

Men and Money: A Scarcity of Men Leads Women to Care More About Relative Gain

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Abstract

Past studies suggested that sex ratio influences individuals' economic behaviors; however, the underlying mechanism of this effect remains unclear. In the current work, we examined how sex ratio influenced women's preference for relative gain over greater absolute gain in the context of games involving resource allocation between oneself and another woman; the role of intrasexual competition in this process was also explored. By experimentally manipulating women's perceptions of local sex ratio, the present study found that women primed with a female-biased sex ratio (i.e., an excess of women) showed higher levels of intrasexual competition. Exposure to the cue of a scarcity of men also led women to care more about their relative gain compared with absolute gain. The effect of sex ratio on shifts of women's preference between relative gain and absolute gain was mediated by the strength of women's competitive attitude toward same-sex others. These findings suggest that, by altering the intensity of female–female competition, sex ratio may have a pronounced effect on women's economic-related decisions.

Keywords

sex ratio, intrasexual competition, relative gain, women, resource allocation

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Operational sex ratio, the ratio of reproductive men to women, varies considerably across different regions (Guilmoto, 2009), and it has a wide range of effect on human life (e.g., Barber, 2001; South & Trent, 1988). Although most studies examining the effect of sex ratio on human behavior have focused on mating, parenting, and aggression (e.g., Durante, Griskevicius, Simpson, Cantú, & Tybur, 2012; Pedersen, 1991), some recent studies suggested that sex ratio could influence some aspects of individual's economic-related behaviors (Griskevicius et al., 2012). Specifically, it was found that male-biased sex ratio influence men's economic decisions and women's expectation of men's spending during courtship. It was also suggested that intrasexual competition might play a role in the effect of sex ratio on individuals' economic decisions. Nevertheless, Griskevicius et al. (2012) did not directly examine the influence of intrasexual competition in the effect of sex ratio on individuals' economic behaviors. Therefore, the underlying mechanism of the effect of sex ratio on individuals' economic decisions remains unclear.

To fill in this gap of knowledge, the present study examined the economic consequences of the increased female–female competition due to the lack of men, and the possible underlying mechanism was also explored. The current study attempted to answer three questions. First, whether manipulating perceived

sex ratio among young women would lead to corresponding changes in their intrasexual competition. Second, whether the influence of perceived sex ratio could impact women's economic decisions in resource allocation tasks. Specifically, the present study investigated how perceived sex ratio may influence women's preference between relative gain over other women and absolute gain for themselves. Third, the current study further examined whether changes in the intensity of intrasexual competition mediated the effect of perceived sex ratio on women's economic decisions.

Sex Ratio and Intrasexual Competition Among Women

Intrasexual competition refers to the use of strategies to compete with same-sex others for mating access to opposite-sex others (Fisher, 2004). It has been suggested that intrasexual

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competition among a given sex would increase when there is an abundance of this sex members in the population (Guttentag & Secord, 1983; Pedersen, 1991). Many experimental studies in nonhuman species have supported the notion that sex ratio influences intrasexual competition for both sexes (e.g., Clark & Grant, 2010). In humans, although some experimental studies have confirmed this prediction for men (Griskevicius et al., 2012), little has been done to experimentally examine whether this casual effect is also true for women. One aim of the current study is to directly test whether sex ratio alters the strength of competition among women.

There is evidence from both animal and human studies that competition among female does exist all over the world (e.g., Burbank, 1987; Stockley & Bro-Jørgensen, 2011). Theoretically speaking, the mating system of human society is characterized by social monogamy and biparental investment; therefore, it could be predicted that variations in sex ratio influence both men and women's mating effort (Pedersen, 1991). This prediction has been supported by empirical findings. Previous correlational studies revealed that when the members of same sex were relatively abundant, both women and men behaved more aggressively and violently toward same-sex others (e.g., Barber, 2003; Hudson & Boer, 2002). However, the causal effect of perceived sex ratio on intrasexual competition could not be determined from these correlational studies due to its nature. Some experimental studies have demonstrated that sex ratio alters male–male competition (Griskevicius et al., 2012), and there is yet no direct evidence for the effect of sex ratio on female–female competition. Based on previous findings, we predicted that an excess of women would lead women to become more competitive toward other women.

Hypothesis 1: A female-biased sex ratio would lead women to be more competitive toward other women.

Sex Ratio and Women's Preference for Relative Gain Over Greater Absolute Gain in Resource Allocation Tasks

Recent studies in evolutionary psychology suggest that the effect of sex ratio has a broad effect on human behavior, including altering economic behaviors (e.g., saving, borrowing, and spending; Griskevicius et al., 2012) as well as career choices (Durante et al., 2012). Given the findings that women under the pressure of intrasexual competition would offer less to others and keep more to herself (i.e., gaining more relatively) in bargaining games (Lucas & Koff, 2013; Lucas, Koff, & Skeath, 2007), it is possible that sex ratio, which theoretically relates to female–female competition, could affect women's preference for relative gain over another woman at the expense of absolute gain. Thus, the current research also aimed to explore how different sex ratios influence women's preference for relative gain over greater absolute gain in a resource allocation task.

According to sexual selection theory, females are predicted to compete most strongly over characteristics, such as

attractiveness, that male value in their mate selection (e.g., Trivers, 1972). Accordingly, women usually compete over physical attractiveness to attract or secure mates by dressing beautiful clothing and wearing other fashion apparels (e.g., Grammer, Renninger, & Fischer, 2004). However, in modern society, material resources could be another important arena where women compete. It is because contemporary women need resources to acquire products (dress, makeup, accessories, etc.) or services (hairdressing, skin caring, etc.) to enhance their attractiveness, whereby they could outlive their same-sex competitors and gain attention of mates (e.g., Guéguen, 2015). For example, a pretty dress or coat in a shopping mall could cost hundreds of Yuan (¥; the base unit of Chinese currencies, 1¥ = US\$0.16), and the designer clothes cost even more. Two nationwide surveys, respectively, in 2011 and 2012, showed that clothing was the largest expense for women in China, accounting for more than a third of average spending (Han, 2013). In addition, it has been suggested that women also engage in conspicuous consumption, consumption of luxury products (Hudders, Backer, Fisher, & Vyncke, 2014; Wang & Griskevicius, 2014). Thus for women, competing over material resources is prevalent nowadays.

It has been found that the strength of intrasexual competition can influence women's decisions in resource allocation tasks. Women who were highly intrasexually competitive made lower offers to other women and rejected lower offers in the ultimatum games (Lucas et al., 2007), and they also offered less amount of money in the dictator games (Lucas & Koff, 2013). Because in those games the resources available are fixed, offering less to others means keeping more for oneself, which also means obtaining more relative gain. Therefore, these findings suggest that intensive intrasexual competition might be associated with women's increased concern about their relative gain at the expense of greater absolute gain.

In the real world, competing with others often requires an individual to spend substantial amount of resources or time which could be spent to generate more resource for oneself. Therefore, the relative gain sometimes comes at the cost of absolute individual gain. A dilemma people often face is to choose from two options: either to gain more than their competitors but smaller absolute income or to gain less than their competitors but larger absolute income. When there is a shortage of available men in local communities, what really matters for women is whether they are better than other women. Thus, we predicted that a surplus of women would lead women to seek relative gain over other women, even at the cost of self-benefits.

Hypothesis 2: When the sex ratio is female biased, women would prioritize relative gain over greater absolute gain.

A third purpose of the present study was to directly examine the underlying mechanism of the effect of sex ratio on women's economic decisions. Previous studies have examined the effect of sex ratio on two types of mating effort—intersexual

courtship and intrasexual competition (Griskevicius et al., 2012). It was found that sex ratio manipulation leads to significant difference in individuals' intrasexual competition, whereas no difference emerged in their mate-attraction motivation. Moreover, it has been suggested, yet not directly tested, that intrasexual competition was responsible for the effect of sex ratio on individuals' economic decision-making (Griskevicius et al., 2012). In line with this study, another study also raised the possibility that the increased competitive attitude toward same-sex others may explain women's heightened desire for relative status during the time period near ovulation (Durante, Griskevicius, Simpson, Cantú, & Simpson, 2014). Therefore, the present study examined the role of intrasexual competition in the effect of sex ratio on economic behavior. Based on previous findings, it was expected that intrasexual competition mediated the effect of sex ratio and women's preference for relative gains at the expense of absolute gain in resource allocation tasks.

Hypothesis 3: The increase in women's intrasexual competition due to a lack of men mediates the effect of female-biased sex ratio on women's preference for relative gain over greater absolute gain.

Overview of the Present Study

In the present research, participants' perceptions of local sex ratio were manipulated to examine how sex ratio influences the intensity of general female–female competition and women's preference for relative gain over another woman versus larger absolute gain for oneself. In real life, relative gain over others sometimes comes at the cost of absolute individual gain because competing with others costs considerable amount of resources, consequently resulting in decreased absolute gain for oneself. Therefore, the present study used an experimental paradigm, which distinguished absolute gain and relative gain between different choice options. And a ratio score was calculated to reflect the extent to which individuals prefer relative gain over absolute gain. The current study also attempted to examine whether the strength of women's competitive attitude toward other woman would mediate the relationship between sex ratio and women's trade-off between relative gain and absolute gain.

Previous studies examining the effect of sex ratio on human behaviors suggested that findings in the control condition were not significantly different from those in the female-biased sex ratio condition (Griskevicius et al., 2012) or those in the male-biased sex ratio condition (Durante et al., 2012). Hence, most of the studies in this field only included two biased sex ratio conditions (see Griskevicius et al., 2012, Study 3; Durante et al., 2012, Studies 3 and 4; Moss & Maner, 2016). Following this common practice, we experimentally primed women with cues of female-biased or male-biased sex ratio by short news articles as the experimental manipulation.

Method

Participants and Design

A total of 375 female undergraduates and postgraduates from Renmin University of China in Beijing participated in this study. Mean participant age was 22.49 years ($SD = 2.54$), and the range was 17–33 (218 single women, 152 women in a romantic relationship, 5 women did not report their relationship status). Participants were randomly assigned to one of the two conditions: the many-women condition and the many-men condition.

Sex Ratio Manipulation

To manipulate participants' perceived sex ratio, we used a method adapted from previous research examining the effect of sex ratio on human behaviors (Durante et al., 2012; Griskevicius et al., 2012). All participants were asked to read one of two short news articles ostensibly taken from a prestigious local newspaper (*China Daily*), which were actually generated specifically for this study. In order to make sure that participants read the article, they were asked to write a title for the article. The news articles, which were translated from the sex ratio manipulation material of previous studies (Durante et al., 2012; Griskevicius et al., 2012), discussed the sex ratio of students on campus, and each version was approximately 650 words in length. The article for the many-women condition highlighted that there are more women in universities, whereas the article for the many-men article noted that there are more men in universities.

Two independent tests were conducted to examine the effect of the manipulation, and the results from both tests supported the idea that the manipulation was effective in shifting participants' perception of students' sex ratio in universities. Both tests recruited a different sample of students from the same university as those in the formal experiment. In the first test, participants ($n = 80$) read either the many-women article or the many-men article. Then they responded to the following question: "Currently, what's the percentage of female on campus?" Results showed that the perceptions of sex ratio are influenced by the news article. Women who read the many-women version perceived there were significantly more female ($M = 63.63\%$, $SD = 1.39$) than did those who read the many-men version ($M = 59.62\%$, $SD = 1.39$), $F(1, 78) = 4.23$, $p < .05$.

The second test ($n = 69$) was similar with the first test, except that an additional condition—control condition—was included. Participants in the control condition read an article discussing freshmen in universities. After reading the priming articles, participants in all three conditions indicated on a 7-point Likert-type scale their perception of students' sex ratio in universities, ranging from 1 (*definitely more men than women*) to 7 (*definitely more women than men*). Results confirmed that the manipulation is effective in shifting participants' perceived sex ratio. The main effect of sex ratio manipulation was significant, $F(2, 66) = 14.738$, $p < .001$, $\eta_p^2 = .309$. Post hoc analyses revealed that participants in the many-men condition

($M = 3.292$, $SD = 1.160$) perceived there are more men in universities than those in the many-women condition ($M = 4.952$, $SD = .805$), $p < .001$, and those in the control condition ($M = 4.208$, $SD = 1.062$), $p = .003$. Participants in the many women condition also perceived there are more women on campus than those in the control condition, $p < .001$.

General Intrasexual Competition

The Intrasexual Competition Scale was used to assess women's intrasexual competition (Buunk & Fisher, 2009). The 12-item scale assesses intrasexual competition as an attitude, namely, the degree one views the confrontation with same-sex individuals, particularly in the context of contact with the opposite sex, in competitive terms. It served as the dependent variable when assessing the effect of experimental manipulation on intrasexual competition (Buunk & Massar, 2012). Each item has an answer varying from 1 (*not at all applicable*) to 7 (*completely applicable*). Scores on these 12 items were averaged into a single score, with a higher score indicating being more competitive toward same-sex others. This scale has been shown to be sex neutral and had a high degree of cross-national equivalence (Buunk & Fisher, 2009). Examples are, "I want to be a little better than other women" and "I tend to look for negative characteristics in women who are very successful." Cronbach's $\alpha = .88$.

Relative-Absolute Gain Game

The relative-absolute gain game used in the present study was adapted from Durante, Griskevicius, Cantú, and Simpson (2014). After the sex ratio manipulation, participants responded to 6 conceptually similar items regarding the trade-off between relative gain and absolute gain, specifically in the context of attractiveness enhancing products. For each item, there were two options, respectively, corresponding to preferences for relative gain and for larger absolute gain. Participants indicated their preference to either Option A or Option B on a 6-point scale ranging from 1 (*Option A is more desirable overall*) to 6 (*Option B is more desirable overall*). Six attractive-enhance products were diamond, necklace, handbag, shoes, skin care products, and dress according to Hill, Rodeheffer, Griskevicius, Durante, and White (2012). For example, Option A is "You get a ¥450 dress, while other woman get ¥800 dress, whereas Option B is "You get a ¥300 dress, while other women get ¥200 dress." In this example, Option A represents the preference for absolute gain, as it yields larger gain for oneself in absolute terms (450). Option B represents the preference for relative gain because it yields a relative gain over the competitor ($300 - 200 = 100$), although it leads to smaller gain in absolute terms ($300 - 450 = -150$). Participants' responses to each of the 6 items ranged from 1 to 6 (6-point Likert-type scale), and their responses were averaged into a single score, which is named as the relative-absolute gain index ($\alpha = .92$). Higher scores indicated a stronger preference for relative gain.

Procedure

Participants first signed the informed consent form. Then, they were randomly assigned to one of the two experimental conditions. Participants in each condition read one of two short articles as the sex ratio manipulation. To minimize suspicion, participants were told that the session consisted of two different studies, the first of which dealt with "summarizing ability." Consistent with this cover story, they were asked to write a title for the article they read. Following this task, participants were told to complete a study examining collaboration and personality during which they completed the relative-absolute gain game and the Intrasexual Competition Scale. Then, participants completed a demographic information sheet. Poststudy interviews of randomly selected participants revealed no suspicion. Finally, each participant was debriefed and paid 5 Chinese Yuan as appreciation of their time and effort.

Results

The titles that the participants composed for the manipulation material were used as a manipulation check, and all participants correctly identified that the article indicated a skewed sex ratio on campus in the correct direction. Therefore, all participants were included in data analyses. Participants' relationship status did not affect their total scores on the intrasexual competition scale, $F(1, 366) = .521$, $p = .471$, $\eta_p^2 = .001$, and the relative-absolute gain index, $F(1, 366) = 1.533$, $p = .21$, $\eta_p^2 = .004$; and it did not interact with experimental condition on these two variables, $F(1, 366) = 2.078$, $p = .150$, $\eta_p^2 = .004$, $p = .988$. Therefore, data were collapsed across participants' relationship status in further analyses.

Intrasexual Competition Scale

An analysis of variance (ANOVA) was conducted with the score on the Intrasexual Competition Scale as a dependent variable, and sex ratio condition served as an independent variable. The main effect of sex ratio manipulation was significant, $F(1, 373) = 10.404$, $p = .001$, $\eta_p^2 = .027$. Consistent with Hypothesis 1, women in the many-women condition reported a higher level of intrasexual competition compared with those in the many-men condition ($M_{\text{many women}} = 3.545$, $SD = .967$; $M_{\text{many men}} = 3.239$, $SD = .869$).

Relative-Absolute Gain Game

An ANOVA was performed with the relative-absolute gain index served as the dependent variables. The independent variable was sex ratio condition. The results revealed a significant main effect of sex ratio on relative-absolute gain, $F(1, 373) = 6.576$, $p = .011$, $\eta_p^2 = .017$. Supporting Hypothesis 2, women in the many-women condition reported a significantly greater preference for relative gain over absolute gain ($M_{\text{many men}} = 3.075$, $SD = 1.370$; $M_{\text{many women}} = 3.438$, $SD = 1.374$).

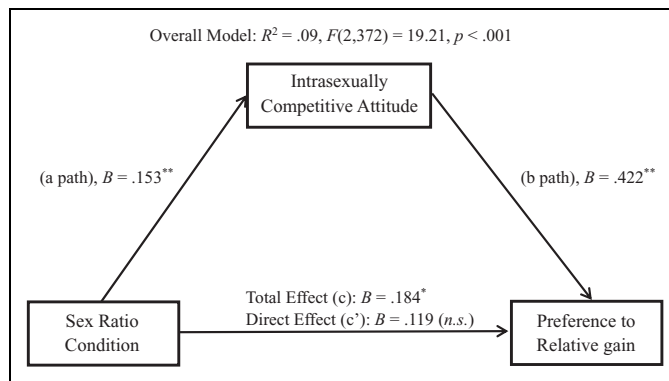


Figure 1. Mediation model for the effect of sex ratio on women's trade-off between relative gain and larger individual gain via changing competitive attitude toward other women. All path coefficients represent unstandardized regression weights. The direct effect coefficient represents the effect of sex ratio condition on desire for relative gain after controlling for the mediating influence of intrasexually competitive attitude. * $p = .010$. ** $p < .001$.

Mediation analysis. We used Preacher and Hayes's (2004) bootstrapping procedure and corresponding SPSS 21.0 macro to test for a significant indirect effect of sex ratio on women's trade-off between relative gain and larger absolute gain via women's competitive attitude toward same-sex others. The bootstrapping procedure was chosen because it allowed to test for indirect effects without the imposition of sample size or normally distributional assumptions required for the more traditional Sobel test or Baron and Kenny procedures (Preacher & Hayes, 2004). Additionally, it allowed us to detect significant mediation even when there are multiple mediators between predictor and the dependent measurement as is likely in the relationship between sex ratio cues and women's preference for relative gain (Rucker, Preacher, Tormala, & Petty, 2011). One thousand bootstrap resamples were performed.

Results revealed a significant indirect effect of priming condition on women's preference for relative gain via their intrasexual competition (see Figure 1). Consistent with the results presented above, sex ratio manipulation significantly predicted the strength of intrasexually competitive attitude (Path a), $B = .153$ ($SE = .047$), $t(374) = 3.225$, $p < .001$, whereby women became more likely to consider other women as rivals when men were scarce. Further, as the degree women view the confrontation with same-sex individuals increased, women became more likely to choose the option which provided relative gain over others (Path b), $B = .422$ ($SE = .074$), $t(374) = 5.598$, $p < .001$. Moreover, although the total effect of sex ratio on women's preference for relative gain via intrasexual competitive attitude was statistically significant (Path c), $B = .184$ ($SE = .071$), $t(374) = 2.597$, $p = .010$, the coefficient representing the direct effect of priming after controlling for the mediating influence of women's intrasexual competition was not (Path c'), $B = .119$ ($SE = .069$), $t(374) = 1.730$, nonsignificant. Additionally, 95% bias corrected confidence interval did not include 0 [.03, .12]. Taken together, these findings indicated that the competitive attitude to other

women fully mediate the effect of sex ratio on women's increased preference for relative gain.¹

Discussion

Based on the findings from both evolutionary research in animal behaviors (e.g., Stockley & Bro-Jørgensen, 2011) and correlational studies of naturally occurring variation in human behaviors (South & Trent, 1988), we proposed that sex ratio would influence women's intrasexual competition and subsequently lead to shifts in women's preferences for relative gains in the context of resource allocation tasks. The present research supports the hypotheses: After being primed with a female-biased sex ratio, women hold a more competitive attitude toward other women, even at the cost of their own absolute benefit. This increase is consistent with theories in evolutionary psychology and past correlational studies on operational sex ratios in human and many nonhuman species (e.g., Clark & Grant, 2010; Trivers, 1972).

The present study contributes to the literature by providing the first experimental evidence that sex ratio can have a causal effect on the level of intrasexual competition among women. More importantly, it also suggests that when women are facing a trade-off between maximizing their own individual absolute gains versus maximizing their relative gains compared with other women, women in the female-biased environment are more concerned with relative material resources rather than their own absolute gains, even if it means choosing fewer absolute resources (Durante et al., 2014). This finding supports the notion that females' intrasexual competition could also happen in the area of material resources, at least for contemporary women. If women want to successfully attract an opposite sex mate, it is necessary for them to enhance their own appearance and weaken the ability of other female competitors, which means occupying more resources than other women (Lucas & Koff, 2013).

Furthermore, the present study responds and extends the study of Griskevicius et al. (2012). Griskevicius and colleagues (2012) found that when the sex ratio is male biased, women expect men to pay more for mating-related expenditures (i.e., a Valentine's Day gift, an entrée for a dinner, an engagement ring), they also suggested to explore the precise influence of sex ratio on women's behavior and to examine the underlying mechanism of the effect of sex ratio on individuals' economic behavior. The current study responds to this call and complements their findings, by demonstrating that sex ratio also exerts an influence on the intensity of intrasexual competition among women, consequently leads to shifts in women's preference for relative gain. More importantly, although Griskevicius et al. (2012) found no effect of sex ratio on some aspects of women's economic behavior, such as saving and borrowing, the present findings suggest that sex ratio can make a difference in women's economic decision-making behavior. One possible explanation is that sex ratio may only influence women's behaviors which are directly related to their reproductive success (e.g., expected spending from men, relative gain over women)

but not those with no direct value on successful reproduction (e.g., saving, borrowing).

Limitations and Future Directions

Although the present findings enhance our understanding of the underlying mechanism of the effect of sex ratio on women's preferences for relative gains, it should be considered in light of some limitations. One limitation of the current work is the population from which the samples were drawn. Participants were female undergraduates and master students in a female-biased university. In the first test of the effectiveness of the manipulation, one-sample test suggested that the perceived proportion of women on campus is larger than 50% for both conditions. Although the second test of the manipulation confirmed that participants who read the many-men article perceived, there are more men in universities than those in the control condition; nevertheless, future research may benefit by testing this manipulation in schools with male-biased or balanced sex ratio.

A second limitation of the present study was that we did not include a control group. Therefore, it is unclear whether the present finding is driven by the female-biased condition or the male-biased condition. Future research is needed to include a control group to serve as the baseline condition.

Another limitation of the present study is that we only examined women's relative-absolute gain preference regarding beauty products. Although some recent findings suggested that sex ratio may influence women's choices across a wide range of contexts, including career choices (Durante et al., 2012) and economic decisions of borrowing, saving, and spending (Griskevicius et al., 2012), it yet remains unclear whether the present finding could be generalized to other contexts. Examining the influence of sex ratio on both women and men's relative-absolute gain preference across different contexts is likely to be a promising direction for future research.

The present study measured women's general competitive attitude toward same-sex others by Intrasexual Competition Scale; future studies may further explore the effect of sex ratio on women's intrasexual competition by examining specific forms of female–female competition. Fisher and Cox (2011) identified four strategies used for female–female competition: self-promotion (i.e., acts that enhance the characteristics that are desirable for male, such as physical attractiveness), competitor derogation (i.e., acts that diminish the value of rivals), mate manipulation (i.e., acts that displace or remove the mate's attention from the rival), and competitor manipulation (acts that convince the rival that the potential mate is not worth the costs of competition). For example, faced with a limited availability of potential mates, women may devalue the facial attractiveness of same-sex rivals, which decreases competitors' chances of winning the competition. A recent study indirectly supported this prediction that women under the pressure of intrasexual competition gave a lower rating for female faces (Fisher, 2004).

In addition, the intensified female–female competition may further impact many areas of women's life. For example, past studies in the health domain found that intrasexual competition would lead women to take attractive-enhancing risks more willingly (i.e., tanning, the pill usage; Hill & Durante, 2011). Thus, it may be possible that a female-biased sex ratio may have negative effects on women's health as well.

In summary, the findings from the present study contribute to the growing literature examining the effect of sex ratio on human behaviors. The relative number of available mates can be regarded as a powerful environmental cue that signals whether or not women in the local environments would prefer more relative gains or larger absolute gains. More importantly, this effect of sex ratio on women's relative-absolute gain preference is mediated by shifts in women's intrasexual competition. As the imbalance of sex ratios continues to remain in parts of the world or parts of a country, it is important for us to have a better understanding of this powerful situational cue, and as suggested by some researchers in the relevant field (e.g., Griskevicius et al., 2012), future researchers might pay more attention to underlying mechanisms when exploring the influence of sex ratio on human behaviors.

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Note

1. A standard mediation analysis was also performed, the result replicated the bootstrapping procedure, Sobel's $z = 2.827$, $p < .05$. The competitive attitude to other women mediates the effect of sex ratio on women's increased preference for relative gain.

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