

Social Dominance and Counter Dominance Orientation Scales (SDO/CDO):  
Testing Measurement Invariance.

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Abstract

Social dominance orientation is defined as one's general approval of group dominance rather than intergroup equality and integration. The new construct of counter-dominance orientation is a measure of psychological response to oppressive hierarchical systems. It is motivated by a collective relational need for inclusion and belonging, a need shaped by the affordances and demands and constraints of the social ecology and the socio-political context within it. This international study tests whether new brief scales to measure social dominance orientation (SDO) and Counter Dominance Orientation (CDO) are comparable across countries. In order to compare the results on SDO and CDO, the two scales must indeed measure identical concepts across the different samples used for comparative or cross-cultural analyses. The equality of the measures may be violated at different levels and for different reasons. For instance, questions and answers may be interpreted in different ways in different countries or languages. For this reasons measurement invariance need to be empirically tested before proceeding to comparative analysis. In this paper, the measurement invariance of SDO/CDO was assessed using multiple group confirmatory factor analysis on a sample of 1809 participants from 18 countries in 7 macro regions (North America, Western Europe, Balkans, Middle-East, Asia, Africa, and Oceania) and in 13 languages. Results show a good fit of the invariance models, when controlled for a few country-specific exceptions. Violations to the invariance model are investigated. Criterion validity, regarding policies about the poor, ethnic or religious minorities, and women, across nations is also shown.

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1. Psychometrics in a Complex World: Why to Test for Invariance

To date, in social psychological research on attitudes, ideologies, and beliefs is common practice to test hypotheses on relatively homogenous populations (e.g., undergraduate students), with the aim of making inferences on general human attitudes and behaviours. The underlying assumption is that human beings share similar psychological processes, independently from their culture, social status or other conditions. However, the real reason behind this approach is often merely opportunistic: research is most likely to be performed on students because students are the cheapest and most easily available population for academic researchers.

Luckily, this weak point of the psychological research is changing in relatively recent years, and comparative studies are increasing as well as research based on surveys and population samples. Cross-national research is then a powerful tool for social psychology, but it rises a number of other problematic aspects, first of all the problem of measuring the same constructs among different populations. Assuming that all psychometric tools measure the same attitudes and beliefs in equivalent way across different social and cultural context may be a false assumption and lead to biased results. Incongruence in scale means or regression coefficients across different samples may derive from systematic bias in the responses and different way of interpreting the questions, rather than from group difference on the specific phenomena (Horn & McArdle, 1992; Steenkamp & Baumgartner, 1998; Van de Vijver, 2003). Cross-cultural psychology research has addressed these issues in

details, proposing tools and procedures to empirically test the equivalence of psychometric tools, rather than assuming it (Van de Vijver & Leung, 1997). In addition to measurement bias, bias responses may also depend by the way question are asked and the way respondents should give their answers. A vast literature on survey methodology has indeed shown that administration procedures and modes may hide bias in responses, which can lead researchers to erroneous substantive conclusions (e.g., Dillman, Smyth & Christian, 2009; Roberts, 2007; Vannieuwenhuyze, Loosveldt & Molenberghs, 2011).

Thus, without testing measurement invariance the interpretation and comparison of results across groups may be problematic and leading to wrong and biased understanding of the phenomena (Ariely & Davidov, 2011; Billiet, 2003; Hui & Triandis, 1985). The aim of this paper is therefore to investigate the measurement equivalence across modes and samples of two psychometric scales developed by Pratto and colleagues (2012a): the Social Dominance Orientation (SDO) scale and the Counter Dominance Orientation (CDO).

### Three Levels of Measurement Invariance

Several techniques are available to assess the invariance of measurement across countries, including item response theory, latent class analysis and multidimensional scaling (e.g., Davidov, Schmidt & Billiet, 2011; Millsap, 2011; Van de Vijver, 2003). Probably the most common approach to testing cross-cultural measurement equivalence is multigroup confirmatory factor analysis (MGCFA, Billiet, 2000; Cheung & Rensvold, 2002). In MGCFA, respondents' answers are treated as indicators of a latent variable. Measurement invariance is assessed by encompassing the factor model through a series of hierarchical steps which test for equivalence

across groups at each of several increasingly more stringent levels. According to Steenkamp and Baumgartner (1998) three hierarchical levels are at least necessary to assess measurement invariance: configural, metric and scalar.

The configural invariance represents the lowest level of equivalence. It implies that the items of the scale exhibit the same configuration in relation to the latent variable. That is, the latent variable should be specified by the same indicators in each cultural group. Thus, configural invariance is supported if the model fits the data well and factor loadings have the same sign and are statistically significant in all subsamples. This model implies that similar, but not identical, latent variables are present in the all groups.

The next step of equivalence is metric invariance, also defined as “weak” invariance. Metric invariance provides an indication that people in different cultural groups have a similar understanding of the questions. To fulfil this level of equivalence, factor loadings between items and constructs should be equal. Thus, the factor loadings are constrained to be equal across groups. This model implies that the same latent variable is being measured across cultures. Metric equivalence is required to meaningfully compare across samples the relationship between the construct of interest and other variables, namely correlations and regression coefficients. It is supported if the metric model fits the data better than the more relaxed model (configural invariance model). Although full metric equivalence is preferable, some authors (Byrne, Shavelson & Muthèn, 1989; Steenkamp & Baumgartner, 1998) have suggested that partial metric equivalence indicated by at least two equal factor loadings per construct is sufficient to allow comparison of correlational coefficients.

Stronger measurement equivalence is assessed by scalar invariance. In this model, along side factor loadings also intercepts are specified to be equal across groups. As

with metric invariance, this specification implies that the measurement of the latent variable is the same across groups. In addition, intercepts invariance assesses that means of the indicators are equal across groups. Scalar invariance is therefore necessary to compare the means of the latent construct in multiple samples. This model specifies that mean differences depend by the actual differences in the mean of latent construct across samples, rather than by differences in factor loadings or intercepts of the observed indicators (Steenkamp & Baumgartner, 1998). Some authors suggest that alike for metric invariance, at least two equal intercepts per construct (partial invariance) may be sufficient to allow a comparison of means (Byrne, Shavelson & Muthén, 1989; Steenkamp & Baumgartner, 1998).

In addition to cross-cultural differences in understanding and interpreting psychometric measures, survey research has highlighted that controlling for different modes of administration is necessary to not introduce a systematic measurement bias in the data (Dillman, Sangster, Tarnai & Rockwood, 1996). However, mode effects are tricky to disentangle and when present difficult to integrate into the interpretation of the results. Alike cross-cultural differences, they can depend from different understanding of question and answers. For instance, certain culture may be more at ease visualising ordered scales while answering to a questionnaire, thus face-to-face or telephone interviews may produce different responses than in culture less used to this type of evaluation. On the other hand, bias may depend on the mode itself. For instance certain item may be subjected to social desirability and results from self administered and face-to-face interviews may not be comparable. If social desirability can sometimes be taken into analysis and included in the interpretation, other mode effects given by the way the question and answers are presented to the respondents (e.g., bias introduced by the use of scroll list in web surveys, Couper, Kennedy,

Conrad, & Tourangeau, 2011) are less straightforward to insert into a substantial interpretation of the results.

Thus, it is pivotal for the analysing cross-cultural data to be aware of the possible source of bias in their data. Once the bias is known, researchers may decide to integrate it into the interpretation of the results or adapting their analytic strategy.

### Social Dominance and Counter-Dominance Orientations

In recent years, the study of the social dominance orientation has become widespread in social and political psychology. Social dominance orientation is described as individual approval of group dominance rather than intergroup equality and integration (Pratto, Sidanius, Stallworth, & Malle, 1994). To date, over 120 published articles cite SDO in the title on the ISI Web of Science database and to date more than 3.500 papers and conference presentations citing SDO are found by Google Scholar. The popularity of the SDO scale largely depends on its explicative power in predicting several relevant constructs for social and political psychology. It is a very robust correlate of group-based discrimination, socio-political ideologies, and belief systems (e.g., Lee, Pratto, & Johnson, 2011). For instance, SDO accounts for over the 50% of the variance in various measures of racism and prejudice (e.g., Ekehammar, Akrami, Gylje & Zakrisson, 2004; Pratto, Sidanius, Stallworth & Malle, 1994; Roets, Van Hiel & Cornelis, 2006; Van Hiel & Mervielde, 2002).

The original 16-items SDO scale has been used in many cultural contexts and translated into different languages (e.g., Aiello, Chirumbolo, Leone, & Pratto, 2005; Lee et al., 2011; Meyer, 2012). The cross-cultural validity of the SDO construct has been tested for a 2-item version of the scale by Küpper, Wolf and Zick (2010), on data from eight European countries involved in the Group-Focused Enmity project. The

authors concluded that SDO (tested together with diversity beliefs) is reliable and adequate for cross-cultural research, showing at least partial cross-country equivalence. In particular, they found a small but significant difference between East and West European country mean scores of SDO. To our knowledge, this study has been the only one to test measurement invariance of SDO across cultures, while some research on the invariance across social groups within the same country has been conducted for the 16-items scale (e.g., Pula, McPherson & Parks, 2012).

Recently, Pratto and colleagues (2012b) proposed a new scale of SDO with four items and a 10-point Likert scale. The new SDO scale has been shown to have a strong predictive validity on various psychological dimensions, such as personality traits, moral concerns, moral inclusion, religious attitudes and beliefs, emotional connectedness, empathy, nationalism. Although the scale has been created in English and first tested on US students, the validity on population samples and Spanish speaking respondents was confirmed (Pratto et al., 2012b).

According to social dominance theory, SDO is mediated by beliefs and ideologies that justify group hierarchy and status differences. In particular, the theory distinguishes between hierarchy enhancing legitimising myths and hierarchy attenuating legitimising myths. Thus ideologies, such as nationalism, protestant work ethic or free-market liberalism, and intergroup attitudes, such as racism, sexism, anti-Semitism, and anti-immigrant, are used to justify the subordinate position of racial groups, women, Jews, and immigrants, etc. (Sidanius, Pratto & Bobo, 1996). On the contrary, opposing myths and ideologies, such as solidarity, universal human rights, multiculturalism and diversity beliefs help to justify interventions aimed to reduce group hierarchy. Thus, similarly to social dominance, we could expect certain people are counter-dominance oriented. Counter-dominance orientation is defined as a

psychological response to oppressive hierarchical systems. It is motivated by a collective relational need for inclusion and belonging, a need shaped by the demands and constraints of the the socio-political context within it. Most of the research to date has operationalized the counter dominance orientation with low scores on the SDO scale. However, although the concepts of social dominance and counter-dominance are in clear opposition, the former is not necessarily the contrary of the latter. Thus, to tap counter dominance orientation Pratto and colleagues (2012b) developed a Counter-Dominance Orientation (CDO) scale.

In this paper three hypotheses are tested to explore measurement and mode invariance of SDO and CDO scales. At first, we test the hypothesis of cross-mode invariance according to which the response on the items of SDO and CDO do not change across administration modes. Furthermore, we hypothesise that the SDO scale accounts for configural, metric and scalar invariance. Similarly we expect that configural, metric and scalar invariance is verified for the CDO scale.

## 2. Methods

### 2.1 Sample and Procedures

Data were collected in Belgium ( $n = 113$ ), Bosnia-Herzegovina ( $n = 60$ ), China ( $n = 90$ ), Greece ( $n = 150$ ), Indonesia ( $n = 66$ ), Ireland ( $n = 60$ ), Italy ( $n = 115$ ), Lebanon ( $n = 95$ ), New Zealand ( $n = 140$ ), Serbia ( $n = 62$ ), South Africa ( $n = 118$ ), Spain ( $n = 112$ ), Switzerland ( $n = 50$ ), Taiwan ( $n = 199$ ), Turkey ( $n = 124$ ), United Kingdom ( $n = 102$ ), United States ( $n = 153$ ). Respondents were recruited with the most convenient and culturally-appropriate ways, including in-person requests, snow-ball sampling, and internet surveys. Modes for each sample are reported in Table 1. Age distributions varied in different nations, medians ranged from Belgium = 19 to Bosnia = 39; gender

distribution per sample was of about 50% male and 50% female (see Table 1).

Translations from English were done by local multi-lingual collaborators (social psychologists or political scientists) in discussion with Felicia Pratto and Fouad Bou Zeineddine. Appropriateness of the translations was ensured through back-translations.

#### 2.4 Measures

The new SDO scale includes 4 items with a response scale from 1 (strongly disagree) to 10 (strongly agree). Items were: 1) *in setting priorities, we must consider all groups*; 2) *we should not push for group equality*; 3) *group equality should be our ideal*; 4) *superior groups should dominate inferior groups*.

The CDO scale was composed instead of 6 items with a response scale from 1 (strongly disagree) to 10 (strongly agree): 1) *there's nothing more important than confronting oppression by dominant groups*; 2) *it is good for weaker groups to rely on more powerful groups*; 3) *sometimes it's right for a subordinated group to compromise with a dominant group*; 4) *dominant group's influence on subordinated groups is never acceptable*; 5) *less dominant groups must sometimes be willing to follow more dominant groups*; 6) *oppressed groups that resist exploitation by dominant groups are worthy of total respect*. An exploratory factor analysis of the overall dataset, using maximum likelihood estimation and eigenvalue greater than 1, extracted two factors: the first was indicated by items 1, 4, and 6; the second by items 2, 3, and 5. Inter factor correlation with Oblimin rotation was  $r = -.17$ . Given the relatively low correlation between the two factors, subsequent analyses were conducted separately.

### 3. Results

#### 3.1. Cross-Mode Invariance

The equivalence across administration modes was assessed on answers to the single items. Unfortunately in most of the samples a single mode of administration was adopted through out all the participants of the same country. Thus, it may be difficult to disentangle a pure mode effect from a cross-country effect. Indeed, only in Spain the sample was split into two different mode of administration (56% face-to-face; 44% paper-and-pencil).

An ANOVA was performed on the single items of the two scale using responses from the overall sample. For SDO items 1 ( $M_{F2F} = 8.65$ ;  $M_{P\&P} = 8.01$ ;  $M_{WEB} = 8.11$ ;  $F(2, 1438) = 3.27, p < .01$ ) and 4 ( $M_{F2F} = 2.18$ ;  $M_{P\&P} = 3.10$ ;  $M_{WEB} = 2.68$ ;  $F(2, 1437) = 7.97, p < .001$ ), and CDO items 5 ( $M_{F2F} = 5.37$ ;  $M_{P\&P} = 5.17$ ;  $M_{WEB} = 4.64$ ;  $F(2, 1242) = 8.91, p < .001$ ) and 6 ( $M_{F2F} = 8.06$ ;  $M_{P\&P} = 7.43$ ;  $M_{WEB} = 7.25$ ;  $F(2, 1392) = 3.72, p < .05$ ) difference between the face-to-face and either the self-administered paper or pencil or web questionnaires was greater than half a point score. The largest difference was found in the SDO item 4 ( $\Delta M = .92$ ) and the CDO item 6 ( $\Delta M = .81$ ), for which the self administered respondents were more likely to score lower on the scale than respondents interviewed face to face. Half a point score difference was found also between paper-and-pencil and web questionnaire for the items 1 ( $M_{F2F} = 6.49$ ;  $M_{P\&P} = 6.12$ ;  $M_{WEB} = 6.80$ ;  $F(2, 1278) = 9.87, p < .001$ ) and 3 ( $M_{F2F} = 5.17$ ;  $M_{P\&P} = 5.38$ ;  $M_{WEB} = 4.80$ ;  $F(2, 1241) = 8.00, p < .001$ ) of the CDO scale.

Given that mean scores are sensitive to the sample size and the  $n$  of the face-to-face was sensibly smaller than those of the other two modes, the same analysis was also performed on the Spanish sample separately, which included both face-to-face and paper-and-pencil modes. In this case, significant difference were found only for

the CDO items 5 ( $M_{F2F} = 5.33$ ;  $M_{P\&P} = 4.44$ ;  $F(1, 109) = 5.57, p < .05$ ) and 6 ( $M_{F2F} = 8.17$ ;  $M_{P\&P} = 8.92$ ;  $F(1, 109) = 4.27, p < .05$ ). In sum, cross-mode invariance did not hold for all the items. In particular the comparison between answers collected with face-to-face and the self administered modes might be problematic. For this reason face-to-face interviews were excluded from the following analyses.

### 3.2. Cross-Cultural Invariance of Social Dominance Orientation

To test measurement invariance across cultures on the SDO scale we used MGCFA as explained earlier in the manuscript. Following Norris (1999) and Morselli (2009), country samples were grouped into eight cultural regions to test invariance: Middle East (Lebanon, Turkey), Middle-Northern Europe (Belgium, Ireland, U.K., Switzerland), South Europe (Greece, Italy, Spain), Balkans (Bosnia-Herzegovina, Serbia), North America (U.S.), Asia (Indonesia, China, Taiwan), Africa (South Africa), and Oceania (New Zealand).

The first model tested configural invariance across the eight cultural regions. An unconstrained factor model indicated by the four items without correlated error terms was specified. Model fits were:  $\chi^2(16) = 28.82, p < .05$ ; CFI = .98; RMSEA = .06; SRMR = .03;  $BIC^1 = 30131.58$ . Since the large sample size the  $p$  value of the  $\chi^2$  statistic is likely to be significant and may lead to reject models with only small misspecification. According to Brown (2006) and Hu and Bentler (1999), CFI larger than .95, RMSEA equal or smaller than .06, and SRMR equal or smaller than .08 can be considered as better indicators of good model fit than  $\chi^2$ . Thus we could assume the configural invariance of the new SDO. That is, the latent construct of SDO was

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<sup>1</sup> Given the large sample size compared to the number of the model parameter, the Bayesian Information Criteria (BIC) has been chosen over the Aikane's Information Criteria (AIC). Simulation studies have shown a better reliability of the BIC over the AIC under this condition (Burnham & Anderson, 2004).

specified by the same number of observed variables, factor loadings were significant and with the same sign across the cultural regions.

The metric invariance was specified constraining factor loadings to be equal across regions. The metric model produced a good fit of the data:  $\chi^2(37) = 61.66, p < .05$ ; CFI = .96; RMSEA = .06; SRMR = .06; BIC = 30018.15. To test whether the constrained model was preferable to the configural model we confronted the BIC of the two models and the loss in the CFI. According to Cheung and Rensvold (2002) and Little (1997) the more commonly used  $\chi^2$  difference test for model comparison is indeed unreliable because suffers of the same problems of other  $\chi^2$  statistics. Smaller BIC (Burnham & Anderson, 2004) and difference in CFI smaller than .05 (Little, 1997) were used as indication that the metric (constrained) model was preferable to the (unconstrained) configural model.

Finally, the scalar invariance model was tested. A model with both factor loading and intercepts constrained to be equal across regions fitted of the data poorly:  $\chi^2(58) = 238.171, p < .05$ ; CFI = .67; RMSEA = .12; SRMR = .13; BIC = 30068.13. Thus, full scalar invariance could not be assumed. However, model with equality constraints on the intercepts relaxed for item 1 in New Zealand and South Europe, item 2 in Middle East, item 3 in Asia; and item 4 in Europe and Asia fitted the data well:  $\chi^2(52) = 82.83, p < .01$ ; CFI = .94; RMSEA = .05; SRMR = .06; BIC = 29926.76. This model was more parsimonious and could be therefore considered preferable to the metric invariance model. The model difference supported the partial scalar invariance of SDO. Alternatively, a full scalar invariance model with indicators centered on the grand mean was also tested. Grand mean centering involves subtracting the overall mean to each individual score. In this way, individual scores are not considered as absolute but represent deviations from the general mean. The grand mean centered

model improved the fit of the data and supported the scalar invariance assumption:  $\chi^2$  (58) = 67.84, ns; CFI = .98; RMSEA = .03; SRMR = .06; BIC = 29862.17.

### 3.3. Cross-Cultural Invariance of Counter-Dominance Orientation

A similar procedure was adopted to test the measurement invariance of the CDO factors separately. The cross-cultural invariance of CDO was tested on the same cultural regions than SDO, with exception of Oceania for which data were not available. The first factor was specified by items 1, 4, and 6. Given the limited numbers of indicators, the configural invariance model was over identified – i.e., zero degrees of freedom – and was not surprising that fit indexes are perfect: CFI = 1.00; RMSEA < .01; SRMR < .01; BIC = 19894.98. However in this study we were mostly interested to the comparison with more restricted model. The metric invariance model produced a good fit of the data ( $\chi^2$  (12) = 10.89, ns; CFI = 1.00; RMSEA < .01; SRMR = .03; BIC = 19820.61) and could be chosen over the configural model. By contrast the scalar invariance model failed to fit the data:  $\chi^2$  (24) = 119.58,  $p < .001$ ; CFI = .41; RMSEA = .13; SRMR = .12; BIC = 19846.33. A partial scalar invariance model was tested, with equality constraints relaxed for the item 1 intercept in the Balkans and South Europe, and the item 4 intercept in Middle East. The model fitted the data well and supported partial measurement invariance:  $\chi^2$  (21) = 26.584, ns; CFI = .97; RMSEA = .04; SRMR = .06; BIC = 19771.89. In addition, also in this case the grand mean centered full scalar invariance model appeared to be the most parsimonious and with a good data fit:  $\chi^2$  (24) = 12.268, ns; CFI = 1.00; RMSEA < .01; SRMR = .03; BIC = 19608.72.

The second CDO factor was also specified by three indicators and consequently the configural invariance model over fitted the data: CFI = 1.00; RMSEA < .01;

SRMR < .01; BIC = 18389.83. Fit statistics of the metric invariance model were:  $\chi^2$  (12) = 13.85, ns; CFI = .99; RMSEA = .03; SRMR = .05; BIC = 18320.99; while for the scalar invariance model were:  $\chi^2$  (24) = 119.75, ns; CFI = .76; RMSEA = .14; SRMR = .09; BIC = 18351.27. Metric invariance could therefore be assumed, but not scalar invariance. Thus a model with unconstrained intercepts of item 2 and 5 in Middle East, North America, and North Europe (only item 5) was tested. The model sufficiently fitted the data:  $\chi^2$  (19) = 38.90,  $p < .01$ ; CFI = .95; RMSEA = .07; SRMR = .07; BIC = 18297.65. This model was better than the metric invariance model, although a CFI difference close to .05 and RMSEA above the conventional threshold suggest a certain caution. In contrast, the alternative grand mean centered model fitted the data well supporting the scalar invariance assumption:  $\chi^2$  (24) = 15.81, ns; CFI = 1.00; RMSEA < .01; SRMR = .04; BIC = 18234.18.

#### 4. Discussion

The test of measurement and mode invariance of SDO and CDO present several considerations and a few recommendations. The test of the effect of the administration mode scratched only the surface of a possible source of bias. In order to exhaustively test mode effects a quasi-experimental design would be needed, which unfortunately was not possible in this research. This being said, the present analysis warned that face-to-face interviews might not be fully comparable to the other modes. The cause of this bias might be searched in the possible social desirability of the SDO and CDO items, especially in social contexts where the normative strength of egalitarianism has increased in recent years (Inglehart, Norris & Welzel, 2002). We therefore recommend using with caution data which include both face-to-face and self administered questionnaire.

Concerning the SDO and CDO, the MGCFA supported cross-cultural metric invariance. Metric invariance ensures that respondents of the different cultural regions responded to the items in the same way. Thus, correlates between the CDO, SDO and other construct of interest can be compared among the cultural regions, at the condition that also the other constructs respect metric invariance. On the contrary full scalar invariance did not find support in our analyses. The scalar invariance held only after centering the indicators on the grand mean. This may lead researchers into two possible directions to compare SDO and CDO means from different cultural regions. The first possibility is to center all data on the general mean. In this way individual and group scores should be interpreted as deviation from the overall mean score. Thus, grand mean can be understood as the overall normative context in which respondents answered to the questionnaire and individual scores are deviation from this normative context.

The second possibility is to take into account the difference between intercepts and include such difference into the analysis and the interpretation of the data. Scalar noninvariance implies that the observed mean differences in the items may not stem from differences in the means of latent constructs. Thus differences in the observed variables may be the product of cross-cultural differences in item functioning. For this reason scalar noninvariance may hide important information on cross-cultural difference. The ways question and answer are understood across cultures and interview modes are indeed more than a methodological issue. Difference in responses may depend from different interpretations of the question itself, the relationship between the answer and the question, and the relationship between different answers option provided in the questionnaire (i.e., the categories of the Likert scale). Taking into consideration invariance allows a

phenomenological approach to social science, in which respondent's interpretation of the question plays a substantial role and can help researchers to deepen the understanding of social phenomena (Fisher, 2004). Thus, the lack of invariance may be considered as a resource rather than a fault of the measurement (Michell, 1990). Several procedures have been suggested for explaining noninvariance, rather than solving it (Davidov, Dülmer, Schlüter, Schmidt Meuleman, 2012; Medina, Smith, & Long, 2009; Poortinga, 1989; Schlüter & Meuleman, 2009). In conclusion, it is not the absence of scalar invariance of both SDO and CDO which can make research results fragile, rather ignoring the fact that it may play an important if not fundamental role in choosing analytic strategies and interpreting the results.

#### References

- Aiello, A., Chirumbolo, A., Leone, L., & Pratto, F. (2005). Uno studio di Adattamento e Validazione della scala di Orientamento/Tendenza alla Dominanza Sociale (Pratto et al. 1994) *Rassegna di Psicologia*, 22, 65–75.
- Ariely, G., & Davidov, E. (2011). Assessment of measurement equivalence with cross-national and longitudinal surveys in political science. *European Political Science*, 1, 1-15.
- Billiet, J. (2003) *Cross-cultural equivalence with structural equation modelling*. In J.A. Harkness, F.J.R. Van de Vijver and P.H. Mohler (Eds.) *Cross-cultural survey methods* (pp. 247–264), New York: John Wiley & Sons.

- Burnham, K. P., & Anderson, D. R. (2004). Multimodel inference: Understanding AIC and BIC in model selection. *Sociological Methods and Research, 33*, 261-304.
- Byrne, B. M., Shavelson, R. J., & Muthén, B. (1989). Testing for the equivalence of factor covariance and mean structures: The issue of partial measurement invariance. *Psychological Bulletin, 105*(3), 456-466.
- Cheung, G.W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233-255.
- Cheung, G.W., & Rensvold, R.B. (2002) Evaluating goodness-of-fit indexes for testing measurement invariance, *Structural Equation Modeling, 9*, 233-255.
- Couper, M. P., Kennedy, C., Conrad, F. G., & Tourangeau, R. (2011). Designing input fields for non-narrative open-ended responses in web surveys. *Journal of Official Statistics, 27*, 65-85.
- Davidov, E., Schmidt, P., & Billiet, J. (2011). *Cross-cultural analysis: Methods and applications*. New Jersey: Routledge.
- differences in people's answers to telephone and mail surveys. *New Directions for Evaluation, 70*, 45-61.
- Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). *Internet, mail, and mixed-mode surveys: The tailored design method*. Chichester: John Wiley.
- Dillman, D., Sangster, R., Tarnai, J., & Rockwood, T. (1996). Understanding
- Ekehammar, B., Akrami, N., Gylje, M., & Zakrisson, I. (2004). What matters most to prejudice: Big five personality, social dominance orientation, or right-wing authoritarianism? *European Journal of Personality, 18*, 463-482.
- Fisher, W. (2004). Meaning and method in the social sciences. *Human Studies, 27*, 429-454.
- Horn, J. L., & McArdle, J. J. (1992). A practical and theoretical guide to measurement invariance in aging research. *Experimental Aging Research 18*(3), 117-144.

- Hu, L.-T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55.
- Hui, C.H., & Triandis, H.C. (1985). Measurement in cross-cultural psychology: A review and comparison of strategies, *Journal of Cross-Cultural Psychology 16*(2), 131–152.
- Inglehart, R., Norris, P., & Welzel, C. (2002). Gender equality and democracy. *Comparative Sociology, 1*, 321-345.
- Küpper, B., Wolf, C., & Zick, A. (2010). Social status and anti-immigrant attitudes in Europe: An examination from the perspective of social dominance theory. *International Journal of Conflict and Violence, 4*, 205-219.
- Lee, I., Pratto, F., & Johnson, B. T. (2011). Support of social hierarchy: Individualistic cultures, liberal political environments, and decreased power increase intergroup dissension. *Psychological Bulletin, 137*, 1029-1064.
- Little, T. D. (1997). Mean and covariance structures (MACS) analyses of cross-cultural data: Practical and theoretical issues. *Multivariate Behavioral Research, 32*, 53–76.
- Medina, T. R., Smith, S. N., & Long, J. S. (2008). Measurement models matter: Implicit assumptions and cross-national research. *International Journal of Public Opinion Research, 21*, 333-361.
- Meyer, I. (2012). The reliabilities of an English, Afrikaans and isiXhosa version of the SDO6 scale in South Africa. *South African Journal of Psychology, 42*, 25-36.
- Michell, J. (1990). *An introduction to the logic of psychological measurement*. Hillsdale, N.J: L. Erlbaum Associates.
- Millsap, R. E. (2011). *Statistical approaches to measurement invariance*. New York: Routledge.

- Morselli, D. (2009). *Obbedienza e disobbedienza: Dinamiche psicosociali per la democrazia* [Obedience and disobedience: Socialpsychological dynamics for democracy]. Unpublished doctoral dissertation, University of Bologna, Bologna.
- Norris, P. (1999). Institutional explanations for political support. In P. Norris (Ed.) *Critical Citizens*. Oxford: Oxford University Press.
- Poortinga, Y. H. (1989). Equivalence of cross-cultural data: An overview of basic issues. *International Journal of Psychology*, 24, 737-756.
- Pratto, F., Stewart, A. L., Foels, R., Henkel, K. E., Zeineddine, F. B., Laham, S. M., & Morselli, D. (2012b). *Beyond me and mine: The socially-inclusive psychology of people low on social dominance orientation*. Manuscript in preparation.
- Pratto, F., Çidam, A., Stewart, A. L., Zeineddine, F. B., Aranda, M., Aiello, A., Chrysochoou, X., Cichocka, A., Cohrs, C., Durrheim, K., Eicher, V., Foels, R., Górka, P., Lee, I-C., Licata, L., Li, L., Liu, J., **Morselli, D.**, Meyer, I., Muldoon, O., Muluk, H., Petrovic, N., Prati, F., Papastamou, S., Petrovic, I., Prodromitis, G., Rubini, M., Saab, R., van Stekelenburg, J., Sweetman, J., Zheng, W., Henkel, K. E. (2012). *The Rosetta stone of group dominance versus inclusion: Short social dominance orientation scale in 15 languages and 20 countries*. Manuscript in preparation.
- Pratto, F., Sidanius, J., Stallworth, L. M., & Malle, B. F. (1994). Social dominance orientation: A personality variable predicting social and political attitudes. *Journal of Personality and Social Psychology*, 67, 741-763.
- Pula, K., McPherson, S., & Parks, C. D. (2012). Invariance of a two-factor model of social dominance orientation across gender. *Personality and Individual Differences*, 52, 385-389.
- Roberts, C. (2007). *Mixing modes of data collection in surveys: A methodological review* (NCRM Methods Review Papers NCRM/008). ESRC National Centre for Research Methods. Retrieved from <http://eprints.ncrm.ac.uk/>

- Roets, A., Van Hiel, A., & Cornelis, I. (2006). Does materialism predict racism? Materialism as a distinctive social attitude and a predictor of prejudice. *European Journal of Personality, 20*, 155–168.
- Schlüter, E., & Meuleman, B. (2009, June-July). *Measurement inequivalence as a source of useful information: Using multi-level SEM to explain why measurements are inequivalent*. Paper presented at the 3<sup>rd</sup> ESRA Conference, Warsaw, Poland.
- Steenkamp, J.-B. E. M., & Baumgartner, H. (1998). Assessing measurement invariance in cross-national consumer research. *Journal of Consumer Research, 25*(1), 78–107.
- Van de Vijver, F. J. R., & Leung, K. (1997). *Methods and data analysis for cross-cultural research*. Thousand Oaks: Sage Publications
- Van de Vijver, F.J.R. (2003) *Bias and Substantive Analyses*. In J.A. Harkness, F.J.R. Van de Vijver & P.H. Mohler (Eds.) *Cross-Cultural Survey Methods* (pp. 207–233), New York: John Wiley & Sons.
- Van Hiel, A., & Mervielde, I. (2002). Explaining conservative beliefs and political preferences: A comparison of social dominance orientation and authoritarianism. *Journal of Applied Social Psychology, 32*, 965-987.
- Vannieuwenhuyze, J., Loosveldt, G., & Molenberghs, G. (2011). A method for evaluating mode effects in mixed-mode surveys. *Public Opinion Quarterly, 74*, 1027-1045.

Table 1. Descriptive statistics per sample

Country	Administration Mode			% women	Age range	Median age	Languages (N)
	Face-to-face	Pencil & paper	Web survey				
Belgium	0	0	113	81	18-43	20	French
Bosnia-Herzegovina	<i>nd</i>	<i>nd</i>	<i>nd</i>	45	22-72	39	Serbo-Croatian
China	0	0	90	47	21-41	26	Simplified Chinese
Greece	0	150	0	61	18-77	31	Greek
Indonesia	0	66	0	74	18-39	20	Indonesian
Ireland	0	60	0	56	25-68	42	English
Italy	0	115	0	56	22-70	38	Italian
Lebanon	3	86	0	45	18-66	32	Arabic
New Zealand	<i>nd</i>	<i>nd</i>	<i>nd</i>	74	18-52	21	English
Serbia	<i>nd</i>	<i>nd</i>	<i>nd</i>	55	20-59	26.5	Serbo-Croatian
South Africa	0	70	0	50	18-67	26	English (89) IsiZulu (12)
Spain	63	49	0	50	18-71	32	Spanish German (27)
Switzerland	0	0	50	54	18-65	32	Italian (6) French (17)
Taiwan	2	197	0	50	18-87	33	Traditional Chinese
Turkey	0	0	124	29	21-67	36	Turkish
U.K.	0	0	102	52	18-74	49	English
U.S.	0	0	153	46	19-78	33	English