Effects of gender inequality and wealth inequality on within-sex mating competition under hypergyny

Abstract

Resources are often central to the formation and persistence of human consortships, and to the evolutionary fitness consequences of those consortships. As a result, the distribution of resources within a society should influence the number and quality of mating opportunities an individual of given status/wealth experiences. In particular, in a wide variety of societies, both contemporary and historic, women have been shown to prefer mates of higher rather than lower status and wealth, a pattern known as 'hypergyny'. Such status-dependent within-sex competition is influenced not only by the preferences individuals express but also by the distribution of resources within and between sexes. Empirical studies show that economic inequality within a sex can amplify mating competition, and that inequalities between women and men also influence behaviours related to mating competition, but the links between resource distribution and mating competition have attracted limited systematic attention. We present simulation models of hypergynous preferences and the effects on mating competition among men and among women within a heterosexual mating market. Our modelling shows that the lower mating success of poorer men and richer women (when compared with richer men and poorer women) is worsened when resource gender gaps are relatively small or when women out-earn men on average. Likewise, high economic inequality, especially among men, amplifies the competition experienced by these groups. We consider the political implications in terms of sex- and status-dependent attitudes to gender equity, wealth inequality, and hypergynous mating norms.

Introduction

Economic considerations and incentives have shaped the evolution of human mate choice. A consortship is, *inter alia*, an economic arrangement, in which both parties share, to some degree at least, their wealth, income, time, and labour (Becker 1973, 1981, Grossbard-Shechtman 1984, Chiappori et al. 2002). Human mating preferences and strategies may have evolved a fine tuning to this economic dimension of mating, biasing individuals to choose mates who have, or are likely to have, the attributes likely to lead to a successful economic partnership (Buss 1991, Buss et al. 2001, Hopcroft 2006, Hopcroft 2021).

Data from traditional, historic, and contemporary societies show that male status and wealth are often strongly associated with success in marriage, extra-marital mating, and producing offspring (Voland 1990, Cronk 1991, see review by Hopcroft 2006, Weeden et al. 2006, Nettle and Pollet 2008, von Rueden and Jaeggi 2016, Hopcroft 2021). The effects of status on female mating success are more variegated; women of higher status or greater wealth often bear fewer children (Hopcroft 2006). Those children, however, are more likely to survive early childhood (Boone III 1986, Hughes 1986, Lummaa 2001, Lartey et al. 2016), suggesting that for women, too, status can elevate evolutionary fitness.

Part of the fitness benefit that high-status men enjoy derives from the practice of hypergyny, according to which women are more likely to "marry upward" to men of higher status than themselves, or to sons of families of higher status than their own. Even though individual women can — and occasionally do — pair with men of lower status, it is far more common for women to pair with men of equal or higher status. As a result, hypergyny is a widespread pattern across contemporary and historic societies (Dickemann 1979, Betzig 1986, Boone III 1986, Betzig 1994, Wooding et al. 2004, Nettle and Pollet 2008, Van Leeuwen and Maas 2010), whereas the reverse pattern (hypogyny – women pairing downward) is unheard of at an aggregate level.

Adaptive theories of human mating emphasise Trivers' (1972) argument that sex differences in obligate parental investment drive the evolution of mate choice and within-sex competition. In humans, 'parental investment theory' is often invoked to explain women's

preference for hypergyny and thus men's competition for wealth and status (Buss and Schmitt 1993, Buss 1995). Trivers' view has, in the intervening half century, been developed into less static models (Kokko and Jennions 2008, Fromhage and Jennions 2016) that better account for among- and within-species variation in animal sex roles and mating behaviour. The promise of this more dynamic approach has, to date, yet to be realised in human research on questions like how cultural variation in the strength of hypergyny arises and how it is enabled or enforced culturally.

Having observed the widespread pattern of hypergyny across societies, we ask what psychological adaptation may be responsible for producing it. The answer to this question invariably concerns women's preference for mates with high status, a preference which has been demonstrated reliably and across cultures e.g.(e.g., Buss 1989). This psychological mechanism likely evolved to solve the problem of securing a mate who can, by investing in a woman's offspring, improve their fitness prospects. Although male parental investment is not obligate, it is often found in environments where paternity certainty is high and paternal investment is fitness benefiting than mating effort (e.g., seeking additional matings; reviewed by Geary 2000). Among humans, male parental investment has been a critical factor for offspring health and survival throughout human evolutionary history and in many cultures, still to this day (Hill and Kaplan 1988, Hill and Hurtado 1996, Kok et al. 1997, Reid 1997) (c.f. Draper and Harpending 1988 for a thorough discussion of cross-cultural differences in parental investment). A psychological predisposition toward choosing a mate with high status is well-designed to solve the recurrent adaptive problem of securing a mate with offspring provisioning capabilities.

While the evolution of hypergynous and status-dependent mating preferences has received considerable empirical and theoretic attention, less attention has been paid to how economic and cultural conditions interact with those preferences to shape mating competition. The primary aim of this paper is to predict how economic inequalities shape within-sex competition. Considerable evidence points to the importance of economic inequality within a sex on competitive behaviour (Wilson and Daly 1997, Daly and Wilson 2001, Daly 2016, Blake et al. 2018, Blake and Brooks 2019). Likewise, inequalities between women and men have been shown to influence behaviours related to mating competition

(Price et al. 2014). Despite the importance of inequalities to human mating markets, most thinking on the subject comprises verbal models and interpretation of empirical evidence. Here we present a simple simulation model that begins with the observable phenomenon of hypergynous female mate preferences. We describe how hypergyny predicts competition among men to mate with women, and among women to mate with men. Our model predicts how these forms of competition are likely to be affected by economic inequalities among men, among women, and between women and men. Our aim is to lay a foundation for a more formal and integrated adaptationist study of how inequalities shape sexual competition and its various manifestations, some of which have important psychological, safety, public health, and security implications.

Lessons from the study of sex ratios

In contrast to the limited modelling of economic inequality's effects on mating competition, the effects of sex ratios on mating competition have received extensive theoretic development and review by biologists (Emlen and Oring 1977, Shuster and Wade 2003, Kokko and Jennions 2008, Klug et al. 2010, de Jong et al. 2012, Kokko et al. 2012, Shuster 2016). Operational Sex Ratios (OSR) – defined by Emlen (1976) as "the ratio of receptive females to potential mating males at any one time" – are widely used in studies of animal mating systems and sexual selection (Kvarnemo and Ahnesjo 1996), amounting to, according to Shuster (2016), over 4500 articles. In parallel, the effects of relative numbers of women and men (i.e., human adult sex ratio) on within-sex mating competition have been subjects of theoretic modelling and empirical research in the human behavioural sciences (Guttentag and Secord 1983, Grossbard-Shechtman 1984, Chiappori et al. 2002, Marlowe and Berbesque 2012, Kandrik et al. 2015, Schacht and Borgerhoff Mulder 2015, Stone 2018).

Sex ratios affect mating markets by altering the supply of mates relative to competitors. Under male-biased sex ratios, women enjoy greater bargaining power over the establishment of relationships, as well as within relationships (Guttentag and Secord 1983), leading to higher rates of marriage, lower rates of births to teen and unwed mothers, and better mate choice outcomes for women (Barber 2000, reviewed by Stone 2018). Male-biased sex ratios intensify competition among men, and some sources show this elevates rates of violence, property crime, addiction, and radicalisation (Hudson and Boer

2004, Edlund et al. 2010). Other studies show that when sex ratios are female-biased, men invest less in their consorts and children, invest more in mating competition (Stone 2018), are more open to uncommitted sex (Kandrik et al. 2015) and to 'poaching' mates from other men (Schmitt and Descript 2004). These forms of elevated mating competition stoke male-perpetrated violence in some societies when men are relatively rare (Schacht et al. 2016). It is clear from the ample work on sex ratios that the effects are manifold, if somewhat complex.

Context-dependent competition

The effects of sex ratios, or any other variable, on within-sex competition are seldom uniform in their expression. In general, young unmarried men who are poor, unemployed, and thus have dim prospects of finding a partner, experience the most intense competition. As a result of this competition, violent offending, dangerous driving, gambling and other risky behaviours are highest among these men (Wilson and Daly 1985, Daly and Wilson 2001). Wilson and Daly (1985) named this constellation of traits "young male syndrome", arguing that these traits function adaptively to enhance status as a means to outcompeting sexual rivals.

Factors that perturb mating markets have a disproportionate effect on young, poor, uneducated men, especially those from low-status groups. A male-biased sex ratio exacerbates the intense competition among low-status men who massively outnumber available women, whereas the mating prospects of high-status men remain largely unaffected. As a result, it is often the poorest men, *ceteris paribus*, who are at greatest risk of being unable to mate, and thus of falling into violence, crime, addiction, and chronic physical and mental illness (Hudson 2002, Hesketh and Xing 2006, Zhou et al. 2013).

Competition among women is also not uniform. Women in low socioeconomic status (SES) neighbourhoods in England reproduce at younger ages when sex ratios are female-biased, whereas women from high SES neighbourhoods do so at older ages (Chipman and Morrison 2013). The interpretation is that, when mates are rare, poorer women cannot afford to wait for a high-earning mate, whereas richer women can do so, and often do. Likewise, when

women outnumber men, it is often high-earning or high-status women who are at greatest risk of remaining unpartnered.

Varying effects of income inequality

Just as the supply-demand effects of sex ratios exert uneven effects on competition, the distribution of wealth is expected to exert comparable effects. The most studied such effect is that of income inequality on male-male competition. Income inequality predicts risky male behaviours, violent crime, and homicide (Krahn et al. 1986, Wilson and Daly 1997, Daly et al. 2001, Peñaherrera-Aguirre et al. 2018). Martin Daly and Margo Wilson marshalled a number of strands of evidence showing that these links are due to an intensification of male-male competition under high economic inequality, particularly for poorer, younger men (Wilson and Daly 1997, Daly et al. 2001, Daly 2016, see also Greitemeyer and Sagioglou 2017).

Competition among women, too, responds to economic inequality. Teenage and unwed births are associated with high inequality (Wilson and Daly 1997). Recently we showed that women's self-sexualisation in the form of posting 'sexy selfies' on social media is robustly associated with high economic inequality at the level of U.S. cities, U.S. counties, and nations (Blake et al. 2018). Moreover, at the U.S. city and county level, women's expenditure on clothing was associated positively and robustly with inequality (Blake et al. 2018). Whether the effects of inequality on self-sexualisation, grooming, and other expressions of women's competition are uniform, or if they are particularly strong in some women rather than others, currently remains unresolved (Blake and Brooks 2019).

Part of the rationale for this study is to model, under simplified conditions, the mating success implications of economic inequalities within and between the sexes for women and men in relation to their status/wealth. Based on the assumption of a very simple and static hypergynous preference, we explore how the mating success of women and men of varying status is altered with varying levels of wealth and gender inequality. In simple terms, our aim is to predict whose mating prospects improve or deteriorate under changing conditions. We hope that such predictions will enrich the study of how individual behaviours and well-being are shaped by the inequalities in their milieu.

Income and wealth inequality are most often measured and studied at the household level, with little heed paid to the possibility that inequalities among men and among women might exert different effects on behaviour. Within 20th Century Western economies, inequalities changed from the 1920s (high gender inequality and income inequality among men, low income inequality among women) to the 1950s (high gender inequality, low income inequality within each sex) to the 1980s (*lower gender inequality*, high inequality within both sexes), with effects on mating markets and gender relations that remain contested (Goldin 1990, Stevenson and Wolfers 2007). Theory concerning whether and how the effects of inequality among men and among women might differ remains limited, at best. One of our aims, here, is to begin the process of dissecting the likely effects of economic inequality on each sex.

Gender inequality

Inequality between the sexes has profound and pervasive effects on human behaviour, including on mating systems and norms concerning sex and the family (Reiss 1986, Jetten and Peters 2019). Differences between women and men in wealth, earning potential, status, and power define the landscape of relations between the sexes (Stevenson and Wolfers 2007, Bertrand et al. 2013, Price et al. 2014, Autor et al. 2019). Nonetheless, few published accounts explicitly consider how gender inequality influences the intensity of competition within each sex.

The more men's mean incomes exceed those earned by women, the greater the return from marriage that women experience (Becker 1973, Wilson 1996). Dwindling gender gaps in employment and income have been named as likely drivers of declining marriage rates and increasing divorces as the proportion of women who can achieve upward mobility on the mating market declines (Wilson 1996, Stevenson and Wolfers 2007, Autor et al. 2019). Indeed, couples are less likely to form, and are more likely to separate, when the woman's earnings approach the man's (Bertrand et al. 2013, Doumbia and Goussé 2019).

As with sex ratios and wealth inequality, it is reasonable to expect that the effects of gender inequality on mating competition will vary among individuals, depending on their status, age, and other characteristics. Our models are designed to generate predictions about the effects of varying gender gaps in wealth on the competition that individuals (of

varying status) experience, and thus to predict behaviour in a way that is informed by adaptationist thinking.

Model

In this paper we present a simple model to explore how the strength of within-sex competition for mates might be influenced by gender inequality, wealth inequality among men, and wealth inequality among women. We consider both competition among men and among women for mates in a heterosexual mating market. Our approach is to model the 'pairing success' of individual males and females in relation to their 'wealth' over a series of 'encounters'. Once an individual pairs (i.e. finds a mate), they do not go back into the pool for subsequent encounters; an individual either pairs monogamously or not at all.

We differentiate the related quantities of 'wealth' and 'status'. Status, for the purposes of our model, is the underlying percentile rank wealth of individuals within their sex, always ranging from 0 to 100. Whereas status is relative, wealth is an absolute property that varies in relation to the distribution properties we assign, and it can thus differ between the sexes in both mean and variance. Although our simple conception of status and wealth evokes contemporary economies, we expect them to generalise to how status and wealth (or income) work in other kinds of economy and society.

The simplest form of our model applies a form of hypergyny in which women pair only with men of equal or greater wealth than themselves, and men mate with any woman willing to mate with them. We call this 'Choice Rule 1' or 'Strict Hypergyny'. We also modelled three other choice rules. Under Choice Rule 2 or 'Capped Hypergyny', women pair only with men who are wealthier than themselves, and men accept women whose wealth is no more than a specified number of units lower than theirs. This constitutes hypergyny within a stratified mating market, a pattern that has been documented in several societies (e.g., Dickemann 1979). Choice Rule 3 retains the same female preference for wealthier men and adds a second trait, X, that men care about. Men accept any woman whose value of X exceeds their own by a specified amount ΔX_m or more. Varying ΔX_m allows one to explore the effect

of the strength of the male preference for X. Choice Rule 4 gives both women and men preferences for both wealth and X.

In the online supplementary material we explore some of the differences in model outcome that depend on the choice rules applied. In summary, when the rule components other than hypergyny are weak, the model results are very similar to those under Choice Rule 1. Stronger non-hypergyny components alter aspects of the model outcome but in most situations the important features of the model under Choice Rule 1 remain. Due to the qualitative similarity in results across the four types of choice rule, we present only the results of Choice Rule 1 in this manuscript to remain focussed on our main goal of exploring the consequences of hypergyny for pairing success and within-sex competition. We provide corresponding figures for each of the other three choice rules in the supplement.

Our interest in modelling this problem stems from the many consequences of within-sex competition. We equate an individual's low pairing success in our model with high competition to escape the circumstances that cause low paring success. Women who experience high competition are more likely than those who experience less competition to engage in competitive behaviours such as overt aggression, social exclusion, gossip (Fisher and Cox 2009), self-sexualisation and status-signalling (Blake et al. 2018, Blake and Brooks 2019) to improve their chances of attracting mates. Likewise, men strive to elevate themselves above other men, especially when they are in circumstances of poverty, youth, or low status that lower their mating success (Wilson and Daly 1997, Daly et al. 2001, Daly 2016, see also Greitemeyer and Sagioglou 2017).

Our model is an abstraction of the observation that women do tend to prefer men of higher wealth or status than themselves, whereas men compete to reach higher wealth and status in order to attract women. The preferences underpinning human hypergyny are, obviously, far more complex and contingent than the simple preferences we model here, and there are many other dimensions to human mate choice. Nevertheless, simplification often provides a useful first step towards understanding the behaviour of complex systems.

All modelling and graphing presented is conducted in MATLAB. Our model considers four economic variables, the mean wealth for men (μ_m), and women (μ_f), and the standard deviation in wealth for men (σ_m), and for women (σ_f). Male and female wealth are each distributed normally, with given mean and standard deviation. We consider a large population (2 million individuals) with an even sex ratio, in which each individual is independently assigned a status (i.e., within-sex ranking) and this is converted into wealth by assigning a position in the relevant distribution.

Human mate choice occurs as an iterative process, with individuals progressively dropping out of the market as they match, at least for a time. Individuals who experience low competition are more likely to find a mutually suitable match and thus to pair early on. Those who experience high competition will tend to match and mate later, or not at all. We therefore model human mating competition as a simulation with a given number of iterative rounds. Starting with an initial population where everyone is unpaired, men and women are randomly arranged into candidate pairs. If a pair is a 'match' (i.e. the candidates meet each other's choice criteria) both woman and man are henceforth recorded as paired. The remaining unpaired individuals are then repeatedly randomly arranged into new candidate pairs, for a specified number of iterations. Competition is then measured as the proportion of individuals that remain unpaired throughout the process.

The used Matlab code is available here.

Gender inequality

When women and men have the same mean and standard deviation in wealth (i.e., $\mu_m = \mu_f$ and $\sigma_m = \sigma_f$), their initial pairing probability, in the first iteration of choice, follows a linear function of wealth rank (solid lines in Figure 1a), with the poorest men and the wealthiest women experiencing zero pairing success.

Any difference from perfect equity (i.e., $\mu_m \neq \mu_f$) results in the relationship between wealth rank and pairing success on the first iteration becoming non-linear. Dashed lines in Figure 1a show the relationship for a one S.D. difference between male and female mean wealth (μ_m

=55; μ_f = 50, and $\sigma_m = \sigma_f$ = 5). Such a gap alleviates competition (and thus elevates pairing success) for all women and men, but especially for the men in the lower half of the wealth rank distribution and women in the upper half. Whereas both women and men at 50 per cent wealth rank would be rejected by half the members of the opposite sex, the one S.D. difference in mean wealth lowers this value below 0.2 or twenty percent.

The number of iterations also influences competition within each sex. Figure 1b shows the results of simulations for 10 iterations and Figure 1c for 100 iterations. More iterations result in fewer individuals of each sex remaining unpaired, since more pairing attempts results in more pairings. Iterative pairing – which is a realistic feature – results in almost all men of above average status and almost all women of below average status finding a match even when male and female mean wealth are equal. These reductions in competition are more dramatic when $\mu_m > \mu_f$.

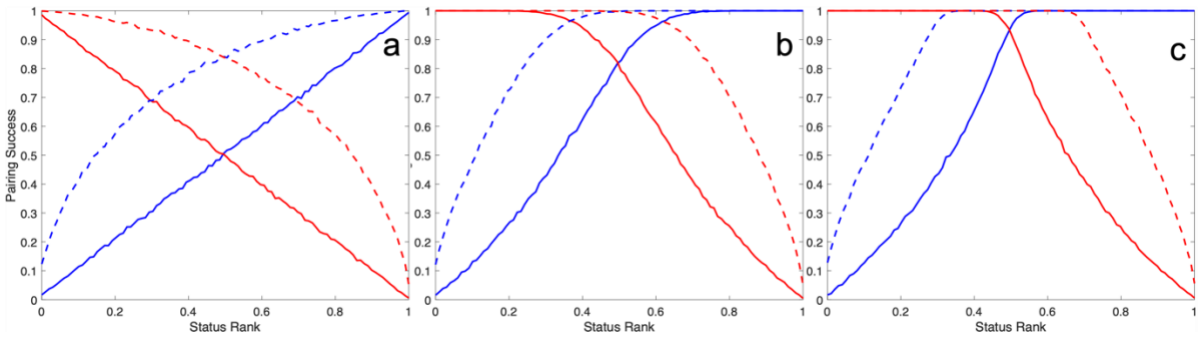

Figure 1. Pairing success of men (blue) and women (red) under equal mean wealth (solid) and a M-F gap of one standard deviation (dashed). Panels indicate the results from a. the first, b. the 10th and c. the 100th iteration.

In order to explore how the size and direction of the gender gap effects the shape of these curves, we kept female mean wealth constant at μ_f = 50 and allowed male mean wealth (μ_m) to vary by up to 4 S.D. in either direction (i.e., between 30 and 70). The more the average wealth gap favours men (i.e. higher values), the larger the proportion of both men and women who pair successfully under hypergyny (lighter shades in Fig 2a & b). The opposite is true for female-biased wage gaps, where a growing proportion of men and women experience very low (<0.1) pairing success (darker shades in Fig 2a & b).

Figure 2 panels c and d show the extent to which pairing success increases (reds, positive numbers) or decreases (blues, negative numbers) compared with equity (i.e. Male-Female Wealth Gap = 0). Both the lowest-status men and the highest-status women benefit most – in terms of greater pairing success - from a male-biased gender gap in average earnings. High-status men and low-status women seldom remain unpaired under male-biased wealth gaps. The mating prospects of low-status men and high-status women remain largely the same – very poor – under female-biased wealth gaps. By contrast, female-biased average wealth gaps dramatically reduce the mating prospects of medium-high status men and medium-low status women who go from near-certainty to little hope of finding a match.

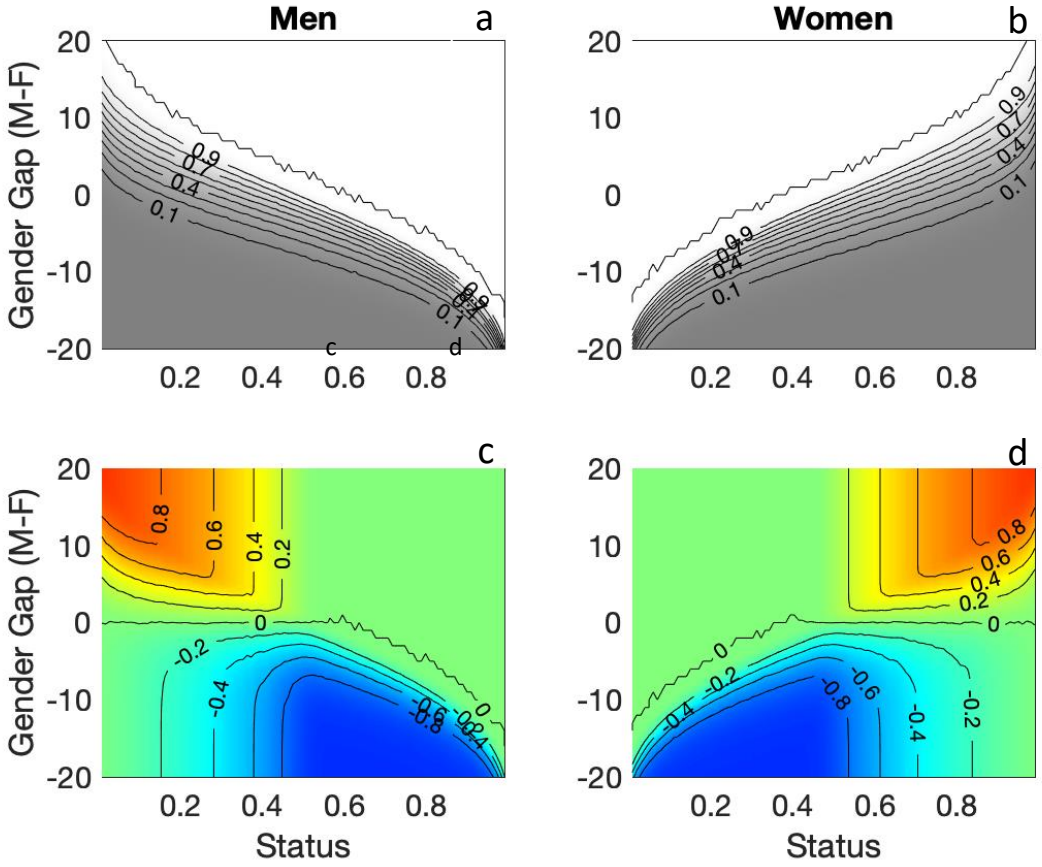

Figure 2. Pairing success experienced by men (a) and women (b), and difference from the situation of wealth equity for men (c) and women (d), in relation to status (i.e., wealth rank) and the size of the male-female wealth gap. In panels a and b the z-axis shows proportion of individuals paired after 100 encounters. In panels c and d the z-axis shows pairing success at various levels of male-female gap minus pairing success at gender gap = 0 (i.e. $\mu_m = \mu_f = 50$).

Wealth inequality

Varying wealth inequality among men and among women at the same time (i.e., $\sigma_m = \sigma_f$) while there is no gender gap (i.e., $\mu_m = \mu_f$) results in a straight line (as per solid lines in Figure 1a) at any modelled level of inequality. Once we introduce a gender gap (in the case of Fig. 3, $\mu_m = 0.55$, $\mu_f = 0.5$), however, high inequality amplifies the relationship between pairing success and status, whereas low inequality diminishes that relationship. Another way of stating this result is that hypergyny generates a positive relationship between inequality and competition for mates.

Men of below-average wealth and women of above-average wealth experience stronger negative effects of high inequality (Fig 3c, d) relative to the baseline (i.e., $\sigma_m = \sigma_f = 5$) inequality levels. These individuals do, however, experience some relief from competition under very low levels of inequality. Wealthy men's and poorer women's pairing success is very high (close to 100 percent, Fig 3 a & b) and largely unperturbed by inequality in the form modelled in Figure 3.

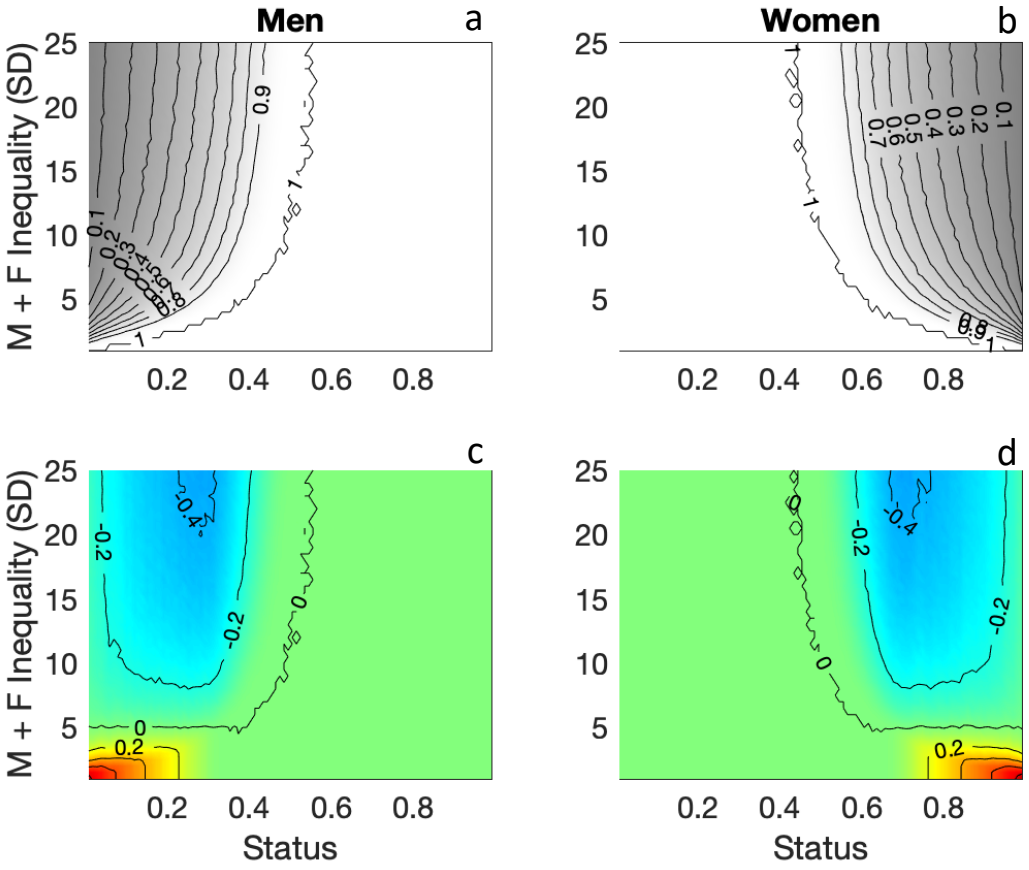

Figure 2. Pairing success (Z-axis) experienced by men and women in relation to status and inequality. Panels a and b show actual pairing success (after 100 encounters), and panels c and d show pairing success relative to that experienced under inequality of $\sigma_m = \sigma_f = 5$*. All figures include a small male-female difference in mean* $\mu_m = 55$, $\mu_f = 50$ for reasons explained in the text.

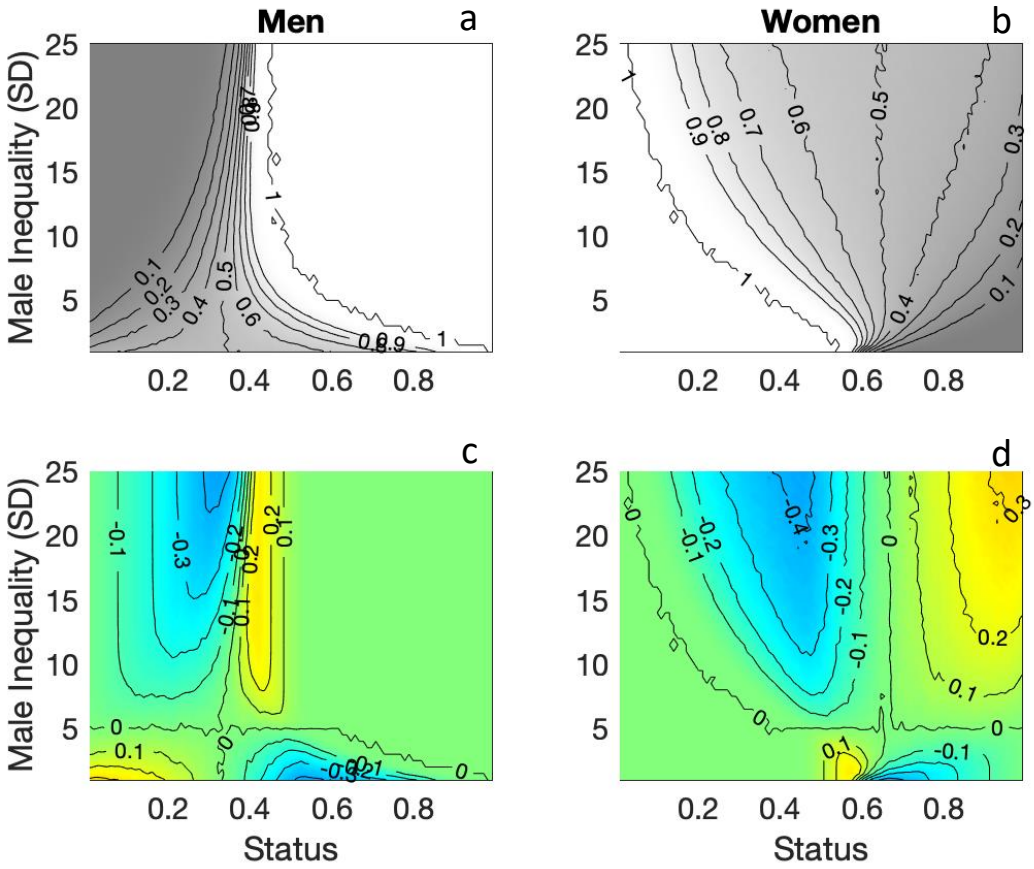

Figure 4. Pairing success (Z-axis) experienced by men and women in relation to status and wealth inequality among men. Panels a and b show pairing success (after 100 encounters), and panels c and d show pairing success relative to that experienced under $\sigma_m = 5$ (i.e., equal male and female inequality). Male and female mean wealth is equal.

Wealth inequality among men

The effects of varying male inequality (σ_m) on pairing success can be seen in Figure 4a and b. The net effects of inequality compared with the null situation ($\sigma_m = \sigma_f = 5$) can be seen in Figure 4c (men) and d (women). Low inequality among men favours low-status men by increasing pairing success whereas high-status men experience lower pairing success. Under high inequality, medium-low status men are worse off, but medium-high status men are better off in terms of pairing success.

Among women, medium-low status women experience increased pairing success under low male inequality, and medium-high status women experience reduced pairing success. Under

high male inequality, variation in pairing success is most strongly affected at the status extremes, with high-status women experiencing higher pairing success and low-status women experiencing lower pairing success than under intermediate male inequality ($\sigma_m = \sigma_f = 5$).

Wealth inequality among women

Varying female inequality (σ_f) while keeping male inequality constant affected the pairing success of men and women (Figure 5) in ways that present a mirror image of the effects of varying male inequality. Low inequality among women improves pairing success of medium-high status men whereas medium-low status men experience lower pairing success. Under high inequality, low status men experience higher pairing success whereas high-status men experience lower pairing success than under intermediate male inequality ($\sigma_m = \sigma_f = 5$).

Among women, low status women experience lower pairing success and high-status women experience higher pairing success under low female inequality than they would under the intermediate baseline level. Under high among-female wealth inequality, medium-low status women experience higher and medium-high status women lower pairing success than they do under modest ($\sigma_m = \sigma_f = 5$) inequality. This effect arises because, as womens' wealth distribution broadens, its right tail overlaps less with the corresponding distribution for men. This makes it harder for medium-high women to find a match, leaving more partners for medium-low status women.

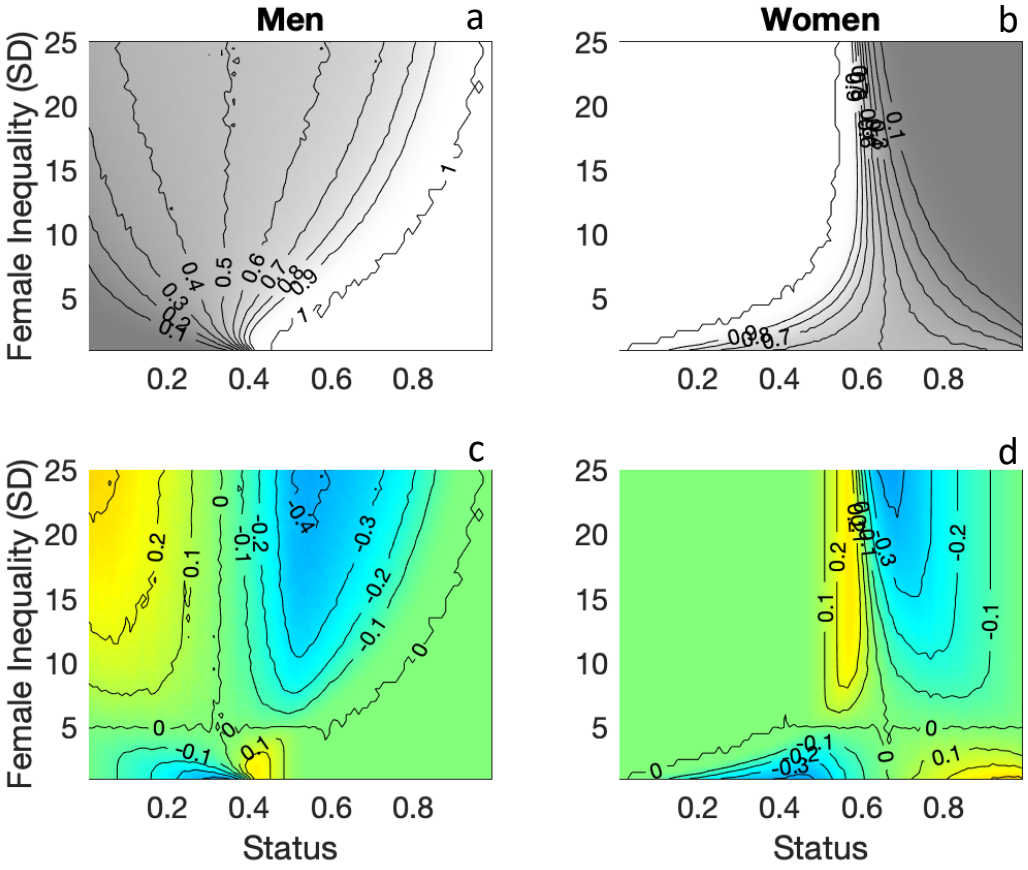

Figure 5. Pairing success (Z-axis) experienced by men and women in relation to status and wealth inequality among women. Panels a and b show pairing success (after 100 encounters), and panels c and d show pairing success relative to that experienced under $\sigma_f = 5$ (i.e., equal male and female inequality). Male and female mean wealth is equal.

Discussion

The simple model we present provides some insights into the effects of a variety of economic inequalities on status-dependent pairing success of women and men. In general, under the kind of hypergyny modelled here, poorer men and wealthier women experience more competition for mates (i.e., lower paring success) than wealthy men and poorer women. When men earn more than women, on average, competition is alleviated and pairing success elevated in both sexes, and especially among poorer men and richer women. A dissection of the contributions of inequality within each sex reveals that high inequality within a sex or low inequality in the opposite sex tend to dampen the pairing success of members of high-competition groups (i.e., poorer men and wealthier women).

Some of the predictions that our models generate correspond with observations from models that were designed for other purposes. Trivers and Willard (1973), for example, in modelling the evolution of parental investment in male versus female offspring, noted that a tendency for women to marry men of higher socioeconomic status than themselves can mean that the reproductive success of a man at the upper end of the socioeconomic scale is likely to exceed that of his sister, whereas the success of a woman of lower socioeconomic status is likely to exceed that of her brother. These differences in reproductive success arise due to status-dependent within-sex competition.

Likewise, Harpending and Rogers (1990), modelling the evolutionary consequences of wealth-transmission strategies within stratified societies, found that high status males have the highest long-term fitness, followed by low status females, then low status males and high status females. Adaptationist studies of dowry and bride-price practices find that dowry—indicative of high female-female competition for eligible mates—is more common at higher status strata, whereas bride price is more common at lower strata of the same societies (Dickemann 1979, Gaulin and Boster 1990).

We did not seek to model how the psychological preferences that lead to hypergyny evolve, but rather to resolve how local circumstances – economic inequalities – alter mating markets where hypergyny is already in place due to historic selection. By identifying how hypergyny, combined with specified levels of inequality, creates mating market "winners" and "losers", our models could be used to predict behaviour of individuals in relation to their status and the inequality in their current environment. Due to the tight links between mating success and evolutionary fitness, there exists considerable scope for close study of psychological adaptations by which individuals track the inequalities shaping their local mating markets and react to the perceived chances that they (and mate-seeking kin) might benefit or lose out. Further, there exist rich opportunities to study the underlying mechanisms, from simple (e.g. preference for high over low mating success) to more complex phenotypically plastic adaptations that alter developmental trajectories, striving behaviour, and social preferences. Given the dramatic changes in economies and inequalities throughout history, we might also expect considerable mismatch between any adapted responses to inequality and the maximisation of fitness in the present day.

This approach also offers some opportunities for commensurability between evolutionary and economic approaches to understanding variation in human behavior. The greater competition and lower average mating success that economists have documented among men employed in the U.S. manufacturing sector during 1990-2014 as a result of the rise of Chinese manufacturing (Autor et al. 2013, Autor et al. 2017, Autor et al. 2019) provides a case in point. Shrinking male-female wage gaps and growing income inequality worsened the mating market prospects of men in areas impacted by this 'China Syndrome'. The relative importance of changes to male-female wage gaps and inequality remains unknown, but both processes are consistent with the predictions from our model (Autor et al. 2019). It is worth noting that men's worsening mating market prospects under the China syndrome had substantial effects on their broader communities, with men suffering poorer mental health, greater likelihood of addiction, suicide, and accidental death (Autor et al. 2019). Moreover, affected areas also showed greater political polarization (Autor et al. 2017).

In a similar vein, we have found that high wealth inequality and low gender inequity, together with male-biased sex ratios or a dearth of single women, result in higher incidences of online misogyny of a kind that reflects local competition among men for mates (Blake et al. 2021, Brooks et al. 2022). The number of tweets by or about men who consider themselves 'involuntary celibate' (i.e., 'Incel') is highest in parts of the USA where sex ratios are male-biased, where there are few single women in the age range 18-39, where income inequality is highest, and where gender gaps in income are smallest (Brooks et al. 2022). This work suggests that Incels are especially common, or at least active on social media, in places where large numbers of young men are unable to earn enough to attract any of the limited numbers of available women.

Our model suggests that poorer or lower-status men are more likely than wealthy or high-status men to experience low mating success as a result of either high wealth-inequality or small gender gaps. Our model also suggests, however, that the two factors affect somewhat different groups of men; gender equity has the greatest effect on the poorest men, whereas inequality increases competition most for men who are just below average.

Our models also, indirectly, indicate the likely future direction of selection on hypergamous mating preferences, which is concordant with cultural trends: over the past 60 years, the narrowing of gender gaps in education, and in some countries the advance of women's education beyond men's has reduced not only hypergamous mating, but also attitudes about the desirability of hypergamy (Esteve et al. 2016).

Political considerations

Gender gaps and economic inequality are well known to motivate ideological beliefs and political activity. In most cases, the political motivations surrounding inequalities are understood in terms of their financial consequences. People are motivated against or in favour of a particular form of inequality because of its effect on income or wealth *per se*. But if economic inequalities influence within-sex competition, then also evolved psychological responses to mating market dynamics may influence the political reactions to those inequalities.

Mating markets influence individual evolutionary fitness, and thus it should not surprise anybody that factors that influence mating markets also motivate individuals' political positions (Kurzban et al. 2010, Petersen et al. 2013, Hatemi et al. 2017, Petersen 2018, Hudson et al. 2020, Luberti et al. 2020). Individual differences in sexual strategies, notably openness to multiple, low-commitment sexual encounters, are associated with less affinity for authoritarianism and for conservative political positions (Hatemi et al. 2017, Petersen 2018).

We predict that the changes in mating market competition that emerge from our model in response to varying inequality and gender inequity will motivate women's and men's political positions in ways that reflect their adaptive (i.e., evolutionary fitness) interests. The importance of status in a hypergynous system such as our simple model will throw the mating interests, and thus the political interests, of people of the same sex but different status into opposition. Such status-dependent individual differences are already known with regard to policies like wealth redistribution (Petersen et al. 2013, Luberti et al. 2020). Our models of status-dependent within-sex competition might be useful in discerning the

interests of individual women and men in relation to changing patterns of wealth inequality or gender inequity.

Those interests might manifest as status-dependent attitudes concerning gender equity and economic inequality. They might also – or instead – manifest as status-dependent attitudes to hypergyny. We note that not only do Incels identify 'sexual inequality' as a proximate cause of their lack of mating success, but they also identify hypergyny as a more distal but pervasive cause of sexual inequality (see Brooks 2021, Perry and DeDeo 2021). Our models predict that opposition to hypergyny will be greatest among low-status men and very high-status women. Their opposition to hypergyny will be more intense under gender equity than when men earn or own more than women. Men of above-average wealth and women of below-average wealth should be uniformly favourable to hypergyny under high male-female gaps but opposed to it when women out-earn men.

In a similar vein, opposition to hypergyny and/or to wealth inequality should be highest in moderately wealthy women or moderately poor men under high wealth inequality, when the degree of inequality among men and among women is the same. The effects are more variegated and complex when the degree of inequality is manipulated independently within each sex. In general, high inequality among men imposes greater mating-market competition on below-average men and women, whereas high inequality among women is more costly for above-average wealth individuals of both sexes. We hope that this modelling exercise will open new opportunities within and beyond the evolutionary behavioral sciences for understanding the rich, contingent drivers of human behaviour, including political attitudes.

Limitations

The model we present here is intentionally simple. We added Choice Rules 2-4 (See Online Supplementary Material) to test whether our results were an artificial consequence of modelling only one simple female choice rule. Our model does not include an explicit time or search cost, but varying the number of iterations may have a similar effect. Neither does it consider feedbacks between economic circumstances, mating market performance, and the strength of preferences, particularly in relation to the risk of remaining forever

unpaired. These, and the addition of a potential for serial monogamy or polygyny, would make for more complex models, and perhaps different results. We encourage researchers to extend the work we have done here to build a broader and more realistic picture of the phenomena in question.

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