Factor Structures across Countries and across Clusters of Countries: A 36-Country Study on the Family Values Scale

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Abstract
Values in the family have been studied within countries and across-countries with respect to their change, transmission, with relation to familial-individual aspects (family roles, psychological bonds, etc.) and with respect to numerous other psychological correlates. To study values across cultures, factor equivalence is of essence. We employed an alternative methodological and statistical factor equivalence approach across our national samples derived from the Georgas et al. dataset on Family related variables (N=7,766 university students). Apart from the individual country level comparison, a country-clustering method was also applied. For these clusters of countries it was shown through covariance structure analysis that the levels of factor equivalence for the respective factor structure were better and the structure was much clearer as compared to the respective solution with countries treated under the same factor estimation methods but as separate units (not clustered). Conclusions are drawn on family values' support and country/cluster characteristics and on the structural homogeneity of cultures within each cluster.

Keywords: Hit matrix; MDS-T; Hierarchical Roles of father and mother; Relationships with Kin; Family Values Scale (FVS).

INTRODUCTION
This study is an attempt to address Hierarchical Roles of father and mother and Relationships with family kin (Family Values Scale, FVS; Georgas, 1993) across a large number of countries using a combination of factor analysis and multidimensional scaling methods. Factor equivalence testing was applied across national research units and across clustered units (described through the alternative methodological and statistical techniques) so as to explore for the extent to which family values' dimensions (Hierarchical roles of father and mother and Relationships with kin dimensions, "H" and "R", respectively) exist in the factor structure for countries vs. for cultural units (clusters of countries) and to be able to compare "H" values and "R" values across countries vs. across clusters of countries. A large sample derived from the "Family Project" currently conducted by Georgas (extended dataset, 42 countries) was employed.

Family values have considerably changed during the past decades, not only in industrialized, individualistic "western" cultures but also in agrarian collectivistic cultures, as models of family change have shown (Kağıtçıbaşı, 2002). As autonomy and relatedness compete, striving to define the ways children are brought up and reared to join each culture's society, values in

the family also change and become less traditional (Georgas et al., 2006). However, the patterns in which these values change may not be necessarily dictated by their relative position on the individualistic-collectivistic continuum but they also may be related to and possibly affected by other cultural characteristics (Georgas et al., 2006; Kağıtçıbaşı, 2005) such as other psychological variables (e.g., family roles, religiosity, bonds within the family) or even ecological factors (such as temperature, precipitation, geographical setting, etc.). Before relating the dimensions assessed to other psychological variables, a primary goal is to describe and compare their scores across several countries. Indeed, such values have been repeatedly described for many countries (e.g., World Value Survey, European Value Survey, etc.) but in many cases their internal structure -if studied at all- as also related to cultural characteristics, has not been addressed, with results remaining at the item-descriptive level. Thus, structurally embedded culture information may have not been fully described or even detected. However, this information is of vital importance if we need to subject the data to cross-cultural modeling and comparison. If one could manage to study the value dimensions having removed as much unwanted cultural information as possible, studying only their effect on the related manifest behavior and its structure, then it would make more sense to compare them across different cultural units. Factor equivalence testing across cultures is obviously related to such a hypothesis and the cross-country aspect of any study is of course only one domain where equivalence testing is appropriate; the equivalence issue pertains when any groups are considered across or within countries (Byrne, 2008; Mylonas, 2009a; van de Vijver, 2011).

To remove unwanted information from the structure one might suggest item removal methods. Deleting an item –if this is considered a source of bias in a cross-cultural study- may remedy for bias levels at the item level (Byrne et al., 1989; Poortinga and van de Vijver, 1987) but it also may seriously affect the scale's validity, with even content validity being at stake (Byrne and van de Vijver, 2010; Van Hemert et al., 2001), if this item has not been rejected via factor-analytic methods. Several methods associated with item deletion in terms of reducing bias have been proposed (Scholderer et al., 2005; Valencia et al., 1995) but they mostly detect the biased-in-terms-of-culture items and deal with this bias by deleting from the beginning the problematic items and then recalculating factor solutions without them.

Regarding cultural units and their definition, in psychological research, a cross-country study is usually considered tautologous to a "cross-cultural" study. The "definition of culture" has been largely debated though (Hofstede, 1980; Kağıtçıbaşı and Poortinga, 2000; Kim et al., 2000; Segall et al., 1990) while culture may not necessarily be tautologous with country (Georgas and Berry, 1995) and can also be dependent on different cultural groups of any kind (e.g., sojourners, different generations, the two genders, etc.). Georgas and Berry (1995) have specifically supported that the operationalization of culture is "mistakenly" equated to country and, following this, ways to avoid the "onomastic fallacy" have been suggested (Georgas et al., 2004). Such a cross-cultural psychology approach has been related to many several other theoretical concerns as of how to test for similarities and/or differences (Poortinga, 1989; van de Vijver and Leung, 1997).

One of the two main aims in the current study was to describe and suggest a set of alternative ways in testing for factor equivalence across country groups, thus reducing "bias in terms of culture" (Mylonas & Furnham, 2014; Poortinga and Van de Vijver, 1987) a suggestion which might also be generalized across groups of any kind within countries/cultures. Then, we might be able to support the existence of constructs and their dimensions under better invariance levels making those directly comparable. In such a "reduction of bias in terms of culture" study we should first reach acceptable means of defining "culture" within the data set available and

then explore factor structures a) without removing suspect or biased items -an effective but problematic procedure in terms of validity method and b) without necessarily equating country to culture (Georgas and Berry, 1995; Georgas and Mylonas, 2006), thus we would need to actually specify the cultural units across which we can apply the methods. An early "clustering of countries" approach (Georgas and Berry, 1995) aimed at homogeneous sets of countries according to indices derived from their ecological features (at the country level), but clustering itself can also be a function of the available measures (values "H" and "R" in this case) and might lead to better levels of within-cluster homogeneity. In such a way, similar patterns (especially factor ones) would be easier to detect within each cluster and would possibly enhance interpretation of construct differences across clusters of countries.

Similar paths with respect to dealing with "bias in terms of culture" through factor equivalence testing within clusters of cultures have been previously followed (Welkenhuysen-Gybels and van de Vijver, 2001). In that study, three methods on the evaluation of multigroup construct equivalence were compared. The direct use of the proportionality coefficients is the main advantage of this 2001 study but the proposed methods are feasible only for unifactorial solutions, thus multi-factor solution comparisons are not possible. Counter-intuitive cluster memberships were encountered, possibly due to data dependencies which, as suggested, may be addressed through multidimensional scaling methods.

Other possible ways of reaching clusters of cultures might involve Latent Structure analysis methods (Marcoulides and Moustaki, 2012) and/or mixture modeling (Lubke and Muthén, 2007) but were not attempted at this stage. The methods applied in the current study have been described and have received initial support in other previous attempts too (Gari, Mylonas, and Panagiotopoulou, 2009; Georgas and Mylonas, 2006; Mylonas et al., 2011) where a set of country clusters was reached through information contained in the country factor structures and better levels of factor equivalence were achieved without having to drop initially problematic items. These methods employed a variant of Multidimensional Scaling (Welkenhuysen-Gybels and van de Vijver, 2001) on the "Hit matrix" of congruence coefficients (as presented in the Method section) and were employed in the current study as well.

To summarize, can we reach better levels of factor invariance by a-priori clustering the participating units, that is treating these countries not as separate cultural units but as members of wider homogeneous clusters? Instead of searching for invariance across all country units ("universal" solution), which is also sometimes very hard to achieve and renders further analyses obsolete, we might attempt to aggregate units aiming at better invariance levels so as to reach more homogeneous in terms of factor similarity sets of countries. Following this, what will the comparisons across clusters of countries and across countries tell us about the value scores? To satisfy the first goal, we attempted to describe our proposed methods and apply them to a large set of 42 countries and specifically, we analyzed the data for the Georgas 18 FVS (Georgas, 1993) under two "conditions": a) for the countries as separate units under comparison and factor equivalence testing and b) for clusters of countries serving as units for the same comparison and testing, these clusters having been formed through the specific method proposed as described in the Method section. For the second aim of the study, we attempted to describe the ways values "H" and "R" are endorsed either by each country separately and by cluster of countries and to explore the variability within each of the two alternative solutions.
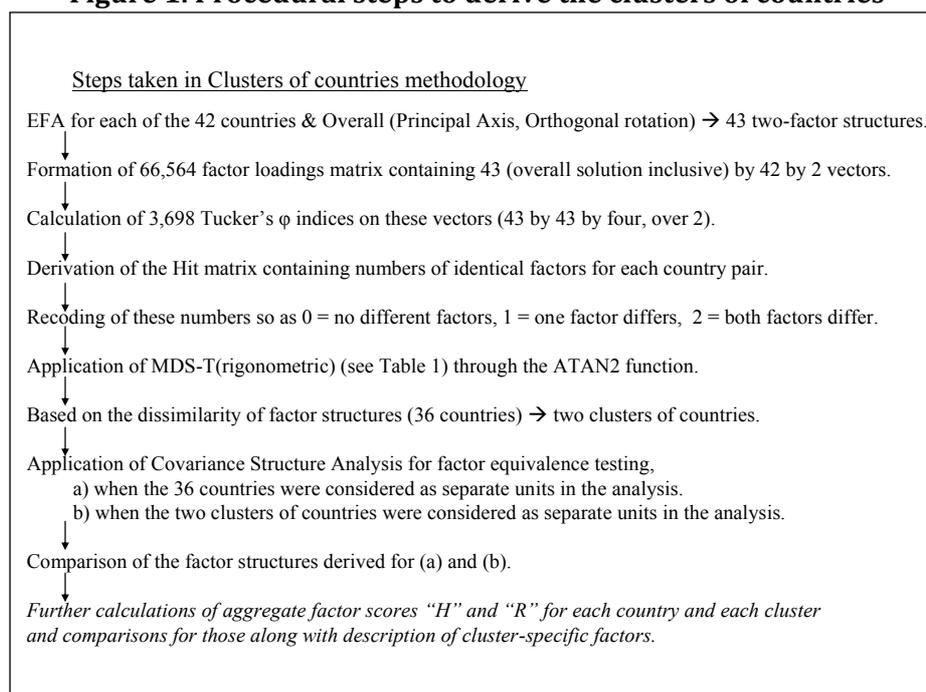
METHOD

Sample

The sample comprised 42 countries (Georgas et al., 2006; Georgas, 2012) with N=8,909 participants (university students, 40.2% males, 59.8% females, mean age=21.6 years): [Algeria (n=107), Argentina (n=81), Australia (n=175), Brazil (n=159), Bulgaria (n=195), Canada (n=215), Chile (n=207), China (n=421), Costa Rica (n=232), Croatia (n=209), Cyprus (n=132), France (n=97), Georgia (n=200), Germany (n=153), Ghana (n=70), Greece (n=350), Guatemala (n=198), Hong-Kong (n=423), Hungary (n=204), India (n=220), Indonesia (n=239), Iran (n=189), Italy (n=209), Japan (n=185), Malaysia (n=309), Mexico (n=227), Netherlands (n=165), Nigeria (n=337), Norway (n=126), Pakistan (n=450), Poland (n=200), Portugal (n=216), Saudi Arabia (n=198), South Africa (n=193), South Korea (n=199), Spain (n=111), Sudan-Geriza (n=112), Switzerland (n=542), Turkey (n=211), Ukraine (n=65), United Kingdom (n=115), United States of America (n=263)]. At a later stage in the analysis it became evident that for six countries very different data patterns were observed than the ones observed for the remaining 36 countries and in addition, the factor structures across these six countries (Iran, Hungary, Poland, Japan, Georgia, Nigeria) were also very different indicating a possible method bias of an outlier nature. Thus, the clustering method was applied first to all 42 countries (while computing homogeneous sets for countries) to achieve maximum power while clustering, and for the second stage (analyzing specific clusters) to the remaining 36 countries (N=7,766) for which the final common factor structure and scores are reported.

Measures

The raw data contained family related variables (Georgas, 1993, 1999; Georgas, et al., 2006). The scale consists of 18 items through which two theoretically driven and empirically supported (Georgas, 1999) independent value dimensions are assessed: Hierarchical roles of father and mother in the family ("H") and Relationships within family and with kin ("R"). The items are scored on a seven-point scale with seven being the total agreement ("traditional") end. All previous research with the scale has supported the existence and orthogonality of the two value constructs ("H" and "R"), with some cross-cultural variations.

Figure 1. Procedural steps to derive the clusters of countries

Steps taken in Clusters of countries methodology

EFA for each of the 42 countries & Overall (Principal Axis, Orthogonal rotation) → 43 two-factor structures.

Formation of 66,564 factor loadings matrix containing 43 (overall solution inclusive) by 42 by 2 vectors.

Calculation of 3,698 Tucker's φ indices on these vectors (43 by 43 by four, over 2).

Derivation of the Hit matrix containing numbers of identical factors for each country pair.

Recoding of these numbers so as 0 = no different factors, 1 = one factor differs, 2 = both factors differ.

Application of MDS-T(rigonometric) (see Table 1) through the ATAN2 function.

Based on the dissimilarity of factor structures (36 countries) → two clusters of countries.

Application of Covariance Structure Analysis for factor equivalence testing,
    a) when the 36 countries were considered as separate units in the analysis.
    b) when the two clusters of countries were considered as separate units in the analysis.

Comparison of the factor structures derived for (a) and (b).

Further calculations of aggregate factor scores "H" and "R" for each country and each cluster and comparisons for those along with description of cluster-specific factors.

A Clusters of Countries Methodology

The methods used in this study in order to arrive into clusters of countries to be further tested under the "experimental condition" are summarized in Figure 1. The procedures involved exploratory factor analyses and separate two-factor solutions, Tucker's φ indices and from those the calculation of the Hit matrix (Gari, Panagiotopoulou, and Mylonas, 2009; Georgas & Mylonas 2006; Mylonas, 2009a; Mylonas, et al., 2011; Mylonas et al., 2017), followed by a variant of ALSCAL Multidimensional Scaling which entails trigonometric transformation to radians and degrees of the coordinates (Mylonas, 2009a; Mylonas et al., 2017; Papazoglou & Mylonas, 2016) to be plotted on the circle periphery. The details with respect to calculating this trigonometric ATAN2 solution (MDS-T) are given in Table 1. These were then followed by factor equivalence testing through Covariance Structure Analysis (CSA) as extended to exploratory factor analysis (CSA-EFA) by van de Vijver and Poortinga (2002) which should indicate whether factor equivalence was enhanced or not under the country-clusters condition. Factor equivalence could of course be examined under other modeling methods such as SEM; we applied CSA-EFA as our question was not whether factor equivalence exists or not, but with respect to the contribution of the clustering techniques, if any.

Table 1. Arctangent transformation for point (y, x) on a (–π, π) range

For any circle, $\quad$ Circumference $= 2\pi r$,
where r is the angle expressed in radians,

Given that, $\quad$ degrees $= r\dfrac{180}{\pi}$, $\quad$ (3) $\quad$ and also given that $\quad$ $sgn(a) = \dfrac{a}{|a|}$,

and for $\hat{\varphi}$ satisfying: $\quad$ $\tan(\hat{\varphi})^* = \left|\dfrac{y}{x}\right|$, $\quad$ $(0, \dfrac{\pi}{2})$

the quadrant-specific inverse tangent with a range of (– π, π), is calculated as:

$$
\begin{array}{ll}
\text{for } y\neq0 \text{ and } x>0, & r(y, x)=\tan^{-1}\left(\left|\dfrac{y}{x}\right|\right) [sgn(y)], \quad ** \\[2mm]
\text{for } y\neq0 \text{ and } x=0, & r(y, x)=\left(\dfrac{1}{2}\pi\right) [sgn(y)], \\[2mm]
\text{and for } y\neq0 \text{ and } x<0, & r(y, x)=\left\{\pi-\left[\tan^{-1}\left(\left|\dfrac{y}{x}\right|\right)\right]\right\} [sgn(y)],
\end{array}
$$

Note: $\quad$ $\tan^{-1}\left(\dfrac{y}{x}\right) \neq \left[\tan\left(\dfrac{y}{x}\right)\right]^{-1} = \dfrac{1}{\tan\left(\dfrac{y}{x}\right)}$

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* As expressed in radians.

** The trigonometric number $\tan^{-1}\left(\dfrac{y}{x}\right) = \tan^{-1}(z)$ is defined through the Mclaurin series as the function of the infinite sum of terms calculated from the values of its derivatives at a single point (including the derivative at point "0").

In notation, $\tan^{-1}(z) = \displaystyle\sum_{n=0}^{\infty} \dfrac{(-1)^n z^{2n+1}}{2n+1}$ with a convergence criterion of .00001 and for $|z| \leq 1$. In logarithmic notation, $\tan^{-1}(z) = \dfrac{i}{2}\log\left(\dfrac{i+z}{i-z}\right)$. More rapid convergence is achieved through Euler's $\tan^{-1}(z) = \displaystyle\sum_{n=0}^{\infty} \dfrac{2^{2n}(n!)^2}{(2n+1)!}\dfrac{z^{2n+1}}{(1+z^2)^{n+1}}$.

RESULTS AND DISCUSSION

Using Principal Axis factoring followed by orthogonal rotation of the axis we computed two-factor structures (two independent factors were expected as the previous literature suggested) for all 42 countries separately and for all of them treated as one unit (the "overall" solution). On average, 39% of the variance (rotation sums of squared loadings) was explained, with factor solutions across countries being far from identical. For all factor solutions the presence of two factors was quite unequivocal and all criteria were acceptable. For the overall solution, the two theoretically expected dimensions were observed, although some irregularities (cross-loadings and/or items loading on the opposite factor) were also present; in addition to this,

such a factor solution cannot be accepted unless some levels of factor invariance have been supported. We calculated Tucker's φ coefficients for all pairs of solutions for all pairs of factors in these solutions. For each pair of countries, four Tucker's φ indices could be computed across countries and factors. If the factors were identical across countries, then Tucker's φ indices of .90 or greater should appear on one of the table's diagonals. If no identical factors existed, none of the four indices would reach .90. These indices were excessively calculated for the overall factor structure in relation to each country as well. We then formed the hit matrix containing number of identical factors (from 0 to 2) for each pair of countries. In this matrix, we observed extended variation as for other pairs of countries identity in factor structures was more than evident, for other pairs only one factor was identical and the other was similar, for other pairs both factors were only similar and then other, lesser levels of similarity were present for other pairs of countries. This matrix was recoded into dissimilarity coding and analyzed through multidimensional scaling using squared Euclidean distances and two dimensions in the solution (S-Stress=.10, R2=.96). The coordinates reached were then trigonometrically transformed (MDS-T) and the degrees calculated were plotted on the periphery (Figure 2).

Figure 2. Clusters of countries as reached through MDS-T on the Hit matrix
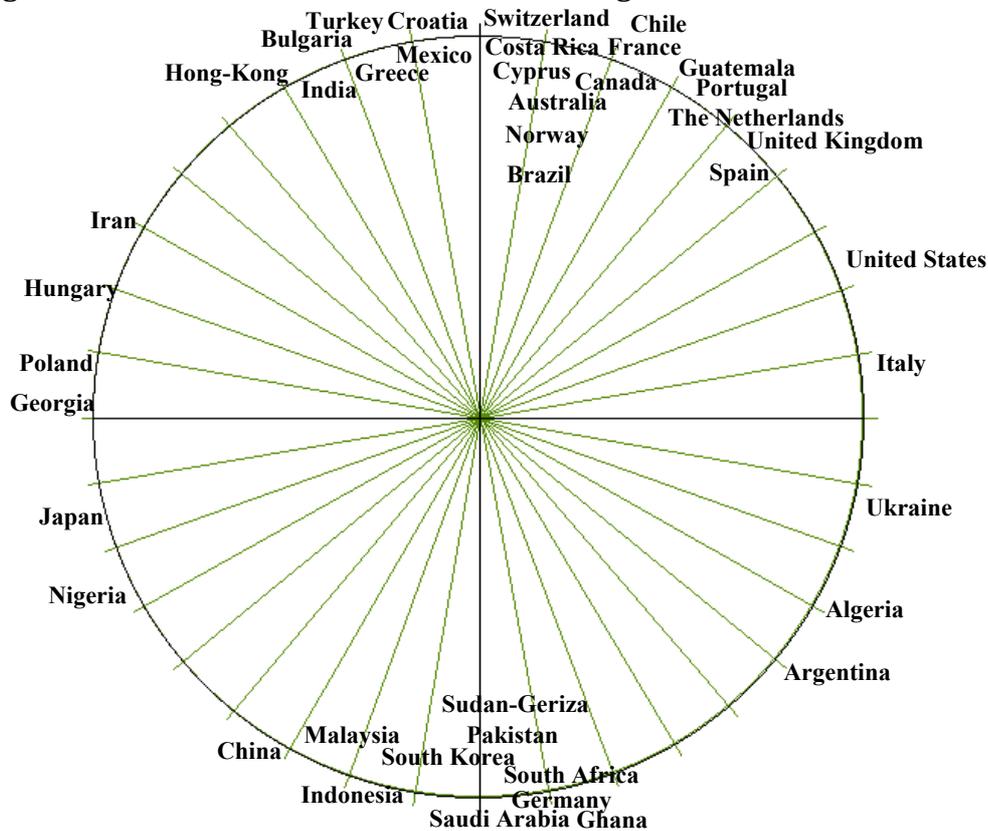
Three clusters of countries might exist in the data. We should stress that these clusters were computed on the basis of their factor structure similarity and not by examining mean item scores. The first cluster of countries was at the top of the periphery, possibly extending up to 130°, the other at the bottom of the periphery (around 180°) and there was one last cluster extending from 240° to 300°. The six countries appearing at this left-hand side of the periphery presented factor structures which were entirely different with each other. These also seemed to contain artifacts of metric (collinearity) and methodological nature possibly being a set of outlier structures causing the grouping in itself. This is a common situation as countries may remain unclustered during the analysis (Mylonas et al., 2011; Welkehuysen-Gybels & van de Vijver, 2001) as statistical artifacts may also be present.

For the two clusters finally explored, one appeared at the bottom of the periphery and the other extended from the top of the periphery to most of the lower right quadrant (an arc of approx. 160°), as there was structural support as to include the less tightly clustered countries as well in this cluster. This support stemmed from the hit matrix pattern for all countries in the larger cluster as compared to the pattern for the smaller cluster. Specifically, the 10 countries positioned all around the 180° area on the periphery had only up to one factor in common with any other country in the same cluster, whereas the larger cluster's main structural characteristic was that all its 26 countries shared both factors at least with some of the countries in the cluster. In all, 36 countries either in the form of separate units or in the form of two contrasting clusters were employed in subsequent analysis.

After forming the two clusters of countries, covariance structure analysis (Muthén, 1994, 2000) as extended to factor analysis by van de Vijver and Poortinga was applied on the estimated between groups and the pooled-within correlation matrices, and the orthogonal factor solutions for both were subjected to Procrustean rotation in order to arrive at the final factor structure, followed by the calculation of the respective averaged Intra-Class Correlation coefficients (ICC). This procedure was carried out treating the 36 countries i) as separate units, and ii) as two cultural units (the two clusters), thus reaching two target-rotated factor structures, comparable in regard to the structure itself and in regard to the intra-class correlation coefficients accompanying the solutions. The outcomes are summarized in Table 2.

Table 2. Summary of the Procrustean factor solutions (covariance structure analysis) for i) the 36 separate countries factor equivalence testing and ii) for the clusters of countries factor equivalence testing

| 36 countries			Clusters of countries	
.40	**.87**	father is head of family	.27	**.76**
.92	.03	good relationships with relatives	**.71**	.03
−.08	**.94**	mother's place is at home	−.06	**.77**
.12	**.93**	mother is go-between	.10	**.74**
.96	−.09	parents teach behavior	**.75**	−.03
.14	**.95**	father should handle money	.08	**.81**
.40	−.13	parents should respect children's privacy	.13	.02
.77	**.46**	children take care of old parents	**.59**	.24
.93	−.13	children should help	**.68**	−.10
.88	.32	problems are solved within the family	**.64**	.16
.74	.29	children should obey parents	**.64**	.25
.71	**.58**	honor family's reputation	**.63**	.39
.89	.16	parents help children financially	**.53**	.09
.98	−.03	children should respect grandparents	**.80**	−.03
.24	**.93**	mother should accept father's decisions	.16	**.78**
.27	**.87**	children should work to help family	.22	**.51**
.72	**.46**	parents should not argue in front of children	**.46**	.29
.20	**.94**	father is breadwinner	.16	**.80**

With respect to Table 2: i) For the 36 separate countries condition, ICC average was as high as .31, which shows large levels of inequivalence across factor solutions. Apart from that, four items (underlined loadings) cross-loaded on both factors (using a cut-off loading criterion of

.40), a rather weak solution both in terms of factor equivalence across the 36 countries and unstable in terms of its structure per se. ii) When the two cultural units (clusters of countries) were analyzed, their average ICC dropped to .14, which is still not revealing a perfect 'fit' (ideally, it should be less than .06) but it is obviously much better than .31 and it clearly points to much better levels of factor equivalence when the two clusters of countries are considered as cultural units and are analyzed as such. The structure itself was much clearer and in accordance with the expected theoretical dimensions ("H" and "R"), as the four cross-loading problems were resolved (towards the expected end). Apart from this, another irregularity was resolved as well; initially, one item approached structure participation in the 36-units solution ("parents should respect children's privacy") but it was not clear whether to accept it or not in the structure as its loading was on the cut-off criterion (.40). The clustered-countries solution diminished this item's loadings on both factors. Although that seems like an item-elimination situation, it is not, as the item still holds its methodological position in the scale, despite the fact that the final structure does not verify its existence in one of the factors. Thus this item becomes redundant while describing the dimensions but not obsolete while assessing them. A final note is that the loadings across factors in the clusters of countries target-rotated solution are in general much more clearly different across the two factors than in the 36-unit solution. In short, the clusters of countries approach provided a solution which seemed much better in terms of factor equivalence and in terms of structure clarity, and this solution was finally accepted to compute overall composite scores for the two factors and proceed with further analyses.

An obvious question would refer to the smaller cluster of countries. If these countries share less similarity and this is the reason they cluster together, could we describe what this structural similarity is? Although the main factor structure as reached through the clustering methods and described in Table 2 still holds for the countries in this smaller cluster, some structural specificity might be hidden in their common factor characteristics. Thus, we examined the separate initial factor structures for these ten countries very closely to find that their shared factor consisted of the following items (with slight variations): "Children should respect grandparents", "children should obey parents", "children should take care of old parents", "children should help", "good relationships with relatives should be maintained", "one should honor family's reputation", "problems should be resolved within the family", "parents teach behavior", "father is the breadwinner", and "father is the head of the family". The last two are "H" items (their loadings reached high levels as well in most country structures) which differentiates this factor -the only one shared by the 10 countries in the cluster– from the equivalent "R" factor found in the clusters of countries solution, thus a cultural specificity seems to exist for these ten countries and could be labelled "R&h". At this point, it became clear that if clusters of countries had not been identified, these specificities –true for the ten countries in the cluster– would have not been revealed.

The composite scores for the "R" factor and the "H" factor were calculated next. Through the clustering techniques applied, we were able to reach a factor structure being as equivalent as possible across countries so as to be able to compare across the aggregate scores for these two factors as they appeared in the solution for the clustered countries. We computed these composite scores for each of the 36 countries and for each of the two cultural units separately. However, we also computed composite scores for the distinct factor (R&h) to depict the specificities as found for the 10-country cluster for the countries in this cluster only. The composite scores employed were the averaged sums of the items in each factor. All means along with their confidence limits appear in Figure 3.

Figure 3. Means and confidence intervals for both factors across all countries (ascending order) and across both cultural units; comparison of "R&h" means within the ten-country cluster
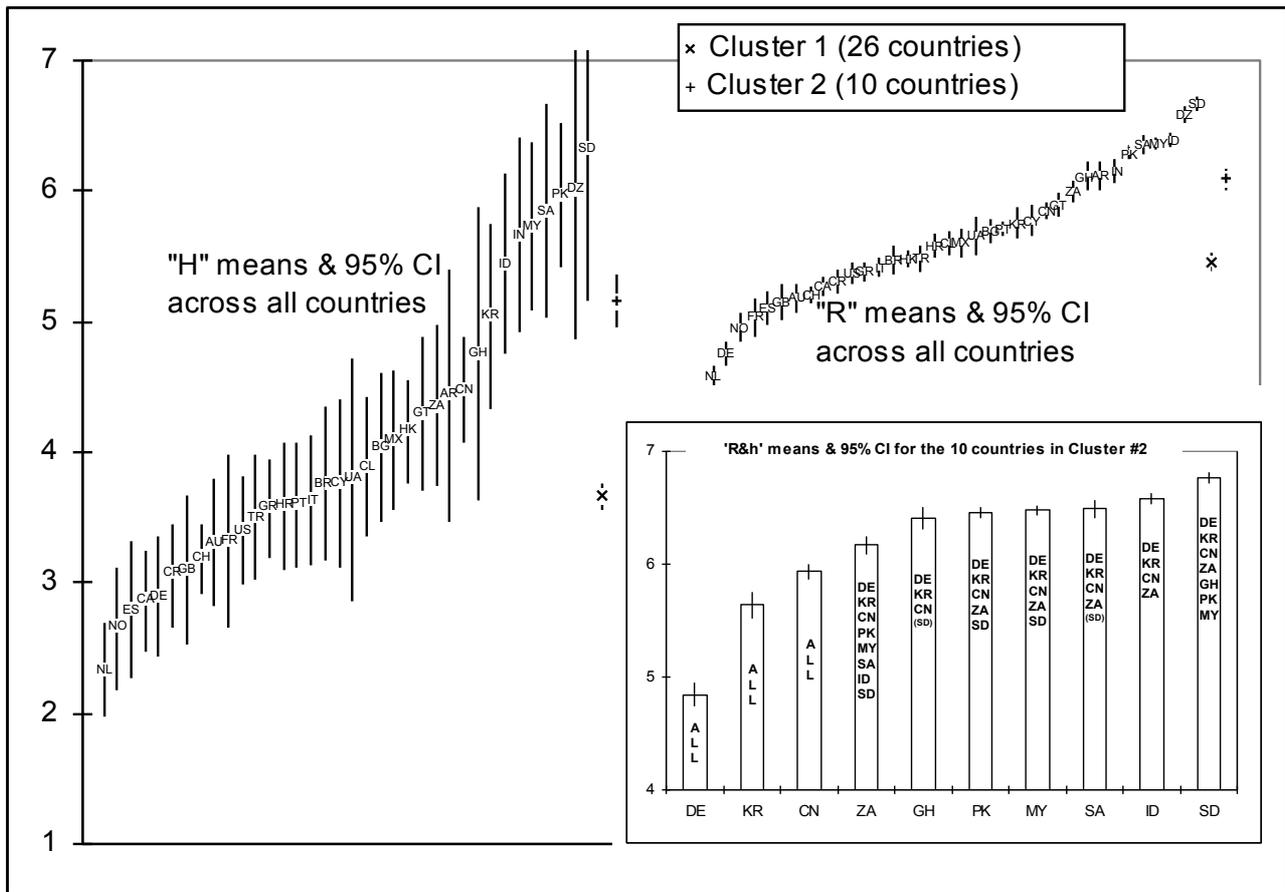
Note: For the "R&h" means and for each country separately, the significantly different countries (post-hoc Scheffé tests) are denoted within the figure columns. Marginally different countries are reported in parentheses.

Starting with the smaller cluster of countries and its specific "h-flavored" "R" factor, this is highly supported by Indonesia and Sudan and much less by Germany and South Korea. In between lie China and South Africa and closer to the Sudanese-Indonesian end are Saudi Arabia, Pakistan, Ghana and Malaysia. From this, we can gather that Germany and South Korea are more reluctant in accepting this "Relationships with some Hierarchy" factor although the respective means are greater than 4.5 on the 7-point scale; Sudan, Indonesia and a few more countries in the same cluster highly endorse this factor.

When the 36 separate countries were compared for their common "H" and "R" factors, strong statistically significant differences were present, as expected: for the "H" factor $F_{(35, 7,622)} = 225.31$, $p < .001$, $\eta2 = .51$ and for the "R" factor, $F_{(35, 7,571)} = 118.15$, $p < .001$, $\eta2 = .35$. However, these strong differences might largely reflect just the large number and the wide range of countries involved; would these differences sustain when the clusters of countries would be compared? For the cluster means on factor "H", $F_{(1, 7,656)} = 2,258.37$, $p < .001$, $\eta2 = .23$ and for the "R" factor, $F_{(1, 7,605)} = 1125.68$, $p < .001$, $\eta2 = .13$. Although the differences were less strong, they still retained differentiating power across the two clusters of countries with respect to Relationships with kin and especially with respect to Hierarchical roles. It is

interesting to note that for both clusters mean scores for "H" are lower than the lowest mean score for the "R" factor (26 country-cluster), although this was not statistically tested.

OVERALL DISCUSSION AND CONCLUSIONS

In this study, FVS and its factor equivalence across a large country dataset was discussed under two alternative methodological conditions. Some conclusions can be drawn with respect to the methods employed to achieve better handling of factor equivalence testing and with respect to the constructs' endorsement by the cultural units analyzed: the outcomes for the clustered solution are enhanced both with respect to factor-equivalence levels and with respect to comparing units at the appropriate level, avoiding possibly over-fragmenting our data and conclusions; the endorsement of the FVS factors as reached through these methods varied between clusters of countries and also among the separate countries revealing interesting differences and similarities. We listed the compatible levels of endorsement in Figure 3 as a future reference and in full numeric comparison across dimensions, countries, and clusters. There are however, several limitations which should be taken into consideration.

The first limitation is that the methods proposed are of course not the only possible ones. Latent structure analysis might prove more appropriate for the Hit matrix and factor equivalence testing via SEM might replace CSA-EFA, and they should be applied on the Hit matrix in future research. Other methods, such as the MD method (Marcoulides & Drezner, 2000) might prove better clustering approximations to the Hit matrix and should also be attempted in future research for large datasets with many cultural units so as to compare these methods to our own. The MDS-T method we employed is also more cumbersome than a simple Hierarchical Clustering method (HCl) which might have been employed instead; however, when HCl was attempted, the two methods resulted into similar but not identical solutions with irregularities in the HCl solution leaving us unable to decide on how to form the clusters, or even decide the number of clusters. In contrast, the MDS-T solution was much clearer with respect to cluster coherence and country participation.

To use the proposed methods, one cannot -and should not- apply them when a cross-cultural study refers to two countries only. The minimum number of countries is three and even this is marginally acceptable. As the number of countries involved increases, the better the initial clustering may prove along with the homogeneity within each cluster allowing for better chances in achieving equivalence for the clustered solution. These methods might also prove useful when analyzing large datasets with many cultural units (e.g., WVS, PISA, EVS, census databases, etc.). Finally, a number of countries was forced out of the analysis during our study. They were considered a method-factor because of their rather unique structures along with some metric and methodological problems such as problems with recoded items, extreme skewness and others. This situation is similar to the non-clustered countries in the Welkenhuysen-Gybels & van de Vijver study (2001), as usually happens especially if the initial number of countries is small (Mylonas et al., 2011). Obviously, no country should be removed from the analysis for minor reasons but it would be unwise to tailor the dissimilarities across all cultural units by deleting items instead. In addition to this argument, these six countries were not removed from the beginning. They were analyzed through MDS-T on the Hit matrix; it was through this that it became evident they should not be treated as a separate cluster. Thus, these six countries did not enter the last part of the analysis only through which the remaining 36 countries yielded a factor solution (through CSA-EFA) and this was compared to the clusters of cultures respective solution (again through CSA-EFA). In summary, we compared what was feasible to compare instead of chopping and cutting edges to indiscriminately

accommodate for all countries in the non-clustered and the clustered solution. Under this light, this limitation may prove being a rather positive aspect of the present study.

Another possible objection would be as to whether homogeneity might have been artificially increased (as we have limited the number of units analyzed). However, according to Kashima (2012, July) cultural dynamics and the way flexibility and variability at the micro-level (countries) can be transformed to strength and stability at the macro-level (clusters) may provide a theoretical answer and accommodate for the better equivalence levels when countries are clustered. Still, more empirical evidence will be necessary to further support the method and its applicability in cross-cultural research or cross-group research of any kind.

With respect to the specific outcomes such as cluster membership of countries, mean score differences across countries and across cluster units, and finally with respect to the smaller cluster "R&h" specific factor we first notice Germany's participation in this second smaller cluster along with nine more countries (the hierarchical clustering solution also concurred) which seems counterintuitive. It has to be kept in mind though that we have not analyzed country means and their similarity or difference to arrive at the MDS-T solution, we analyzed similarities in the factor structures instead. Thus, for Germany the constructs may be similar with Indonesia, South Korea, Pakistan, etc., but the level of agreement on these constructs obviously may vary across these countries. It is the structure and its similarity levels that places these countries in this cluster, not the adherence-defiance of "H" and/or "R" values, so if geographic proximity or some other external criterion were to be considered as the clustering cause, this would certainly lead to a fallacy. The partial identity in structure which clusters these countries together may reflect that they all consider relationships with kin and some hierarchical roles as a culturally adaptable dimension of their everyday lives. Thus, the MDS-T outcomes should not be interpreted independently; the hit matrix and MDS-T methods are merely the vehicle towards better levels of equivalence for a 'truer' factor structure which can be comparable across the two cluster units.

Obviously, the specific differences across the two clusters of countries with respect to both "H" and "R" dimensions should be given attention. For both clusters of countries, that is for the cluster countries holding a more concrete representation of "R" and "H" and the cluster holding looser representations of them possibly adapting them to fit their own cultures, the "R" factor was highly endorsed with means being statistically different but homing on the same traditional end. This was not the same for the "H" factor, as the larger cluster countries do not endorse these values although they do not fully reject them either. Similarities and differences in the mean scores reflect levels of similarity on religion, tradition, interactions with relatives, how much time is spent together, communication among members and family roles, all important foundations of children's upbringing and familial well-being. The family change model differentiates between material and emotional interdependencies and is thus a promising way of interpreting differences between clusters of countries for both "H" and "R". However, it is not only cultural change in general which can explain these differences; we need to further define what this change really comprises. In this study we have found that levels of value endorsement for the "R" dimension and mostly for the "H" dimension may be lower if these dimensions are concretely defined and active within a culture. However, if a modal sense of family value acceptance is active, the levels of these equivalent dimensions will be affected and the traditional end will sustain, especially when Hierarchical roles are combined with the highly endorsed Relationships with Kin values. Thus, clustering in itself will not solve factor equivalence problems, even if factors are more clearly defined and are supported in an overall

solution; the identity of each of the clusters of countries, groups, units, etc. formed through the methods described in this study has to become apparent by carefully studying its structural characteristics. Only then we can be aware of the specific distinction(s) across the units involved in the comparisons and safeguard for better interpretation of similarities and difference across cultures.

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