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The robustness of the win–win effect

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HIGHLIGHTS

- Berdahl et al. (2015) show that national gender equality predicts Olympic medal wins
- Kuppens and Pollet (2015) find otherwise controlling for GDP per capita and world regions
- We show that gender equality predicts Olympic medal wins controlling for GDP per capita
- We argue that controlling for arbitrarily-defined world regions is inappropriate
- Crowdsourcing analysis of complex datasets can address analysis-contingent results

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ABSTRACT

We demonstrate that positive relationships between measures of national gender equality and Olympic medal wins are robust across a variety of appropriate statistical approaches to analyzing cross-national data. First demonstrated by Berdahl, Uhlmann, and Bai (2015), who controlled for GDP, population, latitude, and income inequality, we show that relationships between gender equality and medal wins remain positive when controlling for GDP per capita, consistently log-transforming positively skewed variables, and fully analyzing all four gender gap subindexes. The Win–Win effect is most robust for gender equality in education and earnings. Controlling for arbitrarily-defined world regions ("Anglo-Saxon countries" vs. "Africa") is inappropriate, as such groupings are based on folk stereotypes, not objective scientific criteria, and risks masking meaningful differences between countries. There is, however, often more than one right way to analyze a dataset; we discuss how this can be addressed by crowdsourcing the analysis of complex datasets prior to publication.

Kuppens and Pollet (2015) argue that the positive relationship between national gender equality and Olympic medal wins reported by Berdahl et al. (2015) is nonsignificant and even reverses when controlling for GDP per capita and world regions. Kuppens and Pollet inconsistently log transform variables, however, in a manner that artificially reduces the relationship between gender equality scores and medal wins. Specifically, they log transform GDP per capita to correct for positive skew, but not national population, which is also positively skewed. This is an easy mistake to make, but has a large effect on the degree of empirical support obtained for the Win–Win effect. As we demonstrate below, when GDP per capita and population are both log-transformed, significant positive relationships between measures of gender equality and medal wins remain.

In addition, Kuppens and Pollet (2015) analyze the overall gender gap score from the World Economic Forum but only one of its four subindexes: educational gender equality. We demonstrate that when all four subindexes (educational, economic, health, and political gender equality) are fully analyzed, both educational and economic equality emerge as important predictors of medal wins.

Controlling for arbitrarily defined world regions, as Kuppens and Pollet (2014, 2015) advocate, is not done in research on cross-national comparisons, and for good reason. Such groupings are based on folk stereotypes rather than objective scientific criteria, and risk obscuring real national differences.

Although we disagree with Kuppens and Pollet's (2015) conclusion that gender equality is either unrelated or negatively related to Olympic medal wins, we acknowledge that there is often more than one right way to analyze a dataset. The Win–Win effect, like any other finding based on a complex set of interrelated variables, cannot remain significant at the $p < .05$ level no matter which statistical approach and control variables are used (Anderson & Anderson, 1996). As the field moves

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toward a new era of open data and scientific transparency, we can collectively address the issue of analysis-contingent results by crowdsourcing the analysis of complex datasets prior to publication (Silberzahn et al., 2015).

1. Measures of gender equality positively predict medal wins after controlling for GDP per capita

As emphasized by Berdahl et al. (2015), any analysis controlling for national wealth when predicting an outcome from gender equality is inherently conservative. Gender equality predicts future economic growth: societies in which men and women are given more equal opportunities exploit their human capital more efficiently and therefore enjoy greater prosperity (Barsh & Yee, 2011; Chaaban & Cunningham, 2011; Inglehart & Norris, 2003; Lagerlöf, 2003; Löfström, 2009; Morrison, Raju, & Sinha, 2007; World Economic Forum, 2014). To the extent that gender equality contributes to national wealth *and* athletic success, controlling for national wealth underestimates the effects of gender equality on medal wins (S1 elaborates on this point in greater detail).

That said, it remains important to examine the relationship between national-level gender equality and Olympic medal wins after controlling for national wealth. Table 1 reports the zero-order correlations between all of the variables in the present analysis. Tables 2 to 5 summarize the results repeating Kuppens and Pollet's (2015) analyses when GDP per capita and national population are both log-transformed and all four gender gap subindexes are analyzed.

As seen in Tables 2 and 3, in quasipoisson regressions, overall gender equality significantly predicts Olympic medal wins for women ($b = .33$, $SE = .13$, $p = .013$) but not for men ($b = .05$, $SE = .11$, $p = .643$). Tables 4 and 5 show that this pattern of results is similar using negative binomial regressions: Overall gender equality scores are significantly and positively related to medal wins for women ($b = .83$, $SE = .24$, $p < .001$), a relationship that is in the same direction but not significant for men ($b = .27$, $SE = .18$, $p = .128$). Thus, controlling for GDP per capita reduces the relationship between overall gender equality and medal wins to nonsignificance for men, but it does not reverse the sign of the effect. A higher overall level of gender equality in a society benefits female athletes, without hurting the success of male athletes.

This does not mean, however, that important forms of gender equality in a society never benefit male athletes. Gender equality is multidimensional, and for this reason Berdahl et al. (2015) fully analyzed the World Economic Forum's gender gap subindexes for educational, economic, health, and political gender equality. As seen in Table 1, educational equality and economic equality exhibit positive zero-order correlations with medal wins for both men and women, whereas equality in health and political representation do not.

As noted by Berdahl et al. (2015), the equality-medals effect is most strongly supported across different analytic approaches for the educational equality subindex. In quasipoisson regressions, educational equality predicts medal wins for both women ($b = 1.42$, $SE = .49$, $p = .004$) and men ($b = 1.01$, $SE = .39$, $p = .010$). In the negative binomial regressions, educational equality is likewise a significant predictor of medal wins for both women ($b = .75$, $SE = .35$, $p = .031$) and men ($b = .72$, $SE = .33$, $p = .031$).

In the analyses reported across Tables 2–5, economic gender equality also emerges as a positive predictor of athletic performance. As seen in Tables 2 and 3, in quasipoisson regressions the economic equality subindex predicts women's medals ($b = .56$, $SE = .13$, $p < .001$). This relationship is in the same direction but marginally significant for men ($b = .20$, $SE = .11$, $p = .082$). As seen in Tables 4 and 5, in negative binomial regressions, economic gender equality significantly predicts medal wins for both women ($b = .97$, $SE = .22$, $p < .001$) and men ($b = .41$, $SE = .15$, $p = .005$).

The final columns of Tables 2–5 report analyses with all four gender gap subindexes entered into the regression model simultaneously. These represent some of the most conservative tests of the "Win–Win" hypothesis, given that different types of gender equality correlate with each another. For educational and economic equality to predict medal wins, they must do so above-and-beyond each other as well as above-and-beyond gender equality in health and political representation. Despite this, in all regressions, educational and/or economic gender equality significantly and positively predict medal wins for male and female athletes.

It is clear from the analyses in Tables 1–5 that higher levels of gender equality in health outcomes and political representation do not facilitate the success of either male or female athletes at the Olympic games. When entered with the other three subindexes, the political equality subindex negatively relates to men's medal wins in the negative binomial model (Table 5). However, the zero-order correlation between political equality and medal wins for male athletes is positive in sign (Table 1) and political equality does not predict men's medal wins when entered by itself in the model (see Tables 3 and 5). This overall pattern of results suggests a null rather than a negative relationship between political equality and medal wins.

The heterogeneous results across gender gap subindexes underscore the multi-dimensional nature of gender equality. Some types of gender equality (education and economic) are a "Win–Win" for male and female athletes, whereas others (health and political representation) do not affect their success or failure.

Table 1
Correlations between study variables.

Variable	1	2	3	4	5	6	7	8	9	10
1. Women's medals										
2. Men's medals	.82**									
3. Overall gender equality	.22*	.24**								
4. Educational gender equality	.19*	.23*	.58**							
5. Economic gender equality	.22*	.18*	.74**	.19*						
6. Health gender equality	.04	.07	.19*	.19*	.06					
7. Political gender equality	.06	.12	.74**	.16	.30**	.08				
8. Gini index[a]	−.07	−.20*	−.10	.01	−.06	.07	−.15			
9. Population[b]	.41**	.36**	−.14	−.19*	−.22*	−.12	.09	−.05		
10. GDP per capita[b]	.37**	.47**	.47**	.61**	.20*	.22*	.23*	−.21*	−.12	
11. Latitude	.19*	.26**	.16	.21*	.06	−.01	.10	−.67**	.02	.40**

Notes:
* $p < .05$.
** $p < .01$.
[a] Higher scores indicate more economic inequality.
[b] GDP per capita and population (in thousands) are log transformed.