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How to cite

CONFINO, Dan et al. National gender equality and sex differences in Machiavellianism across countries. In: International journal of personality psychology, 2024, vol. 10, p. 105–115. doi: 10.21827/ijpp.10.41854

This publication URL: https://archive-ouverte.unige.ch/unige:180689
Publication DOI: 10.21827/ijpp.10.41854

International Journal of Personality Psychology
2024, Vol. 10, 105-115
https://doi.org/10.21827/ijpp.10.41854

National gender equality and sex differences in Machiavellianism across countries

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Machiavellianism is characterized by a focus on self-interest and a desire to achieve personal goals at any cost. Research consistently found that, on average, men score higher on Machiavellianism than women. However, the factors contributing to this sex difference remain unclear. The present research examined whether sex differences in Machiavellianism vary across countries and whether national levels of gender inequality are related to these differences. We analyzed Machiavellianism scores of 56,936 adults across 48 countries. We operationalized gender inequality at national level using two indices (the Gender Inequality Index and the Global Gender Gap Index) and assessed Machiavellianism at the individual level using the MACH-IV scale. Multilevel modeling indicated that men scored higher in Machiavellianism than women, with a larger sex difference in countries with higher levels of gender equality, irrespective of the gender inequality index used. This pattern emerged because women's MACH-IV scores decreased as national gender equality increased, whereas men's scores remained stable. We discuss the relevance of these findings for the literature on sex differences in personality and gender equality paradox.

Keywords: gender inequality, Machiavellianism, sex differences, gender norms, gender equality paradox

Machiavellianism is considered a personality trait that reflects manipulativeness and deceitfulness in the service of self-interested goals (Jakobwitz & Egan 2006). The term Machiavellianism was first coined by Christie and Geis (1970) as a personality construct reflecting individual differences in endorsing a core idea in Machiavelli's philosophy– that outcomes are more important than processes ("the ends justify the means").

It is characterized by a tendency to view people as objects or means, leading to distrust, deception, manipulation, exploitation, and cynicism toward others (McIllwain, 2003; Rauthmann, 2012) to gain and maintain power (Jonason & Webster, 2012). Machiavellianism seems sensitive to contextual factors (Jones & Paulhus, 2011; Vernon et al., 2008), such as family functioning (Láng & Birkás, 2014). Furthermore, Machiavellianism is characterized by behavioral flexibility, often described as a protean or chameleon characteristic (Bereczkei, 2017). Indeed, Machiavellian individuals adapt to situational demands and quickly change their tactics to maximize personal gain (Christie & Geis, 1970; Jones & Paulhus, 2009).

Sex differences in Machiavellianism

Machiavellianism is one of the malevolent personality traits comprising the Dark Triad (Paulhus & Williams, 2002). Extensive research has consistently demonstrated that men score higher than women on all three traits of the Dark triad, including Machiavellianism (e.g., Jones & Paulhus, 2014; Muris et al., 2017; Jonason et al., 2013). These sex differences in Machiavellianism persist across the lifespan (Götz et al., 2020), and they are observed regardless of the measurement instrument used (Collison et al., 2021). However, whether these sex differences reflect specific gender-related dispositions (e.g., verbal abilities; Galsworthy et al., 2000) and personality traits (e.g., emotionality; Lee & Ashton, 2020), or more general differences in adapting to social constraints (e.g., social roles or structural constraints) remains poorly understood.

Moreover, research also indicates that Machiavellianism manifests differently depending on sex (see McHoskey, 2001; Szabó & Jones, 2019). For example, in women, Machiavellianism is correlated with harm avoidance, anxiety, vulnerability, and hypersensitivity, while in men it is associated with risk-taking, self-confidence, and an opportunistic worldview (Czibor et al., 2017). Although Machiavellian individuals overall prefer to have power over others (McHoskey, 1999), men tend to be more ruthless self-advancement than women (Semenyna & Honey, 2015). Finally, Machiavellianism is generally coupled with negative consequences (e.g., Abell et al., 2016), particularly for women (e.g., emotional disturbance, anxiety, worse social relationships and quality of life; Abell et al., 2016; Czibor et al., 2017; Zhu et al., 2021).

In sum, past research suggests that men tend to score higher on Machiavellianism than women, and this trait may express differently across sexes. Different factors can

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account for these sex differences in Machiavellianism. Accordingly, in the present research we contend that the level of gender equality in a given social context may influence these sex differences in Machiavellianism.

Machiavellianism and gender inequality

Gender equality is shaped by the legal, social, and cultural context in which women and men benefit from the same rights and dignity. Internationally recognized gender equality indices exist to assess the extent to which men and women in each country have equal access to resources and rights. For example, the World Economic Forum has published the Global Gender Gap Report annually since 2006 (World Economic Forum, 2020), and the United Nations Development Program (UNDP) introduced the Gender Inequality Index in 2010, which has since been published annually (see Sharma, et al., 2021).

During the past few decades, national levels of gender equality have increased across diverse domains (Dorius & Firebaugh, 2010), including religious and cultural traditions, as well as household roles (Malghan & Swaminathan, 2021). Gender equality is overall associated with a large array of positive social and health outcomes, such as higher economic performance (Klasen, 2018), which includes positive benefits for both sexes (e.g., health promoting behaviors: de Looze et al., 2019)

A strong body of evidence shows that national levels of gender equality correlate positively with sex differences in personality traits (e.g., larger sex differences in neuroticism in more gender-equal countries, Schmitt, 2008). This phenomenon, known as the Gender Equality Paradox (GEP), challenges the expectation that greater gender equality would reduce psychological sex differences (Stoet & Geary, 2018). Since it was first reported in an analysis of NEO-PI-R data by Costa and colleagues (2001), the GEP has been observed in numerous other studies. For instance, gender differences have been further observed in personality traits (García et al., 2022; Balducci, 2023), including big-five personality traits (Lippa, 2010; Mac Giolla & Kajonius, 2018; Kaiser, 2019), psychopathic characteristics (Jonason et al., 2020), or emotionality (Lee & Ashton, 2020). It has also been observed in studies of educational outcomes (Stoet & Geary, 2018), career choices (Stoet & Geary, 2022), interests (Vishkin, 2022), values (Fors Connolly et al., 2020), and sex differences in deceptive self-presentation (Kolesnyk et al., 2021).

To our knowledge, only few studies have specifically examined the relationship between national gender equality and sex differences in Machiavellianism, yielding mixed results (Schmitt et al., 2016, cited in Schmitt, 2017; Luo et al., 2022; Jonason et al. 2020). Schmitt et al. (2017), analyzing data including 58 nations, found larger sex differences in Machiavellianism in countries with greater gender equality at the cultural level. However, it is worth mentioning that this study did not focus exclusively on Machiavellianism but measured it as part of the Dark Triad. Likewise, Luo et al. (2022) examined three countries (United Kingdom, Greece, and China) and showed that sex differences were larger in more egalitarian countries. Gender equality seems to relate to lower levels of Machiavellianism in women than in men (Schmitt, 2015). In contrast, another study showed that sex differences in Machiavellianism were not related to gender equality at the country level or to any other index reflecting country's level of development (Jonason et al., 2020). However, the sample in that study consisted of young adults (M_{years} = 21.53, *SD* = 3.17) from 49 countries. As such, further research using different samples is needed to empirically examine whether sex differences in the endorsement of Machiavellianism vary as a function of country levels of gender equality.

Two competing theoretical perspectives have been proposed to explain sex differences in Machiavellianism. On the one hand, results supporting the GEP are often explained as a function of evolutionary theory (Schmitt, 2015), which posits that sex differences in traits and values stem from innate dispositions developed in response to adaptative challenges faced by our ancestors. In this view, increased gender equality, often accompanied by increased resource availability, enables individuals to express gender-specific preferences more freely (Falk & Hermle, 2018). According to this perspective, higher gender equality would *increase* sex differences in personality, namely because individuals are allowed to follow their intrinsic tendencies more intensively (e.g., Schmitt et al., 2008). More specifically, it suggests that gender equality would increase men's endorsement of Machiavellianism and reduce women's.

On the other hand, the second theoretical perspective in support of the GEP is based on the social structural theory (Eagly & Wood, 1999), and presents an opposing view. This perspective argues that any psychological differences between men and women are mainly due to gender roles socialization and sociopolitical power dynamics. According to social role theory, sex differences in personality arise from internalized gender roles, which derive from the gender division of labor in society (Eagly et al., 2000; Eagly & Wood, 1999). Through gender socialization, individuals internalize expectations about gendered behavior, which shapes individuals' personality through processes like self-categorization and self-stereotyping (Wood & Eagly, 2012). According to this theoretical perspective, increases in gender equality should reduce, not amplify, sex differences in personality, including Machiavellianism.

Although previous studies supporting the GEP are often presented as corroborating evolutionary theory, it is worth noting that this evidence does not provide a direct test of the theory. Furthermore, there are reasons to question whether the GEP results solely from a general release and reinforcement of innate dispositions, as suggested by evolutionary theory. Rather than considering social structural and evolutionary theories as mutually exclusive, in the present research we propose that the influence of gender equality on sex differences in Machiavellianism can reflect complex, socially driven processes, that are based on the different functions that Machiavellianism may accomplish for men and women.

Several lines of research support this understanding. We propose that, while men have historically had greater access to resources and power than women (e.g., Pratto, 1996), increased gender equality may change the way men and women perceive and respond to this equality, and adjust their tactics accordingly. Men, for example, may need to compete not only with other men but also with women for power, potentially maintaining or even intensifying their use

of Machiavellian tactics (Off et al., 2022). In contrast, women might benefit more directly from increased gender equality (Arat, 2015) and therefore may feel less need to employ Machiavellian strategies.

Furthermore, research on conformity processes suggests that in gender-equal societies, cross-gender comparisons become more relevant, making gender identity and conformity to gender norms more pronounced (Guimond et al., 2007; see also Costa et al., 2001). In this context, gender equality can be perceived as a threat to gender distinctiveness, triggering reactive responses that increase sex differences through greater adherence to traditional gender norms (e.g., Bosson & Michniewicz, 2013; Falomir-Pichastor et al., 2019). As a result, greater gender equality could increase sex differences in Machiavellianism, namely due to masculinity norms (e.g., power achievement and personal advancement; Schwartz & Rubel-Lifschitz, 2009; Schwartz & Rubel, 2005) that align more closely with Machiavellian tactics than femininity norms (e.g., agreeableness and emotionality; Fischer & Manstead, 2000; see also Abell et al., 2016; Christie & Geis, 1970; Jones & Paulhus, 2009).

The present research

Past research indicates that Machiavellianism constitutes a relatively context-dependent personality trait that particularly suits masculinity, suggesting that sex differences in Machiavellianism may be influenced by a country's level of gender equality. However, few studies have directly examined this issue, and the results have been mixed. To address this gap, the present research aimed to enhance our understanding of the socio-structural determinants of sex differences in Machiavellianism by analyzing data from a large sample of 56,936 participants across 48 countries. Moreover, we used two different indices of gender inequality to minimize potential bias related to the choice of index.

METHOD

Sample

The data from the Machiavellianism Test[1], a version of the MACH-IV (Christie & Geis, 1970), were retrieved in December 2021 from the Open Source Psychometrics website[2] (for instance, see Johnson, 2020; Kaiser et al., 2020). According to the website, the data collection took place July 2017 - March 2019. The data set was uploaded to the website on March 26, 2019, and comprises 73,489 respondents with high predominance of participants from English-speaking countries. Participation was voluntary upon consent and no compensation was offered other than feedback. Demographic information was collected (e.g., age and sex), while the participants' country was automatically determined based on the IP address of the internet connection. Although international participants could mask their geographical location using virtual private servers (VPS; sometimes referred to as virtual private networks – VPN – or proxies; Kennedy et al., 2020), this concern appears irrelevant here because participation in the online questionnaire did not involve any financial profit, so that participants had no incentive to disguise their IP. From the original sample, we removed those participants who did not identify themselves as either male or female. Due to the impact of age on the endorsement of Machiavellianism, particularly during adolescence (see Götz, et al., 2020), it could preclude us from observing accurately the interplay between sex differences and gender (in)equality. As we primarily focused on the interaction between sex and gender inequality, we only included participants aged 18 to 70 years. Finally, we retained only countries comprising at least 100 participants (with more than 30 male and 30 female) for inclusion in the research in order to obtain robust country-level analyses and maximize power for detecting the average effect in social-personality (i.e., Richard et al., 2003). This resulted in a total sample size of 56,936, with respondents from 48 countries[3] (Table 1). The sample included 45.4% (N = 25,829) female and 54.6% (N = 31,107) male participants, with a mean age of 31.76 years (SD = 12.29). The average time spent on the questionnaire was 17 minutes. A flow chart illustrating the data screening procedure is provided in Appendix A.

Materials

We used two indices assessing gender inequality and a measure of Machiavellianism at the country level.

Gender inequality 1

The Gender Inequality Index (GII)[4] 2019 was used, which was developed by the United Nations as part of the Human development report in order to better estimate differences in the distribution of achievements between women and men. For each country, the disparity between female and male achievements is provided across three dimensions: 1) reproductive health, 2) empowerment, and 3) the labor market. The indicators are combined into a composite index by calculating a geometric mean for each dimension. For each country, the inequality between women and men is ranked on a scale ranging from 0 (equality) to 1 (inequality).

Gender inequality 2

We also used the Global Gender Gap Index (GGGI) 2020, developed by the World Economic Forum (WEF) in order to capture the magnitude of gender-based disparities and to track their progress over time across four subindices: 1) Economic Participation and Opportunity, 2) Educational Attainment, 3) Health and Survival, and 4) Political Empowerment. The final GGGI score is an unweighted average of the four subindex scores. For each country, the equality between women and men is ranked on a scale ranging from 0 (inequality) to 1 (equality).

[1] This questionnaire was part of a survey that contained other measurements as well. As the MACH-IV appeared in the beginning of the survey, we reasoned that participants' responses to this scale were not influenced by their responses to the next items.

[2] See https://openpsychometrics.org/rawdata/

[3] Hong Kong and Taiwan were removed due to lack of information regarding the gender inequality index (GII)

[4] See https://hdr.undp.org/data-center/thematic-composite-indices/gender-inequality-index#/indicies/GII

Table 1. Descriptive information

	N of participants			Age		Machiavellianism		Gender index	
Country	Male	Female	Overall	mean	*sd*	Male	Female	GII	GGGI
United Arab Emirates	90	81	171	31	10	3.63	3.19	0.079	0.655
Argentina	61	40	101	27	10	3.70	3.48	0.328	0.746
Australia	1,098	1,139	2,237	34	13	3.49	3.01	0.097	0.731
Austria	127	100	227	28	9	3.57	3.28	0.069	0.744
Belgium	196	88	284	30	10	3.70	3.24	0.043	0.750
Bulgaria	117	105	222	25	7	3.67	3.36	0.206	0.727
Brazil	269	121	390	27	8	3.79	3.46	0.408	0.691
Canada	2,033	1,992	4,025	33	13	3.51	3.06	0.080	0.772
Switzerland	126	84	210	30	10	3.64	3.29	0.025	0.779
China	506	409	915	32	8	3.40	3.30	0.168	0.676
Czech Republic	114	56	170	26	9	3.71	3.29	0.136	0.706
Germany	772	413	1,185	28	9	3.70	3.33	0.084	0.787
Denmark	195	77	272	29	10	3.65	2.98	0.038	0.782
Spain	162	147	309	30	12	3.48	3.05	0.070	0.795
Finland	220	121	341	29	10	3.56	3.15	0.047	0.832
France	366	296	662	27	9	3.66	3.31	0.049	0.781
United Kingdom	2,552	2,098	4,650	32	12	3.62	3.12	0.118	0.767
Greece	183	99	282	28	9	3.81	3.29	0.116	0.701
Croatia	125	85	210	27	8	3.73	3.48	0.116	0.720
Hungary	1,083	342	1,425	32	10	3.39	3.06	0.233	0.677
Indonesia	334	228	562	24	6	3.66	3.26	0.480	0.700
India	955	541	1,496	27	9	3.55	3.23	0.488	0.668
Ireland	187	131	318	32	12	3.78	3.13	0.093	0.798
Israel	77	48	125	31	10	3.45	3.28	0.109	0.718
Italy	234	189	423	28	11	3.69	3.43	0.069	0.707
Japan	97	53	150	32	10	3.48	3.36	0.094	0.652
Kenya	118	46	164	26	6	3.94	3.39	0.518	0.671
Mexico	195	134	329	29	11	3.60	3.27	0.322	0.754
Malaysia	227	242	469	26	9	3.59	3.18	0.253	0.677
Netherlands	635	277	912	30	11	3.66	3.13	0.043	0.736
Norway	342	206	548	32	11	3.54	2.92	0.045	0.842
New Zealand	209	173	382	35	14	3.51	3.11	0.123	0.799
Pakistan	67	55	122	26	8	3.64	3.37	0.538	0.564
Philippines	435	443	878	26	8	3.60	3.31	0.43	0.781
Poland	462	297	759	26	8	3.77	3.40	0.115	0.736
Portugal	159	118	277	27	9	3.61	3.31	0.075	0.744
Romania	329	222	551	27	8	3.79	3.33	0.276	0.724
Russian Federation	113	73	186	27	8	3.88	3.60	0.225	0.706
Singapore	231	219	450	27	9	3.72	3.36	0.065	0.724
Serbia	122	91	213	27	10	3.82	3.41	0.132	0.736
Slovak Republic	71	31	102	27	9	3.73	3.39	0.191	0.718
Slovenia	72	58	130	27	9	3.73	3.24	0.063	0.743
Sweden	571	328	899	33	12	3.50	2.97	0.039	0.820
Thailand	67	33	100	29	12	3.54	3.21	0.359	0.708
Turkey	179	108	287	25	8	3.81	3.46	0.306	0.635
United States	13,495	13,255	26,750	34	13	3.49	3.03	0.204	0.724
Vietnam	430	64	494	26	6	3.34	3.24	0.296	0.700
South Africa	299	273	572	32	11	3.65	3.14	0.406	0.780

Machiavellianism

To assess participants' endorsement of Machiavellianism, we used a version (see Appendix B) of the MACH-IV from Christie and Geis (1970), which specifically measures participants' endorsement of a personality profile termed Machiavellian (e.g., "It is hard to get ahead without cutting corners here and there."). The scale included 20 items, and responses were provided on 5-point scales ranging from 1 (Disagree) to 5 (Agree). Half of the items were written in such a way that high scores reflect less Machiavellianism[5]. These items were reverse-coded, and a mean was computed for the entire scale (M = 3.34, SD = .79; α = .88).

Analytic strategy

Because the sample has a nested structure, such that participants i were nested within countries j, multilevel modeling was appropriate. Data are indeed such that participants' values, at level 1, are nested within countries, at level 2. As such, it is appropriate to consider which predictors are characteristics of participants, which are country-specific, and which result in interactions between participants and countries. To predict Machiavellianism, we used as predictors the participants' sex, the countries' GII or GGGI, and the interaction between sex and GII or GGGI. To account for variability, we allowed for random effects in the intercept and the slope for sex. That means that participants' Machiavellianism scores could vary in their general value, despite control for sex, and that the effect of sex on Machiavellianism could be different for men than for women. The main dependent variable was participants' endorsement of Machiavellianism. All models were run in R (R Core Team, 2019) by using the 'lme4' package (Bates et al., 2015), and a full maximum likelihood estimation (FIML).

The multilevel equation for the model is $Y_{ij} = \gamma_{00} + \gamma_{10}(\text{Gender}_{ij}) + \gamma_{01}(\text{GII}_j) + \gamma_{11}(\text{Gender}_{ij}\ \text{GII}_j) + u_{0j} + u_{1j}(\text{Gender}_{ij}) + \varepsilon_{ij}$, where Y_{ij} is the outcome (endorsement of Machiavellianism), γ_{00} is the overall fixed intercept effect, γ_{10} estimates the effect of sex_{ij} (coded 1 = men, 0 = women), γ_{01} estimates the effect of GII_j, and γ_{11} estimates the interaction between gender and GII. Thus, this interaction tested our main hypothesis according to which sex differences in the endorsement of Machiavellianism vary as a function of country-level gender inequality differences. As usual, the random effects for intercept (u_{0j}) and for gender (u_{1j}), are assumed normally distributed around zero and may covary. Likewise, the overall error (ε_{ij}) is assumed normally distributed around zero. As we employed two indices of gender equality, we conducted the same analysis twice, once including GII and another time including GGGI.

RESULTS

1) Examining the hypothesis using the GII

The main effect of participants' gender was significant, γ_{10} = 0.430, $p < .0001$, indicating that men (M = 3.54, SD = 0.76) score higher on Machiavellianism than women (M = 3.09, SD = 0.75). The main effect of gender inequality was also significant, γ_{01} = 0.340, $p < .012$: endorsement of Machiavellianism decreased as gender inequality at the country level decreased. Finally, the cross-level interaction was significant, γ_{11} = -0.209, $p < .05$, indicating that gender slopes significantly differed as a function of countries' gender inequality (Figure 1).

To decompose the interaction, we estimated the model under two coding schemes. First, when a zero value for country-level gender inequality meant being 1 SD below the average inequality level, and thus a zero corresponded to low level of country-level inequality. Second, when a zero value for country-level gender inequality meant being 1 SD above the average inequality level, thus zero corresponded to high level of country-level inequality. In both coding schemes, the model included as predictors also gender and the interaction between gender and country-level gender inequality. The effect of participants' gender was always significant, but this effect was stronger in countries with low gender inequality compared to countries with high gender inequality (0.412 vs. 0.370). To better understand the nature of this interaction, we also decomposed the interaction effect the other way around—i.e., as a function of gender. The countries' gender inequality was related to increased Machiavellianism for females, γ_{01} = 0.340, p = .012, but this relation was not significant for male participants, at γ_{01} = 0.131, p = .161.

2) Examining the hypothesis using the GGGI

We carried out the same multilevel regression analysis with the alternative GGGI and found similar results. The main effects of participants' gender (γ_{10} = -0.55, $p < .01$) and of gender inequality were significant (γ_{01} = -1.52, $p < .001$): similarly to the using the GII, the endorsement of Machiavellianism decreased as gender inequality at the country level decreased (note that for the GGGI, lower scores indicate lower levels of equality). Finally, the cross-level interaction was significant, γ_{11} = 1.28, $p < .001$, indicating that gender slopes significantly differed as a function of countries' gender inequality. A decomposition of this interaction showed the same effect as for the GII index, namely that this effect is stronger in countries with low gender inequality compared to countries with high gender inequality (0.432 vs 0.342). Further, the decomposition of the interaction in regard to gender shows that the effect was significant for women (γ_{01} = -1.523, $p < .001$) and not for men (γ_{01} = -0.24, p = .23).

DISCUSSION

The current research sought to examine whether country-level gender equality is related to sex differences in the endorsement of Machiavellianism. We hypothesized that higher gender equality would be associated with greater sex differences, with women endorsing Machiavellianism less and men endorsing it more in more gender-equal societies. The results partially supported this hypothesis. Specifically,

[5] We performed CFA which showed that most of the items loaded on a single factor. Therefore, we decided to compute an average score for the entire scale. It should be noted that Machiavellianism has traditionally been treated as a unidimensional construct, measured as a global score (see Jonason, 2022, p. 86), due to the lack of reliability of the subscales.

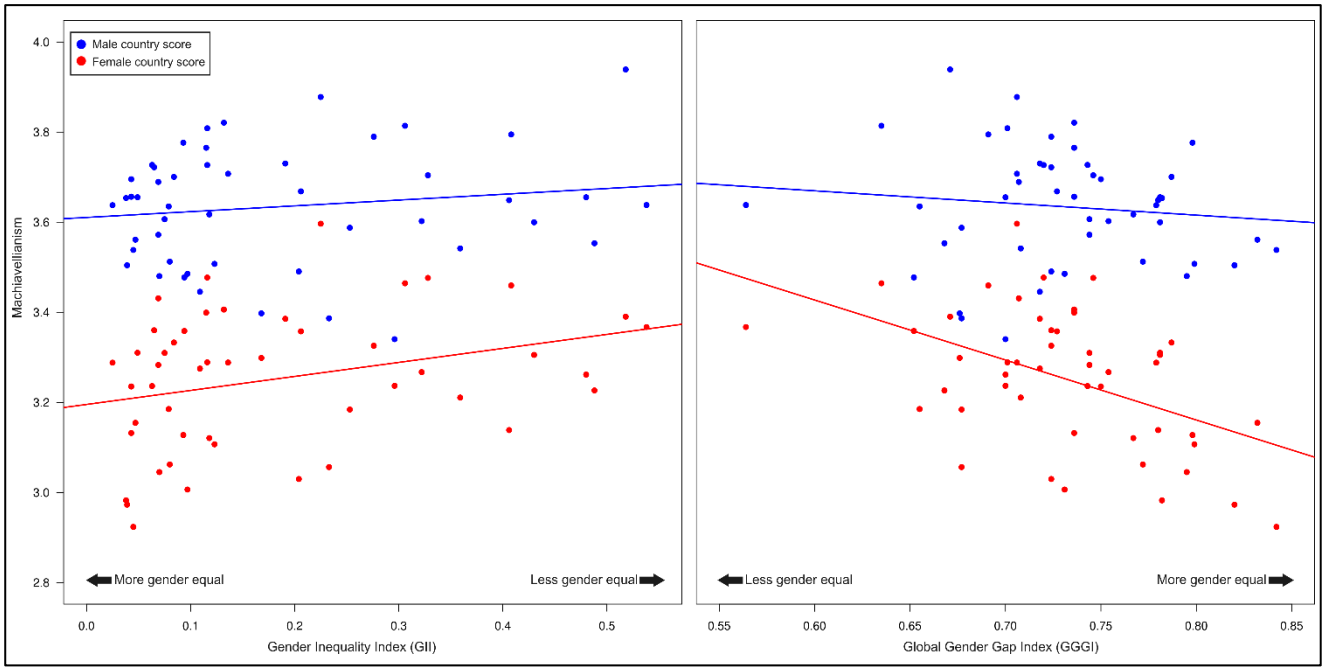

Figure 1. Relation between national level of gender equality and national levels of Machiavellianism for women (in red) and men (in blue) across 48 countries. 1: Countries with a higher level of gender equality as measured by the Gender Inequality Index (GII) have a larger difference between men's and women's average level of Machiavellianism. Note that lower values of the GII indicate higher levels of gender equality. 2: Countries with a higher level of gender equality as measured by the Global Gap Index (GGGI) have a larger difference between men's and women's average level of Machiavellianism. Note that higher values of the GGGI indicate higher levels of gender equality. See also Table 1 for the exact values.

sex differences in Machiavellianism at the individual level increased with higher gender equality at the country level, but this effect was primarily driven by women, who endorsed Machiavellianism less as gender equality increased. No significant change was observed among men, whose endorsement of Machiavellianism remained stable across levels of gender equality, regardless of the index used.

Although this research does not directly examine the underlying processes behind these findings, it offers several contributions to existing theoretical perspectives. First, Machiavellianism is deemed to have a contextual component (Vernon et al., 2008) and is often viewed as a rational decision-making strategy used to pursue personal goals. Accordingly, in more egalitarian countries, where resources are more accessible to both men and women (Falk & Hermle, 2018), individuals might be less inclined to adopt Machiavellian tactics, favoring less unscrupulous and manipulative coping behaviors. However, this was not supported by our results, which showed that gender equality correlated with Machiavellianism as a function of participants' sex.

Second, country-level gender equality was related to lower endorsement of Machiavellianism among women, while no consistent effect was observed among men. These results suggest that gender equality influences women's endorsement of Machiavellianism more than men's. Specifically, in more gender-equal countries, women's increased socio-economic resources may reduce their need to rely on Machiavellian tactics to achieve their goals. This result is also consistent with the idea that gender equality amplifies sex differences in Machiavellianism by reinforcing women's conformity to femininity norms (e.g., empathy, agreeableness or emotionality; Fischer & Manstead, 2000), which are in conflict with Machiavellian principles (e.g., the end justifies the means). Further research is needed to investigate whether this pattern is actually driven by increased conformity to femininity norms in more egalitarian countries.

Alternatively, the lower endorsement of Machiavellianism among women in egalitarian countries may also be explained by reference-group effects (Heine et al., 2002). Gender equality may strengthen intragroup comparisons, with men and women comparing themselves more frequently to members of their own sex in egalitarian countries. In less egalitarian countries, individuals may compare themselves more broadly across both genders. If this assumption holds, the present findings may reflect more accurate measurements of sex differences rather than actual changes. Further research is needed to examine whether changes in intragroup versus intergroup comparisons contribute to the observed results.

Finally, the present research showed that men strongly endorsed Machiavellianism, and this tendency was not related to country-level gender equality. This result challenges the idea that gender equality would increase men's Machiavellianism through heightened conformity to masculinity norms, such as power and status achievement, which are consistent with Machiavellianism principles. It also contradicts the idea that gender equality threatens precarious manhood (Vandello & Bosson, 2013), in particular when it reduces gender distinctiveness (Bosson & Michniewicz, 2013; Falomir-Pichastor et al., 2019; Falomir-Pichastor et al., 2017). While sustained Machiavellianism could reflect men's motivation to affirm their threatened gender identity, the present results suggest that gender equality does not amplify this pattern.

One possible explanation for the lack of relationship between gender equality and men's Machiavellianism may be related to the negative connotations associated with both Machiavellianism and traditional masculinity norms (e.g., power achievement and personal advancement) in egalitarian societies. Some scholars contend that masculinity is in crisis, as feminist movements advocating for greater gender equality and challenge traditional masculinity norms (e.g., Bohan, 1993; Thompson & Bennet, 2015; Wade, 2015). As a result, men in more egalitarian countries score relatively low on measures of traditional masculinity (Smiler, 2004; Thompson & Bennet, 2015) and display ambivalence towards these norms, which are endorsed only in specific contexts (e.g., intragroup; Iacoviello et al., 2021). Accordingly, in more egalitarian countries, men may not endorse Machiavellianism to a greater extent due to the negative perception of traditional masculinity norms aligned with Machiavellianism. Future research is needed also to examine this possibility.

Finally, some limitations of the present research should be acknowledged and addressed in future research. First, while we utilized a publicly available dataset that was employed by previous researchers (Johnson, 2020; Kaiser et al., 2020), which allowed us to gather a large sample from many different countries, this dataset was based on a convenience sample, which may raise concerns about generalizability. To mitigate this issue, we applied strict inclusion criteria to improve data quality. Although the participant distribution across countries was uneven, unbalanced group sizes are usually not problematic in multilevel models (Cools et al., 2009).

Second, the present results align with previous findings (Schmitt et al., 2016 cited in Schmitt, 2017; Luo, et al., 2022) and replicate the observation that women are more influenced by gender equality than men (Schmitt, 2015). However, our results stand in seemingly contrast with those observed in a previous study (Jonason et al., 2020). We can advance at least two post-hoc explanations for these inconsistencies. One possibility is that Jonason and colleagues assessed Machiavellianism as a part of the Dark Triad (Paulhus & Williams, 2002) using the Dirty Dozen, a brief measurement of the dark triad (see Jonason & Webster, 2010), whereas we used the more reliable MACH-IV scale. Alternatively, the discrepancy may arise from differences in the gender inequality indices used: Jonason et al., (2020) used the GII, while we used both the GII and the GGGI. Further research is therefore needed to examine sex differences in Machiavellianism and other Dark Triad traits using different samples, datasets, and measures.

Third, while our research sheds light on the interplay between country-level gender inequality and individual endorsement of Machiavellianism, the complexities of human motivation (Elster, 1999) make it difficult to draw definitive conclusions about the underlying mechanisms. One could speculate that, in more egalitarian countries, where resources are more accessible, women may feel less compelled to use Machiavellian tactics to achieve their goals. This interpretation is consistent with several theories, including social choice theory, social structural theory, and evolutionary theory. In such contexts, women may feel freer to pursue their goals without resorting to manipulative strategies. However, this premise can also be supported by other theories, such as those related to sex differences in emotion expression (Fischer & Manstead, 2000) and choice behavior (Inglehart, 1977). Increased gender equality, often coupled with greater economic security and individualism, may reduce the need for manipulative behavior and lead to more stereotypically congruent choices. Future research is needed to better understand these processes and identify potential moderators.

To conclude, this research not only contributes to our understanding of the GEP (Stoet & Geary, 2018), but also suggests that policies promoting gender equality may reduce socially constructed gender differences. As global gender equality continues to increase worldwide (Collins et al., 2020), there is an intuitive expectation that sex differences, including those in Machiavellianism, will diminish. However, the results of this research underscore the paradox that, in fact, gender equality can lead to an increase in sex differences.

ACCOUNTS

Ethical approval

Ethics approval was not required for this research, as the dataset was not collected by the authors. The entire data for this research was retrieved from a publicly available dataset ("Open Source Psychometrics").

Informed consent

A written informed consent was obtained by the developers of the test ("Open Source Psychometrics") from all participants included in the study.

Competing interests

No potential conflict of interest was reported by the authors.

Availability of data statement

The data that support the findings of this research is freely available online on the "Open Source Psychometrics" website (see https://openpsychometrics.org/_rawdata/).

CRediT author statement

D. Confino: Conceptualization, methodology, data curation, formal analysis, writing - original draft.
P. Ghisletta: Formal analysis, writing - review & editing.
G. Stoet: Formal analysis, writing - review & editing.
J.M. Falomir-Pichastor: Conceptualization, methodology, writing - original draft.

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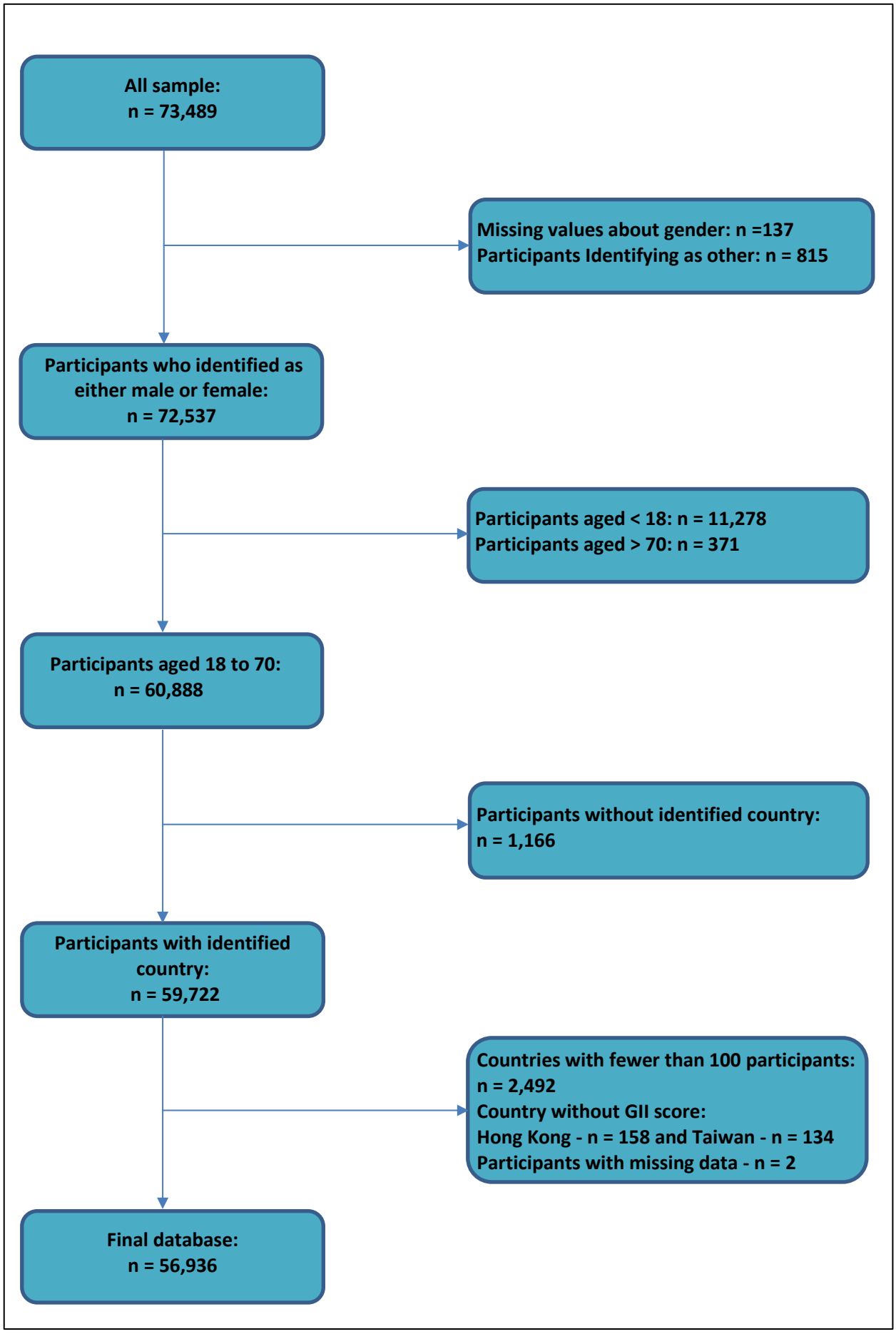
Received June 14, 2024
Accepted September 24, 2024

Appendix A. Data screening procedure



Appendix B

Items of the Mach-IV

1. Never tell anyone the real reason you did something unless it is useful to do so.
2. The best way to handle people is to tell them what they want to hear.
3. One should take action only when sure it is morally right. (R)
4. Most people are basically good and kind. (R)
5. It is safest to assume that all people have a vicious streak and it will come out when they are given a chance.
6. Honesty is the best policy in all cases. (R)
7. There is no excuse for lying to someone else. (R)
8. Generally speaking, people won't work hard unless they're forced to do so.
9. All in all, it is better to be humble and honest than to be important and dishonest. (R)
10. When you ask someone to do something for you, it is best to give the real reasons for wanting it rather than giving reasons which carry more weight. (R)
11. Most people who get ahead in the world lead clean, moral lives. (R)
12. Anyone who completely trusts anyone else is asking for trouble.
13. The biggest difference between most criminals and other people is that the criminals are stupid enough to get caught.
14. Most people are brave. (R)
15. It is wise to flatter important people.
16. It is possible to be good in all respects. (R)
17. P.T. Barnum was wrong when he said that there's a sucker born every minute. (R)
18. It is hard to get ahead without cutting corners here and there.
19. People suffering from incurable diseases should have the choice of being put painlessly to death.
20. Most people forget more easily the death of their parents than the loss of their property.