status by SM than by SW. In the marriage market, low status carries a harsher penalty for SM than for SW because when selecting a partner, the social status of a man is more important to a woman than the social status of a woman is to a man. Correlating social status with relative wealth, we show how intensified distaste at experiencing low relative wealth reduces relative risk aversion.

Keywords: Risk-taking behavior; Gender-based difference in risk aversion; Relative wealth deprivation; Social status; Marriage market outcome

JEL classification: D03; D81; G11; G32

1. Motivation

Drawing on data on the holdings of risky assets by households in the US, a seminal paper by Jianakoplos and Bernasek (1998) finds that "single women exhibit relatively more risk aversion in financial decision making than single men" (p. 620). A particularly appealing aspect of the paper is that it sharpens the focus of studying gender differentiation in risk taking by netting out the possible distorting effect of marital status. The finding of Jianakoplos and Bernasek (1998) is echoed by Sunden and Surette (1998) who, using data from the US Surveys of Consumer Finances, report that single women are less likely than single men to take risky investment decisions, namely to choose "mostly stocks," and are more likely to choose risk-free, interest-earning assets. Comparing single women with single men is a procedure shared, however, by a relatively small body of research which, while finding that women are more risk averse than men, does not hold marital status constant when comparing women with men.[1] Furthermore, this body of research does not provide a behavioral-analytical foundation for the differential risk-taking of men and women in general, or for the differential risk-taking of single men and single women in particular. The studies by Jianakoplos and Bernasek (1998) and by Sunden and Surette (1998), like the remainder of the received body of research, remains in need of such a foundation.

In this paper we seek to fill the lacuna. We conjecture that the observed difference between single women and single men in attitudes towards risk is related to the higher value that single men assign to social status than do single women (Huberman et al., 2004), taking the importance attached to low relative wealth as a measure of the

[1] For example, Hersch (1996) finds that women make safer choices than men when it comes to taking risk-related consumer decisions on such things as smoking, seat-belt use, preventative dental care, and regular blood pressure checks. Eckel and Grossman (2002, 2008) compare the choices of men and women in gambling tasks in a laboratory setting and conclude that, on average, women are characterised by higher risk aversion. Using data from fishing communities along the west coast of South Africa, Brick et al. (2012) observe that fisherwomen are less likely to engage in illegal catching than their male counterparts. Drawing on data from several experimental studies, Charness and Gneezy (2012) infer that women are more financially risk averse than men. In a study of group decision making, Ertac and Gurdal (2012) find that women are less likely to make a risky decision which affects others' payoffs, and that when taking decisions on behalf of their group, women leaders tend to take less risk in comparison with men leaders. Several "meta analysis" studies (Byrnes et al. (1999) in psychology, Croson and Gneezy (2009) in economics) reach a similar conclusion: men are less risk averse than women.

importance attached to low status.[2] This difference by gender can be explained by the fact that low status carries a harsher penalty for single men than for single women, which, in turn, arises from the fact that low status for single men translates into inferior outcomes in the marriage market: in selecting a partner, the social status of a man is more important to a woman than the social status of a woman is to a man (Kenrick et al., 1990). Correlating social status with relative wealth, we show how an intensified distaste at experiencing low relative wealth reduces relative risk aversion, which, in turn, results in a higher propensity to resort to risky behavior.

To understand why status matters to men more than it does to women we invoke evolutionary, socio-biological reasoning, attributing gender-specific behaviors to different selective pressures faced by females and males.[3] Male fitness is limited by access to fecund females, whereas female fitness is limited by physiological and energy constraints. Successful males can enhance their fitness by monopolizing the reproductive performance of several females, whereas the fitness of females cannot profit from multiple mates to the same extent. Females are, therefore, a "contested resource" for which males compete.[4] This competition need not take the form of a direct contest for females. Instead, males compete for assets ranging from feeding territories and food to more intangible "resources" like social status which can be converted into a reproductive opportunity, whether because they are directly attractive to females, or because they help quell rival males. In short, status is a means of gaining a valuable resource via a better hierarchical position, and evolution has embedded this concern for status into individual preferences.

The received literature has long correlated high status with superior outcomes in the marriage market, and social status with relative wealth. We refer briefly to a number of studies that have modeled these links. We do so partly in order to explain why we see

[2] Intriguing evidence (references provided in Gill and Prowse, 2014) supports the notion that women are less inclined than men to enter a variety of competitions that, if won, confer status.
[3] The typical reference in the evolutionary literature is to males and females, not to men and women, so in this paragraph we keep in line with this convention.
[4] In a different setting, Pongou and Serrano (2013) show that women constitute the "short side" of the market: "only men [are] competing for female partners" (p. 299).

no need to model the links ourselves, and partly to explain in what ways our perspective differs from the perspective of others.

With regard to status and the marriage market, Becker (1973) provides a theoretical foundation for the importance of status in the maximization of matching quality in the marriage market. Cole et al. (1992) develop a model in which (p. 1097) “men and women who will match have preferences over the matches they will enter into. … Relative success in the matching process will be determined by agents’ status.” Cole et al. (1992) note that men differ in their wealth, and that women are characterized by varying degrees of quality which, in turn, constitutes an argument in men’s utility function. The model of Cole et al. (1992) suggests that, in equilibrium, women of higher quality choose richer men. This choice or preference intensifies men’s distaste for having low relative wealth. In the spirit of Cole et al. (1992), yet distinct from them, we show that matching considerations induce men to seek to improve their standing in the marriage market and increase their chances of high relative wealth which, in turn, gives them an incentive to be less relatively risk averse. Robson (1996) remarks (p. 190): “Males obtain more offspring as a consequence of greater wealth both directly and because this attracts more mates. The second effect induces gambling driven by relative wealth … .”

With regard to the conversion of relative wealth into (social) status, a natural starting point is Smith (1759) where we already read that wealth accumulation yields social status, and that status matters for individual welfare. Veblen (1899) dwells at length on the notion that in modern Western societies the aspiration for high relative wealth is motivated by an underlying desire for social status. In his study of the origins of modern English society, Perkin (1969, p. 85) comments that “the pursuit of wealth was the pursuit of social status.” Frank (1985) emphasizes the significance of relative wealth for the acquisition of social status. Robson (1992) develops a model of decision making in which agents care not only about their wealth but also about their relative position in the wealth distribution. Robson (1992, p. 837) writes: “[O]rdinal rank in the wealth distribution enters von Neumann-Morgenstern utility as an argument in addition to wealth itself. Thus higher wealth increases utility not only directly but also indirectly via higher status." We differ from Robson (1992) in that in our model *cardinal* rank enters von Neumann-Morgenstern utility as an argument. This refinement enables us to fine-tune rank-related information and link it smoothly with relative risk aversion which, too, is a cardinal measure.[5] Futagami and Shibata (1998, p. 110) define a "person's relative wealth position in the society [as] status." Pham (2005, p. 407) develops a model in which social status is "increasing with individual wealth and decreasing with the average wealth of the society."

A summary of the correlations of high status with superior outcomes in the marriage market, and of social status with relative wealth, is provided in Roussanov and Savor (2014, p. 2497): "[S]ingle individuals may care more about their relative position in the wealth distribution because of competition for mates in the marriage market. … As long as the improvement in the potential quality of the marital match raises the benefit of an extra dollar of wealth (beyond its pure consumption value), the matching environment creates an incentive for individuals to take more (idiosyncratic) risk than they would in the absence of the status contest." In our paper the reference is, however, not to "single individuals" but rather, and as it should be, to single *men*. Moreover, "raises the benefit of an extra dollar of wealth" is incomplete; an accurate statement needs to refer to an extra dollar of *relative* wealth.

We next show how an intensified distaste at experiencing low relative wealth (a concern at having low social status) reduces relative risk aversion, which, in turn, results in a higher propensity to resort to risky behavior.

2. Linking risk-taking preferences to a concern for low relative wealth

Consider a population P consisting of n single men (m), and of n single women (w). Every member of P has a positive level of wealth. The wealth distributions among men

[5] For example, in our framework, in wealth distribution (20, 10) the ordinal rank of 10 is the same (second) as in wealth distribution (11, 10), but as measured cardinally, it is not the same.

and women are given, respectively, by $x_1^m < x_2^m < ... < x_n^m$ and $x_1^w < x_2^w < ... < x_n^w$, where x_i^m denotes the wealth of the i-th man, and x_i^w denotes the wealth of the i-th woman. Let the utility function of individual i belonging to population P be

$$u_i^g(x_1^g,\dots,x_n^g) = (1-\beta_i^g)f(x_i^g) - \beta_i^g RD_i^g(x_1^g,\dots,x_n^g),$$

where $g \in \{m,w\}$ denotes gender; $f:\mathbf{R}_+ \to \mathbf{R}$ is a twice differentiable, strictly increasing, and strictly concave function describing the preferences towards one's own wealth; $RD_i^g(\cdot)$ is a measure of relative wealth deprivation, that is, a measure of having low relative wealth; $\beta_i^g \in (0,1)$ expresses the intensity of the concern that individual i of gender g attaches to having low relative wealth; and $1-\beta_i^g$ is the weight accorded by individual i of gender g to his or her wealth. Because men assign a higher weight to their rank in social space than women, we assume that $\beta_i^m > \beta_j^w$ for all i, j. The measure of relative wealth deprivation of individual i of gender g, where the reference or comparison group is the subpopulation of all individuals of gender g belonging to P,[6] is defined as $RD_i^g(x_1^g,\dots,x_n^g) \equiv \sum_{k=1}^{n} \max\{x_k^g - x_i^g, 0\}$.[7]

It is noteworthy that our measure of low relative wealth is sensitive to any change in the wealth levels of individuals higher up in the wealth distribution who belong to individual i's reference group, even if a change does not occur in terms of ordinal rank (cf. footnote 5). To see clearly the link between our measure and the reference in the received literature to a taste (a desire) for high relative wealth, we note that our measure of a distaste for low relative wealth is merely the inverse of the taste for high relative wealth, entered into the utility function negatively.

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[6] Naturally, when it comes to the marriage market, men and women have different reference groups. Men compare their wealth with the wealth of male competitors, not with the wealth of all members of *P*. Women do the same and compare their wealth with the wealth of female competitors.

[7] A recent presentation of measures of relative wealth deprivation and a brief foray into this concept are in Stark (2013). There, drawing on an axiomatic foundation, relative wealth deprivation is defined as $RD_i^g(x_1^g,\dots,x_n^g) \equiv \frac{1}{n}\sum_{k=1}^{n} \max\{x_k^g - x_i^g, 0\}$. For the purposes of the current paper, the definition in the text is just as fine. See, however, the Comment following the proof of Claim 1.

The coefficient of relative risk aversion, namely the Arrow-Pratt measure of relative risk aversion (Pratt, 1964; Arrow, 1965, 1970), of individual *i* of gender *g*, whose wealth is x_i^g, taken while holding the wealth levels of other members of individual *i*'s reference group constant, is

$$r_i^g(x_i^g) \equiv \frac{-x_i^g \dfrac{\partial^2 u_i^g}{\partial (x_i^g)^2}(x_1^g,\ldots,x_n^g)}{\dfrac{\partial u_i^g}{\partial x_i^g}(x_1^g,\ldots,x_n^g)},$$

and is well-defined in some neighborhood of x_i^g.[8]

Claim 1 shows that the stronger concern of single men at having low relative wealth results in them exhibiting lower relative risk aversion than single women.

Claim 1. Consider a man and a woman from population *P* who experience relative wealth deprivation, and who each have the same wealth and the same rank in the wealth distributions of their reference groups. The coefficient of relative risk aversion of a single man is lower than the coefficient of relative risk aversion of a single woman.

Proof. Let $x_i^m = x_i^w$ be the equal levels of wealth of a man and a woman from population *P* who experience relative wealth deprivation, and who have the same rank, *i*, in the wealth distributions of their reference groups. Given the distribution of wealth of the subpopulation of men $x_1^m < x_2^m < ... < x_n^m$, and given the distribution of wealth of the subpopulation of women $x_1^w < x_2^w < ... < x_n^w$, the utility function of individual i of gender g takes the form

$$u_i^g(x_1^g,\ldots,x_n^g) = (1-\beta_i^g)f(x_i^g) - \beta_i^g \sum_{k=i+1}^{n}(x_k^g - x_i^g),$$

[8] Formally, the function $r_i^g(\cdot)$ is a function of n variables, that is, $r_i^g(x_1^g,\ldots,x_n^g)$. However, as will be seen in the proof of Claim 1, $r_i^g(\cdot)$ actually does not depend on the wealth levels of other members of individual *i*'s reference group, but only on one variable (namely on x_i^g). Thus, for the sake of brevity of notation, we already present $r_i^g(\cdot)$ in a short form.

noting that for any $k \le i$, $\max\{x_k^g - x_i^g, 0\} = 0$.

Thus,

$$\frac{\partial u_i^g}{\partial x_i^g}(x_1^g,\dots,x_n^g) = (1-\beta_i^g)f'(x_i^g) - \beta_i^g \sum_{k=i+1}^{n}(-1)$$
$$= (1-\beta_i^g)f'(x_i^g) + \beta_i^g(n-i)$$

and

$$\frac{\partial^2 u_i^g}{\partial (x_i^g)^2}(x_1^g,\dots,x_n^g) = (1-\beta_i^g)f''(x_i^g).$$

Consequently,

$$r_i^g(x_i^g) = \frac{-x_i^g(1-\beta_i^g)f''(x_i^g)}{(1-\beta_i^g)f'(x_i^g) + \beta_i^g(n-i)}.$$

We denote the same levels of wealth of the man and the woman under consideration by x, namely $x_i^m = x_i^w = x$. In order to find out whether $r_i^m(x) < r_i^w(x)$, we check whether the difference between the coefficient of relative risk aversion of the man and the coefficient of relative risk aversion of the woman is negative. This is indeed so:

$$r_i^m(x) - r_i^w(x) = \frac{-x(1-\beta_i^m)f''(x)}{(1-\beta_i^m)f'(x) + \beta_i^m(n-i)} - \frac{-x(1-\beta_i^w)f''(x)}{(1-\beta_i^w)f'(x) + \beta_i^w(n-i)}$$
$$= \frac{-xf''(x)\left\{(1-\beta_i^m)\left[(1-\beta_i^w)f'(x) + \beta_i^w(n-i)\right] - (1-\beta_i^w)\left[(1-\beta_i^m)f'(x) + \beta_i^m(n-i)\right]\right\}}{\left[(1-\beta_i^m)f'(x) + \beta_i^m(n-i)\right]\left[(1-\beta_i^w)f'(x) + \beta_i^w(n-i)\right]}$$
$$= \frac{-xf''(x)(n-i)(\beta_i^w - \beta_i^m)}{\left[(1-\beta_i^m)f'(x) + \beta_i^m(n-i)\right]\left[(1-\beta_i^w)f'(x) + \beta_i^w(n-i)\right]} < 0,$$

where the inequality sign follows from the assumption that $\beta_i^m > \beta_j^w$ for all i, j. □

Comment. Claim 1 is not specific to the manner in which $RD_i^g(\cdot)$ was defined above. To see this robustness, we alternatively define $RD_i^g(x_1^g,\dots,x_n^g) \equiv \frac{1}{n}\sum_{k=i+1}^{n}(x_k^g - x_i^g)$ as is done, for example, in Stark (2013), where a rationale underlying this definition is also provided.

Because now

$$u_i^g(x_1^g,\ldots,x_n^g) = (1-\beta_i^g) f(x_i^g) - \beta_i^g \frac{1}{n}\sum_{k=i+1}^{n}(x_k^g - x_i^g),$$

we have that

$$\frac{\partial u_i^g}{\partial x_i^g}(x_1^g,\ldots,x_n^g) = (1-\beta_i^g) f'(x_i^g) + \beta_i^g \frac{n-i}{n},$$

and (as before) that

$$\frac{\partial^2 u_i^g}{\partial (x_i^g)^2}(x_1^g,\ldots,x_n^g) = (1-\beta_i^g) f''(x_i^g).$$

Consequently,

$$r_i^g(x_i^g) = \frac{-x_i^g(1-\beta_i^g) f''(x_i^g)}{(1-\beta_i^g) f'(x_i^g) + \beta_i^g \frac{n-i}{n}}.$$

Following the same procedure as in the proof of Claim 1, we get that

$$\begin{aligned}
r_i^m(x) - r_i^w(x) &= \frac{-x(1-\beta_i^m) f''(x)}{(1-\beta_i^m) f'(x) + \beta_i^m \frac{n-i}{n}} - \frac{-x(1-\beta_i^w) f''(x)}{(1-\beta_i^w) f'(x) + \beta_i^w \frac{n-i}{n}} \\
&= \frac{-xf''(x)\left\{(1-\beta_i^m)\left[(1-\beta_i^w) f'(x) + \beta_i^w \frac{n-i}{n}\right] - (1-\beta_i^w)\left[(1-\beta_i^m) f'(x) + \beta_i^m \frac{n-i}{n}\right]\right\}}{\left[(1-\beta_i^m) f'(x) + \beta_i^m \frac{n-i}{n}\right]\left[(1-\beta_i^w) f'(x) + \beta_i^w \frac{n-i}{n}\right]} \\
&= \frac{-xf''(x)\frac{n-i}{n}(\beta_i^w - \beta_i^m)}{\left[(1-\beta_i^m) f'(x) + \beta_i^m \frac{n-i}{n}\right]\left[(1-\beta_i^w) f'(x) + \beta_i^w \frac{n-i}{n}\right]} < 0.
\end{aligned}$$

Finally, as a supplementary check of the robustness of our approach, we verify that a change in relative wealth deprivation brought about by an adverse rank change *causes* relative risk aversion to decline.

Claim 2. Holding constant the individual's own wealth and the intensity of the concern that the individual attaches to having low relative wealth, an adverse rank change causes the individual's relative wealth deprivation to become higher, and the individual's relative risk aversion to become lower.

Proof. Let an individual from the left of x_i^g in the g wealth distribution move, wealth-wise, to the right of x_i^g. The number of individuals whose levels of wealth are higher than the wealth of individual i increases from $n-i$, as it was before, to $n-(i-1)$. This means that the last term in the denominator of $r_i^g(x_i^g)=\dfrac{-x_i^g(1-\beta_i^g)f''(x_i^g)}{(1-\beta_i^g)f'(x_i^g)+\beta_i^g(n-i)}$ is replaced by $\beta_i^g[(n-i)+1]$ which is bigger than $\beta_i^g(n-i)$ and, therefore, $r_i^g(x_i^g)$ is lower. By similar reasoning we establish that the inverse relationship between relative wealth deprivation and relative risk aversion holds regardless of which individual from the left of x_i^g moves, wealth-wise, to the right of x_i^g, and regardless of whether two or more individuals who are initially to the left of x_i^g move, wealth-wise, to the right of x_i^g.

□

3. Conclusion

Single men are more concerned about their relative wealth because it influences their standing in the marriage market more than relative wealth influences the standing of single women in the marriage market. Claim 1 reveals that in comparison to single women, the higher weight assigned to relative wealth by single men, that is, the higher weight assigned by them to (cardinally measured) rank in social space when social status is correlated with relative wealth, translates into lower relative risk aversion. This revision leads to more risk-taking by single men than by single women, including in financial matters. Thus, the empirical findings of Jianakoplos and Bernasek (1998) and of Sunden and Surette (1998) are supported analytically.

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