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# Human Behaviour: Sex Ratio and the City

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**The ratio of males to females in a population is known to influence the behaviour, life-histories and demography of animals. A recent experimental study finds that sex ratio also affects human economic behaviour in a manner consistent with evolutionary theory.**

Sex ratio (the ratio of males to females in a population) is a fundamental concept in evolutionary biology that influences aggression, courtship behaviour and parental care, as well as population growth, viability and vulnerability to extinction [1]. A key idea here is sexual selection: when one sex is in short supply, the other sex should intensify competition (or charm) for the rarer sex. For instance, at male-biased sex ratios males exhibit more intense courtship behaviour than at female-biased sex ratios in fish [2], and male-male aggression and harassment of females intensifies leading to enhanced female mortality and population collapse in lizards [3]. Although evolutionary ecologists have long recognised the importance of sex ratios, its implications for human behaviour remain largely unexplored. In a fascinating social psychology paper, Griskevicius et al. [4] make a leap forward and argue that sex ratio also impacts human financial decisions, economic behaviour and consumer choice.

In their study, Griskevicius et al. [4] ingeniously manipulated the *perceived* sex ratio of subjects and then measured how male and female monetary decisions changed in response. They presented photographs of males and females at different ratios to subjects, or gave subjects a news article to read (ostensibly from their local newspaper) that described their area as either male-biased or female-biased. In one experiment, subjects were next instructed to imagine themselves working in a job after graduation and to specify how much money they would save from their hypothetical income and how much they would like to borrow on top of it. Subjects' choices were then compared between the male-biased and female-biased sex ratio treatments.

The experiments provided three striking results. First, male economic behaviour was more sensitive to sex ratio changes than female economic behaviour. When males perceived tougher competition due to a male-biased sex ratio, they discounted future gains more (i.e. males chose to receive less money now than more money in the future in both settings but at a male-biased sex ratio this difference was greater) and

preferred receiving resources sooner. Females did not change their behaviour. In addition, males but not females increased borrowing and reduced savings at a male-biased sex ratio. Second, males' beliefs about financial investment into mate acquisition (e.g. Valentine's Day gift, engagement ring price) responded to changes in sex ratio (Fig. 1). For instance, males believed that a man should pay \$404 more for an engagement ring at a male-biased sex ratio than at a female-biased sex ratio. Third, sex ratio influenced female expectations as well, since at a male-biased sex ratio females expected higher investment by the males. Thus sex ratio appears to influence women's expectations for how men should (or will) spend their money when looking for a partner. These results support a sexual selection and evolutionary theory interpretation: as females became increasingly rare, competition for mates increased as did male investment into mating.

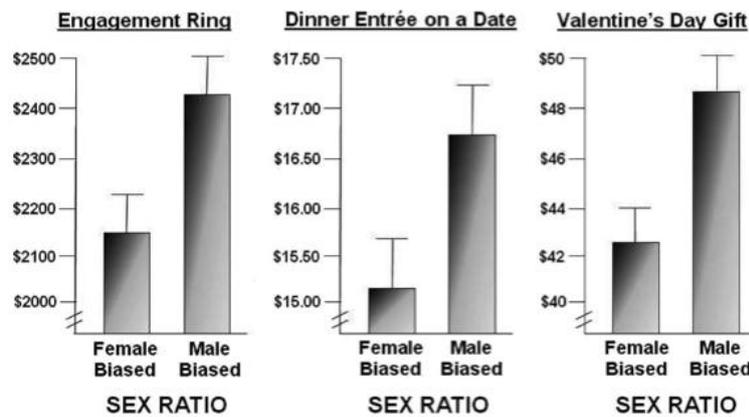


Figure 1. The amount (in USD) subjects, males and females combined, expected men to spend at male-biased and female-biased sex ratios. Errors bars show the standard errors.

There is, however, an alternative explanation. Signalling theory based on the mechanism of *human choice* – as used in the social sciences – may also account for the key results. A core prediction is that in certain situations people will take costly behaviours to reliably signal an unobservable property they possess – such as wealth – to viewers [5 - 7]. When competition for mates intensifies, males should increase their investment into signalling their wealth to stand out from the competition, and thus save less and borrow more. Moreover, both males and females should believe that higher investment into mate acquisition is needed, and because it is not so important for females to demonstrate their wealth to potential partners, one should not observe increased investment on their part, as is the case. The human choice based

signalling theory is different from an evolutionary explanation in a key respect: evolution need not be invoked. Individual choice, imitation or culture can bring about this equilibrium behaviour. While the precise mechanism for Griskevicius et al.'s results remain unknown, their work is important because it shows that perceived sex ratio affects the economic decisions of males, females, or both sexes.

Although Griskevicius et al. interpret their results within the framework of sexual selection and operational sex ratio (the ratio of *sexually active* males to females) theory, this is arguable. Operational sex ratio and adult sex ratio (the ratio of adult males to adult females in a population) are often confused in evolutionary biology, although recent models show they may exert different effects on behaviour [8]. A main distinction between operational sex ratio and adult sex ratio is that the latter is a demographic property of the population (how many adult males and females enter the adult population and remain alive), whereas the former is determined by each individual's sexual activity and the number of sexually mature males and females. Therefore, operational sex ratio may not be an appropriate predictor of sexually selected traits such as courtship behaviour, since operational sex ratio itself is the outcome of mating decision. In addition, in many animals, sexual activity has observable cues – for instance swollen genitalia – allowing sexually active ones to be identified. In humans this is not the case; we cannot visually distinguish between sexually active and sexually inactive people. Therefore, Griskevicius et al.'s treatment, showing the experimental subjects photographs of different ratios of mature males and females, did not necessarily change the perceived operational sex ratio, although it did change the perceived adult sex ratio.

Griskevicius et al.'s study may have four major implications. First, it suggests that socio-economic decisions (e.g. savings, borrowing, purchases and financial commitments) can be investigated within a biological framework, of which sexual selection is a prime candidate. This implies that high risk strategies, such as investing in subprime mortgages, drilling for oil in delicate environments or skyrocketing debts, may follow imbalanced sex ratios. Second, adult sex ratio may influence whole economies and societies. Human sex ratios vary between countries, states and settlements, and a striking implication is that a purely demographic feature, adult sex ratio, influences which businesses may flourish or fail. If sex ratios of newborn babies or the mortalities of males and females during childhood or adulthood may change in the

coming decades, for instance due to sex-biased diseases, these will impact on the adult sex ratio. Third, in societies where men are over-represented in the media, peoples' perceived adult sex ratio may be more male-biased than it is in reality. This could cause males in that society to be more short-term orientated and willing to borrow more to secure a mate. Fourth, it is not yet known how future changes in adult sex ratio will influence human mate choice behaviour – social features such as families and economies. For example, when there is a scarcity of women, females start sexual activity earlier and have more pre-marital and extra-marital affairs [9]. As a response to female behaviour, partnered men might become more vigilant and intrusive given the pressure by unmarried men, and they may attempt to prevent their partners from engaging in activities that might threaten the relationship. In contrast, when there is a scarcity of men, women in relationships might lower their demands for investment.

In conclusion, Griskevicius et al.'s work has opened up a Pandora's Box by suggesting that a demographic trait, adult sex ratio, influences economic decisions. Although the precise mechanisms underlying this behaviour have yet to be identified, the study is ground-breaking. Further work should develop theoretical models to assess how shifts in human adult sex ratio are expected to induce changes in consumer behaviour, test the hypotheses in-field and compare the results across societies with diverse cultures and demography. Carrying out similar studies in other countries, including those with large imbalances in adult sex ratio (e.g. India or China) could be especially productive.

## References

1. Hardy, I.C.W. (ed) (2002). *Sex Ratios: Concepts and Research Methods*, 1st edn. (Cambridge: Cambridge University Press).
2. Forsgren, E., Amundsen, T., Borg A.A., and Bjelvenmark, J. (2004). Unusually dynamic sex roles in a fish. *Nature* *429*, 551-554.
3. Le Galliard, J-F., Fitze, P.S., Ferriere, R., and Clobert, J. (2005). Sex ratio bias, male aggression, and population collapse in lizards. *Proceedings of the National Academy of Sciences, US* *102*, 18231-18236.
4. Griskevicius, V., Tybur, J.M., Ackerman, J.M., Delton, A.W., and Robertson, T.E. (2012). The financial consequences of too many men: sex ratio effects on saving, borrowing, and spending. *Journal of Personality and Social Psychology* *102*, 69-80.
5. Spence, M.A. (1974). *Market Signaling: Informational Transfer in Hiring and Related Screening Processes*. (Cambridge, Massachusetts: Harvard University Press.)
6. Camerer, C. (1988). Gifts as economic signals and social symbols. *American Journal of Sociology* *94*, 180-214.
7. Bacharach, M., and Gambetta, D. (2001). Trust in signs. In *Trust in Society*. K. Cook, ed. (New York: Russel Sage), pp. 148-184.
8. Jennions, M.D., and Kokko, H. (2010). Sexual selection. In *Evolutionary Behavioral Ecology*, D. Westneat and C. Fox, eds. (New York: Oxford University Press), pp. 343-364.
9. Trent, K., and South, S.J. (2011). Too many men? Sex ratios and women's partnering behaviour in China. *Social Forces* *90*, 247-268.