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Ecological Predictors of Reproductive Strategies

by

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Acknowledgments

Declarations

I hereby confirm that I completed this thesis independently, that I have not heretofore presented this thesis to another department or university, and that I have listed all references used, and have given credit to all additional sources of assistance.

Note on Inclusion of Published Work

Chapters 2, 3, and 4 of this thesis have been published during the period of my PhD registration, and the copyright of these papers resides with the publishers (the reproduction of the papers in this thesis is permitted under the terms of the copyright agreement). The publications are:

Chapter 2

Muggleton, N. K., & Fincher, C. L. (2017). Unrestricted sexuality promotes more distinctive short- and long-term mate preferences in women. *Personality and Individual Differences*, *111*, 169–173. doi: 10.1016/j.paid .2017.01.054

Chapter 3

Muggleton, N. K., & Fincher, C. L. (2018). You're not my type: Do conservatives have a bias for seeing long-term mates? *Evolution and Human Behavior*, *39*(6), 652–663. doi: 10.1016/j.evolhumbehav.2018.06.009

Chapter 4

Muggleton, N. K., Tarran, S. R., & Fincher, C. L. (2019). Who punishes promiscuous women? Both women and men are prejudiced towards sexually-accessible women, but only women inflict costly punishment. *Evolution and Human Behavior*. (In press) doi: 10.1016/j.evolhumbehav .2018.12.003

Abstract

Since Charles Darwin's insights into sexual selection, evolutionary psychologists have shown that human reproductive strategies are dynamic, context-dependent, and adaptive. The study of evolution and human behaviour has typically categorised adaptations as occurring at the individual level (within-subjects), as individual differences (between-subjects), or at the regional level (cross-cultural). These approaches are reviewed in Chapter 1.

To assess the extent to which individuals modify their mating strategies, Chapter 2 tests women's propensity to vary their mate preferences across different relationship types. The results indicate that women who are less experienced sexually are less likely to vary their reproductive strategies when seeking a short- vs. long-term partner.

Although flexible mating strategies have been traditionally viewed as adaptive, there could be some circumstances when variation in mate behaviour is costly. Chapter 3 explores the role of social conservatism in modifying mate preference. The results indicate that men and women are less inclined to vary their short- and long-term mating behaviour when there are social taboos surrounding sexual values.

These findings indicate that conservative cultures suppress sexual behaviour. I explore the implications of this in Chapter 4, where I ask whether men or women promote the sexual double standard. Here I find that both sexes are less altruistic to, and less trusting of, women that signal sexual promiscuity. Women, but not men, are driven by intrasexual competition, such that they are willing to inflict punishment on sexualised peers, even when it is costly to do so.

Chapters 2-4 use experimental methods to uncover individual-level variation in mate preferences and sexual attitudes. Chapter 5 investigates the role of socioecological factors in shaping gender attitudes. The results highlight the importance of environmental harshness, inequality, and economic opportunities in fostering gender attitudes.

Chapter 6 discusses the implications of the thesis, and emphasises the importance of socioecological accounts in understanding, and overcoming, unequal gender attitudes.

Abbreviations

Acronyms

BIC	Bayesian Information Criterion
BMI	Body Mass Index
CMH	Cochran-Mantel-Haenszel
DG	Dictator Game
EHBEA	European Human Behaviour and Evolution Association
EPC	Extra-Pair Copulation
EPS	Experimental Psychological Society
GDI	Gender Development Index
GDP	Gross Domestic Product
GGI	Gender Gap Index
HDI	Human Development Index
IAT	Implicit-Association Test
KMO	Kaiser-Meyer-Olkin
LH	Life History
MPI	Mate Preference Inventory
PCA	Principal Component Analysis
PVQ-RR	Portraits Values Questionnaire (Revised)
SES	Socio-Economic Status
SOI-B	Behaviour subscale from the Revised Sociosexual Orientation Inventory

SOI-R	Revised Sociosexual Orientation Inventory
TG	Trust Game
UG	Ultimatum Game
UN	United Nations
WEF	World Economic Forum
WEIRD	Western, Educated, and from Industrialised, Rich, and Democratic countries
WHR	Waist-to-Hip Ratio
WMPQ	Women's Mate Preference Questionnaire
WVS	World Values Survey

Chapter 1

General Introduction

1.1 Introduction

Of all the decisions humans will make across the life course, choosing when to have children, and with whom, is arguably the most consequential. The origins of this decision-making process, however, are shared across species and reflect an innate drive to ensure that offspring are biologically fit. Distinct from natural selection (ensuring one's own survival), sexual selection focuses exclusively on adaptations to maximise the number of healthy offspring (i.e., those who reach reproductive age) by pairing with a high quality mate. As a consequence of these adaptations, human mating strategies reflect a sophisticated suite of preferences that function to maximise the fitness of offspring.

In this chapter I will review prior literature investigating how culture, ecology, biology, and individual differences can inform mating strategies. In section 1.2 I outline sex differences in sexual desire and mate preferences, and in section 1.3 I explore the role of ecological factors in predicting mate preferences. Section 1.4 describes the individual differences in sexual strategies, and in section 1.5 I review the ways in which humans switch between these strategies in different contexts. I then explore social attitudes towards women's sexual strategies by outlining research that investigates prejudice towards promiscuous women and potential causes in section 1.6. In the concluding sections of the chapter I identify key gaps in the literature (section 1.7) and conclude with an outline of this thesis (section 1.8).

1.2 Sex Differences

1.2.1 Sexual Desire

It is well established that men and women differ with respect to their sexuality. Relative to women, men are more willing to engage in uncommitted sex (Lippa, 2009; Schmitt, 2005; Gray, Garcia, & Gesselman, 2019) and desire more sexual partners (Schmitt et al., 2003). Men also have a higher sex drive (Lippa, 2009; Hakim, 2015) and are more likely to masturbate or watch pornography (Petersen & Hyde, 2010; Træen, Spitznogle, & Beverfjord, 2004; Driemeyer, Janssen, Wiltfang, & Elmerstig, 2016). Compared with women, men are open to paying for sex (Jonsson & Jakobsson, 2017; Jakobsson & Kotsadam, 2011), as well as having multiple partners at once or engaging in threesomes (Gray et al., 2019). These sex differences are among the most robust and well-replicated effects in psychology, with Cohen's d often exceeding .74 (Buss & Schmitt, 2019). The origins of these sex differences have variously been accounted for in terms of patriarchy (Travis & White, 2000; Millett, 2000; Tolman, 2006), sociostructural power differentials (Eagly & Wood, 1999), gender schema theory (Bem, 1981), and sexual selection (Trivers, 1972; Buss, 1989; Schmitt, 2005; Darwin, 1879), while others have argued that any differences have been exaggerated (Stewart-Williams & Thomas, 2013; Fine, 2017; Petersen & Hyde, 2010; Hallam, De Backer, Fisher, & Walrave, 2018; Conley, Moors, Matsick, Ziegler, & Valentine, 2011; Zentner & Mitura, 2012).

In the past few decades, evolutionary psychology has provided the most plausible account of sexual behaviour. This perspective argues that mate preferences are borne from an innate drive to produce fit, healthy offspring. The sex differences outlined above are not mere artefacts of social conditioning. Instead, these observations conform with the *males-compete/females-choose* prediction (e.g., Trivers, 1972; Symons, 1979; Buss & Schmitt, 1993). Evolutionary psychology places an emphasis on sexual dimorphism, suggesting that women are motivated to be choosy when selecting a mate, whereas men are motivated to compete for access to the maximum number of females. Simply put, females favour *quality*; men favour *quantity*.

More recently, some evolutionary psychologists have questioned the males-compete /females-choose dichotomy. Although some scholars have argued that sex differences are minimal (e.g., Stewart-Williams & Thomas, 2013; Fine, 2017), most counterarguments question the *magnitude* of the sex difference (Hallam et al., 2018), and nonetheless acknowledge that differences do

occur between men and women (e.g., Roberts & Havlíček, 2013).

In practice, the truth lies somewhere in between both extremes. Although males are choosy (Regan, 1998) and women do compete (Vaillancourt, 2013; M. Fisher & Cox, 2011; Davis, Dufort, Desrochers, Vaillancourt, & Arnocky, 2017), the evidence suggests that women are more selective when choosing a mate (Regan, 1998), whereas men are more likely to show aggression toward a sexual rival (Chaudhary, Al-Shawaf, & Buss, 2018; Llaurens, Raymond, & Faurie, 2009).

1.2.2 Mate Preference

Overall, the traits that men and women seek in a partner are largely similar. Both sexes prefer partners who are warm, funny, physically attractive, healthy, of a high social status, and intelligent (Buss, 2017). Yet across cultures, men place an emphasis on cues of female fertility, such as youth, physical attractiveness, waist-to-hip ratio (WHR), estrogen levels, and breast size (Buss, 1989; Li, Bailey, Kenrick, & Linsenmeier, 2002; Havlíček et al., 2017; Marlowe, Apicella, & Reed, 2005; Thornhill & Grammer, 1999; Conroy-Beam & Buss, 2019; Garza, Heredia, & Cieslicka, 2016), whereas women place a higher emphasis on a mate's access to resources, prioritising income, social status, social dominance, and age (Buss, 1989; Li et al., 2002; Regan, Levin, Sprecher, Christopher, & Gate, 2000; Valentine, Li, Penke, & Perrett, 2014; Garza et al., 2016; Conroy-Beam & Buss, 2019).

From an evolutionary perspective, these sex differences reflect adaptations that motivate preference towards mates that will maximise reproduction and offspring survival (Symons, 1979). Specifically, whereas women's reproductive success may be predicted by her health and fertility status, men's reproductive success may be better predicted by his ability to confer resources, social status, and prestige to his offspring (Buss, 1989). Sex differences in mate preferences are explored further in chapter 3.

1.3 Ecological Variation

1.3.1 Variation in Pathogen Threat

For traditional human societies, pathogens pose a high threat to health and survival (e.g., K. Hill & Hurtado, 1996), with congenital problems and infectious disease the most frequently cited causes of infant mortality (K. Hill,

Hurtado, & Walker, 2007). In response, humans have developed mate preferences that distinguish between healthy and unhealthy individuals. Healthy mates are less likely to pass pathogens to their mate and their offspring should be better equipped to detect, fight, and kill future pathogen threats. Given this, the selective pressure to secure a good genes mate is higher in ecologies where the pathogen threat is high.

Indeed, there is evidence that humans in regions with poor health outcomes place a greater emphasis on selecting good genes mates (Gangestad & Buss, 1993). Those in regions with a high level of disease threat show stronger preferences for sexually dimorphic faces (DeBruine, Jones, Little, Crawford, & Welling, 2011; DeBruine, Jones, Crawford, Welling, & Little, 2010; Penton-Voak, Jacobson, & Trivers, 2004; Moore et al., 2013; Marcinkowska et al., 2014), facial symmetry (Little, Apicella, & Marlowe, 2007), and physical attractiveness (Gangestad & Buss, 1993). Taken together, these findings indicate that mate preference is sensitive to local levels of pathogen prevalence. This has been interpreted as evidence for at-risk individuals placing a greater emphasis on good genes traits at the expense of parental investment traits (Gangestad & Simpson, 2000). That is, as the infant mortality rate increases, the relative benefit of parental investment over good genes is diminished (Robson & Kaplan, 2003). Viewed through this lens, cultural norms in sexual behaviour can be explained with respect to pathogen stress.

1.3.2 Variation in Resource Scarcity

In times of resource scarcity, humans should place a greater emphasis on securing a mate who offers material benefits, such as food, shelter, or protection from potential predators. In cultures where resources are scarce, parental investment may be essential if offspring are to reach maturity. Indeed, there is evidence that both men and women from resource-scarce environments place a greater emphasis on resource-relevant traits (Pillsworth, 2008) and parental investment (Lee & Zietsch, 2011).

Resource scarcity is also associated with a preference for larger breast size among men (Swami & Tovée, 2013) and a higher body mass index (BMI) in both men and women (Lee, Brooks, Potter, & Zietsch, 2015). Fat deposits are viewed as a proxy for access to resources and ability to withstand food shortages, making these signals particularly relevant under times of resource scarcity. Interestingly, Tovée and colleagues found that men moving from a low-resource ecology (rural South Africa) to a high-resource ecology (United

Kingdom) demonstrated a change in mate preferences, such that their ideal BMI in a mate declined (Tovée, Swami, Furnham, & Mangalparsad, 2006). This highlights the plasticity of mate preference, such that individuals can choose the most appropriate mating strategy for a given ecology. This theme is further explored in chapters 2, 3, and 5.

1.4 Individual Differences

1.4.1 Life Chances and Opportunity

A consistent observation is that, as women's economic autonomy increases, there is a shift away from securing a mate who adheres to traditional gender norms. Women who have access to greater career opportunities show a stronger preference for mates signalling emotional warmth, loyalty, or housekeeping skills and a weaker preference for traditionally masculine traits such as high income, status, or dominance (Lu, Zhu, & Chang, 2015; Stanik & Ellsworth, 2010; Zhang, Teng, Chan, & Zhang, 2014). Urbanisation and socioeconomic development are associated with women shifting their priorities from traditionally masculine men, who offer status and financial support, to men who can contribute to traditionally feminine roles, such as cooking, housework, and postnatal support (Kamble, Shackelford, Pham, & Buss, 2014; Lu et al., 2015; Eagly & Wood, 1999). Less is known about men and the evidence that exists is mixed. Although there is some evidence that high status men place a greater emphasis on physical attractiveness (March & Grieve, 2016), others have found no association between SES and men's mate preferences (Khallad, 2005).

1.4.2 Attractiveness

Mate preference is also shaped by how attractive an individual is to potential mates. Assortative mating is based on the assumption that individuals typically pair with a mate who is matched with respect to mate value (Gangestad & Simpson, 2000). Mate value represents one's 'bargaining hand' when in a mating context, and includes one's age, SES, intelligence, and physical attractiveness. There is considerable evidence that individuals calibrate their mating strategy based on their own mate value. Broadly speaking, the results indicate that those with a high mate value are more demanding when choosing a short- and long-term partner (Edlund & Sagarin, 2010; Fales et al., 2016; Buss &

Shackelford, 2008; Conroy-Beam & Buss, 2019). For example, wealthier men and attractive individuals have stronger preferences for mates who are attractive or have a healthy BMI (Fales et al., 2016). This effect persists when an individual's mate value is modified artificially by experimentally manipulating the number of 'mate dollars' one has to spend on a hypothetical partner (Li et al., 2002).

In addition to choosiness, mate value can moderate the type of mate to which an individual is attracted. Attractive women prefer more masculine faces and voices than do less attractive women (Little, Burt, Penton-Voak, & Perrett, 2001; Feinberg et al., 2006; Vukovic et al., 2008), whereas women with a lower mate value experience weaker menstrual cycle shifts in their mate preferences (Millar, 2013; Feinberg et al., 2006). Among men, mate value positively predicts mating effort but negatively predicts parental investment (Apicella & Marlowe, 2007). Men with a high mate value perform more resource-provisioning and fewer insult-inflicting behaviours towards their partners (Starratt & Shackelford, 2012; Miner, Starratt, & Shackelford, 2009; Miner, Shackelford, & Starratt, 2009). Mate value can even moderate moral attitudes, with highly valued mates being more supportive of abortion than those with a low mate value (Anglin, Amaral, & Edlund, 2010).

1.4.3 Sociosexuality

Sociosexuality reflects an individual's willingness to engage in uncommitted, casual sex. Those high in sociosexuality (i.e., *sexually unrestricted*) have more sexual partners, desire a greater number of partners, and are more liberal in their views toward casual sex (Penke & Asendorpf, 2008; Gangestad & Simpson, 1990). These individuals are more likely to have multiple partners (Simpson & Gangestad, 1991), to be romantically unfaithful (Gangestad, Simpson, Cousins, Garver, & Christensen, 2004), or to use apps like Tinder for casual sex (Sevi, 2019).

In addition to behavioural differences, unrestricted individuals demonstrate an increased preference for good genes traits. Specifically, women increasingly favour facial cues of good genes such as high testosterone (Waynforth, Delwadia, & Camm, 2005), symmetry (Quist et al., 2012), attractiveness (Wilbur & Campbell, 2010), and vocal cues of masculinity (O'Connor et al., 2014). What's more, sexually unrestricted men show an increased preference for women with a lower WHR and BMI (Brase & Walker, 2004; Swami, Miller, Furnham, Penke, & Tovée, 2008), pay more attention to women's bod-

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ies (Confer, Perilloux, & Buss, 2010), and are more sensitive to female facial cues (Sacco, Hugenberg, & Sefcek, 2009). The role of sociosexuality in shaping mate preference is explored further in chapter 2.

1.5   Within-Individual Variation

1.5.1   Trade-Offs and the Dual-Sexual Strategy

Most animal species can be classified as being monogamous, polygamous, or promiscuous. But, whereas vertebrates typically adopt one of these mating strategies, humans are unique in their variety of mating strategies. Human pair bonding is an adaptive response to the heavy investment needed to raise human infants. During development, humans are reliant on caregivers for relatively long periods (La Cerra, 1994). In hunter-gatherer societies an offspring's net caloric production (calories consumed minus calories foraged) is typically at a deficit until they reach their late teens (Kramer, 2002) and possibly as late as their twenties (Kaplan, 1994). Relative to other species, women are faced with long pregnancies and extended lactation periods of over two years (Lancaster, Kaplan, Hill, & Hurtado, 2000). These restrictions to women's ability to forage fostered selective pressures for biparenting (Quinlan & Quinlan, 2008).

Parental investment, however, is just one factor affecting offspring survival. To survive childhood and reach reproductive maturity, individuals must develop an immune system capable of fighting harmful pathogens and develop the cognitive skills necessary to hunt or forage, avoid predators, and eventually attract mates. Across populations, genetic variation means that individuals typically differ with regard to heritable fitness (i.e., the genetic traits inherited by offspring from parents). For ancestral women, sexual selection promoted attraction to men possessing good genes (Pillsworth & Haselton, 2006b). Indicators of good genes include masculinity (Penton-Voak et al., 2001), symmetry (Van Dongen & Gangestad, 2011), and sense of humour (Greengross & Miller, 2011). These preferences function to obtain genetic benefits for offspring, such as fewer congenital defects, increased immunological functioning, and a greater mate value (Gangestad, Thornhill, & Yeo, 1994; Thornhill & Gangestad, 2006; Van Dongen, Cornille, & Lens, 2009).

This tension between securing a mate that offers parental investment and good genes can be alleviated by adopting a *dual-sexual strategy*. That is, humans can benefit from forming long-term pair bonds with reliable mates, while covertly seeking sexual opportunities with good genes mates (Pillsworth

& Haselton, 2006b; Gangestad & Simpson, 2000).

1.5.2 Limitations to Our Understanding of the Dual-Sexual Strategy

Given that humans are both a pair-bonding and promiscuous species, one could suppose that both sexes can benefit from adopting a dual-sexual strategy. Yet the majority of preëxisting literature focuses exclusively on women (Pillsworth & Haselton, 2006b; Gangestad & Simpson, 2000; Thornhill & Gangestad, 2008). As such, surprisingly little is known about men's adoption of the dual-sexual strategy.

The rationale for focusing on women is associated with parental investment theory (Trivers, 1972). This approach asserts that, owing to higher investment costs during pregnancy, labour, and lactation, the cost of reproduction is initially high for women. For men, however, the cost can be as little as caloric output and some sperm cells. It is therefore argued that the pressure on choosing an investing mate is greater for women than men.

In recent years, however, this argument has faced criticism. Stewart-Williams and Thomas (2013) note that ancestral men faced selection pressures to invest heavily in offspring. As such, one might expect that both men and women can benefit from a dual-sexual strategy. The question of whether both men and women adopt the dual-sexual strategy is explored in chapter 3.

1.6 Social Attitudes Towards Women's Sexuality

To summarise, humans can engage in a dual-sexual strategy, such that they use pair bonding to induce parental investment with reliable or high status mates, but engage in casual sex with good genes mates. Yet although this approach can be beneficial for both men and women, societies have historically suppressed female sexuality.

The sexual double standard describes society's tendency to punish women for sexual behaviour that goes unpunished for men. This may include attitudes towards premarital sex, extra-pair copulation (EPC), sexual harassment or assault, marital rape, or polygamy.

1.6.1 The Extent of the Problem

Despite society's best efforts to minimise the sexual double standard, attacks on women are on the ascent. In the United Kingdom, violence against women has increased by 31% between 2013–2015 (Her Majesty's Inspectorate of Constabulary, 2015). In Pakistan last year, 2000 women were violently attacked or killed by relatives for alleged 'promiscuous' behaviour (Human Rights Commission of Pakistan, 2015). In many cultures, female genital cutting is supported and perpetuated as a means of reducing female sexual pleasure and promiscuity (Baumeister & Twenge, 2002).

1.6.2 Who Suppresses Women's Sexual Strategies?

Although many politicians, social activists, and citizens agree that such practices must be eradicated, none of these groups have empirically studied the central question of what *causes* such harmful practices. Yet who suppresses female sexuality, and their motives for doing so, have important implications for our understanding of human sexual strategies. In this section, I will review competing theories that offer evidence for female sexuality being suppressed by potential mates (men), other women (intrasexual competition), and kin, as well as the view that women suppress their own sexuality as a means of avoiding sex-related costs.

Argument 1: Men suppress women's sexuality

Perhaps the most prevalent view is that men are the main stiflers of female sexuality. From this perspective, men collectively suppress women economically, politically, and socially as a means of monopolising positions of power and privilege (Travis & White, 2000). Sexual suppression is simply one manifestation of men's desire to suppress women's autonomy so that they can be used by men to fulfil their desires (Brownmiller, 1975; Lerner, 1987; McIntosh, 1978).

More recently, evolutionary psychologists have argued that men are motivated to suppress female sexuality as a means of ensuring paternity certainty (e.g., Buss, 2003). For paternally-investing species such as humans, the number of offspring that a male can hope to sire is considerably lower than in promiscuous species. Given this heavy investment, one could expect men to have adaptations to guard against cuckoldry. By suppressing women's mating strategies, men can monopolise sexual access to their mate(s) and minimise

the risk of unknowingly raising, and investing in, another man's offspring (see also Wood & Eagly, 2002).

Despite similarities, there is an important distinction between these two approaches to male-driven suppression. Whereas feminist theories argue that men (implicitly) conspire to suppress female sexuality at large, evolutionary accounts propose that it is coupled males who suppress their mate's sexuality. Indeed, single males could benefit from encouraging promiscuity in coupled women. This distinction has important consequences for the predictions made by each approach. Whereas feminist scholars would expect all men to show hostility towards sexually-agentic women, evolutionary psychology predicts that men should only show hostility to signs of sexual agency in their own mate(s). This distinction is explored in greater detail in chapter 4.

Argument 2: Women suppress other women's sexuality

Alternatively, a second line of argument posits that women, not men, are the main suppressors of female sexuality. The principle of least interest refers to the notion that, in any relationship, the party who has less desire can exert power over the more interested party (e.g., Waller & Hill, 1951). Noting that men are more interested in sex than women (e.g., Schmitt, 2005; Lippa, 2009), proponents of this view argue that sex is a commodity that women supply and men demand (Baumeister & Twenge, 2002). In societies where men dominate politically, economically, and socially, sex is one of the few domains where women have bargaining power (Cott, 1979). Proponents liken women's sexual behaviour to an organisation like OPEC or a cartel, whereby supply is restricted to keep the market price artificially high (Baumeister, Reynolds, Winegard, & Vohs, 2017). Here, the market price refers to male investment that women demand in return for sexual access. Under these circumstances, women's collective bargaining power is diminished if some women 'defect' by offering sexual access at a lower price.

Despite being labelled as patriarchal by some proponents of male-driven suppression (Rudman, Fetterolf, & Sanchez, 2013; Rudman & Fetterolf, 2015), there is some evidence that women are more critical than men with respect to female promiscuity. Among adolescent girls, pressure to remain chaste appears to come from same-sex peers (Keys & Bhogal, 2016; Oliver & Hyde, 1993; Vaillancourt & Sharma, 2011) or mothers (Du Bois-Reymond & Ravesloot, 1996), rather than from male peers or fathers (Werner-Wilson, 1998; Rodgers & Rowe, 1990). Female genital cutting, a practice carried out to suppress

sexual desire, is typically carried out by mothers and grandmothers (Hicks, 1996; Lightfoot-Klein, 1989), with fathers excluded from the process (Boddy, 1989). King, Balswick, and Robinson (1977) found that 91% of women, but just 42% of men, believed that it was immoral for unmarried women to have sex. More recently, Milhausen and Herold (1999) found that, when asked which sex is the harsher judge of promiscuous women, 46% of women reported other women, whereas 12% reported that men were harsher judges. Finally, there is evidence that women are highly critical in their judgements of women wearing provocative outfits (Keys & Bhogal, 2016; Vaillancourt & Sharma, 2011). The extent to which women, relative to men, demonstrate prejudice toward women wearing provocative outfits is explored in chapter 4.

Argument 3: Kin suppress women's sexuality

Claude Levi-Strauss (1969) argued that marriage is a contract between men, where one man (the bride's father) hands his property over to another man (the bridegroom). In many cultures marriage is patrilocal, such that brides will live with their groom's family in exchange for a bride price (Murdock, 1967). The agreed sum is often explicitly tied to the bride's ability to provide her husband's family with offspring. This is undermined if the bride does not produce offspring or if the paternity of her offspring is uncertain. As such, bride prices are heavily affected by the bride's perceived promiscuity (Ghanim, 2015), with the groom's family often demanding a virginity test prior to the marriage (Pelin, 1999). Given the financial sums involved, there is a considerable pressure on kin to ensure that their daughters, granddaughters, and sisters remain chaste. Women who are perceived to be promiscuous could face familial backlash in the form of beatings and honour killings (Caffaro, Mulas, & Schmidt, 2016).

Evidence from western-based research is less extreme. Research on adult women has typically focussed on similarities and differences in the traits that women desire in a husband and that parents desire in a son-in-law (e.g., Fugère, Chabot, Doucette, & Cousins, 2017; Perilloux, Fleischman, & Buss, 2011; Apostolou, 2011, 2015) rather than her perceived promiscuity. Among adolescent daughters, however, evidence suggests that mothers play the most prominent role promoting abstinence (Libby, Gray, & White, 1978; DeLatamer, 1989; Werner-Wilson, 1998), with fathers seemingly too embarrassed to discuss sex with their daughters (Nolin & Petersen, 1992; J. R. Kahn, 1994). What's more, whereas girls' sexual behaviour is predicted by the extent to

which they discussed sex with their mothers, communication between daughters and fathers does not predict subsequent behaviour (J. Kahn, Smith, & Roberts, 1984).

In summary, there appears to be marked cultural differences in the pressure exerted by kin on women's sexual behaviour. It remains unclear whether these differences are the result of access to contraceptives and abortion, levels of female autonomy, or the influence of bride prices increasing the influence of, and consequences for, kin.

Argument 4: Women suppress their own sexuality

The three suppression arguments outlined above propose that a woman's sexual strategies are stifled by groups of individuals whose interests are at odds with her own. There is, however, the possibility that women suppress their own sexual behaviour because the costs associated with sexual openness are greater for women than for men. As noted by Trivers (1972), the minimum level of parental investment is greater for women than for men, making the cost of an unwanted pregnancy greater. Under these circumstances, it could be prudent to suppress one's sexual desire until such a time that parenthood is desirable. Additionally, casual sex could be perceived as riskier for women than men, owing to the risk of malicious gossip or violence (Rudman et al., 2013). Unfamiliar men who approach women for casual sex are deemed less trustworthy and more dangerous than propositioning women (Conley, Rubin, Matsick, Ziegler, & Moors, 2014). Indeed, when the gap in danger is closed, so too is the likelihood that men and women will accept an offer of casual sex (Baranowski & Hecht, 2015; Conley et al., 2011).

Although these findings highlight the importance of risk in moderating women's sexual strategies, it cannot account for women's reluctance in less risky forms of sexual behaviour, such as sexual expression, masturbation, or fantasy (Baumeister & Tice, 2001). What's more, fear of reputational damage is cited more frequently than concerns about violence or fear of pregnancy (Coleman, 1961). Finally, this perspective fails to account for the finding that women are more likely than men to experience regret after uncommitted sex (Galperin et al., 2013; Bendixen, Asao, Wyckoff, Buss, & Kennair, 2017; Kennair, Wyckoff, Asao, Buss, & Bendixen, 2018). As such, it is likely that external pressure is nonetheless an important factor in explaining the suppression of female sexuality.

1.7 Outstanding Questions and Future Research

As we have seen, much is known about human reproductive strategies. In particular, the work of evolutionary psychologists in the past few decades has provided great insight into the underlying motives that drive mate preference. Nonetheless, there are gaps in our collective understanding. This section outlines some of these deficits and considers possible tests for as yet unanswered questions.

1.7.1 Question 1: Does Experience Make for More Flexible Mating Strategies?

As discussed previously, human infants require heavy investment from their parents. As such, humans must trade-off between their desire for a mate with good genes and one who will provide parental investment. One approach is to develop flexible mating strategies, such that you mostly favour good genes mates for short-term relationships, but parentally-investing mates for long-term relationships (i.e., dual-sexual strategy).

At present, it is unclear whether sexual experience makes for more flexible strategies. In various domains, experienced individuals form better strategies (e.g., Baenninger & Newcombe, 1989; Mikhail, Walther, & Willis, 1997; Chialvo & Bak, 1999). As such, one might expect that sexually-experienced individuals are better equipped at flexibly modifying their mate preferences. Chapter 2 explores this outstanding question by testing whether an individual's level of sociosexuality predicts their flexibility in switching mate preferences across differing relationship contexts.

1.7.2 Question 2: To What Extent Do Men Use the Dual-Sexual Strategy?

Much of the prior literature is based on the assumption that women are more parentally-invested in offspring, making them more long-term oriented than men in their romantic relationships. Consequently, much of the literature into the dual-sexual strategy has focused exclusively on women's behaviour. This research is underlined by an assumption that men are more likely than women to favour promiscuity over monogamy. Although men's minimum level of investment is lower than women's (Trivers, 1972), in practice men's investment in offspring is far from trivial. If the gender gap in sexual strategies is great, one could expect that men possess a short-term mating bias, such that they prefer

shorter, less committed relationships than women. If, however, men also adopt a dual-sexual strategy, one might expect a preference for short-term mating with women possessing good genes and long-term mating with women high in parental investment traits. We explore men's use of the dual-sexual strategy in chapter 3.

1.7.3 Question 3: Are Flexible Mating Strategies Sometimes Too Costly?

The dual-sexual strategy is an adaptive solution to the problem of mate choice trade-offs. But, as we have seen in section 1.6, short-term mating is not without risks. This is particularly true in nonwestern cultures, which are typically less sexually open (Schmitt, 2005). Yet despite this, a common critique of contemporary psychology is its emphasis on western, undergraduate participant pools. This raises the question of whether the dual-sexual strategy is universally adopted.

As discussed previously, humans learn from their environment and moderate their mate preferences accordingly (Tovée et al., 2006). Given this, one might anticipate that societal cues of conservatism and sexual restrictiveness could skew the dual-sexual strategy in favour of a long-term bias. Chapter 3 addresses this gap by testing the extent to which cultural- and individual-level conservatism moderates the flexibility of one's mating strategies.

Question 4: Who Suppresses Women's Sexuality?

At present, it is unclear who suppresses women's sexuality. Although some have argued that women suppress their own sexual behaviour as a means of avoiding sex-related costs (e.g., Rudman, 2017), it seems unlikely that suppression can be fully explained as a personal choice. Additionally, although families in nonwestern cultures do apply some pressure on young women to remain chaste, evidence from western cultures suggests that suppression persists even when kin are less invested in promoting abstinence.

There is, however, strong evidence for both male- and female-driven suppression. Although proponents of female control theory offer compelling arguments for why men shouldn't be motivated to suppress female sexuality (e.g., Baumeister, Catanese, & Vohs, 2001), there is as yet a lack of empirical data to test their hypotheses. Additionally, it seems unlikely that women are the sole suppressors of female sexuality. Finally, present models do not

provide an insight into the mechanisms that promote suppression of women's mating strategies. Chapter 4 begins to remedy this gap by empirically testing whether men and women are prejudiced towards sexually-accessible women and suggesting potential motives for such behaviour.

Question 5: How Can We Explain Cultural Differences in Gender Attitudes?

As discussed in section 1.3, researchers have made considerable advances in understanding the role of ecology in shaping mate preference (e.g., Schmitt, 2005; Gangestad & Buss, 1993; Penton-Voak et al., 1999; Swami & Tovée, 2013). Less clear is whether ecological factors influence gender attitudes with respect to sexuality, roles in marriage, or women's autonomy. There is, however, much evidence to suggest that harsh environments foster more conservative attitudes (e.g., Van de Vliert, 2013; Fincher, Thornhill, Murray, & Schaller, 2008; Gelfand et al., 2011). Given this, one might expect that environmental harshness predicts variation in gender attitudes held by men and women. Chapter 5 addresses this gap by exploring this prediction.

1.8   Thesis Overview

In this thesis I present four empirical chapters investigating the role of ecology in shaping human reproductive strategies. In chapter 2 I present evidence that sociosexuality, a measure of an individual's willingness to engage in casual sex, predicts variation in female mate preferences. Women who are sexually open favour distinctive traits for short-term and long-term mates. But those with more restricted sexuality favour short-term mates who closely resemble their long-term mate preference. I replicate these findings in a USA- and India-based sample.

Chapter 3 explores how cultural values can influence reproductive strategies. In conservative cultures, individuals are likely to face costs such as punishment for short-term mating. Here I show that conservatives overperceive some mates' suitability as long-term partners, despite their lack of commitment-compatible traits. I measure conservatism at the individual and national level, recruiting participants from the UK, USA, and India.

Having demonstrated that conservative norms are associated with a bias away from sexual openness (chapter 3), I ask how female chastity is maintained in society. Chapter 4 investigates whether men, women, or both sexes regulate

women's sexual behaviour. I build on two previous theories, male control theory and female control theory, and improve upon their limitations to develop a third alternative: sex-specific control theory. Through economic games I demonstrate that both sexes are prejudiced towards women, but that different mechanisms promote male and female bias. Although both sexes are less altruistic towards, and trusting of, sexually-accessible (vs. sexually-restrictive) women, only women are motivated to inflict costly punishment on sexually-accessible women. I argue that women's punishment of sexually-accessible women is motivated by gender inequality with respect and women's economic dependence on men. I contend that, if women were to achieve economic parity with men, this behaviour should diminish.

Chapter 5 directly tests this claim by investigating the association between regional variation in the gender gap and support for women's autonomy in 54 countries using multilevel modelling. In this chapter I investigate whether the gender gap for economic-relevant indicators (e.g., economic participation and opportunity), but not economic-irrelevant indicators (e.g., health and survival), predict an individual's support for women's rights.

Chapter 6 summarises the results from the empirical chapters and concludes this thesis.

Chapter 2

Unrestricted Sexuality Promotes Distinctive Short- and Long-Term Mate Preferences in Women

2.1 Study 1

2.1.1 Introduction

When choosing a romantic partner, humans may encounter potential suiters who can differ, among other traits, in physical attractiveness, personality, social status, and health. Rather than mating at random, women's mate preferences reflect a sophisticated suite of strategies that function to obtain high quality mates (Gangestad & Simpson, 2000). That being said, women's perception of what constitutes a "high quality mate" can differ across individuals (Havlicek & Roberts, 2009; Jonason, Valentine, Li, & Harbeson, 2011) and relationship context (e.g., one-night stand, marriage, 'friends with benefits', cuckoldry; Buss et al., 1990).

Dual-sexual strategy

Across populations, genetic variation can mean that individuals differ in heritable fitness (i.e., the *genetic benefits* that are inherited by offspring from parents). Among men, indicators of good genes include masculinity, symmetry, social dominance, and sense of humour (Gangestad, Garver, Simpson, &

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Cousins, 2007). In addition to good genes, women are also attracted to men with access to material resources. Men who offer *material benefits*, such as wealth, high status, emotional stability, and maturity, are better equipped to provide the resources necessary for raising reproductively successful offspring, making them more attractive in the mating market (Lu et al., 2015).

Although women typically favour males who offer both genetic and material benefits, most find that they cannot "have it all" (Buss & Shackelford, 2008). For example, men with good genes can access multiple high quality mates without investing greatly in time or the provisioning of material goods (Faurie, Pontier, & Raymond, 2004), meaning they are more likely to favour short-term mating. Further, women's ability to attract a high-quality, long-term partner is constrained by the availability of mates (Stone, Shackelford, & Buss, 2007) and her own mate value (Buss & Shackelford, 2008).

In response to these trade-offs, women adopt a *dual-sexual strategy*, such that they prioritise different male characteristics when choosing either a short- or long-term mate. Men who can offer material benefits are best equipped to provide parental investment, making these attributes particularly valuable for long-term relationships (Gangestad & Simpson, 2000). But women can additionally access genetic benefits from males with good genes via short-term mating (e.g., one-night stand, cuckoldry; Pillsworth & Haselton, 2006a). In this way, women who adopt the dual-sexual strategy can gain long-term benefits from men who offer material benefits, whereas good genes can be accessed sporadically via short-term mating. Nonetheless, in some contexts female promiscuity can be costly, resulting in slut shaming, malicious gossip, honour killings, or a lower bride price (Ghanim, 2015; Hartung, 2012; Mayeda & Vijaykumar, 2016).

Sexual strategies and sociosexuality

Whereas most women can enact a dual-sexual strategy (Li, Valentine, & Patel, 2011), the extent to which women prioritise short- (vs. long-) term mating is moderated by individual differences in traits possessed by the chooser, such as intelligence, personality traits, and sociosexuality (Schmitt & Shackelford, 2008; Simpson & Gangestad, 1992; Stanik & Ellsworth, 2010). Sociosexuality is a personality construct that measures one's willingness to engage in casual, noncommitted sex. *Sexually unrestricted* individuals have sex earlier in relationships, are more open to uncommitted relationships (e.g., 'friends with benefits'), and are more likely to have multiple partners at one time (Simpson

& Gangestad, 1992) or cuckold their partner (Gangestad et al., 2004). Unrestricted women are particularly attracted to good genes traits in short-term mating, such as physical attractiveness and masculinity, as a means to gain heritable benefits for offspring (Gangestad et al., 2004; Waynforth et al., 2005). Alternatively, sexually restricted women typically prioritise material traits via long-term mating with investing males (O'Connor et al., 2014).

Taken together, these studies indicate that women's mating strategies are influenced by their sociosexuality. Nonetheless, the question of whether women's sociosexuality can predict the distinctiveness of their preferences for short- vs. long-term mates has not been addressed. We suggest three key reasons why sociosexuality could moderate the distinctiveness of women's short- and long-term mate preferences.

First, sexual experience could amplify relationship preferences. Sexually unrestricted individuals are, by definition, more experienced in choosing a short-term mate than more restricted women. This experience could translate into a greater success at choosing short-term mates who offer heritable benefits for offspring. Some research has indicated that those high in sociosexuality are more successful at identifying facial cues of good genes, such as symmetry (Quist et al., 2012) and masculinity (Provost, Kormos, Kosakoski, & Quinsey, 2006; Sacco, Jones, Debruine, & Hugenberg, 2012), although others have failed to replicate this finding (Glassenberg, Feinberg, Jones, Little, & Debruine, 2010; Sacco et al., 2009). The second argument speaks to the cognitive mechanisms that maintain sexual strategies. As we have seen, rather than possessing one universal mating tactic, women differ with respect to their optimal mating strategy. From this perspective, those who demonstrate unrestricted sexuality can benefit from a dual approach by choosing investing males for long-term mating and ad-hoc short-term mating with good genes males. Restricted women, however, benefit from engaging in a targeted, long-term strategy, inducing men to invest prior to sexual access (Baumeister & Twenge, 2002). This raises the question of how such strategies are maintained. We propose that sexually restricted women are predisposed to choosing an investing male, even in contexts where prioritising good genes could be viewed as beneficial (e.g., for short-term mating). In so doing, restricted women can increase their likelihood of attracting (and being attracted to) a mate who possesses material attributes. Alternatively, unrestricted women can benefit from both material and genetic traits by differentiating between their short- and long-term sexual strategy.

Third, sociosexuality could moderate an individual's objectives within the domain of short-term mating. In this view, for unrestricted women, short-term mating is a tool to obtain genetic benefits for offspring. Alternatively, restricted women may use short-term mating to evaluate and attract long-term mates (Buss & Schmitt, 1993). Therefore, selecting short-term mates who could be suitable husbands would be an adaptive strategy for restricted women.

The present research

The purpose of the current study was to investigate whether unrestricted women are more prone to adopting a dual-sexual strategy. We propose that sexually unrestricted women make a greater distinction between their ideal short- and long-term mate. From this three predictions emerge. First, we predicted an interaction between sociosexuality and relationship context (short-, long-term) such that women high in sociosexuality possess more distinctive mate preferences than do women with low sociosexuality. That is, as women become more conservative in their sexual behaviour, their short- and long-term preferences should converge (prediction 1).

To test the cross-cultural validity of our claims we focussed our recruitment on two contrasting cultures: India and the USA ($N = 459$). Relative to the USA, Indians report having had fewer sexual partners (3.0 vs. 10.7) and one-night stands (13% of Indians vs. 50% of Americans). Indians are also more likely to encourage young people to abstain from premarital sex (49% vs. 14%) (Durex Sexuality Study, 2005). Consequently, we predicted that women from India would be sexually restricted, relative to women from the USA (prediction 2), resulting in more similar short- and long-term preferences among Indian women, relative to USA women (prediction 3).

Following the measurement of individual preferences in sociosexuality, women were apportioned a budget in mate dollars to construct their ideal short- and long-term partners. Mate dollars could be spent on a menu of six genetic and six material traits. We examined whether the proportion of dollars spent on genetic and material traits for short- and long-term mates is predicted by sociosexuality.

2.1.2 Method

Participants

Participants were 459 women (India = 230; USA = 229) recruited in an Amazon Mechanical Turk study. All participants were aged 18-44, heterosexual, and reported that they were fluent in English. The age distribution was 18-24 (9%), 25-34 (56%), and 35-44 (33%). Fifty-nine percent were married, 19% were in committed relationships, 16% were single, and the rest were engaged or widowed. Participants were financially reimbursed for their time (USA: 2.25 USD; India: 1.50 USD).

Design

In a three-factor, mixed factorial design, nationality (USA, India) was a between-subjects factor and context (short-, long-term) a within-subject factor. Our third independent variable was the participant's sociosexuality score. The dependent variable was the proportion of mate dollars spent on genetic (vs. material) traits.

Procedure

To measure sociosexuality, participants completed the 9-item revised Sociosexual Orientation Inventory (SOI-R) (Penke & Asendorpf, 2008), a Likert-type scale that measures sociosexual *behaviour* (e.g., "With how many different partners have you had sex within the past 12 months?"), *attitudes* (e.g., "Sex without love is OK"), and *desire* (e.g., "In everyday life, how often do you have spontaneous fantasies about having sex with someone you have just met?"). Consistent with previous studies, the three subscales were aggregated prior to analysis (Brown & Sacco, 2017; Kandrik, Jones, & DeBruine, 2015; Lewis, Al-Shawaf, Conroy-Beam, Asao, & Buss, 2012). Higher scores were associated with less restricted sexuality.

Participants were then asked to construct their ideal romantic partner by spending 30 mate dollars on twelve male traits (see below). Instructions indicated that each dollar spent was equivalent to 10 percentile points. For example, as $5 spend on the trait 'athletic' was equivalent to 'buying' a mate who is more athletic than 50% of the male population.

At the start of each trial, participants were told do construct both their ideal "short-term partner (i.e., one-night stand)" or "long-term partner (i.e.,

husband)". The presentation order of the relationship context variable was counterbalanced across women.

To measure women's mate preferences we presented participants with 12 male traits. Of these, six were associated with genetic benefits; the remaining six were associated with material benefits. Traits were based on those identified in the Women's Mate Preference Questionnaire (WMPQ) (Lu et al., 2015). Lu and colleagues conducted a Principal Component Analysis (PCA) to identify items that best conceptualised genetic (*Good Genes*) and material (*Good Father*, *Good Provider*) traits (Lu et al., 2015). Following the authors' recommendations, items with the highest factor loadings were selected for each trait category.[1] The six genetic traits were: *sense of humour*, *masculine*, *good body*, *athletic*, *good voice*, and *good-looking*; the six material traits were: *stays at home*, *considerate*, *patient*, *good income*, *high social status*, and *successful career*.

After data collection the mate dollars were summed to give a total amount spent on genetic traits and a total for material traits for each participant. From this we calculated the proportion of the $30 budget that was spent on genetic traits. Hence, if a participant spent $10 on genetic traits and $20 on material traits, the proportion spent on genetic traits was .33. No specific action was taken in cases where participants spent either $30 on genetic or material traits. Participants chose to spend $30 on genetic traits in 8.2% of cases, and $30 on material traits in 1.7% of cases.

2.1.3 Results

Statistical analysis

Do sociosexuality and nationality predict the distinctiveness between women's ideal short- and long-term mate? Overall, sociosexuality (SOI-R) scores were higher in the USA ($M = 27.42$) than India ($M = 18.72$), $t(457) = -7.58$, $p < .001$, $d = .71$.[2] To avoid issues surrounding multicollinearity, we sought to demonstrate that SOI-R captures unique aspects of mate preference not mediated by nationality. To resolve potential issues, we conducted a series of hierarchical regression analyses on the predictor variables of SOI-R, nationality, and relationship context. For model I, SOI-R score and context (short-term, long-term) were entered as predictor variables. For model II, the predictor variables were nationality (India, USA) and context. For model III, all three predictors were entered. Partial F tests showed whether model III accounted

for additional variance in the outcome (proportion spent on genetic traits), relative to models I and II.

Model I: Sociosexuality and mate preference

Do sexually unrestricted women display more distinctive short- and long-term mate preferences than restricted women? Figure 1 plots the proportion spent on genetic traits as a function of SOI-R separately for the short- and long-term contexts. We observed a positive relationship between SOI-R score and spend on genetic traits, $F(1, 914) = 24.85$, $p < .001$, $\eta_p^2 = .03$. The main effect of context was also significant, $F(1, 914) = 324.34$, $p < .001$, $\eta_p^2 = .26$, with women spending more in genetic traits in the short-term context. The interaction between SOI-R and context was significant, $F(1, 914) = 11.50$, $p < .001$, $\eta_p^2 = .01$, with women high in SOI-R showing more distinctive short- and long-term preferences, relative to women with low SOI-R scores.

Regression slope tests revealed that SOI-R predicted the proportion spent on genetic traits in the short-term context, $t(457) = 5.23$, $p < .001$, indicating that women high in SOI-R particularly favour genetic traits in one-night stand partners. SOI-R did not, however, predict preferences in the long-term context, $t(457) = 1.33$, $p > .05$. Relative to restricted women, those with unrestricted sexuality particularly favoured genetic traits when choosing a one-night stand, but not when choosing a husband.

Model II: Nationality and mate preference

Next we asked whether women from the USA display more distinctive short- and long-term mate preferences than Indian women (model II). The Nationality x Context interaction yielded the predicted main effect for context, $F(1, 914) = 340.39$, $p < .001$, $\eta_p^2 = .27$, with women spending proportionally more on genetic (vs. material) traits in the short-term context (Figure 2). The main effect for nationality was significant, $F(1, 914) = 35.41$, $p < .001$, $\eta_p^2 = .04$, with those from the USA spending proportionally more on genetic traits. As predicted, the Nationality x Context interaction was significant, $F(1, 914) = 47.96$, $p < .001$, $\eta_p^2 = .05$, indicating that women's preferences for short- and long-term mates were more distinctive in the USA, relative to India.

Regression slope tests showed that women from the USA (relative to India) spent particularly more on genetic traits in the short-term context,

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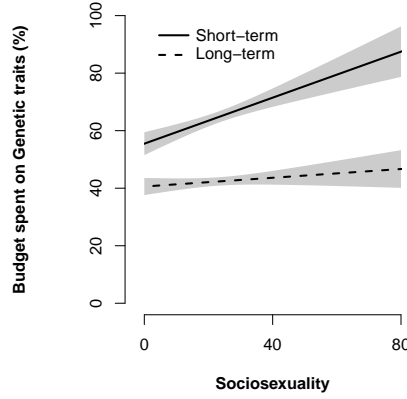
Figure 1: Proportion of budget spent by women on their ideal partner's genetic (vs. material) traits as a function of sociosexuality (higher values are less restricted sexuality) and relationship context. *Note.* Shading denotes 95% confidence intervals.

$t(457) = 8.15$, $p < .001$, but that Indian and USA spend were matched in the long-term context, $t(457) = -0.79$, $p > .05$. Relative to Indian women, participants in the USA particularly favoured genetic traits when choosing a one-night stand, but not when choosing a husband.

Model III: Sociosexuality, nationality, and mate preference

As with the previous models, model III observed a significant main effect for SOI-R, nationality, and context (all Fs > 20.00, ps < .001). Further, the SOI-R x Context and Nationality x Context interactions were also significant (all Fs > 12.00, ps < .001). But we did not observe an interaction between SOI-R x Nationality, $F(1, 910) = 3.64$, $p > .05$, or SOI-R x Nationality x Context, $F(1, 910) = 2.07$, $p > .05$.

Partial F tests showed that model III explained additional variance in proportion spent on genetic traits, relative to model I, $\Delta R^2 = .05$, $F(4, 910) = 16.07$, $p < .001$, and model II, $\Delta R^2 = .01$, $F(4, 910) = 4.59$, $p < .01$. Hence, SOI-R and nationality are statistically independent in predicting mate preference.
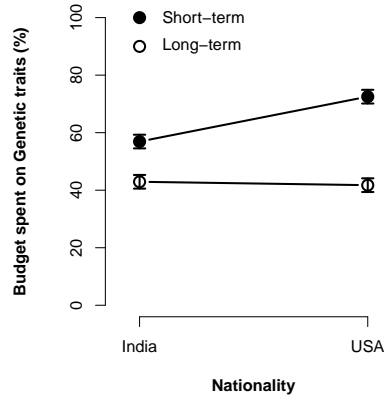
Figure 2: Proportion of budget spent by women on their ideal partner's genetic (vs. material) traits as a function of nationality and relationship context. *Note.* Error bars denote 95% confidence intervals.

2.1.4 Discussion

The primary motivation of this study was to investigate whether women high in sociosexuality display more distinctive preferences for short- and long-term mates. An additional aim was to examine cross-cultural differences between women from India (i.e., relatively low in sociosexuality) and the USA (i.e., relatively high in sociosexuality).

Sociosexuality as a predictor of short- and long-term preferences

Consistent with prediction 1, we observed that sexually unrestricted women demonstrated more distinctive short- and long-term mate preferences than did those who were restricted. That is, as women's sociosexuality scores increased, the ideal short-term partner began to look considerably *less* like their ideal long-term partner. Sexually unrestricted women appear to engage in long-term mating to gain material advantages, such as parental investment and social status, and engage in short-term mating to access heritable genetic benefits for offspring. In contrast, sexually restricted women were more likely to use a blended approach when choosing a mate, such that preferences for material *and* genetic traits are more closely matched across short-term and long-term relationships.

These findings provide insight into the role of personality traits in moderating women's sexual strategies. Women who are sexually unrestricted may

adopt a dual-sexual strategy and profit from engaging in a combination of short- and long-term mating. Restricted women, however, demonstrated a targeted, long-term strategy by spending a higher proportion on social status and paternal investment for both mating contexts. Our findings are consistent with prior research that found unrestricted women are more successful at differentiating between cues of good genes (Provost et al., 2006; Quist et al., 2012; Sacco et al., 2012). The present study extends these claims by demonstrating that women's ideal long-term mate is not moderated by individual differences in sociosexuality.

The finding that sociosexuality predicts attraction to genetic traits in short-term, but not long-term, mating can be viewed as an adaptive strategy. Good genes males are less likely to confer parental investment than men high on material traits (Faurie et al., 2004), making attraction to such men suboptimal in long-term relationships. For unrestricted women, a better approach could be to favour material traits in long-term mating and to engage in short-term mating with good genes males (Gangestad & Simpson, 2000).

Mate preferences in India and the USA

An additional aim of the study was to test whether women's mate preferences differed in regions where women's behaviours are sexually restricted (India) versus unrestricted (USA). Consistent with prediction 2, women in India exhibited restricted sexuality, relative to women in the USA. We also found that women from the USA possessed more distinctive short- and long-term preferences than those from India (prediction 3).

It is noteworthy that this effect does not merely reflect sociosexual differences between India and the USA. That is, model III showed that sociosexuality and nationality were independent predictors of mate dollar spend. This raises the question of what additional factors (besides sociosexuality) cause cross-cultural differences in mate preference. From a cultural learning perspective, these preferences could be adaptive. Women in sexually restricted cultures may face a greater pressure to conform to norms surrounding chastity and sexual innocence. As such, a cognitive bias that promotes the socially desired norm (i.e., long-term mating) could serve to minimise social ostracism and harmful punishment. Alternatively, women in sexually unrestricted regions can benefit from pursuing different strategies for short- and long-term mating. Future research should seek to understand what motivates women from different cultures to possess distinctive mate preferences.

Limitations and future directions

The present report has several limitations. First, mate preference was measured using Lu and colleagues' Women's Mate Preference Questionnaire (WMPQ) (Lu et al., 2015), a 12-item measurement that was translated from Chinese to English. As such, it is possible that the essential meaning of some items changed during the translation process. For example, the term *gú jiā*, which was used in the WMPQ, is ambiguous in English and could be translated as *stays at home* (as translated in the present report), but also as *staying around home*, *being home a lot*, or *stay and care about home* (Lei Chang, personal communication). Second, the WMPQ was validated among a Chinese (and not an Indian or American) sample. An important next step would be to validate Lu and colleagues' questionnaire in a non-Chinese sample. Despite these limitations in measuring mate preference, the findings nonetheless replicate previous observations that genetic traits are typically favoured in short-term mating, whereas material traits are favoured in long-term mating (e.g., Li, 2007), thus supporting the validity of the WMPQ.

It is also worth noting that the observed effect sizes for sociosexuality and nationality, plus the interaction with relationship context, are small to medium ($.01 < \eta_p^2 < .05$). As with many observations within the mating literature, this supports the claim that multiple factors, such as intelligence (Stanik & Ellsworth, 2010), personality traits (Quist et al., 2012), and ecological factors (Kandrik et al., 2015), interact to form an individual's mate preference.

Another caveat to the study is the uncertainty with respect to the mechanisms that underly cultural differences in sociosexuality. Although not within the scope of this chapter, we speculate that one possible explanation for the findings is that imbalanced sex ratios, ecological pressures, and cultural norms surrounding sexual behaviour foster relatively restricted sexual behaviour in India (Kandrik et al., 2015; Schmitt, 2005).

Finally, the present findings raise the question of what drives the observed differences in short-term mate preference between restricted and unrestricted women. Further research is needed to identify whether these strategic differences emerge from variation in sexual experience or whether unrestricted women systematically bias their behaviour in favour of short-term mating. If sexual experience is driving the observed effect, it would suggest that successful mating strategies are learned via trial and error in the mating market. Alternatively, it is possible that it is *beneficial* for some (i.e., restricted) women to

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possess similar short- and long-term mate preferences, potentially to increase their own attraction to high-investing males.

Conclusions

These findings demonstrate the role of sociosexuality in predicting women's mating strategies. As sociosexuality increases, preferences for short- and long-term mates diverge. This suggests that sexual openness promotes a dual-sexual strategy, which could be an optimal approach to accessing both material and genetic benefits. In contrast, sexual restrictiveness could function to promote attraction to males who are likely to invest in long-term relationships.

Chapter 3

You're Not My Type: Do Conservatives Have a Bias for Seeing Long-Term Mates?

3.1 Introduction

What traits do humans seek in a sexual partner? Should we expect a similar answer from a British university student and a middle-aged individual from Sudan? For decades evolutionary and social psychologists have been interested in the traits that men and women desire in a sexual or romantic partner. Because human evolution has been shaped as much by social interactions as immunological diseases, a cultural view of psychology should play a central role in an evolutionary account of mating behaviour. Here we investigate the role of cultural norms in shaping evolved mating strategies. Specifically, we ask: (a) whether individuals from conservative backgrounds moderate their preferences by avoiding short-term mating even when, potentially, the benefits to offspring outweigh the costs, and (b) what mechanisms support this bias.

3.1.1 Evolved Mate Preferences

According to evolutionary psychologists, successive generations of early humans faced recurrent problems when choosing a suitable partner. Specifically, ancestral men and women would trade-off between mates offering genetic and parental quality (Pillsworth & Haselton, 2006a; Gangestad & Simpson, 2000). As such, humans have developed two distinctive mating strategies. For short-term relationships, individuals favour genetic traits that signal fertility, such

as physical attractiveness and high sex drive (Pillsworth & Haselton, 2006a; Gangestad & Simpson, 2000). For long-term relationships, however, individuals prioritise material traits, such as emotional warmth, wealth, and high social status (Gangestad & Simpson, 2000; Li et al., 2002; Regan et al., 2000).

The trade-off between genetic and parental quality is shaped further by ecological factors, such as historical levels of disease an resource scarcity, which influence fitness outcomes for offspring. For example, when rates of infectious disease are high, it would be prudent to favour mates with symmetrical faces, as symmetry is highly correlated with immunological functioning (Trivers, Manning, Thornhill, Singh, & McGuire, 1999; Thornhill, 1997). Additionally, when women's economic independence is low, they should favour men with wealth and high status (Stanik & Ellsworth, 2010; Lu et al., 2015). Cross-cultural research has also shown that people from countries with a low average birth rate, high infant mortality, higher parasite stress, or shorter life expectancy are less likely to engage in uncommitted sexual behaviour (Schmitt, 2002; Schaller & Murray, 2008; Thornhill, Fincher, Murray, & Schaller, 2010; Muggleton & Fincher, 2017).

Although there has been substantial focus on how environmental factors shape mate preference, previous research has typically focussed on an individual's motivation to maximise the fitness of offspring. Yet most individuals will take into account factors that are indirectly related to their own fitness, such as the attitudes of their parents, society, and other potential mates. Furthermore, sex with multiple or unfamiliar partners can result in the transmission of many pathogens, including sexually transmitted infections, making uncommitted sex particularly risky when disease prevalence is high. As such, there could be opportunities where individuals should avoid uncommitted sex with mates with a high good genes value because the potential benefits to offspring may be outweighed by social costs, such as punishment for promiscuous behaviour, which can reduce an individual's residual reproductive value.

3.1.2 Social Benefits of an Evolved, Long-Term Mate Bias

Given that social cues influence mate choice, how are social norms surrounding sexuality maintained? One possibility is that individuals from conservative groups conform because they fear punishment. Yet harsh punishment is an inefficient mechanism for maintaining norms because it increases the risk of rebellion and a social backlash (Baumeister & Twenge, 2002; Brehm, 1966; LaFree, Dugan, & Korte, 2009). This, by definition, would undermine social

cohesion. Alternatively, a more adaptive approach could be for individuals to internalise the norms of the group by means of a bias. It could be, for example, a cognitive, learning, or cultural bias, but we are agnostic about the form this bias should take.

At first glance, biases can be viewed as violations of rational choice and thus an evolutionary *mal*adaptation. Economic utility theory, philosophical reasoning, and conventional wisdom dictate that humans who are rational in their decision-making should outperform those who demonstrate bias. Nonetheless, in some social situations biases can result in improved decision-making. Just as a smoke detector is attuned to prioritise safety (i.e., minimise false negatives, even if this maximises the number of false positives) over accuracy (minimise error rate overall), evolution has selected for psychological responses that maximise human survival (Nesse, 2005; Schaller & Park, 2011). In this view, biases, instead of design *flaws*, are design *features* (Haselton, Nettle, & Murray, 2015).

Similar logic could apply to individuals' perceptions of long-term mates. Consider this: social groups differ in the extent to which they are conservative. Conservative social norms dictate that individuals should be chaste; violation of these norms can result in malicious gossip, reputation damage, or honour killings (Ghanim, 2015; Hartung, 2012; Mayeda & Vijaykumar, 2016; Flood, 2013). A potentially adaptive bias could be an internalisation of social norms surrounding chastity, which results in an overperception of a mate's suitability as a potential long-term partner. In conservative groups, for example, the cost of a false positive (e.g., overperceiving the risks of promiscuity) could lead to a missed opportunity to mate with a high quality mate. Yet the cost of a false negative (e.g., failing to detect the risks of promiscuity) could result in social ostracism. Thus, in conservative contexts, individuals may demonstrate a bias that promotes social conformity to long-term mating. Nonetheless, in liberal groups, where the costs of short-term mating are lower, individuals can benefit from engaging in distinctive mating strategies, that is, by favouring short-term mating with good genes mates but long-term mating with good parent or good provider mates.

We propose a theoretical model where personal and societal levels of conservatism predict the likelihood of a long-term mate bias. In all societies, humans can benefit from engaging in short-term mating. Benefits include increased offspring fitness, opportunities for mate poaching, mate value feedback, and immediate access to resources (Greiling & Buss, 2000; Meston &

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Buss, 2009; Smuts, 1992). But the costs of engaging in short-term mating are moderated by social norms in a given ecology. If the social group is tolerant of short-term mating, the potential payoff of mating with good genes mates is relatively high. But if the social groups is conservative, the potential payoff of short-term mating is diminished.

Observational data support the claim that conservatism promotes a long-term mating bias. Individuals from conservative regions enter into marriage at a younger age (Schmitt, 2005) and are less likely to terminate these long-term bonds (Vandello & Cohen, 1999). Societal conservatism negatively predicts willingness to engage in short-term mating (Schmitt, 2005; Muggleton & Fincher, 2017; Thornhill, Fincher, & Aran, 2009), which could lead to costly punishment. The present report, however, seeks to test empirically whether individuals from conservative groups overperceive prototypically short-term mates as potential long-term mates.

To test this proposition we selected two relatively liberal regions (UK and USA) and one conservative region (India). The three regions differ in mean number of sexual partners (UK: 9.8; USA: 10.7; India: 3.0) and one-night stands (UK: 52%; USA: 50%; India: 13%). Indians are also more likely to encourage young people to abstain from intercourse until they are married (49%, vs. UK: 6%; USA: 14%) (Durex Sexuality Study, 2005). As such, we might expect that Indian mating strategies are influenced by more conservative social norms and a higher likelihood of punishment. We also measured conservatism at the individual level to account for within-region variation amongst individuals.

3.1.3 The Present Research

We propose that conservatives have a bias for seeing long-term mates. Although prior research has demonstrated that conservatives possess distinctive short- and long-term mate preferences, displaying a short-term strategy may prove costly in conservative groups. As such, an adaptive response could be a bias that promotes long-term mate preferences, even under ecological conditions where - in some societies - a short-term mating strategy is adaptive. From this, four predictions emerge.

In study 2, we predict that liberals will demonstrate stronger, more distinctive preferences for short- and long-term mates, relative to conservatives (prediction 1). Central to this proposition is the prediction that conservatives avoid a distinctive short-term strategy as a mechanism to maintain traditional

social norms. In conservative cultures, short-term mating could threaten traditional values, which poses a greater societal risk to conservative than liberal cultures (Roos et al., 2015). To test this assumption directly we investigated whether an individual's motivation to conserve traditional values promotes convergent short- and long-term strategies. We predicted that adherence to traditional norms should negatively predict the distinctiveness between short- and long-term preferences (prediction 2).

The proposed theory assumes that similar short- and long-term mate preferences are indicative of a *long-term mating bias* among individuals from conservative groups. In study 3 we investigated whether conservatism-liberalism predicts the extent to which individuals overperceive a mate's suitability as a potential long-term partner. Compared with liberals, conservatives should be less willing to engage in short-term mating with the archetypal one-night stand. That is, when selecting their ideal relationship with a 'sexy cad' (Durante, Griskevicius, Simpson, Cantú, & Li, 2012), conservatives should favour longer commitments than liberals (prediction 3). But ratings of the archetypal spouse should be unaffected by conservatism; that is, all participants should perceive this mate as an ideal spouse (prediction 4).

The purpose of our report was to investigate whether conservatives are less prone to demonstrate distinctive short- and long-term sexual strategies, relative to liberals. In study 2, we examined whether participants from the USA and UK (liberal regions) demonstrated more distinctive short- and long-term preferences than Indian participants (conservative region). We also investigated whether this was associated with a drive to maintain traditional values. Study 3 directly investigated whether conservatives overperceived a mate's suitability as a potential long-term partner.

3.2 Study 2

3.2.1 Introduction

Study 2 investigated whether conservatives were less likely to adopt a distinctive short-term mating strategy. We also investigated the potential causes for regional differences by testing whether short-term mating strategies are predicted by an individual's motivation to preserve traditional norms. Participants constructed their ideal short- and long-term mates by spending 30 mate dollars on 12 traits.

3.2.2 Method

Participants

To maximise statistical power, we conducted a power analysis based on Muggleton and Fincher (2017). Our analysis indicated that, to obtain the recommended statistical power $1 - \beta = .80$ at $\alpha = .05$ (Cohen, 1988), our study would require $N \geq 70$ per condition. Posthoc tests revealed that our observed power was $\geq .81$ for all key tests (pwr; Champely, 2017).

We recruited 527 participants from India, the UK, and US (women = 254, men = 273) in a Prolific Academic study. Prolific Academic is an online crowdsourcing tool that produces data of a quality comparable with Amazon Mechanical Turk (Peer, Brandimarte, Samat, & Acquisti, 2017). All participants were aged 18-73 ($M = 33.31$, $SD = 10.26$), heterosexual, and reported that they were fluent in English. Participants were financially reimbursed for their time.

Design

In a mixed-factorial design, nationality (USA, UK, India), sex (male, female), and tradition scores were the between-subject factors. Trait (good genes, good parent, good provider) and context (short-term, long-term) were the within-subject factors. The dependent variable was the proportion of mate dollars spent on each trait.

Psychological instruments

Mate Preference Inventory

Development The instrument was based on the Women's Mate Preference Questionnaire (WMPQ) (Lu et al., 2015), a 12-item measurement that was translated from Chinese to English. To account for potential mistranslations (Muggleton & Fincher, 2017), we chose to validate the questionnaire for an English-speaking sample by developing the Mate Preference Inventory (MPI). Participants rated a list of 30 mate traits based on the long version of the WMPQ, which was translated by Lu and colleagues from Chinese to English (Lu et al., 2015).[3]

For this development of the MPI 151 heterosexual women from the USA were recruited in a Prolific Academic study. All participants were aged 18-44 years ($M = 30.46$, $SD = 6.94$). Participants were presented with a list of 30

mate traits (Table 13, Appendix A) and asked to rate how much they valued each item in a short-term, then long-term, partner. Presentation of the short- and long-term questionnaires was counterbalanced. Responses from both questionnaires were combined (i.e., two preference profiles per participant) for the Principal Component Analysis (PCA).

Analysis We conducted a PCA on the 30 items using a varimax rotation. All items correlated .40 with at least one other item in the list, indicating acceptable factorability (Table 13, Appendix A). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was high, KMO = .92 (see Kaiser, 1974) and above .73 for all individual items (greater than the recommended .50). For the data, Bartlett's test of sphericity was significant, $\chi^2(435) = 2345.23$, $p < .001$. These findings suggest that interitem correlations were acceptably large for PCA.

Using the eigenvalue-greater-than-one rule and scree plot inflection analysis, three factors were carried forward to the final analysis. As in Lu and colleagues' (2015) study, the items cluster on the same components: *Good Provider* (Component 1), *Good Parent* (Component 2), and *Good Genes* (Component 3). To ensure that the factors were equally balanced for study 2, the four items with the highest factor loading were carried forward for the 12-item version of the MPI. The 12 items and factor loadings are presented in Table 1. The sum a participant spent on the 12 items was subsequently aggregated for each component type (Table 1).

Tightness-looseness scale Gelfand and colleagues' (2011) six-item tightness-looseness scale measures the extent to which social norms are clearly defined and consistently imposed within a region, for example: "There are many social norms that people are supposed to abide by in this country" and "In this country, if someone acts in an inappropriate way, others will strongly disapprove". Cultural tightness is a construct that's related to, yet distinct from, conservative political values (Harrington & Gelfand, 2014).

Tradition Tradition was a three-item subscale from the Portraits Values Questionnaire (Revised) (PVQ-RR) (Schwartz et al., 2012). The subscale measures the extent to which individuals believe that cultural norms should be maintained. Items include: "It is important to maintain traditional values or beliefs". The full version of the PVQ-RR measures 19 human values

Table 1: Mate Preference Inventory (MPI) items and factor loadings ($N = 151$).

	Component		
	1	2	3
	Good Provider	*Good Parent*	*Good Genes*
Good income	**.75**	.10	.16
Industrious	**.74**	.11	−.07
Ambitious	**.72**	.10	.13
Successful career	**.72**	.13	.19
Considerate	.04	**.84**	.12
Kind	.09	**.82**	.04
Caring	.20	**.80**	−.03
Patient	.25	**.78**	.03
Good body	.06	.01	**.85**
Good looking	.02	.00	**.82**
Athletic	.26	−.12	**.71**
High sex drive	.01	.02	**.60**
Eigenvalues	9.10	3.37	2.56
Proportion of variance	.24	.17	.12
α	.84	.88	.84

Note. Factor loadings above .60 appear in bold.

recognised cross-culturally, such as tradition, hedonism, and benevolence. The most recent version has been validated in eight countries (Cieciuch, Davidov, Vecchione, Beierlein, & Schwartz, 2014).

Controlling for confounds

It is possible that conservatives, rather than demonstrating a bias, instead find it difficult to discriminate between short- and long-term mates. Specifically, their lack of experience with short-term mating could impair their performance in this task. This would suggest that, given sufficient exposure to short-term mating, individuals from conservative groups would eventually demonstrate a distinctive short-term mating strategy. To control for this we administered the Behaviour subscale from the SOI-R (SOI-B) (Penke & Asendorpf, 2008), a three-item questionnaire that measures an individual's level of sexual experience and has good internal consistency, $\alpha = .85$. The items included: "With how many different partners have you had sexual intercourse on *one and only one* occasion?".

Table 2: Mean (SD) scores for individual-level measures aggregated by nationality and sex.

Item	India		UK		USA	
	Female	Male	Female	Male	Female	Male
Tightness	26.62	24.91	24.51	23.80	24.53	23.33
	(4.28)	(3.03)	(3.44)	(3.47)	(3.97)	(4.24)
SOI-B	5.39	8.46	8.56	9.08	7.24	10.94
	(3.47)	(4.99)	(5.09)	(5.48)	(4.24)	(6.91)
Tradition	13.61	12.69	9.15	9.14	8.33	9.51
	(3.97)	(3.40)	(4.05)	(4.47)	(4.13)	(4.36)

Procedure

Participants completed the tightness-looseness scale, the SOI-B, and the PVQ-RR. Next, participants were asked to construct their ideal romantic partner by spending 30 mate dollars on 12 traits (see Table 1). Instructions indicated that each dollar spent was equivalent to 10 percentile points. For example, a $5 spend on the trait 'athletic' was equivalent to 'buying' a mate who is more athletic than 50% of the population. A participant's preference for traits was calculated by aggregating their spend on each trait component listed in Table 1.

At the start of each trial, participants were told to construct either their ideal "short-term partner (i.e., one-night stand)" or "long-term partner (i.e., husband / wife)" (deleted, as appropriate, based on participant sex). The presentation order of the relationship context variable was counterbalanced across participants.

3.2.3 Results

Tightness-looseness validation

As a confirmatory measure, we tested whether our target regions differed in their average tightness scores (Table 2). Planned contrast analysis revealed that participants from India were significantly more tight than those from the UK and USA, $t(515) = -4.15$, $p < .001$, but that participants from UK and USA were matched, $t(515) = 0.042$, $p > .05$. Men's tightness scores were significantly lower than women's scores, $t(515) = -3.61$, $p < .001$, but the Nationality x Sex interaction was not significant (India vs. UK & US: $t(515) = 1.05$, $p > .05$; UK vs. US: $t(515) = -0.616$, $p > .05$).

Table 3: Mean spend on traits by nationality as a function of short-term (ST) and long-term (LT) relationship contexts, the difference (Diff.) between ST and LT, and Cohen's d (d).

		ST	LT	Diff.	d
	India	9.65	12.48	−2.83	−0.50
Good genes	UK	8.78	20.24	−11.46	−1.59
	US	8.75	19.37	−10.62	−1.39
	India	11.55	10.25	1.30	0.24
Good parent	UK	15.84	7.92	7.93	1.14
	US	15.13	8.06	7.07	1.00
	India	8.79	7.27	1.53	0.33
Good provider	UK	5.38	1.84	3.53	0.82
	US	6.12	2.57	3.55	0.76

Short- and long-term preferences

We first asked whether individuals from the USA and UK display more distinctive short- and long-term mate preferences than Indian participants. To simplify interpretation of the results we analysed spend on good genes, good parent, and good provider traits in isolation. For each trait type we performed a three-way, mixed ANOVA on participants' spend, with sex (male, female) and nationality (India, US, UK) as between-subjects factors and context (short-term, long-term) as a within-subject factor.

Good genes The main effect of nationality was significant, $F(2, 515) = 19.21$, $p < .001$, $\eta_G^2 = .04$ (Figures 3(a) and (d)). Planned contrasts showed that Indian participants spent significantly less on good genes than non-Indian participants, $t(515) = 6.73$, $p < .001$, but that UK and US participants were matched on spend, $t(515) = -0.858$, $p > .05$ (Table 3). Sex was also significant, with men spending significantly more on good genes than women, $F(1, 515) = 92.75$, $p < .001$, $\eta_G^2 = .10$. We observed a significant effect of context, with participants spending more on good genes in the short-term context $F(1, 515) = 523.39$, $p < .001$, $\eta_G^2 = .30$.

The Nationality x Sex interaction was significant, $F(2, 515) = 4.87$, $p < .01$, $\eta_G^2 = .01$. Planned contrasts showed that Indian men spent approximately \$2.36 more on good genes traits, relative to Indian women, $t(515) = -2.92$, $p < .01$, $d = -0.41$. The difference between male and female spend was \$5.71 in the UK, $t(515) = -7.66$, $p < .001$, $d = -0.65$, and \$4.83 in the US, $t(515) = -6.32$, $p < .001$, $d = -0.54$.
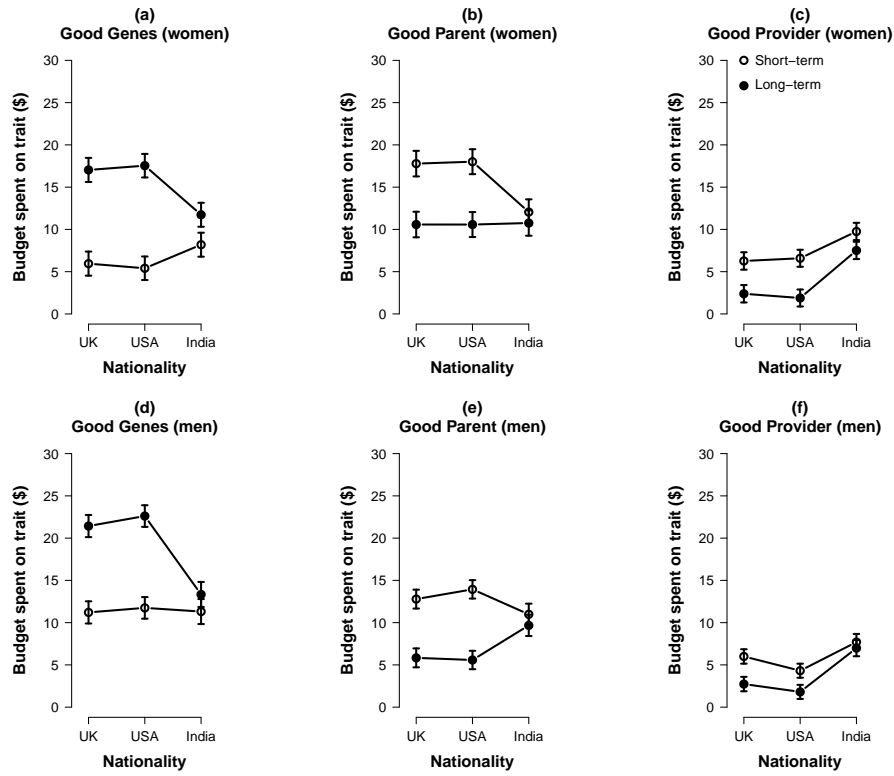
Figure 3: Mean spend by nationality as a function of relationship context for women (top row) and men (bottom row). Left = good genes, centre = good parent, and right = good provider traits. *Note.* Error bars denote 95% confidence intervals.

The Nationality x Context interaction was significant, $F(2, 515) = 55.90$, $p < .001$, $\eta^2_G = .08$. The difference between short- and long-term spend was greater in the liberal regions than in India, $t(515) = 6.73$, $p < .001$, but that there was no difference between the USA and UK, $t(251) = 0.03$, $p > .05$. For good genes, short- and long-term preferences were more distinctive in the UK and USA, relative to India.

Neither the Sex x Context interaction, $F(1, 515) = 2.78$, $p > .05$, $\eta^2_G < .002$, nor the Nationality x Sex x Context interaction, $F(1, 515) = 0.07$, $p > .05$, $\eta^2_G < .001$, reached significance.

Good parent The main effect of sex was significant, $F(1, 515) = 64.62$, $p < .001$, $\eta^2_G = .07$, with women spending significantly more on good parent traits (Figures 3(b) and (e)). Context was also significant, such that participants spent more on good parent in the long-term context $F(1, 515) = 304.89$, $p < .001$, $\eta^2_G = .16$ (Table 3). Nationality, however, did not predict spend on good parent traits, $F(1, 515) = 2.55$, $p > .05$, $\eta^2_G = .01$.

We observed a Nationality x Sex interaction, $F(2, 515) = 6.97$, $p < .01$, $\eta^2_G = .02$, with planned contrasts showing that Indian women spent approximately \$1.07 more on good parent traits, relative to Indian men, $t(515) = 1.32$, $p > .05$, $d = 0.20$. There was, however, a greater sex difference in loose cultures; in the UK, women spent \$4.53 more than men, $t(515) = 6.05$, $p < .001$, $d = 0.59$; the sex difference was \$4.86 in the US, $t(515) = 6.34$, $p < .001$, $d = 0.64$.

The Nationality x Context interaction was significant, $F(2, 515) = 39.46$, $p < .001$, $\eta^2_G = .05$. Planned contrasts revealed that the difference between short- and long-term spend was smaller in India than in the liberal regions, $t(515) = 2.40$, $p < .05$, but that there was no difference between the USA and UK, $t(515) = -0.60$, $p > .05$.

Neither the Sex x Context interaction, $F(1, 515) = 0.15$, $p > .05$, $\eta^2_G < .001$, nor the Nationality x Sex x Context interaction, $F(2, 515) = 0.32$, $p > .05$, $\eta^2_G < .001$, reached significance.

Good provider Overall, women spent significantly more on good provider traits than men, $F(1, 515) = 6.38$, $p < .05$, $\eta^2_G = .09$ (Figures 3(c) and (f)). We also observed a main effect of nationality, $F(2, 515) = 68.19$, $p < .001$, $\eta^2_G = .15$, such that Indian participants spent significantly more on good provider traits, $t(515) = -13.16$, $p < .001$, but spend was matched in the US and

UK, $t(515) = -1.83$, $p > .05$ (Table 3). The main effect of context was significant, with spend on good provider traits higher in the long-term context, $F(1, 515) = 154.19$, $p < .001$, $\eta_G^2 = .09$.

We observed a Sex x Context interaction, $F(1, 515) = 9.68$, $p < .01$, $\eta_G^2 = .01$. Women spent significantly more than men in the long-term context, $t(941) = 3.87$, $p < .001$, but spend was matched in the short-term context, $t(941) = 0.214$, $p > .05$.

The Nationality x Context interaction was significant, $F(2, 515) = 8.74$, $p < .001$, $\eta_G^2 = .01$. Planned contrasts showed that Indians spent significantly more than US and UK participants in both the short- and long-term contexts (ts > 5.2, ps $< .001$). Spend, however, was matched between US and UK participants in both the short- and long-term contexts (ts < 1.40, ps $> .28$).

The Nationality x Sex interaction, $F(2, 515) = 1.79$, $p > .05$, $\eta_G^2 < .005$, plus the Nationality x Sex x Context interaction, $F(2, 515) = 1.02$, $p > .05$, $\eta_G^2 = .001$, did not reach significance.

Tradition and mate preference

Next we investigated whether short- and long-term preferences are predicted by an individual's desire to maintain social norms. Mean tradition scores are reported by nationality and sex in Table 2. To aid interpretation of the results, good genes, good parent, and good provider traits were analysed in isolation.

Good genes Do nontraditional individuals display more distinctive short- and long-term mate preferences than traditional individuals? The main effect for tradition (PVQ-RR) was significant, $F(1, 517) = 38.94$, $p < .001$, $\eta_G^2 = .04$, with more traditional individuals spending less on good genes traits. We also observed a significant Tradition x Context interaction, $F(1, 517) = 57.36$, $p < .001$, $\eta_G^2 = .04$, indicating that low tradition scores are associated with more distinctive short- and long-term mate preferences (Figures 4(a) and (d)). Regression slope analyses revealed that tradition negatively predicted spend on good genes traits in the short-term context, $\beta = -0.32$, $t(519) = -7.80$, $p < .001$, but did not predict spend in the long-term context, $\beta = 0.00$, $t(252) = 0.05$, $p = .96$.

Neither the Tradition x Sex, Sex x Context, nor Tradition x Sex x Context interactions reached significance (Fs < 3.5, ps $> .06$).
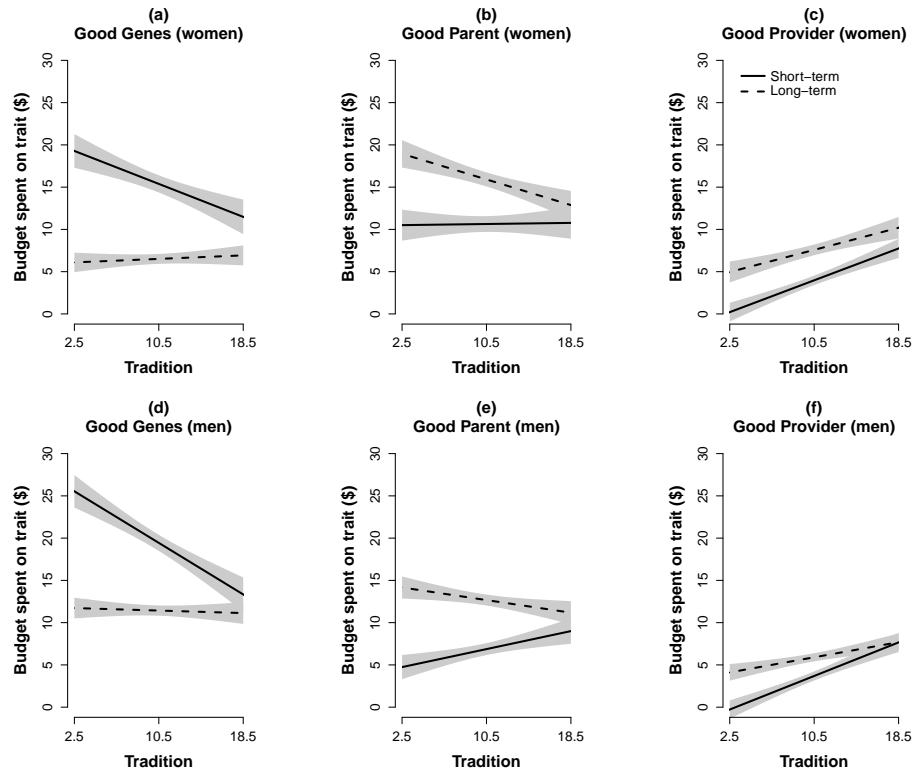
Figure 4: Mean spend by tradition score as a function of relationship context for women (top row) and men (bottom row). Left = good genes, centre = good parent, and right = good provider traits. *Note.* Shading denotes 95% confidence intervals.

Good parent The main effect of tradition did not predict participants' spend on good parent traits, $F(1, 517) = 2.20$, $p > .05$, $\eta_G^2 = .002$ (Figures 4(b) and (e)). The Tradition x Context interaction was, however, significant, $F(1, 517) = 32.88$, $p < .001$, $\eta_G^2 = .02$, indicating that individuals high on traditionalism had converging short- and long-term mate preferences (Figure 4). Regression slope tests showed that tradition positively predicted spend on short-term traits, $\beta = -0.09$, $t(252) = 2.10$, $p = .036$, but negatively predicted spend in the long-term context, $\beta = -0.20$, $t(252) = -4.64$, $p < .001$.

The Tradition x Sex interaction was significant, $F(1, 517) = 4.96$, $p < .05$, $\eta_G^2 = .01$. Regression slope tests showed that tradition negatively predicted spend among women, $t(506) = -2.48$, $p < .05$, but did not predict men's spend, $t(532) = 0.64$, $p > .05$.

The Tradition x Sex x Context interaction was not significant, $F(1, 517) = 0.15$, $p > .05$, $\eta_G^2 < .001$.

Good provider Overall, tradition was associated with an increased preference in good provider traits, $F(1, 517) = 112.92$, $p < .001$, $\eta_G^2 = .13$ (Figures 4(c) and (f)). The Tradition x Context interaction was significant, $F(1, 517) = 16.44$, $p < .001$, $\eta_G^2 = .01$. Specifically, tradition positively predicted spend in the short-term context, $\beta = 0.44$, $t(519) = 11.14$, $p < .001$, and the long-term context, $\beta = 0.26$, $t(519) = 6.19$, $p < .001$.

Neither the Tradition x Sex, nor the Tradition x Sex x Context interactions reached significance (Fs < 1.6, ps $> .20$).

Sexual experience

Are the observed effects driven by differences in sexual experience? As a control measure we tested whether the SOI-B score predicted mate preference. Mean sexual experience is reported by nationality in Table 2. In the multiple regression model, context (short-, long-term) and trait (good genes, good parent, good provider) were the within participants factors and SOI-B score was the between-participants factor. Neither the SOI-B x Context interaction, $F(1, 519) = 0.00$, $p > .05$, $\eta_G^2 < .001$, nor the SOI-B x Context x Trait interactions were significant, $F(2, 1038) = 0.00$, $p > .05$, $\eta_G^2 < .001$. Hence we can conclude that sexual experience does not predict whether individuals have distinctive short- and long-term mate preferences.

3.2.4   Discussion

When choosing a partner, individuals can benefit from prioritising different attributes for short- and long-term mating. Nonetheless, study 2 shows that socially conservative participants were less likely to have distinctive mate preferences. This was also affected by individual differences in motivation to maintain traditional values, indicating that conservative norms can restrict participation in short-term mating.

We also observed that, independent of relationship context, conservatism (measured at the societal- and individual-level) negatively predicted spend on good genes, but positively predicted spend on good provider traits. Further, women low on tradition spent more on good parent traits, but there was no association between tradition and good parent spend among men. This is consistent with previous findings that, as societies become increasingly progressive and women gain parity with men, women increasingly favour good parents over good providers (Lu et al., 2015; Stanik & Ellsworth, 2010). As women gain economic independence there is less pressure to secure a mate who can provide financially. Instead it becomes increasingly important to find a mate who can contribute at home.

We observed further sex differences with respect to trait preference. Although men spent more than women to obtain good genes traits, women spent more than men on good parent and good provider traits. This supports a wealth of literature suggesting that men prioritise cues of fertility but women prioritise cues of resources (e.g., Buss, 1989; Kamble et al., 2014; Conroy-Beam, Buss, Pham, & Shackelford, 2015; Souza, Conroy-Beam, & Buss, 2016).

Finally, we found that differences between men and women were smallest in India but matched in the US and UK. This could be driven, in part, by converging short- and long-term preferences in this region. More broadly, this might reflect less variance in behaviour in conservative regions.

In sum, study 2 showed that the ideal short- and long-term mates are less distinctive for conservatives. This provides support for our prediction that conservatives demonstrate a bias, which makes it difficult for them to perceive an ideal short-term mate. The purpose of study 3 was to examine further this prediction.

3.3 Study 3

3.3.1 Introduction

Although highlighting that conservatism is positively associated with indistinguishable short- and long-term mate preferences, the methodology of study 2 does not directly address our proposition that those from conservative groups have a long-term mate bias, compared with those from liberal groups. For example, it is possible that Indian participants have similar short- and long-term preferences, but that this reflects long-term preferences that more closely resemble an individual's short-term ideal (compared with the UK and USA samples). We addressed this by presenting participants with descriptors of the archetypal one-night stand and spouse, then tested their perceptions of these archetypes as suitable for comparatively longer relationships.

3.3.2 Method

Participants

Owing to the novel nature of our methodology, we could not base our target sample size on effect size estimates. Instead, we chose a target sample size that was comparable with study 2 (target $N \approx 80$). Posthoc analyses showed that the observed power was $\geq .81$ for all key tests.

We recruited 322 individuals (women = 156, men = 166) from India and the US via Amazon Mechanical Turk. All participants were aged 18-63 ($M = 31.57$, $SD = 8.08$), heterosexual, and financially reimbursed for their time.

Procedure

Following completion of the PVQ-RR questionnaire, participants were presented with two vignettes that described either the archetypal short-term ('ideal fling') or long-term ('ideal spouse') partner (adapted from Simpson & Gangestad, 1992):[4]

> **Ideal fling** Person A is considered physically attractive and "sexy". He [she] has a sort of charisma that attracts the attention of those around him [her]. Although some might consider him [her] arrogant, A possesses a kind of self-confidence that others admire. A is not known, however, for living a responsible lifestyle. In the past,

he [she] has had a series of relatively short-term relationships. Some have ended because of questionable faithfulness on the part of A.

Ideal spouse Person B is an average-looking person, someone most people wouldn't consider "sexy". He [she] is sufficiently socially skilled but does not possess the kind of magnetic personality that draws the attention of others. Rather, B has a stable and responsible personality. In a relationship, B is caring, dependable and faithful. He [she] would very much like to have a family, likes children, and would probably be good with them.

The ideal fling has good genes traits but lacks good parent and good provider traits; this pattern is reversed in the ideal spouse vignette. This matches our findings in study 2, which found that participants from all regions favoured good genes traits in a short-term partner but good parent and good provider traits in a long-term partner. As such, the ideal fling vignette comprised of the traits that liberal *and* conservatives claimed to value in short-term, but not long-term, relationships (study 2).

Presentation of vignettes was counterbalanced. For each archetype, participants were asked to rate the type of relationship they'd *ideally* have with the person described: "Select the type of relationship you'd most like to have with this man [woman], if there were no consequences for your choice. Consequences could include judgements from your family, friends, society, etc."; and the relationship they'd most *realistically* have with the individual described: "Select the type of relationship you'd most realistically have with this man [woman]".

To measure whether participants believed that their ratings were in line with their peers, we asked them to estimate the ratings of other same-sex participants: "Select the type of relationship you think most other women [men] would like to have with this man [woman], if there were no consequences for their choice. Consequences could include judgements from your family, friends, society, etc."; and: "Select the type of relationship you think most other women [men] would most realistically have with this man [woman]". To incentivise thoughtful and truthful answers, participants were told that the individuals with the most accurate estimates would receive a 20 USD Amazon voucher in addition to their participation fee.

Participants selected their response using a moveable slider that ranged from 0 (labelled in the console as 'one-night stand') to 100 (labelled as 'hus-

band' for female participants and 'wife' for male participants). At the start of each trail the slider was set at the midpoint (50). Responses for the ideal and realistic condition were significantly correlated, $r = .91$, $p < .001$, and are hereafter combined.

Design

In a mixed-factorial design, nationality (USA, India) and sex (male, female) were the between-subject factors. Perspective (self, third-party) and archetype (ideal fling, ideal spouse) were the within-subject factors. The dependent variable was participants' relationship preference (from 0 to 100).

3.3.3 Results

Tradition by nationality and sex

Tradition scores were highest among Indian women, ($M = 15.20$, $SD = 2.36$, 95% CI [15.0, 15.4]), followed by Indian men, ($M = 13.80$, $SD = 2.90$, 95% CI [13.5, 14.0]). Next were US men, ($M = 9.71$, $SD = 4.23$, 95% CI [9.39, 10.00]), followed by US women, ($M = 8.86$, $SD = 4.65$, 95% CI [8.49, 9.22]).

Nationality

Self-reports We first asked whether participants from India (vs. USA) were more likely to perceive the ideal fling as a potential long-term mate. A three-way mixed ANOVA was performed on participants' ratings, with sex (male, female) and nationality (India, US) as the between-subjects factors, and archetype (ideal fling, ideal spouse) as the within-subjects factor. Overall, the main effect of archetype was significant, $F(1, 313) = 603.63$, $p < .001$, $\eta_G^2 = .54$, indicating that participants favoured long-term relationships with the spouse archetype but short-term relationships with the fling archetype. The main effect of nationality was significant, $F(1, 313) = 42.75$, $p < .001$, $\eta_G^2 = .05$, with participants in India favouring comparatively longer relationships. There was, however, no main effect of sex, $F(1, 313) = 0.44$, $p > .05$, $\eta_G^2 = .001$.

We observed a Nationality x Archetype interaction, $F(1, 313) = 13.30$, $p < .001$, $\eta_G^2 = .03$, such that US participants differentiated between the vignettes more so than Indian participants (Figures 5(a) and (b)). Posthoc comparisons using the Bonferroni correction indicated that Indian (vs. US) participants favoured longer relationships with the ideal fling prospect, $t(574.18) =$

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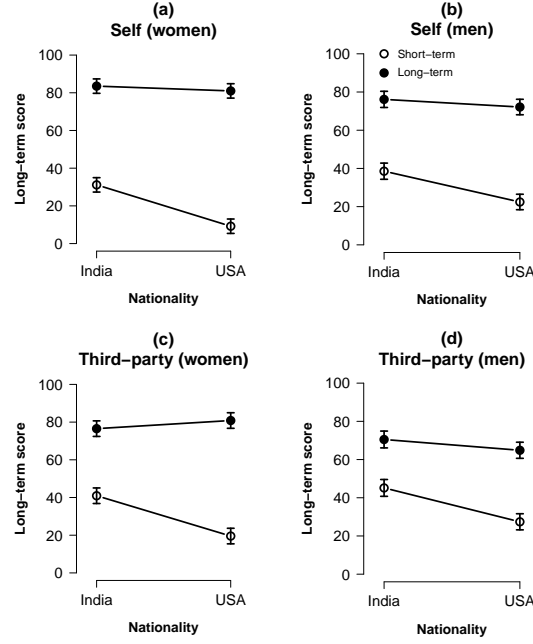
Figure 5: Mean score for preferred relationship length (0 = short-term, 100 = long-term) as a function of nationality, relationship context, and sex, for (a, b) self-reports of relationship preference and (c, d) estimates of a third party's preference. *Note.* Error bars denote 95% confidence intervals.

8.39, $p < .001$, $d = 0.67$, but that ratings for the ideal spouse were matched across India and the US, $t(631.81) = -4.3169$, $p > .05$, $d = 0.15$.

We also observed a significant Sex x Archetype interaction, $F(1, 313) = 18.50$, $p < .001$, $\eta^2_G = .04$, indicating that women's preferences were more distinctive than men's preferences. Bonferroni-adjusted comparisons revealed that women (vs. men) favoured comparatively shorter relationships with the ideal fling, $t(631.81) = -4.32$, $p < .001$, $d = 0.34$. Additionally, women (vs. men) favoured longer relationships with the ideal spouse, $t(628.64) = 4.40$, $p < .001$.

The Nationality x Sex and Nationality x Sex x Archetype interactions did not reach significance (Fs $< .80$, ps $> .39$).

Third-party estimates   Next, we asked whether participants believed that their preferences would be shared by same-sex participants. As with self reports, we conducted a three-way mixed ANOVA on participants' ratings, with sex (male, female) and nationality (India, US) as the between-subjects factors and archetype (ideal fling, ideal spouse) as the within-subjects factor. Overall,

the main effect of archetype was significant, $F(1, 313) = 308.71$, $p < .001$, $\eta_G^2 = .39$, indicating that participants correctly predicted that others would favour long-term relationships with the spouse archetype but short-term relationships with the fling archetype. Ratings differed as a function of nationality, $F(1, 313) = 34.98$, $p < .001$, $\eta_G^2 = .04$, with participants in India predicting comparatively longer relationship preferences. There was, however, no main effect of sex, $F(1, 313) = 2.15$, $p > .05$, $\eta_G^2 = .002$.

The Nationality x Archetype interaction was significant, $F(1, 313) = 17.11$, $p < .001$, $\eta_G^2 = .03$, indicating that US participants differentiated between the vignettes more so than Indian participants (Figures 5(c) and (d)). Posthoc comparisons using the Bonferroni correction indicated that Indian participants predicted longer relationship preferences for the ideal fling, $t(594.94) = 8.22$, $p < .001$, $d = 0.66$, but that ratings for the ideal spouse were matched across India and the US, $t(631.58) = -0.4903$, $p > .05$, $d = 0.04$.

We also observed a significant Sex x Archetype interaction, $F(1, 313) = 14.30$, $p < .001$, $\eta_G^2 = .03$, indicating that women's ratings were more distinctive than men's preferences. Bonferroni-adjusted comparisons revealed that women (vs. men) favoured longer relationships with the ideal spouse, $t(627.78) = 5.72$, $p < .001$, $d = 0.45$. For ideal fling ratings, however, both sexes were matched, $t(631.36) = -2.30$, $p > .05$, $d = 0.18$.

The Nationality x Sex and Nationality x Sex x Archetype interactions did not reach significance (Fs < 2.30, ps $> .13$).

Tradition

Self-reports Are traditional individuals more likely than liberals to perceive potential mates as suited to long-term relationships? Overall, traditional participants favoured longer relationships, $F(1, 313) = 49.38$, $p < .001$, $\eta_G^2 = .06$. The Tradition x Archetype interaction was significant, $F(1, 313) = 10.32$, $p < .01$, $\eta_G^2 = .02$, indicating that traditional participants demonstrating less distinctive preferences (Table 4). Regression slope tests showed that traditional (vs. nontraditional) individuals favoured longer relationships with the ideal fling, $\beta = 0.31$, $t(632) = 8.25$, $p < .001$, and the ideal spouse, $\beta = 0.11$, $t(632) = 2.78$, $p < .01$. Individuals high on tradition were more likely to perceive the archetypes as suitable for comparatively longer relationships.

Neither the Tradition x Sex nor the Tradition x Sex x Archetype interactions reached significance (Fs < 2, ps $> .16$).

Table 4: Multiple regressions for relationship preference as a function of tradition, sex, and archetype.

Predictor	Dependent variables			
	Self		Third-party	
	β	p	β	p
Tradition	0.23	<.001	0.25	<.001
Sex	0.08	.43	0.10	.17
Archetype	0.98	<.001	1.13	<.001
Tradition x Sex	0.07	.48	−0.01	.09
Tradition x Archetype	−0.17	.001	−0.48	<.001
Sex x Archetype	−0.03	<.001	−0.43	<.001
Tradition x Sex x Archetype	−0.20	.17	0.22	.17

Third-party estimates Additionally, more traditional participants estimated that others participants would favour longer relationships, $F(1,313) = 25.44$, $p < .001$, $\eta_G^2 = .03$. The Tradition x Archetype interaction was significant, $F(1,313) = 13.45$, $p < .001$, $\eta_G^2 = .03$, with traditional participants demonstrating less distinctive preferences (Table 4). Regression slope tests showed that traditional (vs. nontraditional) individuals predicted longer preferences for the ideal fling, $\beta = 0.27$, $t(632) = 7.10$, $p < .001$. Tradition did not, however, predict ratings for the ideal spouse, $\beta = 0.02$, $t(632) = 0.395$, $p > .05$. Individuals high on tradition predicted that same-sex others would view the ideal fling as suitable for comparatively longer relationships.

Neither the Tradition x Sex, nor the Tradition x Sex x Archetype interactions reached significance (Fs < 3, ps $> .08$).

3.3.4 Discussion

Study 3 used two approaches to measure perceptions of prospective romantic interests. We found that participants, independent of nationality or traditionalism, identified the archetypal fling as suitable for short-term relationships, relative to the archetypal spouse. But participants from the conservative region (India), as well as traditional participants from all regions, demonstrated relatively longer relationship preferences. This was largely specific to their ratings of ideal flings. That is, although liberals and conservatives similarly viewed the ideal spouse as a suitable long-term mate, conservatives demonstrated a tendency to favour longer relationships with the ideal fling, despite a lack of commitment-compatible traits. There was, however, one exception to this trend. Tradition scores positively predicted the preferred relationship

length for ideal spouses, as well as ideal flings, suggesting that traditional participants were particularly long-term-oriented for all relationships.

Contrary to previous findings, we observed that men and women were matched for their preferred relationship length. Traditional accounts maintain that men are more short-term oriented (Schmitt et al., 2012; Schmitt, 2012), although this perspective has faced recent criticisms (Thomas & Stewart-Williams, 2018; Hallam et al., 2018; Stewart-Williams & Thomas, 2013; Zentner & Mitura, 2012). Although we do not find sex differences in preferred relationship length, we did observe an interaction with archetype such that women's preferences were more distinctive than those reported by men. Specifically, women favoured shorter relationships with the ideal fling but longer relationships with the ideal spouse.

To summarise, we found that conservatives believed that the one-night stand prospect more closely resembled a long-term mate, relative to liberals. The variance between perceptions of the ideal fling and ideal spouse was greatest among liberals, indicating that those participants adopted two distinctive sexual strategies (i.e., short-term mating with the ideal fling; long-term mating with the ideal spouse). This supports the claim that individuals from liberal groups are more likely to demonstrate distinctive short- and long-term preferences, whereas those from conservative groups overperceive some mates' suitability as a long-term partner.

3.4   General Discussion

How do differences in specific social norms shape the traits that individuals seek in short-term and long-term partners? We examined perceptions of the ideal short- and long-term mate; in so doing, we found that conservatives demonstrate a regional- and individual-level bias such that they believe that potential mates lacking in desired long-term traits (e.g., status, emotional warmth) are nonetheless suitable for comparatively longer relationships.

In study 2 we found that liberals prioritise genetic traits when choosing a short-term mate but parental quality is favoured for long-term mates. Nonetheless, ideal short- and long-term mates were less distinct for conservatives. When asked to describe their ideal short-term partner, conservatives described a mate who shared similar traits to their ideal long-term partner. This effect was replicated for two measures of conservatism-liberalism. Study 3 found that, relative to liberals, conservatives were more willing to invest in

long-term relationships with hypothetical partners. This was unique to the ideal fling condition; for the ideal spouse condition, both groups successfully identified that the target mate was suited for a long-term relationship. This is particularly interesting given that the ideal fling was comprised of the traits that conservatives claimed to value in short-term, but not long-term, relationships (study 2). Taken together, these findings support our prediction that conservatism - at the regional- and individual-level - moderates mate preferences, such that individuals avoid short-term mating, foregoing a potential genetic payoff for their offspring.

3.4.1 Social and Adaptive Benefits of a Long-Term Mate Bias

These findings offer clarity to our understanding of how social norms shape evolved mate preferences. Most research has approached mate preference from the perspective of evolutionary-based goals (i.e., maximising fitness) or social goals (i.e., conforming to group norms). The present research offers something new by investigating how, and when, humans avoid short-term mating, passing on the genetic payoff.

The findings also indicate that evaluations of a prospective mate is weighted by social norms surrounding sexuality. According to this approach, short-term mating is a viable mating strategy in liberal groups, so long as the potential mate has an acceptably high good genes value. Put another way, if the benefits to offspring outweigh the costs, even conservatives should consider short-term mating. For individuals in conservative groups, however, short-term mating is *only* viable when the target mate has an exceptionally high good genes value. In practice this means that conservatives will view mates who have good genes traits, but lack parental traits, as nonetheless being suited to comparatively longer relationships. These findings complement observational data, which has found that individuals from conservative regions have a higher threshold for short-term mating (Schmitt, 2002; Muggleton & Fincher, 2017; Thornhill et al., 2009) and are less willing to divorce spouses who are poor long-term partners (Vandello & Cohen, 1999).

It is interesting to note that, when financially incentivised to guess other participants' ratings, the long-term bias persisted. This suggests that conservatives have internalised the bias such that they believe others will similarly rate the poor long-term prospect as being suitable for a committed relationship. Rather than a personal preference for long-term mating, conservatives did not indicate that the potential mate described in the ideal fling context is

poorly suited to parenting, responsibility, or commitment, and was thus a poor choice for a long-term mate. These findings are comparable to Durante and colleagues' work, which finds that ovulating women overperceive '*sexy cads*' suitability as good dads (Durante et al., 2012). The authors suggested that this perceptual bias evolved to induce women into mating with good genes males during peak fertility.

An alternative explanation could be that conservatives rated ideal fling partners as suited to long-term mating because they have less access to high quality mates. But given that conservatism did not predict evaluations of the ideal spouse, it is unlikely that mate scarcity or quality could account for these findings. Additionally, if conservatives are particularly attracted to fertility cues, we should have seen greater spend on good genes traits in study 2. Instead, conservatism negatively predicted spend on good genes traits. This indicates that our findings are not attributable to mate scarcity in conservative cultures.

More broadly, our findings conform with previous observations that natural selection favours behaviours that steer us away from the most costly error (Nesse, 2005; Haselton et al., 2015; Schaller & Park, 2011). In liberal groups, mating with the individual described in the one-night stand context is more costly in the long-term than the short-term. In conservative groups, the cost of ostracism could be greater than the cost of choosing a poor life partner. As such, individuals bias their mating strategies in favour of the least costly error.

Finally, we also found that the data could not be accounted for by experience of short-term mates. Specifically, conservatism, but not participants' past experience of uncommitted sex (SOI-B; Penke & Asendorpf, 2008), predicted short- and long-term preferences. Hence we can rule out the possibility that, given sufficient exposure to short-term mating, conservatives would modify their short-term mate preferences.

In sum we find evidence that local mating customs are maintained, in part, by individuals internalising group norms. If conservatives' avoidance of short-term mating was purely driven by their fear of punishment, then this would suggest that they still desired short-term mates but publicly suppressed their desire for uncommitted sex. In contrast, we found that conservatism negatively predicted evidence of distinctive, short-term mate preferences. In study 3, when asked to predict how other participants would perceive the target mates, conservatives were more likely than liberals to view potential partners

as suited for longer relationships - even when the target lacked long-term traits. Hence, when exposed to conservative norms, individuals experience a shift in judgement, perceiving good genes mates as partners worthy of investment.

3.4.2   Theoretical Implications

Previous evolutionary-based accounts of mate choice have shown that individuals trade-off between mates offering genetic and parental quality (Pillsworth & Haselton, 2006a; Li et al., 2002) and that this trade-off is influenced by environmental factors, such as disease prevalence, women's educational opportunities, and average birth weight (Trivers et al., 1999; Stanik & Ellsworth, 2010; Schmitt, 2002). Although valuable, this does not account for the wider context of mate choice, such as cultural norms, a desire for high status, and respect for one's kin. This report builds on previous research demonstrating that social, nonreproductive factors can moderate evolved mating strategies. In so doing, we sought to investigate cultural factors that can influence mate preference.

Our findings also question the extent to which prior literature can be generalised to diverse samples. Within social psychology there is clear evidence that attitudes are shaped by culture. To date, however, studies of mate preference have been based mostly on Western samples. Although the dual-sexual strategy has been studied extensively (e.g., Buss & Schmitt, 1993; Gangestad & Simpson, 2000; Gangestad & Thornhill, 2008), the present findings challenge the conclusion that adoption of the dual-sexual strategy is homogenous across cultures. Instead we provide preliminary evidence to suggest that strategies are contingent upon social norms, in addition to the genetic considerations. These findings could have significant implications for our understanding of cross-cultural differences in mate preference, as well as our understanding of mate guarding.

These findings could also have implications for the study of parental investment. Traditional accounts assume that, because men's minimum parental investment is low, they are typically the less choosy sex (Trivers, 1972). Although this may be true, our findings suggest that sex differences are modest, with men favouring long-term investment with mates who signal high-status and maternal warmth. Alternatively, men are less willing to invest in sexy mates who lack commitment traits. This is at odds with the *males-compete/females-choose* prediction and converges with several recent findings suggesting that sex differences are exaggerated (Thomas & Stewart-Williams,

2018; Hallam et al., 2018; Stewart-Williams & Thomas, 2013; Zentner & Mitura, 2012).

More broadly, we believe that the findings contribute to a wider understanding of how social norms are maintained. Related to this is the notion of cultural tightness, a construct that closely resembles, but is distinct from, conservatism. Tight cultures are those with homogenous social norms and high levels of punishment for those who violate these norms (Gelfand et al., 2011). In groups where social deviance is not tolerated, individuals should internalise multiple social codes that the group enforces. For example, conservative cultures demonstrate higher prevalence of religiosity (Saroglou, Delpierre, & Dernelle, 2004). In these groups the cost of deviance (*expressing atheist beliefs*) outweighs the costs of conforming (*religiosity*). As such, a bias for internalising religion could be adaptive. The present report has far-reaching implications for the study of social norms with respect to outgroup prejudice, gender roles, and social hierarchy.

3.4.3 Limitations and Future Research

The present study has several limitations. First, we relied solely on participants' stated preference rather than direct measures of preferences. Although this method has been reliably adopted and validated in previous studies (Snyder et al., 2011; Gangestad, Garver, et al., 2007), and the mate budget task added an element of forced trade-off (Li et al., 2002), implicit measures (e.g., implicit-association test (IAT), face preference, process dissociation, cognitive load) would provide a more accurate measure of attraction. Future research should incorporate direct measures, which would prove more conclusive in testing the psychological mechanisms underlying this bias.

Second, study 3 was designed as a forced-choice task, such that participants could not opt out of selecting a preferred relationship length. This was to ensure that conservative, sexually-inexperienced participants nonetheless evaluated all target mates. In a recent study, however, this methodology was amended, with participants being given the offer of selecting a long-term, short-term, or no relationship with the target individual (Snog, Marry, Avoid paradigm; Thomas & Stewart-Williams, 2018). Here the authors found that most participants chose to have neither a short- nor long-term relationship, indicating that both men and women are relatively choosy. Given this, future research might incorporate a mix of both forced-choice and opt-out studies.

Finally, this study focuses on participants' ideal mate (*mate prefer-*

ence) rather than their actual mate (*mate choice*). Although the two are related, the extent to which preferences translate into choice has been contested (Wincenciak et al., 2015). Future investigations into coupled men and women, and their partners' traits, could help us to understand the extent to which a long-term mate bias manifests within conservative societies.

3.4.4 Conclusions

In the present report we found that conservatives overperceive some mates' suitability as a committed partner. This effect was specific to hypothetical mates who were ideally suited to short-term mating (i.e., sexy but uncommitted). Ratings for ideal long-term mates (i.e., committed but not necessarily attractive) were consistently perceived across liberals and conservatives. Although it can be prudent for individuals to favour a short-term strategy with good genes mates, the genetic benefits for offspring may be offset by the potential for social backlash. Consistent with error management theory (Haselton & Buss, 2000) and signal detection analysis (Nesse, 2005) we find that, in conservative groups, a sexy but unfaithful mate could transform from being perceived as just a fling to an ideal spouse.

Chapter 4

Who Punishes Promiscuous Women? Both Women and Men Are Prejudiced Towards Sexually-Accessible Women, but Only Women Inflict Costly Punishment

4.1 Introduction

Amongst human freedoms, how often one has sex and with whom is basal and level with the freedom to think any thoughts, speak any words, and worship any object or being. But, in fact, not every one is allowed these freedoms. Across human cultures there exists a sexual double standard. Whereas young men are encouraged to "sow wild oats" (Crawford & Popp, 2003; Hadfield, 2011), young women and girls are at risk of slut shaming, female genital cutting, and honour killings (Doğan, 2016; Gruenbaum, 2005; Tate, 2016) for the same behaviours. Due to the importance of sexual freedom and the commonality across human societies of sexual double standards, several economic, sociological, and political models have been proposed to explain this gender imbalance. The present report seeks to inform the discovery of the ultimate causes of human sexual double standards by asking: who suppresses female

sexuality, and why? In answering this we propose a more nuanced version of sexual control theory than existed previously.

4.1.1 Evidence for Male-Driven Suppression

Given that men have historically dominated women politically and economically, it is logical to suggest that they have also dominated women sexually (Travis & White, 2000). By enforcing gendered double standards, men can monopolise sexual access to their mate(s) yet gain further access to additional females via extra-pair copulation (EPC) and thereby enhance their reproductive success. Therefore, men suppress female sexuality to maximise paternity certainty and, in so doing, ensure that property is inherited by legitimate male heirs (Buss, 2003; Coontz & Henderson, 1986). More recently, Rudman and colleagues have argued that men are more likely than women to endorse the sexual double standard, which they attribute to hostile sexism and belief in male entitlement (Rudman et al., 2013; Rudman & Mescher, 2012).

Yet despite intuitive appeal, this argument has several flaws. Although coupled men should be motivated to choose romantically faithful mates, single men could benefit from *promoting* female promiscuity. Empirical evidence supports this view, showing that men are more open to casual sex than women (Petersen & Hyde, 2010). What's more, whereas female peer groups pressure their friends to not go too far sexually (Crawford & Popp, 2003; Eder, Evans, & Parker, 1995; Kreager & Staff, 2009), adolescent males don't mind if a female peer is sexually experienced (Crawford & Popp, 2003; Coleman, 1961) and will actively encourage girlfriends to become more sexually experienced (e.g., B. C. Miller & Benson, 1999; see also Gámez-Guadix, Straus, & Hershberger, 2011). Counter to patriarchal models, none of the aforementioned studies found evidence to suggest that men stifle their partners' sexuality.[5]

4.1.2 Evidence for Female-Driven Suppression

At first glance the suggestion that women should self-regulate their behaviour in such a way that limits their choices and freedoms seems irrational. Yet on closer inspection, there is overwhelming evidence that women judge promiscuity harshly among their peers. Consider malicious gossip and slut shaming. A cursory glance at women's magazines and tabloids will demonstrate prejudice towards women deemed too sexy or showing too much skin. This trend is reflected in women's perceptions of sexual double standards. When asked which

sex judges sexually-accessible women more harshly, 46% of women reported that other women were harsher, but just 12% identified men as the harsher sex (Milhausen & Herold, 1999). From the view of male control theory, this is a strange and unnecessary behaviour. If men suppress female promiscuity, we should expect high levels of disapproval among men but indifference among women.

But consider this: more than 200 million girls and women alive today have been the victims of female genital cutting, with 3 million at risk each year (United Nations Children's Fund, 2013). Genital cutting is carried out to prevent women from enjoying sexual intercourse, thus restricting victims from engaging in premarital sex or EPC. Nevertheless, these practices are carried out by mothers and grandmothers (Hicks, 1996; Lightfoot-Klein, 1989), with fathers typically excluded from the process (Boddy, 1989). Do potential husbands demand cutting of their brides? On the contrary, Sudanese men prefer uncut wives (Abdalla, Omer, & Elmusharaf, 2012; Shandall, 1979). What's more, uncut, Western wives are often favoured in regions with high female genital cutting prevalence, with men stating that they want a wife who enjoys sex (Lightfoot-Klein, 1989).

This is difficult to reconcile with models of male-driven suppression; why should women maintain a practice that restricts their collective sexuality and is actively disliked by men? The notion of 'biological markets' was first outlined by Noë and Hammerstein (1994, 1995) to describe interactions between organisms (or 'traders') that involve the exchange of goods, such as food, shelter, and gametes, or services, such as protection, pollination, and warning calls. As goods and services become scarce (*demand outstripping supply*), organisms become increasingly competitive and will offer a higher sum for a given utility. More recently, Baumeister and colleagues have developed the concept of biological markets as a possible explanation for female sexual suppression. Sexual economics theory (Baumeister & Vohs, 2004) starts from the assumption that sex is a valuable 'product' that women supply and men demand (Baumeister et al., 2001). In societies where men dominate economically and socially, sexual access represents one of the few commodities that women control. In this view, to access sex men must offer benefits such as commitment, money, or status (Lu et al., 2015). Where sexual access can be bartered for benefits, women are at an advantage when the cost of sex is high. Crucially, this position of power is diminished when other women grant sexual access at a lower cost (Baumeister, Catanese, & Wallace, 2002). As

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such, women are incentivised to maintain a price floor, through the control of women's sexuality, to keep the price of sexual access high.

Nonetheless, there are several issues with sexual economics theory. First, Baumeister and colleagues' (Baumeister & Twenge, 2002; Baumeister & Vohs, 2004) theory is based largely on a literature review and noncurrent metaänalyses (Oliver & Hyde, 1993; for more recent reviews, see Petersen & Hyde, 2011, 2010) rather than direct empirical tests. Second, given that men (vs. women) hold more negative attitudes about other women (Swim, Becker, Pruitt, & Lee, 2010), it seems unlikely that they are champions of women's sexual liberation. For example, men are more likely to objectify sexualised women (Vaes, Paladino, & Puvia, 2011), which is associated with sexual aggression (Rudman & Mescher, 2012). Finally, some aspects of sexual economics theory seem paradoxical. Baumeister and Vohs (2004) claim that when a woman wears sexy clothing she is signalling that the cost of sex with her would be high. But given that women who wear sexually revealing clothes are perceived as more promiscuous (Goetz, Easton, Lewis, & Buss, 2016), we argue that provocative clothing should be interpreted as signalling a lower cost of sexual access. This conforms with the conventional wisdom that young women should refrain from "showing off the goods", that is, by wearing revealing clothing.

4.1.3 Uncovering Motives for Sexual Suppression

Conflicting models offer different accounts of female sexual suppression. Male control theories propose that men suppress women's sexuality to achieve status (Travis & White, 2000), increase paternity certainty (Buss, 2003), or maintain property rights for male heirs (Coontz & Henderson, 1986). Female control theories suggest that women suppress their own sexuality to maintain a price floor (Baumeister et al., 2002; Baumeister & Vohs, 2004), or as a form of intrasexual competition (Keys & Bhogal, 2016; Vaillancourt & Sharma, 2011). Although useful, it is unlikely that either theoretical approach captures the complexity of female sexual suppression. Instead, a review of the literature suggests that both men and women are prejudiced toward sexualised women, but in different contexts (e.g., Rudman & Mescher, 2012; Blake, Fourati, & Brooks, 2018; Keys & Bhogal, 2016; Vaes et al., 2011).

In the present report we provide further evidence that female sexual suppression cannot be attributed to one sex exclusively. Instead, we show that both sexes demonstrate prejudice, albeit via different mechanisms and for different reasons. We present findings from three studies designed to disentangle

the role of each sex in suppressing women's sexuality.

4.1.4 The Present Research

We argue that male-driven suppression is associated with a need to secure a sexually-faithful mate. That is, men are motivated to suppress female sexuality as a form of mate guarding and to raise paternity certainty. Owing to concealed ovulation and internal fertilisation, paternity is always less than certain. Men can, however, increase the likelihood of paternity via mate guarding, sexual jealousy, and choosing women who are sexually faithful (Bendixen, Kennair, & Buss, 2015; French, Meltzer, & Maner, 2017; Haselton & Gangestad, 2006; Leivers, Rhodes, & Simmons, 2014; Prokop & Pazda, 2016). From this perspective, men should demonstrate prejudice towards sexually-accessible women (prediction 1a). If men's prejudice is motivated by a desire to raise paternity certainty, then men should view sexually-accessible women as being less trustworthy (prediction 2a). Finally, men's prejudiced behaviour should be specific to mates or potential mates. That is, although men may seek to punish promiscuous behaviour in their partner(s), they are not incentivised to punish sexual-accessibility in women that they are not romantically involved with (prediction 3a). To summarise, men should favour nonsexualised women, but do not benefit from punishing sexually-accessible women.

At the same time, we argue that female-driven suppression is associated with intrasexual competition. In species where males invest in offspring, females may compete for high-quality mates (Stewart-Williams & Thomas, 2013). In our own species, intrasexual competition among women can take the form of competitor derogation (H. S. Fisher, Swaisgood, & Fitch-Snyder, 2003; Keys & Bhogal, 2016), malicious gossip about a rival's promiscuity (Buss et al., 1990; Laidler & Hunt, 2001), and aggression (Vaillancourt & Sharma, 2011). Consequently, women should demonstrate prejudice towards sexually-accessible women (prediction 1b). Previous research has found that women perceive rivals as more likely to poach a potential mate (Fink, Klappauf, Brewer, & Shackelford, 2014) or sabotage their sexual strategies by providing deliberately misleading romantic advice (M. Fisher & Cox, 2011; Russell, Ta, Lewis, Babcock, & Ickes, 2017). Given this, we predict that women will be less trusting of rivals who signal sexual-accessibility (prediction 2b). Finally, we predict that women will regulate their competitors' sexual behaviour by inflicting costly punishment on those signalling sexual accessibility (prediction 3b).[6]

To test our predictions we conducted three experiments based on three standard economic games. In all games, although the participants were told that they were playing the opponent in real time, they were playing against a computerised opponent who was either wearing a provocative or conservative outfit. In study 4 we recruited 400 participants to interact in the Dictator Game (DG). Unknown to the participant, all individuals were assigned to the role of Dictator. In study 5 314 participants chose a financial sum to invest in a sexually-accessible or -restrictive woman. In study 6 318 participants were assigned the role of 'Responder' in an Ultimatum Game (UG), choosing whether to accept (coöperate) or reject (inflict costly punishment on their game partner). All three experiments used a 2 (male vs. female participant) x 2 (sexually-accessible vs. sexually-restricted partner) between-subjects design, with four conditions: (a) male participant paired with accessible woman; (b) female participant paired with accessible woman; (c) male participant paired with restrictive woman, and; (d) female participant paired with restrictive woman.

4.2 Methods and Materials

4.2.1 Stimuli Production

We conducted a pilot study to develop and validate photographic stimuli that signalled whether a confederate was either sexually accessible or sexually restrictive. Participants rated six photographs for promiscuity, sociosexuality, and attractiveness. Three female models were recruited to produce experimental stimuli. For the sexually-accessible condition all women wore bold, red outfits (Prokop & Pazda, 2016; Keys & Bhogal, 2016), copious make-up (Coutinho, Hartnett, & Sagarin, 2007), tight-fitting clothes (Goetz et al., 2016), and - in one photograph - bore a tattoo (Swami & Furnham, 2007). In the sexually-restrictive condition, women wore neutral colours, natural make-up, did not have a visible tattoo, and wore loose clothing.[7] To avoid issues surrounding intrasexual competition among female participants (Vaillancourt & Sharma, 2011) or attraction effects among male participants (G. R. Miller, Tybur, & Jordan, 2007; Solnick & Schweitzer, 1999) we sought to ensure that women in the sexually-accessible and sexually-restrictive conditions were matched for attractiveness. Finally, to control for racial prejudice (Stanley, Sokol-Hessner, Banaji, & Phelps, 2011) we recruited models from three ethnic backgrounds: British-Caribbean, British-Caucasian, and British-Lebanese.

To enhance the believability of the cover story, all photographs resembled an informal, online profile picture. Photographs were taken in a kitchen environment that matched those found in a University's halls of residence or a bedsit. Photographs were taken using an iPhone 6S camera that was mounted on 100.4cm tripod stand. For each photograph, the model was instructed to stand on a marked spot that was 250cm from the camera. This distance allowed for a full body shot of the model.

Thirty-one participants (men = 23; women = 8) were recruited in an online study using Prolific Academic. Each participant viewed all six photographs. That is, participants saw each of the three models twice: once in the sexually-accessible context and again in the sexually-restricted context. Presentation of all photographs was counterbalanced.

For each photograph, participants were asked to rate the following question on a Likert-scale from 1 (not at all) to 7 (extremely): "How promiscuous do you think this woman is? Promiscuous means that a person engages in frequent, noncommitted sexual activity". Photographs were also rated from 1 to 7 for attractiveness ("How attractive is this woman?"). Finally, we administered an adapted version of the revised Sociosexual Orientation Inventory (SOI-R) (Penke & Asendorpf, 2008) questionnaire. Items were changed from a first-person perspective (e.g., "With how many different partners have you had sex within the past 12 months?") to a third-person perspective ("With how many different partners do you think this woman has had sex within the past 12 months?"). The modified SOI-R questionnaire is outlined in Appendix B. The to-be-rated photographic stimuli remained present on the screen throughout testing.

Overall, participants reported that the models in the sexually-accessible context had a higher SOI-R score, $F(1, 29) = 33.56$, $p = .002$, $\eta_G^2 = .29$. When explicitly asked to rate the models' level of promiscuity, scores were greater in the sexually-accessible context, $F(1, 29) = 18.14$, $p < .001$, $\eta_G^2 = .023$. But participants' ratings of attractiveness were matched in both conditions, $F(1, 29) = 0.00$, $p = .95$, $\eta_G^2 = .001$. For all dependent variables, sex and the Sex x Context interaction were not significant (Fs < 1, ps > .30), indicating that both sexes perceived the sexually-accessible and sexually-restrictive photographs in a comparable manner. For all measures the Model x Context interaction was not significant (Fs < 1.68, ps > .19), suggesting that the effect of provocative clothing was consistent across each model.

4.2.2 Experimental Set-Up

For each experiment participants were told that they were taking part in an "Economic Decision-Making Game". They were asked to log in at a specific time, as they were to play an online opponent in real time. But rather than competing against a human opponent, participants were unknowingly interacting with computerised responses. Participants were told: "You are now being matched with a partner, who could be located anywhere in the world. This could take 2-5 minutes". The instructions stated that, if a match could not be made within five minutes, the study would be terminated and the participant would receive their participation fee. In fact, the waiting time was standardised at 30 seconds for all participants. During this time a loading wheel was presented and participants were asked to wait while a partner was identified.

Participants were required to pass a comprehension task before proceeding to the task, to ensure that they understood the rules of the economic game. This task was repeated until they successfully completed the comprehension task. Next, participants chose an online screen-name and were given the opportunity to upload a profile picture of themselves. Participants then viewed a 'profile picture' of their opponent, whose screen-name was 'Emily'. The precoded picture was randomly selected from the six photographs outlined in section 4.2.1 and indicated that their opponent was sexually-accessible or sexually-restrictive (counterbalanced between participants).

Participants then continued onto one of the three economic games that are outlined below. Finally, to ensure that answers were incentive-compatible, participants were told that they would be entered into a prize draw to earn the sums determined by the game. In fact, a randomly selected participant received the full £20 sum, independent of their actions during the game.

4.3 Study 4

4.3.1 Introduction

The aim of study 4 was to test whether men and women were less altruistic towards sexually-accessible, relative to sexually-restrictive, women. To test this we presented participants with a DG. In DGs, two players are randomly paired and assigned the roles of *Dictator* and *Receiver*. The Dictator is initially given a sum of money (σ) but the Receiver is given nothing. Next, the Dictator can choose to give a share (δ) of her portion to the Receiver such that $0 \leq \delta \leq \sigma$.

This results in:

$$\text{Dictator's payoff} = \sigma - \delta$$
$$\text{Receiver's payoff} = \delta \tag{4.1}$$

From an economic perspective, the Dictator should always give the sum $\delta = 0$ so as to maximise her payoff. But empirical evidence suggests that the majority of Dictators choose to offer the Recipient a nonzero sum (Edele, Dziobek, & Keller, 2013). This sum is determined by the Dictator's liking of their partner (Wu, Leliveld, & Zhou, 2011; Brañas-Garza, Durán, & Espinosa, 2011; Whitt & Wilson, 2007). As such, participants who judge their partner favourably should give a higher sum than to those they dislike.

The aim of study 4 was to establish whether men and women offer smaller monetary sums to sexually-accessible women. In an online study participants engaged in a DG with a female player. Unknown to participants, they were matched with a computerised player whose responses were precoded. The computerised player had a profile picture to signal that she was either sexually-accessible or sexually-restrictive. We predicted that both men and women would offer lower sums to women in the sexually-accessible outfit (predictions 1a and 1b).

4.3.2 Method

Participants

Based on effect sizes observed in the pilot study ($\eta_p^2 = .02$) an a priori power analysis indicated that a sample of 401 participants was needed to detect a significant Sex x Context interaction with sufficient power, $1 - \beta = .9$ at $\alpha = .05$ (easypower; McGarvey, 2015). Four hundred British participants (men $= 203$; women $= 197$) were recruited in a Prolific Academic study. Participants were diverse with respect to age ($18-44$; $M = 30.45$; $SD = 6.94$), relationship status (single $= 29.4\%$, in a relationship $= 23.5\%$, married / engaged $= 44.4\%$, divorced or widowed $= 2.7\%$), and education (high school or less $= 9.3\%$, college or higher education $= 75.8\%$, masters or professional degree $= 15.0\%$). Most participants were heterosexual (90.9%), homosexual (4.2%), or bisexual (3.2%); 1.7% answered "other" or "prefer not to say". All participants were financially reimbursed for their time.

Design

In a between-subjects design participant sex (male, female) and context (sexually-accessible, sexually-restrictive) were the independent variables. The dependent variable was the sum offered to the partner.

Procedure

Following the experimental set-up (section 4.2.2), participants received instructions about the DG. Participants were told that they would be randomly assigned to the role of *Giver* (i.e., Dictator) or *Receiver*.[8] All participants were, however, assigned to the Giver role. The participant was given a sum of £20 and asked to decide how much (if anything) he or she would like to share with the Receiver.

4.3.3 Results

Do sexually-accessible women receive a smaller payout in a Dictator Game? To analyse the effect of female promiscuity on participants' DG offers, we performed a 2 (context) x 2 (sex) factorial ANOVA.

Figure 6 plots the sum given by participants as a function of context (sexually-accessible, sexually-restrictive) and participant sex. The main effect of context was significant, $F(1, 396) = 9.01$, $p = .003$, $\eta_p^2 = .02$, $\mathrm{BF}_{01} = 0.12$, providing "substantial evidence" that sexually-accessible women receive lower offers than sexually-restrictive women (cf. Wagenmakers, Wetzels, Borsboom, & van der Maas, 2011). Specifically, the mean offer fell from £8.44 95% CIs [7.79, 9.08] in the sexually-restrictive condition to £7.09 95% CIs [6.48, 7.69] in the sexually-accessible condition.

But neither the main effect of participant sex, $F(1, 396) = 0.90$, $p = .344$, $\eta_p^2 < .01$, $\mathrm{BF}_{01} = 7.88$, nor the interaction term, $F(1, 396) = 0.52$, $p = .470$, $\eta_p^2 < .01$, $\mathrm{BF}_{01} = 3.66$ reached significance. Given that $3 < \mathrm{BF}_{01} < 10$ provides "substantial evidence" for the null prediction (Wagenmakers et al., 2011), we concluded that participant sex does not moderate offers made to (sexually-accessible) opponents in the DG.

One possibility is that the observed findings of lower altruism towards sexually-accessible women is moderated by relationship status. That is, women in relationships might be more hostile than single women as they stand to lose more (i.e., a romantic partner) to a sexually-accessible woman. We found,
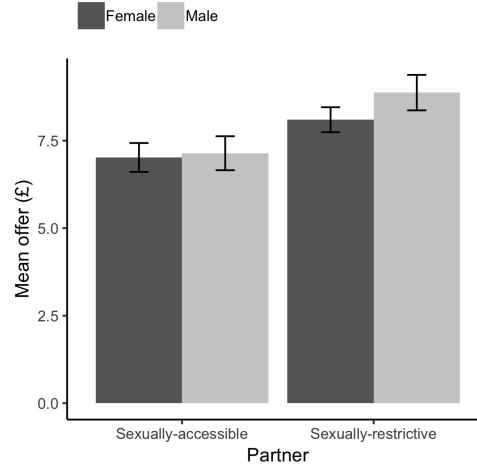
Figure 6: Mean offer in the Dictator Game (DG) as a function of context and participant sex. *Note.* Error bars denote standard error.

however, that neither participants' relationship status (Fs < 1.93, ps > .12) nor the effect of sexual orientation reached significance (Fs < 1.08, ps > .36).

4.3.4 Discussion

In study 4 participants assumed the role of Dictator and chose how much of their budget - if anything - they'd like to share with a recipient. As predicted, both men and women offered lower sums when their partner signalled sexual-accessibility (predictions 1a and 1b). Given the anonymous nature of the game, participants' behaviour could not have been driven by perceptions about socially desirable behaviour. Further, participants were told that this was a 'one-shot game', meaning the Recipient could not deliver punishment. Hence we can conclude that the observed effect was caused by prejudicial behaviour towards women wearing an outfit that signalled sexual-accessibility.

4.4 Study 5

4.4.1 Introduction

The purpose of study 5 was to test whether men and women are less trusting of sexually-accessible, relative to sexually-restrictive, women. To test this we presented participants with a Trust Game (TG). In this task participants are paired and each player is randomly assigned the role of *Investor* or *Trustee*.

The Investor is initially given a sum of money (σ) but the Trustee is given nothing. The Investor can choose to invest a share (δ) of her portion with the Trustee such that $0 \leq \delta \leq \sigma$. This results in:

$$Investor's \ sum = \sigma - \delta$$
$$Trustee's \ sum = \delta$$

(4.2)

The Experimenter subsequently triples the amount that the Investor gives to the Trustee such that the Trustee's sum is $3 \times \delta$. The Trustee then decides how much - if anything - to return to the Investor. Investing in the Trustee is a high risk strategy. If the Trustee is honest, the Investor can increase their earnings by maximising their investment; if the Trustee is dishonest, the Investor could stand to lose their invested sum. The sum invested is therefore a proxy for measuring the extent to which an individual trusts their game partner. The TG is a useful tool when experimenters wish to examine the "give-and-take" pattern of social relationships (Cronk, 2007). Levels of investing in the TG has variously predicted investment among resettled (vs. nonresettled) villagers in Zimbabwe (Barr, 2004), gift-giving obligations among the Maasai community (Cronk, 2007), and self-reported general trust (Gobin & Freyd, 2014). In the domain of sexual behaviour, Stirrat and Perrett (2010) found that men higher in testosterone were more likely to cheat their opponent and received smaller investment sums than men lower in testosterone. In sum, the literature suggests that one's trust in an agent's propensity to 'play fair' and adhere to social norms of reciprocity is captured by one's willingness to risk a financial sum, in the hope of fair play, in the TG.

Based on the previous finding that performance in the TG is associated with real-world trust, we predicted that men and women would be less trusting of women signalling sexual accessibility (predictions 2a and 2b).

4.4.2   Method

Participants

Based on the effect sizes observed in study 4 ($\eta_p^2 = .02$) an a priori power analysis indicated that a sample of 81 participants per condition would be sufficient to detect a medium-sized Sex x Context interaction with sufficient power, $1 - \beta = .8$ at $\alpha = .05$ (easypower; McGarvey, 2015). Owing to six participants failing to complete the task, recruitment was marginally lower

than our target of 320 participants. One-hundred and fifty-eight men and 156 women were recruited in a Prolific Academic study. Participants were from 25 unique countries and ranged from 18-73 ($M = 31.41$, $SD = 10.07$). Of these, 40% were single, 37% were in a relationship or engaged, 23% were married, and 1% were divorced. Most participants were heterosexual (90.5%). The rest were homosexual (3.8%), bisexual (2.5%), or selected "other" or "prefer not to say" (1.9%). All participants were financially reimbursed for their time.

Design

In a between-subjects design, participant sex (male, female) and context (sexually-accessible, sexually-restrictive) were the independent variables. The dependent variable was the sum offered to the partner.

Procedure

Following the experimental set-up and exposure to stimuli (section 4.2.2) participants were told that they would be randomly assigned to the role of *Investor* or *Trustee*. In fact, all participants were assigned to the role of Investor. The participant was given a sum of £20 and asked to decide how much (if anything) he or she would offer to the *Trustee*.

4.4.3   Results

Do men and women differ in their trust of sexually-accessible women? A two-way ANOVA yielded a main effect for condition, $F(1, 310) = 5.75$, $p = .017$, $BF_{01} = 0.58$, $\eta_p^2 = .02$, indicating that women signalling sexual-accessibility were endowed with less money in the TG ($M = 10.3$, $SD = 5.78$) than those signalling sexual-restrictiveness ($M = 11.8$, $SD = 5.94$; Figure 7). The main effect of participant sex was not significant, $F(1, 310) = 0.33$, $p = .567$, $BF_{01} = 6.90$, $\eta_p^2 = .001$. The interaction effect was not significant, $F(1, 310) = 3.66$, $p = .057$, $BF_{01} = 3.93$, $\eta_p^2 = .01$.

As with study 4, we explored the role of participants' relationship status and sexual orientation as potential moderators. Neither participants' relationship status ($Fs < 1.42$, $ps > .22$) nor sexual orientation ($Fs < 0.83$, $ps > .51$) reached significance.
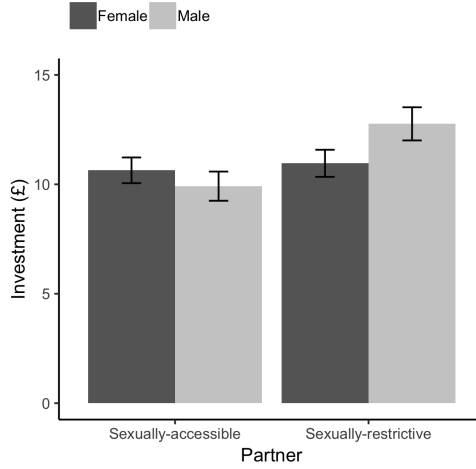
Figure 7: Mean investment in the Trust Game (TG) as a function of context and participant sex. *Note.* Error bars denote standard error.

4.4.4 Discussion

In study 5 participants were assigned the role of Investor and chose how much, if anything, to invest with a Trustee. Our prediction was confirmed; participants invested less when their game partner signalled sexual-accessibility (prediction 2). The design of the task was incentive-compatible, meaning participants believed there could be financial repercussions for their actions in the game. As such, it appears that both sexes believe that sexually-accessible women are less trustworthy than sexually-restrictive women.

More broadly, the finding that sexually-accessible women are deemed less trustworthy is consistent with Bourdage and colleagues' (2007) finding that honesty-humility negatively correlates with sociosexuality. This association can be understood when we view honesty-humility as one's propensity to play fair or an aversion to cheat or exploit others. Viewed through this lens, the findings in study 5 are consistent with our view that sexually-accessible women are perceived as more likely to cheat on mates or poach the mates of others.

4.5 Study 6

4.5.1 Introduction

Study 6 uses an Ultimatum Game (UG) to test whether women (vs. men) are more willing to inflict costly punishment on sexually-accessible women. The

UG bears close resemblance to the DG. A pair is allocated a sum of money (σ) and the Proposer chooses how much - if anything - to offer to the Responder (δ), resulting in:

$$\text{Proposer's share} = \sigma - \delta$$
$$\text{Responder's share} = \delta \tag{4.3}$$

The Responder now has the chance to accept or reject the Proposer's offer. If he accepts, the money is split according to equation 4.3. But if he rejects, both the Proposer and Receiver receive nothing. Classical economic accounts argue that the Responder should accept any value of $\delta > 0$, as it increases his net earnings (Camerer, 2003). Yet previous studies show that Responders will reject any offer that is deemed unfair (Fehr & Gintis, 2007) and that third-parties will punish the Proposer when she makes an unfair offer (Fehr, Fischbacher, & Gächter, 2002; Gintis, Bowles, Boyd, & Fehr, 2003). Rejecting an unfair offer can be viewed as costly punishment as the Responder is foregoing payment δ to ensure that the Proposer receives nothing.

The aim of study 6 was to test whether men and women inflict costly punishment when their game partner signals that she is a sexually-accessible women. We predicted that women, but not men, would inflict costly punishment on sexually-accessible women (predictions 3a and 3b).

4.5.2 Method

Participants

Based on the small to medium effect sizes observed in studies 4 and 5 an a priori chi-squared power analysis indicated that a sample of 320 would be needed to detect a count-based Sex x Context interaction with sufficient power, $1 - \beta = .8$ at $\alpha = .05$ (easypower; McGarvey, 2015). Three hundred and eighteen participants (men = 132; women = 186) were recruited in an online study. Of these, 200 were recruited using Prolific Academic. The remaining 118 participants were recruited via email and social media as part of an undergraduate dissertation. All participants were aged 18-75 ($M = 41.33$; $SD = 53.86$) and varied in educational attainment (high school or less = 10.38%, college or higher education = 68.87%, masters or professional degree = 20.75%). Most participants reported that they were heterosexual (91.5%), homosexual (2.5%), or bisexual (2.5%); the rest answered "other" or "prefer not to say" (3.5%).

Design

In a between-subjects design, participant sex (male, female) and context (sexually-accessible, sexually-restrictive) were the independent variables. The dependent variable was the participant's response to the offer (accept, reject).

Procedure

Following the experimental set-up (section 4.2.2) participants were allocated the role of Responder. All participants received an unfair offer of £2 from the Responder (i.e., 10% of the total sum) and decided whether to accept or reject the offer.

4.5.3 Results

Are men or women more likely to inflict costly punishment to sexually-accessible partners? We used chi-squared tests to predict the frequency of responses. The main effect of sex was significant, $\chi^2(1, N = 318) = 6.19$, $p = .013$, $BF_{01} = 0.24$, with women significantly more likely than men to reject an offer. The main effect of condition, however, was not significant, $\chi^2(1, N = 318) = 0.00$, $p = .983$, $BF_{01} = 7.11$, signalling that sexually-accessible and sexually-restricted women did not differ in levels of punishment received. To explore the Sex x Condition interaction we used the Cochran-Mantel-Haenszel (CMH) test with continuity correction to predict the frequency of responses. The CMH test is a variant of the chi-square test and is used for multiple chi-square tests across multiple groups. In the CMH test participant sex, condition, and choice (accept, reject) were our factors. The CMH revealed a significant interaction, $\chi^2_{MH}(1) = 6.15$ $p = .01$. The common odds ratio across groups was not equal to 1, OR = 1.81 95% CIs [1.15, 2.84], indicating that there was a significant association between participant sex and outcome across conditions (Figure 8).

Posthoc analysis

A chi-square test of independence was performed to examine the relation between participant sex and willingness to accept an unfair offer from a sexually-accessible woman (Table 5). The relation between these variables was significant, $\chi^2(1, N = 169) = 8.15$, $p = .004$, $BF_{01} = 0.10$. Women were 2.46 95% CIs [1.32, 4.65] times more likely than men to reject an offer from a sexually-accessible woman.
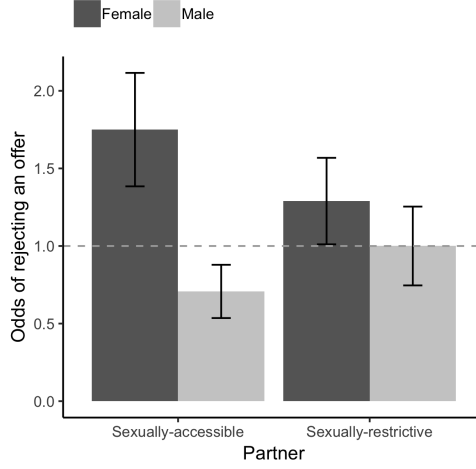
Figure 8: Odds for accept-reject rates in the Ultimatum Game (UG) as a function of context and participant sex. *Note.* Error bars standard error. Dashed line reflects the point of indifference between accept and reject, OR = 1.

Table 5: Results from chi-square tests as a function of participant sex and Condition.

Sex	Condition	Outcome	Observed	Expected	Δ	χ^2	p
Male	Accessible	Accept	41	35.0	-6.0	2.06	.151
		Reject	29				
	Restricted	Accept	31	31.0	0.0	0.00	1.00
		Reject	31				
Female	Accessible	Accept	36	49.5	13.5	7.36	.007
		Reject	63				
	Restricted	Accept	38	43.5	5.5	1.39	.238
		Reject	49				

In the sexually-restrictive condition, however, men and women were equally likely to accept an offer from a sexually-restrictive woman, $\chi^2(1, N = 149) = 0.58$ $p = .45$, $BF_{01} = 3.77$ (Figure 8). Women were no more likely than men to inflict costly punishment on a sexually-restrictive woman, OR = 1.29 95% CIs [0.67, 2.49].

4.5.4 Discussion

In study 6 participants assumed the role of Responder and chose whether to accept or reject an unfair offer. As predicted, women accepted offers from sexually-restrictive partners at chance (see 95% CIs, Figure 8) but were more

likely to reject offers made by sexually-accessible women (prediction 3b). But men did not choose to punish sexually-accessible women (prediction 3a) and accepted offers at chance.

Taken together, these findings indicate that men are not incentivised to punish sexually-accessible women so are not willing to incur a cost to do so. Women, however, adopt costly punishment such that they are willing to incur a £2 fine to ensure that their partner did not receive £18.

4.6   General Discussion

To date, conflicting models have offered differing accounts for the origins of women's sexual suppression. In the present report, however, we found that both men and women are prejudiced towards sexualised women. Independent of own sex, participants were less altruistic in sharing a financial endowment when paired with a sexually-accessible woman (study 4). Prejudice was also observed in study 5, where participants were less likely to trust a sexually-accessible woman with a financial investment. In study 6, however, women, but not men, were willing to inflict costly punishment on sexually-accessible women.

4.6.1   Sex-Specific Motives for Prejudice

These findings suggest that, although men are less generous towards, and trusting of, sexually-accessible women (studies 4 and 5), they do not seek to actively punish them (study 6). Although more research is needed to understand the exact process, this bias can be viewed as pragmatic: when women offer low paternity certainty, men should invest low sums to gain sexual access; when paternity certainty is high, men should be more willing to invest. But it is nonrational for men to inflict costly punishment on a woman that he is not romantically involved with as he is unaffected by an unknown woman's sexual behaviour. As such, men's punishment behaviour is not affected by a target woman's sexual-accessibility.[9]

These findings are difficult to reconcile with male control theories of female sexual suppression. Proponents of this view have typically argued that men suppress women as a class and are motivated to punish all forms of female sexuality (Travis & White, 2000; Rudman et al., 2013). Our findings, however, suggest a more nuanced approach is needed. As we have seen, men seem disinterested in suppressing women's sexual autonomy by means of costly pun-

ishment. Although prejudice undoubtedly exists, the evidence suggests that men's behaviour is more flexible than has been previously assumed by male suppression theories.

Our findings also suggest that women are motivated to punish sexually-accessible rivals. This conforms with the suggestion that women coördinate to keep the cost of sex high (Baumeister et al., 2002; Baumeister & Vohs, 2004). To achieve this, they contend, women must coöperate by restricting sexual access. This is undermined if some women lower the cost of sex. For example, if all women demand marriage as a prerequisite for sex then more men will be willing to invest early in relationships. But if some women offer access to casual sex, men can choose either short- or long-term relationships. Consequently, a woman who offers sexual access, but at a high cost (e.g., after marriage), may find her bargaining power diminished.

It is interesting to note that there was a main effect of participant sex, such that women were more likely than men to punish their opponent independent of the experimental condition. This might reflect that intrasexual competition is present even when female participants are paired with a non-sexualised opponent (Sutter, Bosman, Kocher, & van Winden, 2009). Alternatively, this might reflect chivalric behaviour among male participants towards female partners (Eckel & Grossman, 2001).

4.6.2 Theoretical Implications

Taken together, these findings undermine the view that prejudice towards sexualised women are solely attributable to either sex. Instead, both sexes perpetuate and maintain prejudiced evaluations of sexually-accessible women, but for different reasons. Therefore, we propose a theory of female sexuality that acknowledges that men and women have different routes to reproductive success, and that both men and women can attempt to control a woman's sexuality simultaneously. This complements previous evidence that men and women are motivated to objectify sexualised women via different mechanisms (Vaes et al., 2011).

A key implication of these findings is the need to recognise the foundational role of the local ecology and circumstances for whether female control or male control is more dominant or whether they are equivalent for the actual shaping of a woman's sexual behaviour at a given point in time. This is not a new observation, and speaks to a wider finding that ecological factors shape sexual suppression (Price, Pound, & Scott, 2014; Baumeister & Mendoza, 2011;

Schacht & Bell, 2016). Blake and colleagues recently highlighted how aspects of the local mating ecology can shape both men and women's endorsement of female sexual suppression (Blake, Fourati, & Brooks, 2018; Blake, Bastian, Denson, Grosjean, & Brooks, 2018). In support of female-driven suppression, there is recent evidence that women are more likely to sexually-objectify themselves under ecological conditions of income inequality (although not gender inequality; see Blake, Bastian, et al., 2018). This could indicate that economic volatility induces women to use sexualisation as a form of intrasexual competition.

More broadly, our results find that sexual suppression cannot be described as being either male- or female-driven. Instead, more nuanced models are needed to understand society's propensity to suppress female sexuality. The sex difference in the derogation of a sexually-accessible women highlights the value of an evolutionary framework, which seeks to understand variation between male and female motives. If society is to understand and overcome the sexual double standard, interventionists should seek to uncover how men and women vary in their attitudes towards sexualised women.

4.6.3 Limitations and Future Research

This report has several limitations. First, studies 4 and 5 recruited participants exclusively from the UK. The UK is relatively low in the global gender gap index (ranked 20 out of 144 countries) (World Economic Forum, 2016), offers statutory maternity and paternity pay, plus welfare support that does not discriminate between single and married mothers. As such, women's economic reliance on men is relatively low in the UK. This might result in weaker prejudice among women. Men's prejudice might also be weaker in the UK. That is, if women are increasingly independent it may be less costly to mate and reproduce. Yet despite this, we still observed that men and women were prejudiced towards sexually-accessible women. This limitation could be corrected by collecting data from less gender-equal societies.

A second limitation was the reliance on photographic stimuli rather than face-to-face interactions. Photographs were chosen because they allowed for stimuli validation and standardised interactions across participants. But it's unclear whether participants' judgements of brief photographic stimuli are comparable with their perceptions of physically meeting a woman dressed in provocative clothing. Related to this is the role of context. Had a confederate worn the outfits presented in the lab, she would likely receive a different

reaction than if she had been in a bar. Indeed, some might argue that the photographs displayed are not too dissimilar from many young women's profile pictures on Facebook, Snapchat, or Instagram. As such, participants in the present report may not have judged their partners as harshly as, say, in a real-world context. Nonetheless, despite this limitation, we observed prejudice towards the sexually-accessible (vs. sexually-restrictive) stimuli.

In the present report we provided sex-specific reasons for participants being less trusting of sexually-accessible women. There are, however, alternative explanations for this finding. It is possible that women high in sociosexuality are viewed as less trustworthy in all exchange relationships. Related to this is the finding that sociosexuality is associated with honesty-humility (Bourdage et al., 2007). de Vries and colleagues similarly argue that those low in honesty-humility are more likely to seek out opportunities to access both sex and money (de Vries, Tybur, Pollet, & van Vugt, 2016). Given that those high in sociosexuality are reported as being more arrogant and phoney (Bourdage et al., 2007), we might see that sexualised women are viewed as less trustworthy exchange partners, independent of sexual fidelity. Future research is needed to uncover whether the observed findings are associated with issues of paternity certainty or fear of exploitation in exchange relationships.

It is also worth noting that our methodology provides an indirect test of prejudice rather than a direct measurement of participants' motivations to suppress female sexuality. Economic games benefit from providing a quantifiable measure of concepts like altruism, trust, and costly punishment. What's more, these methods provide participants with a financial incentive to tell the truth, which has contributed to their popularity among evolutionary psychologists (Fehr & Fischbacher, 2004; Eisenbruch, Grillot, Maestripieri, & Roney, 2016). Nonetheless, we provide a caveat that economic games are an indirect observation of participants' hidden strategies and underlying prejudices.

There is some evidence that sexual suppression is moderated via contextual factors such as local levels of gender equality (Baumeister & Mendoza, 2011) and women's economic reliance on men (Price et al., 2014; Stanik & Ellsworth, 2010). In a recent paper, Blake and colleagues found plasticity in sexual suppression, such that support of the Islamic veil is higher among men, as well as women with a higher number of sons relative to daughters (Blake, Fourati, & Brooks, 2018). Taken together, these findings indicate that, in certain situations, female sexual suppression can be strategically advantageous for both men and women. Future work should consider additional moderating fac-

tors such as women's economic dependence on men, sex ratio (that is, skewed supply and demand), and ecological factors that influence moral norms (e.g., Weeden & Kurzban, 2013; Fincher & Thornhill, 2012; Rand, Tarnita, Ohtsuki, & Nowak, 2013). Nonetheless, we should be cautious of attempting to infer cognitive motivations for participants' observed behaviour. Further research is needed to develop our understanding of the specific mechanisms that promote female sexual suppression.

4.6.4 Conclusions

The present report develops a novel theory to understand what motivates individuals to suppress female sexuality. We show that sex-specific theories provide a better fit for the data than both male control theory and female control theory. By providing a more coherent theory for female suppression, society can begin to address harmful practices, such as slut shaming, female genital cutting, and honour killings.

Chapter 5

Ecological Predictors of Gender Inequality: A 54-Nation Study of Ecology, Opportunity, and Economic Inequality

5.1 Study 7

5.1.1 Introduction

The past century has seen an unprecedented shift in gender attitudes, with women achieving suffrage in 188 of 195 countries,[10] the proportion of women in the workforce rapidly increasing,[11] and many societies challenging of traditional codes of female sexuality.[12] Due to the importance of gender equality across human societies, several theories have been offered to account for these changes, variously highlighting specific cultural events (e.g., women's contributions during WWI, Smith, 2005; development of the contraceptive pill, Goldin & Katz, 2002), technological advancements (Jacobsen, 2011; Kronenfeld & Whicker, 1986), or a general trend towards global democratisation and egalitarianism (López-Córdova & Meissner, 2008) as fostering gender equality. Although insightful, these theories typically record isolated factors rather than providing a generalised account for these patterns. In response to these limitations there has been a growing interest in the link between social attitudes and ecological factors, such as pathogen prevalence (Thornhill & Fincher, 2014; Varnum & Grossmann, 2016), resource scarcity (Gelfand et al., 2011; Roos et

al., 2015), and life expectancy (Schmitt, 2005). The present report seeks to inform the discovery of the ultimate causes of gender inequality by identifying the ecological predictors of gender attitudes.

An ecological approach to cultural norms

There is ample evidence that ecological factors are important in determining regional variation in values. For example, disease prevalence (Tybur et al., 2016; Fincher & Thornhill, 2012; Fincher et al., 2008; Murray, Schaller, & Suedfeld, 2013), likelihood of war (Little, Burriss, Jones, & Roberts, 2007), low natural resources (e.g., food scarcity; Gelfand et al., 2011; Roos et al., 2015), high infant mortality (Schmitt, 2005), and demanding climate (Van de Vliert, 2013) all increase local levels of conservatism. Increased conservatism during times of environmental harshness could be adaptive as it minimises an individual's exposure to new experiences and social groups, which is more risky during times of threat (Schaller & Park, 2011). What's more, under conditions of societal threat, there is some evidence that conservative social groups outperform liberals (Roos et al., 2015; Gelfand et al., 2011).

Additionally, ecological factors promote sexual conservatism. Environmental harshness is associated with lower levels of sexual openness (Schmitt, 2005; Thornhill et al., 2010), a greater emphasis on female purity (Vandello & Hettinger, 2012), and preference for sexually dimorphic partners (i.e., masculine men, feminine women; de Barra, DeBruine, Jones, Mahmud, & Curtis, 2013), whereas disease prevalence predicts regional levels of gender inequality (Varnum & Grossmann, 2016; Gangestad, Haselton, & Buss, 2006; S. E. Hill, Boehm, & Prokosch, 2016; Thornhill & Fincher, 2014). Nonetheless, recent research found that women are more likely to sexually-objectify themselves under ecological conditions of income inequality (although not gender inequality; see Blake, Bastian, et al., 2018), suggesting that economic volatility induces women to use sexualisation as a form of intrasexual competition.

Gender inequality and cultural attitudes

In addition to ecological factors, sociocultural factors can predict attitudes regarding gender roles. For example, as societies place an increasing emphasis on women being educated and economically independent, both male and female citizens are less likely place an emphasis on securing a partner who conforms to the traditional roles of *female homemaker* and *male breadwinner* (Lu et al.,

2015; Stanik & Ellsworth, 2010; Zentner & Mitura, 2012; Sweeney & Can-cian, 2004). What's more, suppression of female sexuality is most prevalent in ecologies where women are financially reliant on men (Baumeister & Mendoza, 2011; Price et al., 2014) and when reproductive-age males are scarce (Schacht & Bell, 2016). At the regional level, societies that are richer, fitter, and better educated are more progressive in their attitudes towards gender (Inglehart, Norris, & Ronald, 2010; Napier, Thorisdottir, & Jost, 2010). Finally, there is observational evidence that industrialisation is associated with a loosening of gender norms. Whereas female promiscuity is suppressed in non-WEIRD (western, educated, and from industrialised, rich, and democratic) cultures, sexual double standards are challenged (Ringrose & Renold, 2012), or even reversed (Papp et al., 2015), in WEIRD cultures.

The present report

Although the studies outlined above suggest an association between ecological factors and gender attitudes, there are a number of potentially important limitations. First, prior research has typically used national levels of gender inequality as a proxy for gender attitudes. Aggregate differences between men and women's life chances (e.g., education, health outcomes, economic participation) are necessary but not sufficient to indicate that gender attitudes are associated with ecological harshness (see Brandt, 2011). For example, national levels of inequality can manifest from prejudice among a ruling minority rather than attitudes of the majority (cf. apartheid rule in South Africa). Additionally, much of the current evidence for socioecological predictors of gender attitudes is indirect (Brinda, Rajkumar, & Enemark, 2015; Uthman, Lawoko, & Moradi, 2010), does not control for intercorrelated items (Thornhill et al., 2010; Varnum & Grossmann, 2016), or based on aggregate data (Varnum & Grossmann, 2016; Brinda et al., 2015), thus ignoring the variability of attitudes within a population. The aim of this study is to provide a direct test at both individual and national levels for the socioecological factors that promote unequal gender attitudes by examining variation across 54 different countries. In so doing, we explore the interaction between individual- and national-level differences to uncover what ecological factors, if any, promote inequality.

We test this directly by analysing the sixth wave of the World Values Survey (WVS). To identify items relevant to the study of gender attitudes, we identified 10 items from the WVS questionnaire. Following Principal Component Analysis (PCA), the remaining five items were aggregated to provide a

gender attitudes score for 80 399 individuals in 54 countries. We then used a multilevel model analysis where individuals are nested by their nationality. We first explore the role of female empowerment and opportunity in predicting sexist attitudes. We then test the predictive power of socioecological factors. Our final analysis explores the gap between men and women's gender attitudes.

5.1.2 Method

Data treatment

World Values Survey   All participants completed the sixth wave of World Values Survey (WVS). The WVS reflects the work of a global network of social scientists who study changing social values with respect to family, society, politics, and other personal values. Researchers conduct face-to-face interviews with participants from approximately 60 countries using a common questionnaire. Participants are recruited to ensure a nationally representative sample of the adult population. If a given language is spoken by 15% of a country's population, the questionnaire is translated from the WVS's root language (English) to the local language(s). The sixth wave of the WVS comprised of 258 items. Data were collected between 2010 and 2012.

The entire WVS dataset comprised of 90 350 participants from 60 countries. Of these, participants from six countries or territories (Hong Kong, Iraq, Libya, Palestinian Territories, Taiwan, Uzbekistan) were removed owing to unavailable data at the national level. Participants with missing sex identification were also excluded from analysis. Our inclusion criteria are outlined in Figure 9.

Measuring gender attitudes in the WVS   To measure the extent to which an individual had progressive gender attitudes, we identified items indicating whether a participant believes that men and women are, or should be treated as, equal. For the present investigation, two behavioural psychologists independently rated each of the 258 items listed in the WVS as "yes" (*relevant measure of sexism*) or "no" (*irrelevant measure of sexism*). Interrater reliability was high, with both raters agreeing on all 258 items, ICC $= 1$, $p < .001$. Specifically, both raters highlighted the ten items listed in Table 6 as being relevant for the study of sexism (for the exact wording of each question, see Appendix C, Table 14). The remaining 248 items were labelled as not relevant by both raters and were excluded from subsequent analysis.
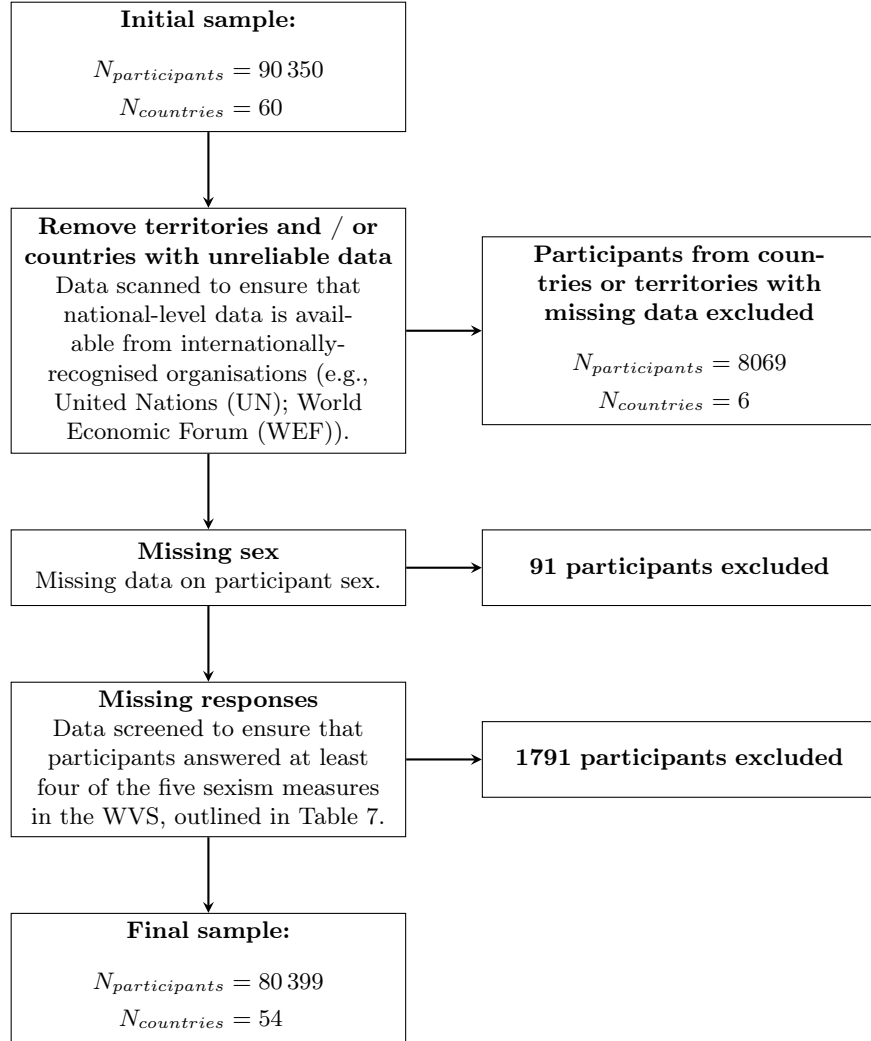
Figure 9: Flowchart of systematic inclusion criteria.

Table 6: Correlations for 10 items identified by independent raters as measures of sexism in the World Values Survey (WVS).

	V45	V47	V48	V50	V51	V52	V53	V54	V139
V47	.29								
V48	.01	-.10							
V50	.26	.25	.01						
V51	.42	.26	.03	.32					
V52	.31	.22	.04	.27	.41				
V53	.42	.26	.04	.31	.62	.49			
V54	.14	.08	-.03	.18	.20	.18	.22		
V139	.18	.13	.11	.10	.17	.20	.17	.01	
V208	-.13	-.09	-.08	-.06	-.13	-.16	-.13	-.01	-.17

Analysis   The correlation matrix of our ten variables indicated that five items - *V47*, *V48*, *V54*, *V139* and *V208* - did not sufficiently correlate with at least one other item ($|r| < .3$, Table 6) and were subsequently dropped from our analysis. For the remaining five items, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was high, KMO = .79, (see Kaiser, 1974), and above .73 for all individual items (greater than the recommended .5). For the data, Bartlett's test of sphericity was significant, $\chi^2(10) = 98\,664.84$, $p < .001$. These findings suggest that interitem correlations were acceptably large for PCA.

We conducted a PCA on the five items using a varimax rotation. Using the eigenvalue-greater-than-one rule and scree plot inflection analysis, all five items mapped onto one factor of gender attitudes. A summary of the items is provided in Table 7.

Data treatment   In line with previous studies (e.g., Ebbeler, Grau, & Banse, 2017; Archer, 2006), all correlational analyses were conducted at the country level. We then inputted the national-level variables to predict an individual's gender attitudes. Individual demographic variables, such as age and sex, were added to investigate the relationship between these variables and sexist attitudes.

Final sample   Participants were 80 399 adult participants (51.8% female; 48.2% male) from 54 countries (Table 8). The total number of participants in each region ranged from 799 to 5345 individuals ($M = 1488.87$; $SD = 706.87$).

Table 7: Items measuring gender attitudes in the World Values Survey (WVS) and factor loadings ($N = 82\,190$).

Item	Description	Loading
V53	"On the whole, men make better business executives than women do."	.83
V51	"On the whole, men make better political leaders than women do."	.80
V52	"A university education is more important for a boy than for a girl."	.70
V45	"When jobs are scarce, men should have more right to a job than women."	.67
V50	"When a mother works for pay, the children will suffer."	.56
Eigenvalue		2.57
Proportion of variance		.51
α		.76

Design

Dependent variable   Our dependent variable (an individual's sexism score) was calculated by averaging their responses to the five items listed in Table 7. Prior to aggregation, all five items were standardised between 0 (*sexist or nonprogressive attitudes*) to 1 (*nonsexist or progressive attitudes*).

Independent variables

Gender Gap Index (GGI)   To test the role of sociocultural factors, we explore the lag between women and men's life chances. The gender gap is preferable to assessing women's life chances in isolation as it provides a benchmark for women's economic, political, and social reliance on their spouse and/or male kin. For example, in a country where *both* men and women have low levels of educational attainment (e.g., Barbados), we might expect greater gender parity than in a country where male education is high but female education is moderate (e.g., Pakistan). Hence, the *gap* between men and women is more meaningful than the *absolute* level of female opportunity.

To measure the gap between male and female opportunities, we employed the four subindexes of the GGI (World Economic Forum, 2016). The GGI examines the gap between men and women with respect to four

Table 8: Total number of World Values Survey (WVS) participants by Country and Sex.

Country	Women	Men	Country	Women	Men
Algeria	579	591	Morocco	546	563
Argentina	533	463	Netherlands	986	849
Armenia	725	372	New Zealand	467	332
Australia	819	647	Nigeria	871	888
Azerbaijan	501	501	Pakistan	570	619
Bahrain	534	650	Peru	579	590
Belarus	845	684	Philippines	600	600
Brazil	925	557	Poland	519	435
Chile	496	485	Qatar	572	488
China	1082	1040	Romania	826	627
Colombia	760	748	Russia	1357	1097
Cyprus	534	464	Rwanda	770	757
Ecuador	620	582	Singapore	1083	889
Egypt	1033	490	Slovenia	606	443
Estonia	838	669	South Africa	1748	1746
Georgia	644	550	South Korea	607	589
Germany	1025	1011	Spain	602	572
Ghana	772	780	Sweden	635	564
India	2191	3154	Thailand	552	608
Japan	986	909	Trinidad & Tobago	543	450
Jordan	600	600	Tunisia	556	626
Kazakhstan	906	594	Turkey	810	771
Kuwait	446	794	Ukraine	900	600
Kyrgyzstan	764	736	United States	1142	1073
Lebanon	608	583	Uruguay	514	459
Malaysia	632	668	Yemen	491	494
Mexico	1000	998	Zimbabwe	810	690
Total				41 660	38 739

subindexes: economic participation and opportunity, educational attainment, health and survival, and political empowerment. Descriptions of the subindices, plus subitems and descriptive statistics, are provided in Appendix C, Table 15.

Socioecological factors   To test the effect of socioecological factors on gender inequality, we used the nine measures identified by Schmitt (2005) and validated by Kandrick and colleagues (2015). For each country, we obtained data on gross domestic product (GDP) per capita (World Bank, 2018c), life expectancy at birth (World Bank, 2018d), teenage pregnancy rate (World Bank, 2018a), mean age that women marry (World Bank, 2018f), fertility rate (World Bank, 2018b), low birthweight prevalence (World Bank, 2018e), childhood malnutrition prevalence (UNICEF, 2018), and infant mortality rate (World Bank, 2018g).

Control variables   In order to address differences in baseline opportunities for women, we use a set of control variables. First, we control for regional differences in baseline levels of gender development with the Gender Development Index (GDI) (United Nations Development Programme, 2017). Whereas GGI and its subcomponents measure the extent to which women are autonomous from men, GDI measures women's quality of life with respect to health, knowledge, and income per capita. The GDI is a subcomponent of the Human Development Index (HDI) measure that separately measures men and women's life chances. In addition to the quality of life measures, we controlled for individual-level measures of participant sex, age, socio-economic status (SES), and education. Political studies show that demographic traits can predict sexist attitudes (Glick & Fiske, 1997; Swim et al., 2010).

Statistical analysis

Owing to the hierarchical structure of the data, we conducted a multilevel model with individuals nested within a given country. Multilevel modelling is beneficial as it allows researchers to investigate level 1 (individual-level) and level 2 (country-level) influencers separately but simultaneously. Level 1 predictors (age, SES, education, sex) were centred around their group mean (i.e., country mean). Level 2 predictors were centred around the grand mean.

5.1.3 Results

Validation of the gender attitudes measure

To ensure validity of the sexist attitudes via the five WVS items, we obtained an online sample of participants from Prolific Academic. A priori analysis showed that, to detect a medium effect size, $r = .30$, this study would require 112 participants. Analysis of comparable studies suggested a recruitment target of 177 (Brandt, 2011; Napier et al., 2010). Given this, our target sample size was set at 130 participants. One-hundred and thirty-one participants (men = 67; women = 63; other = 1; mean age = 30.97; $SD = 8.98$) from 24 different countries completed the five items from the WVS, plus four established measures of sexism (cf. Brandt, 2011).

The WVS-based scale was positively correlated with the old-fashioned sexism scale (Swim, Aikin, Hall, & Hunter, 1995), $r(131) = .41$, $p < .001$, and the modern sexism scale (Swim et al., 1995), $r(131) = .43$, $p < .001$, but negatively correlated with the hostile sexism inventory (Glick & Fiske, 1996), $r(131) = -.61$, $p < .001$, and the attitudes towards women scale, $r(131) = -.61$, $p < .001$ (Spence, Helmreich, & Stapp, 1973). In sum, the WVS-based scale provided a suitable measure of an individual's propensity to view men and women as unequal.

Gender attitudes in the WVS

Descriptive statistics Gender attitudes were most sexist in Yemen ($M = 28.69$) and least sexist in Sweden ($M = 80.09$). Globally, men were more inclined to demonstrate sexist attitudes (49.44), relative to women (57.66), $t(79\,754) = 48.08$, $p < .001$, $d = .34$. The descriptive statistics of our data is summarised in Table 9. National aggregates of gender attitudes are summarised in Figure 10.

Multilevel analysis of sexist attitudes We constructed a multilevel model by fitting individual variables as level 1 predictors (sex, age, education, SES), the national variables as level 2 predictors (GGI subscales, socioecological factors), and the control variables (HDI, GDI). Our models are outlined in Tables 10-12.

Table 9: Descriptive statistics for key variables.

Variable	Description	Source	Min	Max	Mean	(SD)
Dependent variable inc. subcomponents						
Attitude score	Aggregate of subitems	WVS	0	100	53.70	(24.56)
V45	Job scarcity	WVS	0	100	52.85	(44.79)
V50	Women as mothers	WVS	0	100	49.29	(30.54)
V51	Women in politics	WVS	0	100	48.04	(32.93)
V52	Women and education	WVS	0	100	65.11	(30.77)
V53	Women in business	WVS	0	100	52.79	(32.48)
Independent variables						
EPO	Economic Participation	WEF	0.31	0.83	0.63	(0.14)
PE	Political Engagement	WEF	0.01	0.54	0.20	(0.14)
EA	Educational Attainment	WEF	0.74	1.00	0.97	(0.05)
HS	Health and Survival	WEF	0.92	0.98	0.97	(0.01)
LBW	Low birthweight	WB	2.38	32.00	9.74	(5.91)
CM	Child malnutrition	UN	0.2	35.7	6.69	(8.26)
IM	Infant mortality	WB	1.8	66.9	14.82	(14.73)
LE	Life expectancy	WB	53.43	83.98	74.58	(6.17)
TP	Teenage pregnancy	WB	1.67	109.27	31.62	(25.21)
AM	Mean age women marry		19.9	32.3	24.2	(2.62)
FR	Fertility rate	WB	1.17	5.53	2.23	(0.89)
GDP	GDP per capita ($1000)	WB	0.66	63.51	16.15	(17.74)
Control variables						
GDI	Gender Development Index	UN	0.74	1.03	0.95	(0.07)
HDI	Human Development Index	UN	0.48	0.94	0.76	(0.12)

Note. WVS = World Values Survey; WEF = World Economic Forum; WB = The World Bank; UN = United Nations.
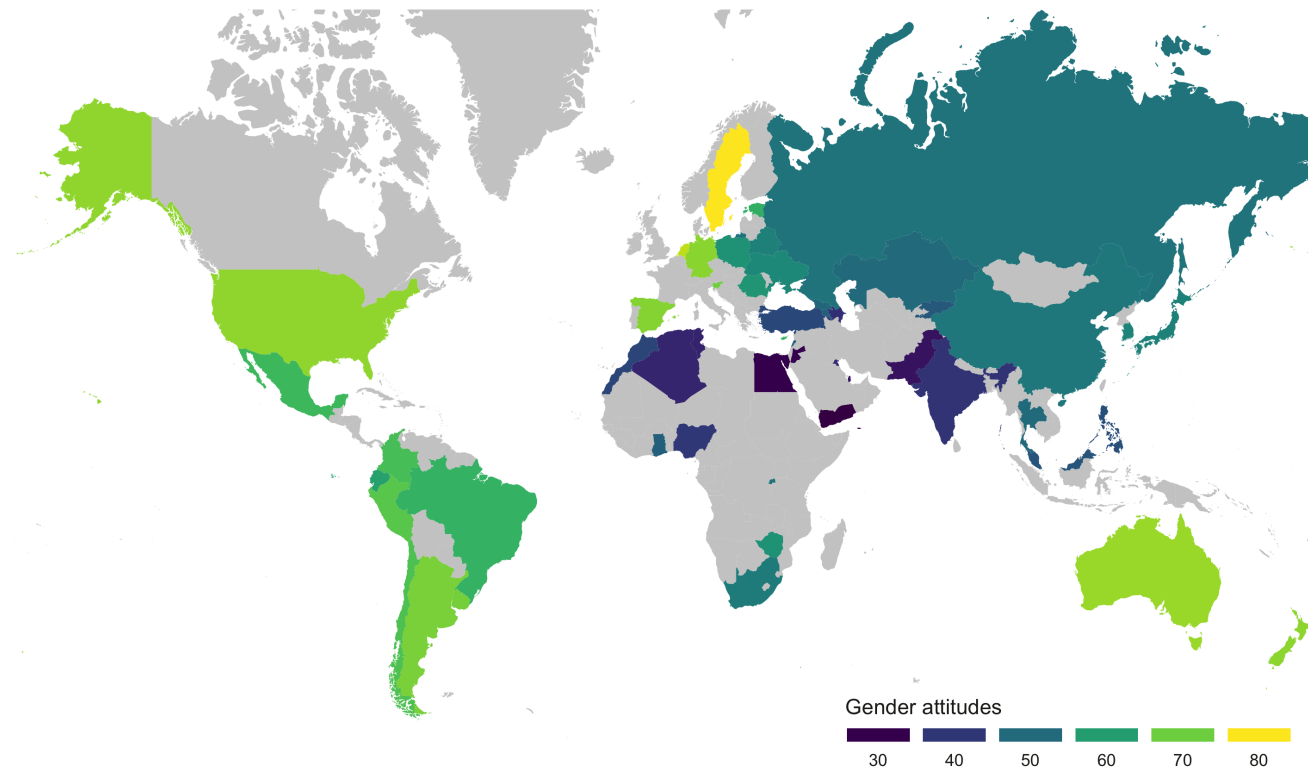
Figure 10: Heat map illustrating gender attitudes across 54 countries. Yellower countries demonstrated less sexist values in the gender attitudes questionnaire.

Table 10: Results of multilevel model analysis predicting sexist attitudes from demographic data (individual-level) and gender gap measures (national-level) plus the interaction with participant sex.

Predictors	I		II		III		IV		V		VI	
Intercept	54.12	(1.85)	57.90	(1.84)	57.23	(1.38)	57.71	(1.04)	57.90	(1.05)	57.90	(1.05)
Level 1: Effects of individual sexism												
Sex (0 = female)			-7.93	$(0.15)^{***}$	-7.93	$(0.15)^{***}$	-7.93	$(0.15)^{***}$	-7.93	$(0.15)^{***}$	-7.90	$(0.15)^{***}$
Age			-1.04	$(0.08)^{***}$	-1.04	$(0.08)^{***}$	-1.04	$(0.08)^{***}$	-1.04	$(0.08)^{***}$	-1.70	$(0.11)^{***}$
Education			2.81	$(0.08)^{***}$	2.81	$(0.08)^{***}$	2.81	$(0.08)^{***}$	2.81	$(0.08)^{***}$	3.10	$(0.11)^{***}$
SES			0.45	$(0.08)^{***}$	0.45	$(0.08)^{***}$	0.45	$(0.08)^{***}$	0.45	$(0.08)^{***}$	0.32	$(0.10)^{**}$
Level 2: Effects of national aggregates												
GDI					5.51	$(1.73)^{**}$	0.49	(3.01)				
HDI					4.81	$(0.09)^{**}$	6.51	$(1.39)^{***}$	6.00	$(1.11)^{***}$	5.50	$(1.11)^{***}$
EPO							4.44	$(1.95)^{*}$	4.73	$(1.17)^{***}$	4.79	$(1.17)^{***}$
EA							-1.33	(1.94)				
HS							1.65	(1.28)				
PE							5.65	$(1.16)^{***}$	5.63	$(1.14)^{***}$	5.07	$(1.14)^{***}$
Interaction terms												
Sex x Age											1.36	$(0.15)^{***}$
Sex x Education											-0.62	$(0.16)^{***}$
Sex x SES											0.20	(0.15)
Sex x HDI											1.04	$(0.15)^{***}$
Sex x EPO											-0.11	(0.15)
Sex x PE											1.14	$(0.15)^{***}$
Increase in model fit			$\chi^2(4) = 4692.93^{***}$		$\chi^2(2) = 31.24^{***}$		$\chi^2(4) = 32.83^{***}$		$\chi^2(3) = 2.38$		$\chi^2(3) = 225.00^{***}$	
Log-likelihood	$-343\,940$		$-341\,594$		$-341\,578$		$-341\,563$		$341\,562$		$341\,450$	
BIC	$687\,914$		$683\,266$		$683\,257$		$683\,238$		$683\,270$		$683\,081$	

Note. I = null; II = I + sex + age + education + SES; III = II + GDI + HDI; IV = III + GGI subscales; V = IV - poor-fit items; VI = V + interaction terms; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Table 11: Results of multilevel model analysis predicting sexist attitudes from demographic data (individual-level) and socioecological factors (national-level).

Predictors	VII		VIII		IX		X	
Intercept	56.13	(1.54)	55.58	(1.75)	56.96	(1.62)	57.36	(1.50)
Level 1: Effects of individual sexism								
Sex (0 = female)	−7.85	$(0.16)^{***}$	−7.84	$(0.16)^{***}$	−7.84	$(0.15)^{***}$	−7.84	$(0.15)^{***}$
Age	−0.96	$(0.08)^{***}$	−0.85	$(0.08)^{***}$	−1.04	$(0.08)^{***}$	−1.04	$(0.08)^{***}$
Education	2.73	$(0.08)^{***}$	2.91	$(0.09)^{***}$	2.83	$(0.08)^{***}$	2.83	$(0.08)^{***}$
SES	0.56	$(0.08)^{***}$	0.44	$(0.08)^{***}$	0.48	$(0.07)^{***}$	0.48	$(0.07)^{***}$
Level 2: Effects of national aggregates								
Early and prolific reproduction								
Teen pregnancy rate	7.40	$(2.10)^{***}$						
Mean age at marriage for women	5.78	$(1.99)^{**}$						
Fertility rate	−9.08	$(1.96)^{***}$						
Familial stress								
Low birthweight			−4.56	(2.83)				
Infant mortality			−2.54	(2.58)				
Childhood malnutrition			−0.27	(3.33)				
Mortality								
Life expectancy at birth					7.10	$(1.71)^{***}$		
Economic resources								
Gross domestic product							1.34	(2.38)
HDI							6.99	$(2.37)^{**}$
$N_{participants}$	68 897		66 359		78 704		78 704	
$N_{countries}$	48		44		54		54	
Log-likelihood	−305 537		−294 651		−348 364		−348 360	
BIC	611 185		589 413		696 818		696 822	

Note. VII = II + early and prolific reproduction; VIII = II + familial stress; IX = II + mortality; X = II + economic resources; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Table 12: Results of multilevel model analysis predicting sexist attitudes from demographic data (individual-level) and socioecological factors (national-level) plus the interaction with participant sex.

Predictors	XI		XII		XIII		XIV	
Intercept	56.09	(1.54)	55.41	(1.75)	56.96	(1.62)	57.35	(1.50)
Level 1: Effects of individual sexism								
Sex (0 = female)	−7.74	$(0.16)^{***}$	−7.49	$(0.17)^{***}$	−7.82	$(0.15)^{***}$	−7.81	$(0.15)^{***}$
Age	−0.94	$(0.08)^{***}$	−0.83	$(0.08)^{***}$	−1.03	$(0.08)^{***}$	−1.03	$(0.08)^{***}$
Education	2.76	$(0.08)^{***}$	2.92	$(0.09)^{***}$	2.85	$(0.08)^{***}$	2.85	$(0.08)^{***}$
SES	0.55	$(0.08)^{***}$	0.43	$(0.08)^{***}$	0.47	$(0.07)^{***}$	0.47	$(0.07)^{***}$
Level 2: Effects of national aggregates								
Early and prolific reproduction								
Teen pregnancy (TP)	7.21	$(2.10)^{**}$						
TP x Sex	0.38	$(0.20)^{+}$						
Mean marriage age of women (AM)	5.70	$(2.00)^{**}$						
AM x Sex	0.15	(0.18)						
Fertility rate (FR)	−8.47	$(1.97)^{***}$						
FR x Sex	−1.26	$(0.20)^{***}$						
Familial stress								
Low birthweight (LBW)			−4.43	(2.83)				
LBW x Sex			−0.27	(0.29)				
Infant mortality (IM)			−1.57	(2.58)				
IM x Sex			−1.93	$(0.23)^{***}$				
Childhood malnutrition (CM)			−1.11	(3.34)				
CM x Sex			1.66	$(0.33)^{***}$				
Mortality								
Life expectancy (LE)					6.66	$(1.71)^{***}$		
LE x Sex					0.90	$(0.14)^{***}$		
Economic resources								
GDP							1.07	(2.38)
GDP x Sex							0.58	$(0.23)^{*}$
HDI							6.85	$(2.38)^{**}$
HDI x Sex							0.26	(0.22)
$N_{participants}$	68 897		66 359		78 704		78 704	
$N_{countries}$	48		44		54		54	
Log-likelihood	−305 510		−294 613		−348 345		−348 345	
BIC	611 164		589 371		696 791		696 814	

Note. XI = VII + interaction term; XII = VIII + interaction term; XIII = IX + interaction term; XIV = X + interaction term; $^{+}p < .1$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

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Gender gap and sexist attitudes Model I, a null model, served as a baseline for comparison of the log-likelihood and Bayesian Information Criterion (BIC) values between models. Model II comprised of model I plus the level 1 predictors of sexism (participant sex, standardised age, standardised education, standardised SES). Table 10 shows that men were significantly less progressive than women, $t(77\,126.94) = −54.07$, $p < .001$, (Figure 11a, red outline). Higher age negatively predicted progressive values, $t(77\,124.43) = −13.62$, $p < .001$ (Figure 11b, solid). Progressive values were positively associated with more education, $t(77\,124.30) = 35.67$, $p < .001$ (Figure 11c, solid line), and higher SES, $t(77\,124.29) = 5.93$, $p < .001$ (Figure 11d, solid line). Chi-square analysis showed that model II significantly improved on the null model (ΔBIC $= 4648$; Table 10).

In model III we added the control measures of Gender Development Index (GDI) and Human Development Index (HDI) to our multilevel model. Table 10 shows that GDI positively predicted progressive values, $t(53.98) = 3.19$, $p < .001$, such that society become significantly less sexist as women access increasingly more opportunities. We also observed a positive association between HDI and values, with participants from more developed countries demonstrating more progressive values, $t(53.96) = 2.78$, $p < .05$. All level 1 predictors remained significant. Overall, model III was a significantly better fit for the data than model II (ΔBIC $= 27$).

Model IV comprised of model III plus the four GGI subscales. The gender gap in political empowerment was a significant predictor of progressive values, $t(53.93) = 4.86$, $p < .001$. As women become increasingly represented in political and social life, citizens from a given region increasingly adopt progressive views. Similarly, we found that economic participation and opportunity predicted progressive values, $t(54.00) = 2.28$, $p < .05$ (Figure 12). In countries where women are heavily dependent on men for economic support, citizens were significantly less progressive. The gender gap for educational attainment, $t(54.01) = −0.68$, $p > .05$, and health and survival, $t(53.91) = 1.29$, $p > .05$, were not significant. When we included our four measures of GGI we found that GDI was no longer a significant predictor of progressive values. Model IV was a significantly better fit for the data than model III (ΔBIC $= 28$).

Model V comprised of model IV minus the nonsignificant terms. This allowed for a more appropriate comparison for model VI, which contained relevant interaction terms. In model V all of the included items remained significant ($ps < .001$) and the model did not differ significantly from model IV

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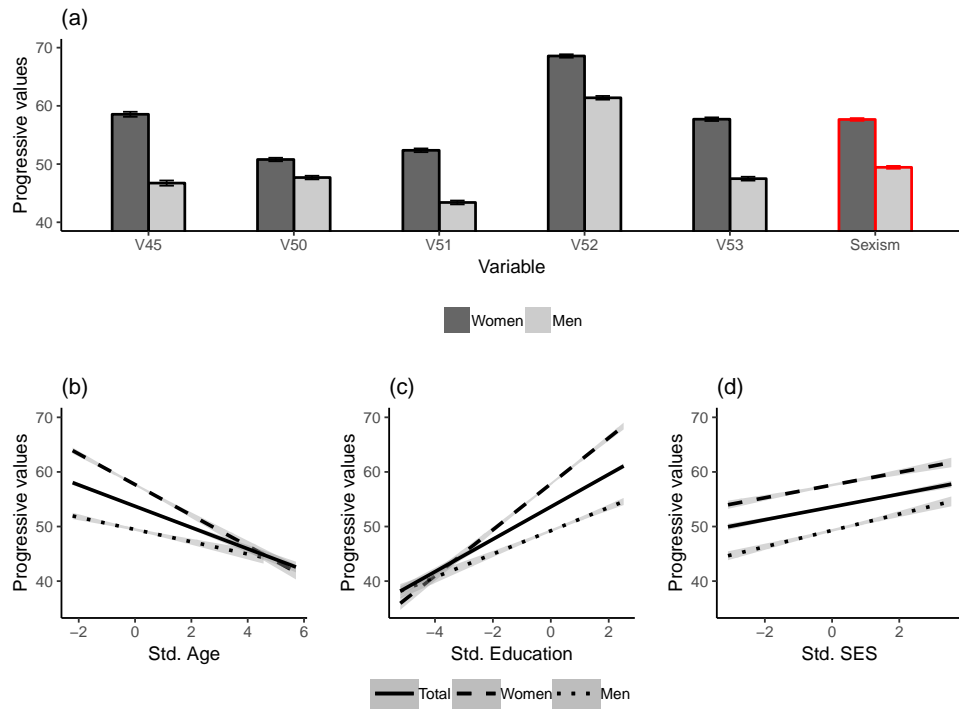
Figure 11: Mean progressive values scores as a function of demographic data. Lower scores reflect less progressive attitudes. (a) Responses to individual items in the World Values Survey (WVS) as a function of participant sex. Red outline reflects the mean responses across items. (b) Sexism scores as a function of standardised age and participant sex. (c) Sexism scores as a function of standardised education and participant sex. (d) Sexism scores as a function of standardised SES and participant sex. *Note.* Error bars (a) and shading (b, c, d) denote standard error.

AM=Armenia; AR=Argentina; AU=Australia; AZ=Azerbaijan; BH=Bahrain; BR=Brazil; BY=Belarus; CL=Chile; CN=China; CO=Colombia; CY=Cyprus; Di
DZ=Algeria; EC=Ecuador; EE=Estonia; EG=Egypt; ES=Spain; GE=Georgia; GH=Ghana; IN=India; JO=Jordan; JP=Japan; KG=Kyrgyzstan; KR=South
KZ=Kazakhstan; LB=Lebanon; MA=Morocco; MX=Mexico; MY=Malaysia; NG=Nigeria; NL=Netherlands; NZ=New Zealand; PE=Peru; PH=Philippines; F
PL=Poland; QA=Qatar; RO=Romania; RU=Russia; RW=Rwanda; SE=Sweden; SG=Singapore; SI=Slovenia; TH=Thailand; TN=Tunisia; TR=Turkey; TT
UA=Ukraine; US=United States; UY=Uruguay; YE=Yemen; ZA=South Africa; ZW=Zimbabwe

Figure 12: Progressive values of participants in the World Values Survey (WVS) as a function of the gender gap in economic participation and opportunities. Data are clustered such that each point reflects participants' mean score in a given country. Point colour represents the region for a given country. The point size reflects the sample size captured by the data point. Countries are labelled by the ISO alpha-2 country code.

(ΔBIC = 4).

Sexist attitudes mediated by sex   Model VI investigated the interaction between participant sex and the predictors from model V. Overall, the model was a significant improvement on model V (Table 10; ΔBIC = 217). For posthoc tests, data were split into separate multilevel models for men and women.

Age   In model VI the Sex x Age interaction was significant, $t(77\,126.85) = 8.90$, $p < .001$. Posthoc tests showed that the effect of age was greater for women, such that women experience a greater decline in progressive values across the lifespan ($B = -1.69$, $SE = 0.11$, $p < .001$), relative to men ($B = -0.34$, $SE = 0.11$, $p = .002$; Figure 11b.).

Education   Model VI revealed a significant Sex x Education interaction, $t(77\,128.70) = -3.91$, $p < .001$. Posthoc tests showed that the effect of education was greater for women, such that education predicted a greater increase in progressive values among women ($B = 3.10$, $SE = 0.11$, $p < .001$) than men ($B = 2.48$, $SE = 0.11$, $p < .001$; Figure 11c.).

HDI   We observed a significant Sex x HDI interaction in model VI, $t(1.04) = 0.15$, $p < .001$. Posthoc analyses showed that the influence of HDI was greater for men ($B = 6.6208$, $SE = 1.15$, $p < .001$) than women ($B = 5.4277$, $SE = 1.13$, $p < .001$) (Figure 13).

Political empowerment   In model VI the Sex x Political Empowerment interaction was significant, $t(77\,131.75) = 7.74$, $p < .001$. Specifically, the effect of women becoming more prominent in political life predicted a greater increase of progressive values among men ($B = 6.0120$, $SE = 1.19$, $p < .001$), relative to women ($B = 5.2357$, $SE = 1.17$, $p < .001$; Figure 14).

Other interactions   The remaining interaction terms in model VI, Sex x SES, $t(77125.52) = 1.342$, $p > .05$, and Sex x Economic Participation and Opportunity gap, $t(77131.36) = -0.740$, $p > .05$, were not significant and are not discussed further.

AM=Armenia; AR=Argentina; AU=Australia; AZ=Azerbaijan; BH=Bahrain; BR=Brazil; BY=Belarus; CL=Chile; CN=China; CO=Colombia; CY=Cyprus; DE=Germany; DZ=Algeria; EC=Ecuador; EE=Estonia; EG=Egypt; ES=Spain; GE=Georgia; GH=Ghana; IN=India; JO=Jordan; JP=Japan; KG=Kyrgyzstan; KR=South Korea; KW=Kuwait; KZ=Kazakhstan; LB=Lebanon; MA=Morocco; MX=Mexico; MY=Malaysia; NG=Nigeria; NL=Netherlands; NZ=New Zealand; PE=Peru; PH=Philippines; PK=Pakistan; PL=Poland; QA=Qatar; RO=Romania; RU=Russia; RW=Rwanda; SE=Sweden; SG=Singapore; SI=Slovenia; TH=Thailand; TN=Tunisia; TR=Turkey; TT=Trinidad & Tobago; UA=Ukraine; US=United States; UY=Uruguay; YE=Yemen; ZA=South Africa; ZW=Zimbabwe

Figure 13: Progressive values of participants in the World Values Survey (WVS) as a function of Human Development Index (HDI). Data are clustered such that each point reflects participants' mean score in a given country, for women (left panel) and men (right panel). Point colour represents the region of a given country. The point size reflects the sample size captured by the data point. Countries are labelled by the ISO alpha-2 country code.
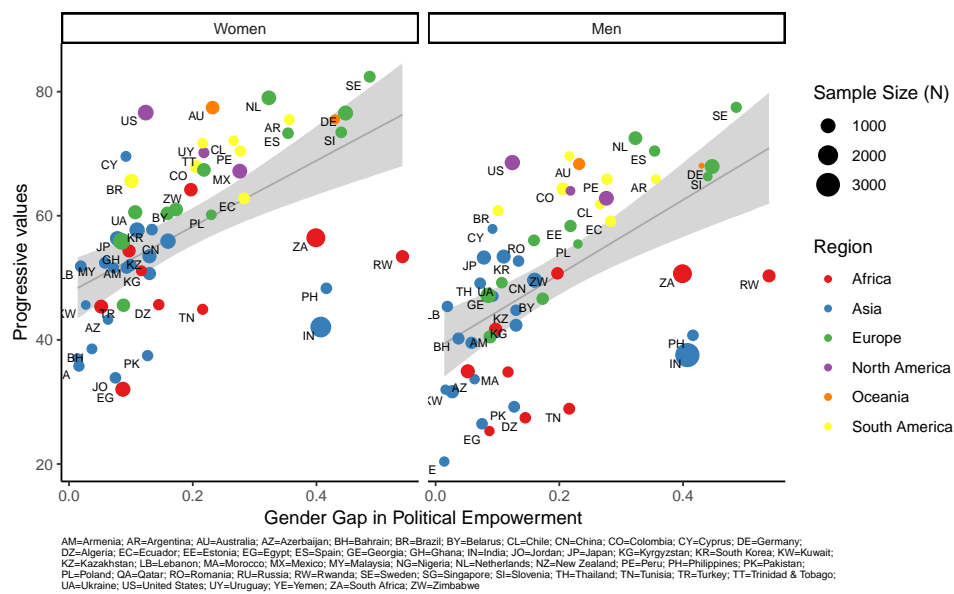
Figure 14: Progressive values of participants in the World Values Survey (WVS) as a function of the gender gap in political empowerment. Data are clustered such that each point reflects participants' mean score in a given country, for women (left panel) and men (right panel). Point colour represents the region of a given country. The point size reflects the sample size captured by the data point. Countries are labelled by the ISO alpha-2 country code.

Socioecological factors Model VII comprises of individual-level measures (model II) plus three measures of early and prolific reproduction (Table 11). Progressive values were significantly predicted by the national aggregates of teen pregnancy, $t(47.95) = 3.53$, $p < .001$, mean age at which women marry, $t(47.94) = 2.90$, $p < .01$, and the national fertility rate, $t(47.96) = -4.63$, $p < .001$. The fit of model VII was a significant improvement on model II (ΔBIC $= 72\,081$). In sum, early and prolific reproduction is negatively associated with progressive gender values.

Model VIII explored the predictive power of childhood and early on gender attitudes. We found that neither low birthweight, infant mortality rates, nor childhood malnutrition predicted responses in the WVS ($|t|$s < 1.7, ps $> .1$). National aggregates of familial stress do not predict gender attitudes.

In model IX we added mortality to model II. Life expectancy at birth was positively associated with progressive gender attitudes in the WVS, $t(53.96) = 4.15$, $p < .001$.

Model X revealed mixed effects for the predictive value of economic resources. As described previously (Table 10), HDI is positively associated with gender attitudes. GDP, however, did not predict attitudes in the WVS, $t(53.98) = 0.565$, $p > .05$.

Socioecological factors mediated by sex Table 12 summarises the interaction between socioecological factors and sex. We observed a significant mediating effect of sex for some or all variables in models XI-XIV. To aid the interpretation of results we plotted the difference between men and women's WVS responses against socioecological factors (Figure 15). Each point represents the sex difference for a given country. Positive values indicate that women are more progressive than men in a given region.

The gap between men and women's values is positively predicted by the national fertility rate, $t(68\,850) = -6.42$, $p < .001$, infant mortality, $t(66\,320) = -8.46$, $p < .001$, and childhood malnutrition, $t(66\,320) = 4.99$, $p < .001$. The effect of teen pregnancy rates almost reached significance, $t(68850) = 1.89$, $p > .05$. Taken together, environmental harshness and prolific reproduction are associated with a greater sex difference in gender attitudes. Additionally, we find that GDP, $t(78\,650) = 2.50$, $p < .05$, and life expectancy at birth, $t(78\,650) = 6.24$, $p < .001$, negatively predict the difference between men and women's gender attitudes. In sum, living in a healthy, wealthy region reduces the sex gap in gender attitudes.
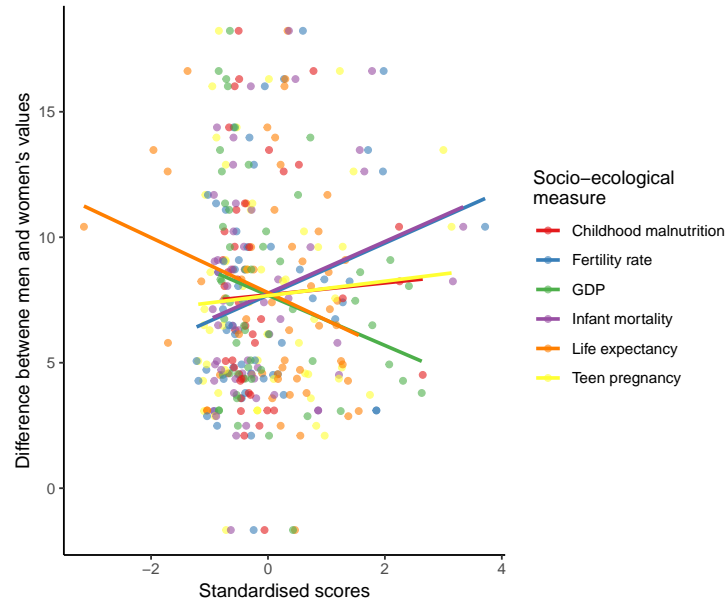
Figure 15: Gap between male and female gender attitudes aggregated by country and socioecological measure. y-axis: positive scores indicate that women are more progressive than men; 0 indicates that men and women have identical mean attitude scores.

5.1.4 Discussion

Overview of findings

We tested the relationship between socioecological factors and gender inequality. Using PCA we calculated gender attitudes of more than $80\,000$ individuals in 54 countries. Multilevel analysis revealed that, after controlling for individual-level factors, the gap between the sexes' political and economic empowerment positively predicts unequal gender attitudes. Put another way, in cultures where women rely on men for economic and political leadership, individuals are less likely to view men and women as being equal. Nonetheless, the gap in education attainment and health did not predict gender attitudes. Taken together, this suggests that it is women's dependence on men, rather than gender inequality *per se*, that promotes sexist attitudes. This complements Blake and colleagues' recent finding that economic volatility, but not gender inequality, predicts women's self-objectification via the use of sexy selfies online (Blake, Bastian, et al., 2018).

Second, we found that ecological stressors decrease gender equality. In countries that are less developed, have early and prolific reproduction, and

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shorter life expectancy, women are treated as unequal to men. Viewed through the lens of Life History (LH) theory, fast life strategies are associated with unequal gender attitudes. This observation is, however, moderated by sex: in countries with relatively equal gender attitudes, men and women's gender attitudes are aligned. But as societies become less gender equal, men's gender bias increases at a greater rate than women's bias. Our findings suggest that women's gender attitudes are more resistant to socioecological variation than men's. For example, an increase in the fertility rate, GDP, life expectancy, or childhood malnutrition causes a greater shift in men's, relative to women's, gender attitudes. That is, as technological advances foster more secure environments, we should anticipate greater shifts in men's gender attitudes. Conversely, if climate change renders some regions inhospitable, we could see a widening of the gender attitudes gap, primarily driven by men's increased aversion to gender equality (cf. Bhattarai, Beilin, & Ford, 2015).

At the individual level, we also found that sex moderates the effect of demographic factors, such as standardised age, education, or SES. We found that relatively young, educated, and wealthy individuals demonstrated more egalitarian gender attitudes. Men's attitudes were, however, more resistant than women's to demographic shifts. Whereas women's gender attitudes became significantly less equal as a result of ageing, or with lower education and SES, shifts in men's gender attitudes were more muted. This suggests that improving the education and relative SES of an individual will cause a greater shift in gender attitudes among women, relative to men. The role of age is unclear. One possibility is that women experience a greater change of gender attitudes across the life course. Alternatively it's possible that each successive generation is consistently more progressive than their parents (see Konty & Dunham, 1997, for discussion). Finally, we see that men and women's views are more compatible among the elderly and poorly educated, who tend to harbour unequal views, and those with a relatively high SES, who are typically more progressive.

More broadly, our findings contribute to a growing literature that highlights the role of ecological factors in shaping social conservatism. In addition to environmental harshness (Gelfand et al., 2011; Roos et al., 2015), short LH strategies (Schmitt, 2005), and climate change (Bhattarai et al., 2015) we find that women's life chances, including their economic empowerment, delaying or limiting reproduction, and life expectancy, all contribute to their attitudes towards gender. To our knowledge this report is the first to highlight the finding

that men's attitudes are more susceptible to changes in ecological factors.

Theoretical implications

Previous ecological accounts of gender attitudes have suggested that harsh environments tend to be more conservative (Thornhill & Fincher, 2014; Gelfand et al., 2011; Van de Vliert, 2013), which can subsequently foster inequality between the sexes (Varnum & Grossmann, 2016; S. E. Hill et al., 2016; Gangestad & Grebe, 2016). Although insightful, previous work has typically used outcome measures (e.g., women's educational attainment) as a proxy for gender attitudes. This research builds on previous work to show that socioecological factors can moderate an individual's gender attitudes. In so doing, we aimed to highlight the interaction between national- and individual-level factors that foster sexist attitudes.

Our findings also raise the question of what drives the observed differences in gender attitudes. One possibility is that women's economic dependence on male kin and/or husbands fosters sexist attitudes. It is interesting to note that not all gender inequality fosters sexist attitudes. That is, we found that sexism is predicted by the extent to which women have autonomy from men in public spheres (i.e., economically, politically) but not by women's personal wellbeing (i.e., education, health and survival). Additionally, we found that women's early and prolific reproduction increases sexism among both sexes. The rate at which women reproduce is inversely related to her opportunity to gain economic autonomy by prioritising her career. As such, women from regions with early and prolific reproduction are more dependent on male breadwinners for financial support. Taken together, these findings suggest that increasing women's autonomy and visibility in public spheres should prove effective in diminishing sexist attitudes.

Alternatively, these findings might reflect a general association between ecological harshness and conservatism. Many of the items in the WVS questionnaire bore a resemblance with the old-fashioned sexism scale (Swim et al., 1995), to which it was significantly correlated. Given this, we can consider the WVS as tapping into old-fashioned gender attitudes. As such, we might expect that other measures of ecological harshness, such as climate, prevalence of historical invasions, and food scarcity might predict sexist attitudes. More broadly, we believe that our findings contribute to a wider literature that describes the role of environmental harshness and conservative values.

Limitations and future research

This report is not without shortcomings. First, we conceptualise gender attitudes by aggregating scores from five items in the WVS. Although validated using PCA and an online study, the report sacrifices the precision of the laboratory, where the researcher can choose specific question items for experimentation, for the global reach of the WVS.

Second, our socioecological metrics are measured at the national level. There is, however, considerable within-country variance in both socioecological factors and cultural norms (e.g., Walasek & Brown, 2015; Blake, Bastian, et al., 2018). For example, relative to rural communities, women in urban environments have access to greater economic opportunities (Coombes & Raybould, 2004), which can, in turn, moderate their perceptions of gender norms within marriage (Lu et al., 2015). Granular data would have enabled a more detailed understanding of the role of ecological factors.

Third, as with all cross-cultural research, it is possible that unanticipated factors are omitted in our analysis, thus inflating the effect sizes reported here. Although attempts have been made to consider a broad array of variables, as well as potential confounds, further experimental work is needed to validate associations between ecological factors and other established measures of gender attitudes (e.g., Glick & Fiske, 1996; Swim et al., 1995).

Conclusions

These limitations notwithstanding, the observed association between environmental harshness and gender attitudes, particularly among men, highlights the complexity of gender attitudes, as well as the role of ecology in shaping social attitudes of gender and equality. Our findings also serve to highlight the challenge that societies face in trying to reach gender parity. More broadly, the current report demonstrates the importance of socioecological factors in the emergence of cultural differences.

Chapter 6

Conclusion

This thesis investigated how ecological factors can shape human reproductive strategies. The evolution of reproductive strategies has been studied extensively. Classic accounts focused on explaining sex differences in sexual behaviour (Darwin, 1879; Bateman, 1948; Trivers, 1972). More recently, scholars have questioned whether the sex differences have been exaggerated (Stewart-Williams & Thomas, 2013; Fine, 2017; Hallam et al., 2018). Instead, there has been an emphasis on explaining individual and cultural differences in mating strategies. As I discuss in chapter 1, these studies have typically investigated differences within participants (e.g., relationship length: Pillsworth & Haselton, 2006b; ovulatory shifts: Gangestad, Simpson, Cousins, & Christensen, 2001), between participants (i.e., individual differences: Stanik & Ellsworth, 2010; March & Grieve, 2016), or regional differences (Kandrik et al., 2015; Schmitt, 2005; Zentner & Mitura, 2012).

An individual's mating strategy, however, can depend on their experience with mate choice. We may find that individuals who are sexually inexperienced are less efficient in choosing an optimal mating strategy. To investigate the role of experience in shaping mate strategies, chapter 2 examined whether individual differences in sociosexuality predicted women's mating strategies. The results showed that women high in sociosexuality demonstrated more distinctive preferences than those with low sociosexuality. Specifically, as women's sociosexuality scores increased, their ideal short-term partner looked *less* like their long-term ideal. This suggests that sexually unrestricted women adopt a dual-sexual strategy, such that they use short-term mating to obtain genetic benefits and long-term mating to gain access to material benefits. Alternatively, sexually restricted women could use long-term mating as an opportunity

to evaluate and attract long-term mates.

I also observed that nationality was a predictor of participants' mate preferences, independent of sociosexuality. That is, sociosexuality and nationality were relatively independent in predicting mate preference. This raised the question of what additional factors - besides sociosexuality - were driving cross-cultural differences. It is possible that women from more conservative regions face pressure to suppress their short-term mating strategies, relative to women from more liberal regions. If true, a cognitive bias promoting long-term mating could be considered adaptive.

Chapter 3 examined possible predictors of ecological differences in reproductive strategies. Previous research had shown that natural selection has favoured biases that steer behaviour away from the most costly error (Haselton et al., 2015). I proposed that similar error management logic could apply to perceptions of long-term mates. In India, a conservative culture where individuals could face punishment for promiscuity, I found that both men and women demonstrated a cognitive bias for seeing long-term mates. But in regions where punishment is less severe (UK and USA), men and women demonstrated preferences for both short- and long-term mating.

Chapter 3 demonstrated that, in addition to nationality, participants' individual levels of traditionalism also predicted whether they had a long-term mate bias. Taken together, the results showed that conservative values promote attraction to long-term mate traits (e.g., high social status, caring), relative to short-term traits (e.g., attractive, healthy). A concern about the results was that this methodology did not directly address my proposition that those from conservative regions possessed a cognitive bias.

To address this issue, I ran a subsequent study to identify whether conservatives *see* mates who are poor long-term prospects as nonetheless suited for marriage. In chapter 3 I found that participants from the conservative region believed that hypothetical mates suited to short-term mating nonetheless resembled a long-term mate, relative to participants from liberal regions.

Overall, chapter 3 found evidence for a mechanism that serves to minimise derogation and punishment from one's own network. When the cost of promiscuity is high, individuals demonstrate a cognitive bias that promotes the least costly error (i.e., a long-term bias). When the cost of promiscuity is diminished, individuals are more likely to risk social ostracism in favour of mating with good genes partners.

This raises the question of how social norms surrounding female chastity

are influenced and maintained by ecological triggers. Chapter 4 investigated what motivates the suppression of female sexuality. Competing theories argue for male-driven suppression (Rudman et al., 2013; Travis & White, 2000) and female-driven suppression (Baumeister et al., 2017). I found evidence of a third alternative. The data suggested that both men and women express prejudice towards, and are less trusting of, promiscuous women. Yet women, but not men, were willing to inflict costly punishment on sexually-accessible women. This suggests that different mechanisms promote male and female prejudice towards sexually-accessible women. For men, prejudice appears to be associated with parental investment, whereas, for women, prejudice is tied to intrasexual competition.

Underlying these findings is the assumption that (i) parental investment is most costly when women are economically dependent on men, and (ii) intrasexual competition should be strongest when women are economically dependent on men. If true we should find that, as women gain access to other mechanisms (e.g., political freedoms, education, reproductive rights), the relative emphasis on sex as a bargaining tool should be diminished. Chapter 5 directly tests this claim using real-world survey data from over 80 000 participants in 54 countries. Here I show that gender attitudes are less equal in regions where women's life chances are low. In line with the findings in chapter 4, I find that unequal gender attitudes are found in regions where women are increasingly reliant on men for economic support and political leadership. Additionally, the age that women marry, their fecundity, and the rate of teenage motherhood are all associated with imbalanced gender attitudes; early and prolific reproduction among women is associated with inequality. Although I observed this effect in men and women, the role of ecological harshness was greatest among men. That is, the extremes of gender attitudes that men possess are more variable than those observed among women.

Taken together, the studies reported in this thesis highlight the various ways in which conservatism can shape human reproductive strategies, foster the sexual double standard, and influence gender attitudes. As I noted in chapter 1, prior literature on mate choice has suffered from mostly relying on a biased in favour of undergraduate participant pools. Samples from western cultures are more liberal and reside from more secure ecologies (Henrich, Heine, & Norenzayan, 2010) than those from underrepresented samples. As a result, many of the previously proposed accounts of mate strategies do not sufficiently account for the role of conservatism in shaping one's sexual behaviour. In

contrast, this thesis proposes a new model to account variation in reproductive strategies. In chapters 2-4 I propose a new perspective for understanding individual differences in sexual strategies and attitudes. Chapter 5 provides an account for regional variation in gender attitudes.

In summary, this thesis investigated the role of ecological factors in shaping human reproductive strategies and, in so doing, highlights the role of cultural conservatism in shaping sexual strategies, perceptions of female sexuality, and gender attitudes at large. I hope that future research continues this line of inquiry to advance our scientific understanding of sexist attitudes.

Notes

[1]Items with the highest factor loading were selected, with the exception of *creative* (Good Genes). Creative was omitted because of potential cross-over with material traits. Creativity has been associated with measures of intelligence (Osler et al., 2003) and previous studies have indicated that the association between intelligence and good genes measures may be tenuous (summarised in Gangestad, Thornhill, Quinlan, & Flinn, 2007), as intelligence could also indicate one's ability to provide material resource (Gottfredson, 2002). As such, creative was replaced with the next best-fitting item, *good-looking.*

[2]The addition of relationship status and age did not predict the proportion spent on genetic traits ($ps > .05$). As well, the interactions Relationship Status x Context and Age x Context did not significantly predict the proportion spent on genetic traits ($ps > .05$).

[3]The authors' original intention had been to collect data exclusively from women. As such, this preliminary work was carried out on a female-only sample.

[4]Square parentheses indicate the pronouns presented to male participants; female participants were presented with nonparenthesised pronouns.

[5] Although men do not stifle their female partners' sexuality, both men and women use mate guarding tactics to prevent extra-pair copulation (EPC) (see Chapais, 2009; Gavrilets, 2012).

[6]The argument that moral judgements are best described in terms of strate-

gic interests, and not from abstract moral ideology, is supported by work exploring the evolution of morality (Weeden, Kurzban, & Kenrick, 2016; Weeden & Kurzban, 2013; Kurzban, Dukes, & Weeden, 2010; Weeden, Cohen, & Kenrick, 2008).

[7]For photographic stimuli, please contact the author.

[8]The label Giver was favoured over Dictator, as a means of avoiding loaded language that might prime authoritarian behaviour (Gomes & McCullough, 2015; Shariff & Norenzayan, 2007).

[9]The finding that men's behaviour is not moderated by his relationship status suggests that men's aversion to female promiscuity is not limited to his mate: instead, males tended to show a generalised aversion to overt sexuality in women.

[10]Six countries (Saudi Arabia, United Arab Emirates, Iraq, Kuwait, Oman, Afghanistan) granted suffrage in 21st century; the Vatican has not granted suffrage (source: `en.wikipedia.org/wiki/Timeline_of_women%27s_suffrage`).

[11]source: US bureau of labor statistics, `bls.gov`

[12]source: `en.wikipedia.org/wiki/Sexual_revolution`

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Appendices

Appendix A   Correlation Matrix (Chapter 3)

Table 13: Correlations between the 30 items presented to women during the development of the Mate Preference Inventory (MPI) ($N = 151$).

	CR	HU	MA	GB	AT	GV	GL	CO	HE	SD	SH	CN	PA	FA	CA	LC	GH	HO	DO	KI	GI	SS	SC	GF	AM	ED	CP	LE	GE
Creative (CR)																													
Sense of humor (HU)	.27																												
Masculine (MA)	.07	.09																											
Good body (GB)	.04	.04	.44																										
Athletic (AT)	.08	.02	.43	.57																									
Good voice (GV)	.27	.15	.14	.35	.24																								
Good looking (GL)	.05	.02	.36	.70	.51	.39																							
Courageous (CO)	.40	.27	.18	.08	.14	.21	.01																						
Healthy (HE)	.19	.18	.23	.26	.35	.26	.31	.20																					
High sex drive (SD)	.09	.01	.37	.43	.41	.20	.36	.09	.17																				
Stays at home (SH)	.33	.22	.18	-.03	.09	.22	-.10	.39	.23	.05																			
Considerate (CN)	.31	.41	.00	-.05	-.10	.22	.01	.31	.20	-.04	.18																		
Patient (PA)	.36	.35	-.01	-.12	-.08	.20	-.15	.37	.22	-.11	.32	.64																	
Faithful (FA)	.33	.35	-.09	-.28	-.19	.02	-.30	.44	.13	-.29	.44	.44	.59																
Caring (CA)	.41	.38	-.02	-.20	-.15	.12	-.19	.39	.11	-.09	.32	.67	.69	.61															
Loves children (LC)	.23	.24	.06	-.20	-.02	.08	-.21	.44	.18	-.10	.46	.32	.47	.62	.48														
Good housekeeping (GH)	.45	.37	.05	.00	.06	.22	.03	.40	.27	.04	.46	.29	.36	.42	.38	.38													
Honest (HO)	.31	.50	-.04	-.23	-.20	.07	-.26	.34	.14	-.20	.29	.55	.55	.63	.62	.45	.35												
Domestic (DO)	.41	.37	.05	-.12	-.04	.10	-.16	.44	.18	-.02	.56	.35	.50	.56	.44	.51	.60	.42											
Kind (KI)	.32	.39	.01	-.08	-.16	.19	-.10	.32	.17	-.08	.23	.68	.62	.46	.65	.35	.30	.53	.34										
Good income (GI)	.34	.24	.06	.00	.10	.22	.05	.43	.22	-.05	.46	.29	.37	.56	.37	.48	.52	.34	.52	.32									
High social status (SS)	.27	.07	.04	.20	.28	.24	.28	.28	.28	.03	.21	.03	.03	.07	.01	.13	.30	.00	.21	.03	.49								
Successful career (SC)	.31	.28	.04	.03	.13	.22	.07	.40	.28	-.10	.41	.32	.34	.52	.34	.45	.45	.34	.48	.28	.74	.50							
Good family (GF)	.29	.25	.05	-.15	.03	.17	-.12	.43	.22	-.05	.44	.30	.39	.53	.35	.59	.43	.40	.51	.30	.55	.30	.51						
Ambitious (AM)	.42	.33	.06	-.10	.09	.12	-.09	.59	.23	.02	.41	.25	.34	.54	.35	.44	.48	.36	.51	.32	.57	.32	.54	.45					
Good education (ED)	.38	.27	.01	-.03	.02	.18	-.02	.39	.26	-.12	.39	.32	.43	.49	.42	.42	.40	.39	.42	.31	.55	.30	.55	.48	.43				
Capable (CP)	.31	.34	.24	.01	.03	.22	.05	.49	.19	.04	.29	.38	.39	.43	.40	.31	.38	.38	.37	.39	.39	.17	.38	.33	.47	.32			
Good leader (LE)	.45	.22	.19	-.03	.17	.18	-.04	.51	.22	.04	.44	.18	.31	.38	.34	.33	.47	.27	.43	.22	.42	.28	.45	.40	.50	.38	.36		
Generous (GE)	.38	.34	.15	-.03	.08	.19	.02	.41	.26	.02	.31	.57	.53	.40	.59	.41	.43	.44	.47	.48	.28	.08	.33	.35	.35	.34	.28	.30	
Industrious (IN)	.44	.25	.09	-.08	.10	.15	-.11	.54	.11	-.08	.41	.26	.43	.52	.40	.40	.46	.37	.44	.31	.52	.25	.50	.39	.57	.40	.50	.54	.33

Appendix B Modified Sociosexual Orientation Inventory (SOI-R; Chapter 4)

> Participants were presented with a photograph of a woman whose outfit signalled that she was (i) sexually-accessible, or (ii) sexually-selective. The photograph was presented throughout the rating task. This task was repeated for all six photographs. Presentation order was randomised.

1. With how many different partners do you think this woman has had sex within the past 12 months?
    - ○ 0
    - ○ 1
    - ○ 2
    - ○ 3
    - ○ 4
    - ○ 5-6
    - ○ 7-8
    - ○ 10-19
    - ○ 20 or more

2. With how many different men has she had intercourse on *one and only one* occasion?
    - ○ 0
    - ○ 1
    - ○ 2
    - ○ 3
    - ○ 4
    - ○ 5-6
    - ○ 7-8
    - ○ 10-19
    - ○ 20 or more

3. With how many different partners has she had sexual intercourse without having an interest in a long-term committed relationship with this person?
    - ○ 0
    - ○ 1
    - ○ 2
    - ○ 3
    - ○ 4
    - ○ 5-6
    - ○ 7-8
    - ○ 10-19
    - ○ 20 or more

4. Do you think this women would agree that sex without love is OK?
    - ○ 1 (Strongly disagree)
    - ○ 2
    - ○ 3
    - ○ 4

○ 5

○ 6

○ 7

○ 8

○ 9 (Strongly agree)

5. Do you think that this woman is comfortable with and enjoys "casual" sex with different partners?

    ○ 1 (Strongly disagree)

    ○ 2

    ○ 3

    ○ 4

    ○ 5

    ○ 6

    ○ 7

    ○ 8

    ○ 9 (Strongly agree)

6. Do you think that this woman does *not* want to have sex with a person until she is sure that they will have a long-term, serious relationship? *Reverse-scored*

    ○ 1 (Strongly disagree)

    ○ 2

    ○ 3

    ○ 4

    ○ 5

    ○ 6

    ○ 7

    ○ 8

    ○ 9 (Strongly agree)

7. How often do you think she has fantasies about having sex with someone she is *not* in a committed romantic relationship with?

    ○ Never

    ○ Very seldom

    ○ About once every two or three months

    ○ About once a month

    ○ About once every two weeks

    ○ About once a week

    ○ Several times per week

    ○ Nearly every day

    ○ At least once a day

8. How often do you think she experiences sexual arousal when she is in contact with someone she is *not* in a committed romantic relationship with?

    ○ Never

○ Very seldom

○ About once every two or three months

○ About once a month

○ About once every two weeks

○ About once a week

○ Several times per week

○ Nearly every day

○ At least once a day

9. In everyday life, how often do you think she has spontaneous fantasies about having sex with someone she has just met?

○ Never

○ Very seldom

○ About once every two or three months

○ About once a month

○ About once every two weeks

○ About once a week

○ Several times per week

○ Nearly every day

○ At least once a day

Appendix C   Supplemental Tables (Chapter 5)

Table 14: Items identified in the World Values Survey (WVS) as being relevant to the study of sexism. **Bold** indicates the items carried forward for Principal Component Analysis (PCA).

Item	Question
V45	**When jobs are scarce, men should have more right to a job than women.**
V47	If a woman earns more than her husband, it's almost certain to cause problems.
V48	Having a job is the best way for a woman to be an independent person.
V50	**When a mother works for pay, the children suffer.**
V51	**On the whole, men make better political leaders than women do.**
V52	**A university education is more important for a boy than for a girl.**
V53	**On the whole, men make better business executives than women do.**
V54	Being a housewife is just as fulfilling as working for pay.
V139	Women have the same rights as men.
V208	[It is justifiable] For a man to beat his wife.

Table 15: Items and weights for each subindex of the Gender Gap Index (GGI) from the Global Gender Gap Report 2017 (World Economic Forum, 2017).

Ratio	SD	SD per 1% Δ	Weight
1. Economic Participation and Opportunity			
Female labour force participation over male value	0.160	0.063	.199
Wage equality between men and women for similar work	0.103	0.097	.310
Female estimated earned income over male value	0.144	0.069	.221
Female legislators, senior officials and managers over male value	0.214	0.047	.149
Female professional and technical workers over male value	0.262	0.038	.121
2. Political Empowerment			
Females with seats in parliament over male value	0.166	0.060	.310
Females at ministerial level over male value	0.208	0.048	.247
Number of years with a female head of state (last 50 years) over male value	0.116	0.086	.443
3. Educational Attainment			
Female literacy rates over male value	0.145	0.069	.191
Female net primary enrolment rate over male value	0.060	0.167	.459
Female net secondary enrolment rate over male value	0.120	0.083	.230
Female gross tertiary enrolment ratio over male value	0.228	0.044	.121
4. Health and Survival			
Sex ratio at birth (converted to female-over-male ratio)	0.010	0.998	.693
Female healthy life expectancy over male value	0.023	0.441	.307

Note. Calculations are based on the *Global Gender Gap Report 2006* (World Economic Forum, 2006).