Competitiveness Is Profoundly Sex-differential

Steve Moxon

The confirmation in major reviews of behavioural economics studies that competitiveness is a male (or far more a male than a female) trait is not challenged by efforts to find conditions in which there is apparent failure or partial failure to replicate, because this is mistaken interpretation in not recognising confounds. The error is through basing modelling on simple economics augmented only by internally-inconsistent and tautological 'gender'-sociological constructs. The pertinent major biological / evolutionary factors that should have been foundational are utilised in the framework here outlined. Biological theory on several ever deeper levels provides a key principle that competition is within- and not between-sex. Where there is ostensible inter-sexual competitiveness it is explicable as being instead implicit sexual display (and, given priming to make opposite-sex salient; an artefactual shadow of

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male deference or female co-operation). This analysis cuts through the confusion in the behavioural economics literature to yield albeit more complicated but more ecologically valid understanding to better inform hypothesis formation and testing.

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Competitiveness and its sex-differentiality are researched especially in the field of behavioural economics, where the overall conclusion is that men favour competition whereas women back away from it [for an up-to-date review, see Niederle 2015]. Yet this heavily understates real-world manifestation (the experiments have little ecological validity) in that data from these experiments essentially of one-off instances of competition do not reflect the accumulated impact of repeat competitive interactions over time, which is the experience of human males, just as it is of males of most other species, in forming dominance hierarchies. The first ever set of experiments featuring such iteration reveal a far greater sex-differential in competitiveness: win or lose, males are spurred to be substantially even more competitive, whereas females still further reduce effort [Gill & Prowse 2012]. In other words, whilst even winning discourages females, winning is its own reward for males, who are also driven to convert losing into winning. Evidently, males are quintessentially competitive, but for females competition appears to be problematic. The only feed-back seemingly undermining male competitiveness is heavy losing when the stakes are high, but this too serves to further drive male competitiveness in prompting men to 'cut their losses' and transfer all effort to some other competitive arena to which they are better suited. This is what is found in the well-attested very different character of the normal distribution curve according to sex of any measurable effort, ability or achievement. Males overwhelmingly predominate at both the top and the bottom tails, in contrast to female predominance at the median. Consequently, even in a case where average competitiveness is not sex-differential — or even if females out-perform males (as in some female-sex-typical tasks) — there is, nonetheless, far greater male competitiveness towards the apex of performance where sex-differentials are at their most conspicuous.

In reaction to the findings of behavioural economics experiments of sex differentials, researchers have sought to discover conditions in which studies fail to replicate, in the hope of identifying some factor(s) to provide an alternative explanation for women being the less competitive sex. In consequence, the field has become somewhat confused, with in some cases indeed a failure to replicate the usual results; but this has not led to the identification of salient factors. In their absence there is no model that can inform experimental design to test hypotheses and establish whether the sometimes contradictory data from behavioural economics is the result of the complications in the nature and manifestation of competitiveness or that the conclusion of a sex difference in competitiveness instead is attributable to something else. Rather than elucidating the topic, the literature to not a small extent reflects a focus less on the scientific quest to find the basis of the sex difference than in what is really an ideological effort to try to show that the phenomenon is somehow artefactual.

The field being set within a usual framework of 'the standard social science model' thereby concerns itself not with biological but 'cultural' factors, which represents a failure to understand the

need to look for a biological basis, in that culture is itself a biological manifestation, necessarily evolving to have the function of feeding back to fine-tune and reinforce the biology from which it arose [Moxon 2010]. Consideration of culture is restricted to what are essentially sociological constructs – based on the false notion that social phenomena cannot be analysed at a lower level, but must be analysed in their own terms — in an attempt at explanation which tends to be at best descriptive and at worst a circular relationship between data and the premise on which the experiment is designed, supposedly, to provide some evidence: a tautological loop. More than is anyway often the case within social science, premises are liable to be notably in essence ideological rather than scientific, given that questions re men / women and their similarity / dissimilarity are core current political concerns. A key issue is disentangling the factors pertaining to within- (intra-) as opposed to between- (inter-) sexual interaction, and how these may differ according to sex (see below). Too often these very different scenarios are considered in effect interchangeable, notwithstanding that experiment easily reveals that they yield distinctly different results.

The standard explanatory refuge has been and continues to be the internally inconsistent (and externally invalid) ideologically derived notion of a simultaneously identical nature of the sexes and a presumed male-to-female major antipathy through supposed stereotyping, pejoratively envisaged as inaccurate prejudice internalised into implicit cognition by the female recipient, to the extent of seriously impairing her performance. [It is never questioned how two supposedly identical types could systematically show a unidirectional effect unless the two types are *non*-identical. The feminist understanding of the sexes, which has been assimilated as an assumption in social science, is a constantly oscillating irresolvable contradiction.] Given this supposed implicit cognition, then the female performance impairment is presumed to be evident in all contexts, irrespective of whether or not any males are present, or if a male is the competitor. Thus is explained the failure of experimenters to focus on the difference between the intra- and inter-sexual condition.

Formulated as 'stereotype threat' theory, it's most recently been invoked to explain sex differences in competitiveness by Iriberri & Rey-Biel (2013), even though recent attempts to test it produced entirely contrary findings [Geraldes, Riedl & Strobel (2011); Fryer, Levitt & List (2008)]. But to be considered a scientific theory, 'stereotype threat' has to be a falsifiable concept and not an hypothesis for which any and every evidence – even that which is mutually antagonistic – can be interpreted as invariably supportive. The 'theory' has been comprehensively refuted by the first ever full review of all studies to investigate the supposed phenomenon [Stoet & Geary 2012] – there is a prior review paper by Kit, Tuokko and Mateer (2008), but far from an investigation of the phenomenon, the paper was predicated on the assumption that 'stereotype threat' is real, and merely looked at "progression" and "relevance" of research within the field.

Stoet & Geary reveal generic deeply flawed methodology; notably a usual complete absence of a male control group. The authors conclude that there is little if any evidence at all for the supposed phenomenon. In any case, 'stereotyping' is a usual social-conditioning argument failing to appreciate that there is an infinite regress to biology in the absence of explanation beyond description. A stereotype can be an inaccurate generic representation through political prejudice or in-grouping psychology, but perennial stereotypes are likely to be not merely accurate as rule-of-thumb distillation of repeated parallel observation over time, but the result of observation over evolutionary time leading to an implicit understanding deeply embedded as part of human psychology.

The other leading contender as explanation for sex differences in competitiveness is still more transparently descriptive: a supposed female egalitarian attitude with no correspondence in the male. Most recently, this supposed phenomenon has been ascribed to a female 'aheadness'-aversion – an antipathy to winning — in a seeming re-labelling of an egalitarian attitude; but the finding in the same study [Bartling, Fehr, Marechal & Schunk (2009)] that there is not also 'behindness'-aversion – a fear of losing – reveals this conceptualisation to be chimerical. An egalitarian attitude usually would be thought of as if anything the opposite: an aversion to losing, not to winning. A non-aversion to losing reveals a profound antipathy to competitiveness: the very conclusion researchers have been so exercised to avoid. Indeed, it's merely a re-statement of sex-differential competitiveness. This is not an informative deconstruction that can obviate the conclusion of sex-differential competitiveness.

An explanation in terms of a supposed female egalitarian attitude implies greater female co-operativeness, but the evidence is contrary. Whereas males readily identify themselves as being part of any symbolic group – such as their work-group or university year cohort – to include all other individuals, both male and female, without exception; females instead have an idiosyncratic, exclusionary and overwhelmingly same-sex feeling of belongingness [Goodwin & Rudman 2004; Maddox & Brewer 2005]. In consequence, even in a minimal grouping condition of newly formed same-sex dyads, males are more co-operative; and, unlike for females, this is irrespective of any expectation of reciprocity [Yamagishi & Mifune (2009)]. Introducing an inter-sexual inter-group condition changes this picture profoundly, because of the implicit threat a male out-group poses in female psychology. Whereas a female's performance in an inter-sexual dyad is still further reduced, if the inter-sexual dimension is one of opposite-sex same-sex grouping, then the performance of the females in the female same-sex dyads is markedly increased, through greater co-operativeness when there is a salient male out-group [Ivanova-Stenzel & Kübler (2005)]. Not only is this performance increase not due to competitiveness; neither is it due to co-operation of a positive kind. It appears to be an exercise in threat reduction akin to the behaviour of herd animals minimising the risk of individual predation by corralling.

Another 'cultural' explanation of sex-difference in competitiveness put forward by one group of researchers is in terms of an impact of the higher education of parents – with girls of well-educated parents being markedly non-competitive – only to contradict themselves in stating that this facilitated the manifestation of 'innate' sex differences which then explained their results [Almas, Cappelen, Salvanes, Sørensen & Tungodden (2012)].

Common to all of these lame attempts at explanation is a self-deception to a ruse to re-state the premise as the findings, through a putative explanation in some way sufficiently – which, it turns out, is but mildly — convoluted or mysterious as to hide that it's a mere tautology.

The most comprehensive attempt to date to test which putative component factors or facets of competitiveness are key to the sex-differentiality [Cotton, McIntyre & Price (2015)] rules out male over-confidence and/or female under-confidence, mis-perceptions about male or female ability, and sex-differential preferences. The review confirms that males are competitive in comparison to females because they enjoy competition or have a higher intrinsic value of winning, can better cope with the

pressure of competition, and are less concerned with the possibility of any negative aspects of competition. This is a cluster of what are proxies for or facets of competitiveness, or the lack thereof. The research clearly shows that males are much more competitive than are females because they possess inherent competitiveness far more than do females. The sex-differential is in competitiveness per se.

In trying to support a 'cultural' explanation – that is, in attempting to dismiss the sex difference as real – a slew of recent research has focused on discovering conditions in which a sex difference in competitiveness does not hold; but in each case interpretation is forced and flawed.

The classic ruse here is to use tasks that are not 'gender'-neutral but male-sex-*a*typical or female-specific, so that either male performance decreases – through, possibly, relatively poor ability or unfamiliarity with the task, or because males feel it's inappropriate for them – and/or female performance increases; neither change being the result of differing degrees of competitiveness per se. For example, Wieland & Sarin (2012) measure across several different tasks to claim that there is no sex-differential in competitiveness overall but only greater competitiveness by either males or females according to the domain (meaning the sex-typicality) of the task: but they use fashion as one of their four competition domains, with no corresponding domain which is male-specific, thereby heavily skewing the task type to female domains, rendering their interpretation of their data invalid.

A most recent short review of 'cultural' explanation (see Section 2, 'Related Literature', within Gupta, Poulsen & Villeval, 2013) reveals a usual uncritical attitude. The mini review begins with a claim that "the recent literature has provided pieces of evidence mainly in favor of a cultural origin of these gender differences in competitiveness", yet none of the studies cited withstand examination in this regard.

The first is by Gneezy et al (2009), purporting to show that the sex differential in competitiveness can be reversed in a matrilineal society; but as with Wieland & Sarin's study, this relies on a sleight of hand in respect of the nature of the set tasks. Here there is only the one, which is characterised as supposedly male-sex-typical, when by its nature and context it is anything but – not male-sex-typical or 'gender'-neutral', but female-sex-typical. The task was directly related to an ingrained female routine action, conducted within a domestic setting, using a domestic utensil. The setting was a 'traditional' undeveloped third-world community within a house, making use of a household bucket, with the task of very gently tossing a tennis ball for an extremely short distance into a bucket. This effectively reproduced in abstract the gathering work women in traditional forager societies perform daily; an activity that has been so clearly female through evolutionary time that it is likely to have resulted in specific psychological adaptations. Yet the authors of the study deem it male-sex-typical in that there is a throwing component, even though a male-sex-typical throwing task would entail a very muscular, high-velocity, long-range, accurate use of a projectile in the context of hunting. Taking together the nature of the action and its context within a traditional society, this would be considered by participants as being profoundly within a female domain and sphere of control. To consider any aspect of this to be male-sex-typical or even merely 'gender-neutral' is hardly credible. Women naturally would be expected to perform well in a female-sex-typical task within an environment that is definitively within female control, and it would be anticipated that this would be still more the case in the context of a matrilineal society, because female spheres of control would

be more extensive and more explicitly demarcated, thereby further dissuading male involvement. Even with no depression but merely no elevation of male performance, this scenario likely would produce the results as obtained. On the evidence here, it seems that the only way to claim that female competitiveness is equivalent to that by the male is by a special combination of factors to encourage females and discourage males, and to avoid not only the inverse but also a level playing field. This is to distort the phenomenon under study; and, therefore, the experiments do not show what they purport.

Second cited is the paper by Dreber et al (2009), in which there is reported a failure to replicate with Swedish children the gender [*sic*] gap in competitiveness (because, it is suggested, Swedish society is more egalitarian than others). But this study features cross-sex pairings with explicit indication to the children that the one-on-one encounters are and should be considered to be competitive. Very strong priming making salient both the cross-sexual *and* competitive nature of the interaction is likely to evoke in boys deference to girls. Deference is a signalling of non-engagement of dominance-submission interaction: a feeling of inappropriateness of competing other than intrasexually; against fellow boys (see below). [In the text of the study, on page six, it is stated that the facilitator "presented the tasks as competitive activities. The dance competition was presented as a 'battle'".] Again, the experiments do not warrant the interpretation and conclusion by the authors, but a wholly different interpretation according to a factor the experimenters had not considered.

Next is marshalled the finding by Booth & Nolan (2009) that girls educated in single-sex schools are more competitive than girls from mixed-sex schools. Yet it is hardly a surprise that being steeped in an institutional same-sex environment might improve female performance, as this may be through freer rein to the well-attested notably female quality of conscientious [eg, Kling, Noftle & Robins (2013)] in the absence of the atmosphere created by the boisterous behaviour of boys, and the diverting of attention by the teachers away from them and towards the boys – not least through the different teaching style boys require. Even if the improved performance indeed were down to facilitating female intra-sexual competitiveness, there is anyway no comparison in the study with male intra-sexual competitiveness – boys in single-sex schools. That is, no results are included to compare boys' and girls' single-sex school performance: no control; presumably for the inadmissible reason that they would (or would be anticipated to) contradict the other findings. Neither is there ecological validity, in that the usual context of competition, in the workplace and in mainstream education, is where both sexes are present. Therefore, there is here neither evidence against a biological underlying basis of competitiveness nor in favour of a 'cultural' explanation of any sex-differential.

Finally, is the citing of Sutter & Rutzler (2010), supposedly to show that sex-differential competitiveness is not 'innate' and instead acquired; but the study reveals if anything the opposite in its being present already by the very early age of four years. Much necessarily genetically-based behaviour first manifests not at birth but at some age-appropriate stage of development, until when it remains un-triggered. Age four is only just past toddler age, when the genetically based most elementary social behaviours of male dominance and hierarchy formation and corresponding female 'personal-networking' emerge. In any case, there is a minimum age below which testing children in respect of socially interactive behaviours becomes severely problematic, so there is little possibility of providing a control with a younger cohort.

Contrary to the implicit assumptions of behavioural economics, there is no shortage of lines

of evidence indicating a biological basis of sex-differential competitiveness. That male competitiveness in contrast to female backing-away is very deep-seated and not a cultural phenomenon is shown in its not merely cross-cultural but ancient occurrence: the same pattern is found even in extant hunter-gatherer (forager) societies [Apicella CL & Dreber A (2014)], which are thought to closely resemble human ancestral populations generally. Here, males are more competitive in gender-neutral as well as male-sex-typical tasks, and only in female-sex-typical tasks are females as willing to compete as are the males; just as is generally found in sampling of men/women, boys/girls across behavioural economics study of competitiveness.

A key hormonal basis of this has been discovered in the sex-dichotomous effects of oxytocin: boosting co-operation in women, whereas in men the boosting is not of co-operation but of competitiveness [Fischer-Shofty, Levkovitz & Shamay-Tsoory (2013)]. This sex-dichotomy is more broadly underpinned by the contrasting – in major respects completely non-overlapping – features of neurohormonal pathways of stress response according to sex, whereby stress appears to be in effect manufactured in males in order to drive competitiveness, in contrast to females, for whom stress is something to be ameliorated [Wang et al (2007); Juster & Lupien (2010); Bangasser et al (2010); Lee & Harley (2012); Strerrenburg (2012) – based on Kozicz, Sterrenburg & Xu (2011); Lighthall et al (2012); see Moxon (2015 forthcoming) for a review].

Underlying these mechanisms in turn is the biology of sexual selection theory, which is the most comprehensively well-established of almost any in biology: that the comparatively very low potential reproductive output of the female against the potentially extremely high male output leads to male intra-sexual competition for sexual access to females, but not vice-versa. Very many outlines, discussions and reviews are available [eg, Puts (2010)], with abundant evidence of how this impacts on competitiveness cross-sex. For example, Buunk & Massar (2012) find that "as predicted on the basis of theorizing on sexual selection, males behaved more competitively towards another man than towards a woman, whereas women did not distinguish between men and women in their degree of competitiveness. At the same time, men behaved more pro-socially towards women than women did towards men".

At a level of explanation below even this, is the basis of why there evolved separate mating types, with one of two types designated the female sex specialising in reproduction per se. This is the need to deal with the key problem for all biological systems of accumulated gene replication error, which is most efficiently by allocating such function to half of all reproducing individuals and in effect quarantining this activity away from the other half of the reproductive group, so that their reproduction is unimpeded [Moxon 2012]. The key mechanisms of this 'genetic filter' [Atmar 1991] or 'mutational cleansing' [West-Eberhard 2005] function are careful female mate-choice in favour only of males with high genetic quality, and male-male competition to display relative genetic quality and then to form a clear rank order accordingly, thus facilitating female mate-choice according to female criteria.

From this, it is self-evident that the male is competitive in a way, to a degree, and for ends not corresponding in the female (for whom it would have little obvious function), and that this is *intra* and not inter-sexual (because, not only, again, would inter-sexual contest serve no function, but it would be severely counter-productive), as is seen in all biological dominance [Moxon 2009,

2012].

Inter-sexually, though there is not competitive interaction, continuing from basic biological principles it would be anticipated that there would be interaction in terms of *sexual display*, and this would seem to be apparent in the additional overall finding in the above-cited most recent review [Niederle 2015] that *inter*-sexually boys and men may actually *increase* their performance and/or choose a more competitive form of contest in comparison to girls and women. For males, effective sexual display is to indicate their dominance or potential dominance over other males, and therefore, performance per se – in effect competitiveness against *own* or imagined other males' past or expected performance levels – is likely to be evoked in an inter-sexual context.

It is a commonplace observation that in many species actual male dominance signalling (though then divorced from male dominance behaviour per se) has been co-opted in evolution for courtship function; with the female, in sexually selecting males according to their dominance over other males, responding to male dominance signalling by coyness to try to evoke more of it in a call-and-response loop of courtship development, leading up to the possibility of mating. This male-female courtship routine is likely to be a non-conscious (implicitly cognitive) feature of male-female interaction generically, whether or not there is any context construable as courtship. Self-evidently, this is not unlikely to be misconstrued as male competitiveness and female non-competitiveness, leading to a false conclusion that in some circumstances males are inter-sexually competitive, and more so in this regard than are females.

Conversely, a factor in cross-sexual scenarios that might be anticipated when competition is strongly primed (made salient) – or in competition scenarios if opposite-sex is primed — would produce instead a *decrease* in ostensible male inter-sexual competitiveness: male indication of non-engagement in dominance-submission interaction by behaving deferentially. Male deference to females is well recognised in humans and is a biological phenomenon exhibited in many species, notably now recognised in the various species previously thought to be 'female dominant', but now known actually to feature female feeding priority through males having evolved simply to stand aside to allow it [Kappeler 1993; Moxon 2009, 2012]. This may be misinterpreted as low male inter-sexual competitiveness, and with no such deference expected in the other direction, there could be misinterpreted female relative competitiveness, and hence a false conclusion that in some circumstances females are more inter-sexually competitive than are males. [For females – as pointed out above — priming (making salient) the opposite-sex composition of an out-group fosters female intra-sexual co-operation, leading to increased performance; and this is the case whether or not competition is salient.]

These are principles to which the 'standard social science model' for the most part is blind, if not in some respects in ideological opposition; so it is not surprising that the behavioural economics literature has struggled to come to terms with the topic of competitiveness and the sexes.

There are further factors at play which are recognised in the literature, though, of course, not understood in respect of how it interacts with biological factors: sex-typicality of task and priming; which have already been alluded to and discussed in the context of flawed studies. To perhaps more clearly state, summarise, and extend: both actual and ostensible competitiveness would be an-

ticipated to be modifiable in intensity according to the sex-typicality of task (somewhat reduced though not eliminated when the task is female-sex-typical, because males are neither as able nor can be as attractive to females as with a male-sex-typical task) and as to whether or not competitiveness is primed (made salient to participants). Correspondingly for females, if the task is sufficiently female-sex-typical, then performing it may not be compromising to the indication and signalling of female qualities, and therefore it might be anticipated that competitiveness would not decrease. An increase would seem less likely given that competitiveness itself is not female sex-typical, other than when it is intra-sexual and over physical appearance and/or reliability as a prospective pair-bond partner. Task-related competitiveness can have little utility for females as a means of sexual display. Behavioural economists see the importance of sex-typicality of task, and have incorporated this as a factor in experimental design; but they have considered this mainly in terms of eliciting different levels of confidence in performance according to 'stereotype' – on the lines of the now discredited hypothesis of 'stereotype threat'.

When a biologically-based framework is used to interpret the results of behavioural economics studies of competitiveness, the complex confusion of the literature in the sometimes only partial replicability of studies (or failure to replicate) appears to be an artefact of the variety, internal inconsistency, ecological invalidity and tautological emptiness of 'gender'-sociological theorising. Through a biological understanding, the priming or otherwise of competition, sex, and the male- or female-sex-typicality of the task have a clear contrasting impact on whether there is produced competitiveness and/or sexual display (or, in some circumstances, male deference or female co-operativeness), as a function of whether subjects are paired inter- or intra-sexually. Results of studies now can all be interpreted in terms of this model of competitiveness and/or sexual display, and possibly male deference or female co-operation. For example, the data in the above-cited study the authors claim is consistent with 'stereotype threat' [Iriberri & Rey-Biel (2013)] is neatly accounted for within the biological framework, completely dispensing with the tautological sociological/ ideological postulate.

To list and more precisely state and slightly expand major factors and their impact that should be expected in inter-sexual ostensibly competition scenarios:

- Competition that is psychologically salient as such (both implicitly and explicitly) is not inter-, but only intra-sexual, in line with dominance behaviour across the animal kingdom. Boys/men readily compete with other boys/men; girls/women (though less so, and more restrictedly) other girls/women. If the sexes are placed obligatorily against each other in a competitive scenario, then, in this de facto competition, any element of competitiveness per se would be expected to be weak, owing to the absence of a salient opponent per se. Any apparent competition would be comprised of other phenomena.
- For males, competition per se is highly sex-appropriate, in that males compete with each other to establish dominance rank (status) as a principal mechanism to reveal the extent to which each individual male possesses 'good genes', which is the criterion of mate-value by which males are sexually selected by females. There is nothing corresponding for females, whose mate-value is in terms of their fertility (indicated by youthfulness and 'beauty'), over which there is far less scope for competition. Indeed, competitiveness per se is inimical to female sexual display, unless of a certain narrow form. Consequently, in an intra-sexual competition scenario, males are likely to perform well and/or to choose a 'competition' option, whereas females are likely to back off

from performing well and/or from choosing a 'competition' option.

- When the sex of an obligatory-competition opponent is salient, and the opponent is opposite-sex, then instead of competition there is more likely to be sexual display, and this is likely to be mutual. In other words, there is ostensible continuation of competitiveness when actually it is male sexual display with female reciprocation to facilitate it.
- By way of sexual display, males are likely to utilise the male-appropriateness of competitive behaviour (just as across the animal kingdom dominance signalling has been co-opted for a courtship function), and therefore may well *increase* their performance and/or more frequently choose a 'competition' option (in comparison to an intra-sexual scenario) – at least if the competition scenario is male sex-typical – even though the behaviour is not competitiveness with the female per se.
- Females in a cross-sex competition scenario correspondingly are likely to *reduce* performance and/or avoid a 'competition' option in favour of adopting body poses and demeanour that effectively display their femininity better than does the physical activity or pugnaciousness involved in competition.
- Rendering salient not just the sex ('gender') but competition per se – to a large degree, perhaps so that it becomes explicit rather than just implicit cognition – is likely to undermine male utilisation of competition performance as sexual display (an intuitive 'chivalry' stemming from evolved deference – signalled non-engagement in dominance behaviour); and in consequence males are then likely to *reduce* performance and/or avoid choosing a competition option. No such phenomenon is likely to be evident in female behaviour. On the contrary, females in same-sex grouping – especially if membership is freely chosen (as in the formation naturally of female 'personal network') – are likely to respond to being primed with a male out-group to up their performance through within-group co-operation. These effects are likely to be misconstrued as female inter-sexual competitiveness, despite being merely ostensible and not real.
- The sex-appropriateness or typicality of a competition task and/or context may be crucial; possibly even to the extent of males backing away from competition and reducing their performance in an extreme female-appropriate/typical task/context; whilst being more eager to engage in competition and increasing their performance in a male-appropriate/typical task/context. Backing-away is the standard female behaviour here and even in female sex-appropriate/ sex-typical tasks/contexts females usually do not improve in performance; merely not performing worse.
- In some forms of competition settings, female conscientiousness – a trait that research reveals to be more typically female than male – is not unlikely to be mistaken for competitiveness. This would make the sex difference in competitiveness considerably wider than what may be apparent.

These biologically-based factors foundational to social structure and dynamics, from a 'gender'-sociological perspective pose very considerable problems in interpreting data from behavioural economics experiments on competitiveness and 'gender' [*sic*]. Some of these factors had been partially identified – notably the importance of whether or not competition is primed and sex-appropriateness of task – but not understood. Jettisoning the usual orientation in behavioural economics of 'gender'-sociology and competition only in respect of goods, in favour of taking on board biological principles, offers clearly better interpretation of studies. Yet there seems not to be even an elementary awareness amongst behavioural economists (and work psychologists) not only of biological factors but also any philosophical or scientific understanding of the general relationship whereby biology

subsumes culture.

This impasse renders the experimental design of studies hitherto published often of limited use in uncovering what actually is going on regarding competitiveness and the sexes. Behavioural economists would be well advised to collaborate across disciplines: to work with evolutionary biologists/ psychologists/ anthropologists, thereby escaping the confines of 'the standard social science model' to constructively seek scientific answers to questions of competitiveness and the sexes.

This is challenging, in that the promise of greater parsimony depends on providing effective controls in experimental design, given the possibility of multiple interacting dimensions (competitiveness, display and deference). The advance, though, is that now there is clarity regarding what needs to be controlled for, and therefore we are able to see what is likely to be a successful experimental design.

The attempt at a 'gender'-sociological critique of the overall finding of profound sex-difference in competitiveness has backfired, with studies intended to refute it instead being interpretable with more internal consistency and external validity within a biological framework, thereby further revealing competitiveness to be not only sex-differential but intra- and *not inter*-sexual, in line with the other levels of analysis and lines of evidence briefly outlined here. This completely undermines the attempted critique in that it removes the inter-sexual dynamic necessary even to allow the possibility of male-to-female prejudice and 'bullying', as hypothesised in the discredited hypothesis of 'stereotype threat'. The very basis of the ideological supposition of a male-on-female 'oppressive' dynamic to explain supposed female disadvantage is exposed as empty and false.

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Steve Moxon is an independent researcher based out of Sheffield in the United Kingdom. He is a cross-disciplinary researcher in the biological roots of human sociality, with a special interest in the sexes. He can be reached at stevemoxon3@talktalk.net.