IV Congresso Latino Americano de Opinião Pública da WAPOR, Belo Horizonte - Brasil

AT1 - Metodologia e Investigação em Opinião Pública

ASSESSING THE VALIDITY OF MODERNIZATION-POST MODERNIZATION DIMENSION:

EVIDENCES FROM A GRADE OF MEMBERSHIP APPROACH

(Draft paper. Please do not cite or distribute without permission of the author.)

Fabrício Mendes Fialho
fabriciofialho@gmail.com
University of California, Los Angeles

Keywords: Modernization; Postmodernization; Materialism; Postmaterialism; Grade of Membership; World Values Survey

ABSTRACT

For over three decades, Ronald Inglehart and his associates have argued that a deep cultural shift is in course worldwide. Individual's priorities would be changing from economic and security issues toward self-expression. However, some authors have disputed Inglehart's conclusions arguing that they are sustained by inadequate methods. I propose a new method to test the Modernization-Postmodernization dimensionality and argue that the Grade of Membership (GOM) model may be an alternative method to test the validity of Inglehart's value types. Results from GOM model corroborate Inglehart's Modernization-Postmodernization value types. I also propose further application of the GOM model in research on values.

INTRODUCTION

For over three decades, Ronald Inglehart and his associates have argued that a deep cultural shift is in course worldwide. Individual's priorities would be changing from economic and security issues toward self-expression. Inglehart have presented quite consistent findings supporting such a Materialism-Postmaterialism values change thesis, and numerous studies conducted by other scholars have corroborated his results. More recently, Inglehart (1997) has argued for a larger process, a Modernization-Postmodernization values change, including not only economic yet cultural and political dimensions as well. Some authors, however, have disputed Inglehart's findings arguing that they are obtained from inadequate methods.

This paper proposes a new method to test the Modernization-Postmodernization dimensionality. I argue that the Grade of Membership model may be an alternative method to test consistency of the Modernization and Postmodernization value types. I also present some preliminary validity tests. Firstly, I present a brief summary of some arguments in the debate on Materialism-Postmaterialism dimensionality and measurement; because despite Inglehart (1997) has recently shifted to the broader Modernization-Postmodernization process, most of debate on measurement has focused on Materialism-Postmaterialism issues. Secondly, I present the Grade of Membership model. Thirdly, I expose research objectives, and data and methods used in Grade of Membership analysis and validity test. Fourthly, I present results for both the Grade of Membership analysis and validity test. My findings corroborate Inglehart's Modernization-Postmodernization value types. In the final section, I discuss the limits of this study and further analysis to be conducted.

THE MATERIALISM-POSTMATERIALISM DIMENSIONALITY AND THE DEBATE ON MEASUREMENT

Since the 1970s, Ronald Inglehart (e.g. 1971, 1981, 1997, among others) has been arguing that a deep cultural shift is in course worldwide (besides its larger visibility in advanced industrial countries). According to this author, generations that are born and grow up in affluent and stable societies, in which scarcity and physical insecurity no more are threats to survival, tend to give lesser priority to economic and security goals (that are taken for granted) and to increasingly emphasize self-expression. This change from a materialist (or "acquisitive") toward a postmaterialist ("or post-bourgeois") values, largely documented by

Inglehart and co-authors, besides its depth and importance, would be just one dimension of a larger and deeper change from a "modern" toward a "postmodern" social arrangement, that would include cultural, social, political, and economic issues (see especially Inglehart 1997).

Inglehart's findings have been based on analysis of trends in response to several questions in international comparative surveys, yet the core of his argument is the response to two ranking questions about priority goals to be pursued, and using responses given to such questions he classifies individuals and societies as "materialists", "postmaterialists", or "mixed." The position in this tripartite classification would be a relatively strong predictor of answer to other value questions. The author interprets this value change process based on a dual-hypothesis model: a *scarcity hypothesis*, stating that individuals tend to prioritize thing that are in relatively short supply [strongly influence by Maslow's (1943) hierarchy of human needs]; and a *socialization hypothesis*, pointing that values learned during early socialization tend to be relatively resistant to life cycle effects and remain stable during one's entire life (Inglehart 1981, 1997). Therefore, individuals' socioeconomic position along the formative years would shape their priorities (according to the scarcity hypothesis), and they would keep these priorities during their whole life (as stated by socialization hypothesis). This way, affluent and stable societies – a phenomena especially strong in Western countries, but expected in other countries as well as they achieve certain development levels – would socialize more and more cohorts in "favorable" social environments to the rising of postmaterialist values and, due to generational replacement, these values would increase in number of supporters and become predominant in such societies.

Some authors, however, have criticized Inglehart's findings and methods arguing that they would present serious problems for the study of broader cultural and values change. Clark (and Dutt 1991, Clark el. al. 1997, Clark et. al. 1999) and Duch and Taylor (1993), for instance, argue that the long-range cultural change proposed by Inglehart's data would in fact be an artifact of his survey instruments. According to these authors, Inglehart's questionnaire would not be able to capture some relevant short-time events that could attenuate or even reverse response patterns and thus change the supposed rising of postmaterialism. Flanagan (1987) criticizes the use of ranking questions since they would force the interviewee to choice between equally desirable issues, producing a false hierarchy. Davis and Davenport (1999) suspect that Inglehart's findings would just be result from random choices made by respondents. Davis (2000) disputes the substantive relevance of materialism-postmaterialism

dimension since materialism-postmaterialism variables would not be related to other values and attitudinal variables as theoretically expected.

Nevertheless, other authors have both supported and tried to refine Inglehart's findings. Sacchi (2008) provides both evidences supporting the use of rankings questions for measurement and a demonstration of the robustness of factor analysis for ipsative measures in the study of values. Moors (2003) supports the general Inglehart's findings, but he also proposes that materialist-postmaterialist dimension constructed using Inglehart's four-item questions should be unfolded in two distinct dimensions, influenced by different "causes": freedom of speech-fighting rising prices, more related to education; and more say-maintaining order, almost exclusively related to age. Moors and Vermunt (2007) findings support the existence of a postmaterialist dimension, yet also find strong heterogeneity and the possibility that different sub-dimensions would be nested inside the materialist dimension.

These works replicating, contesting, and supporting Inglehart's findings for different reasons suggest that, despite the robustness and consistency of results during almost forty years of research, there is still no consensus about the best way to test and interpret his theses, and discussion about how to analyze values data is still open.

THE GRADE OF MEMBERSHIP MODEL

The Grade of Membership model (GOM) is a technique for analysis of high dimensional categorical data based on fuzzy set theory (Manton et. al. 1994). In brief words, fuzzy set theory is an extension of the classical crisp set theory stating that one element may "pertain" to more than one set at the same time. In fuzzy set theory, elements present different *degrees of membership* (represented by the Latin letter g) to different sets, varying from null to total membership to a certain set, and not just an "all-or-nothing", 0 or 1 membership like in crisp set theory. Elements may still present total or zero membership to a set, but these are not the only possibilities as in crisp set theory, since they can assume *any* degree of membership between these extremes. According to fuzzy set theory, the membership of an element to a set may vary from 0 to 1 (that is, $0 \leq g \leq 1$), meaning that its attachment to a set may vary from none to full. Membership of an element to all sets still sums up to one, yet it may have partial memberships to infinity of sets: membership may be total to a set and zero for all others, be equally shared among different sets, or present any other configuration. Therefore, fuzzy set

theory is a more general set theory, and classical crisp set theory would just be a specific application of fuzzy sets (Zadeh 1965; Smithson and Verkuilen 2006).

The GOM model estimates two parameters, λ_{kjl} and g_{ik}. Parameter λ_{kjl} refers to the probability λ an individual with full membership to a set or profile k –we call an "extreme profile" or "pure type" – will present the response l for the variable j. Since λ_{kjl} refers to individuals representing extreme profiles, it refers to "typical" characteristics of a profile or set k. Parameter g_{ik} indicates the grade of membership g of an individual i to a profile k. The probability of a response l to the jth variable by individual i, conditional on g_{ik} scores, is given by $\Pr(Y_{ijl} = 1) = \sum_{\mathrm{i}=0}^{\mathrm{n}} g_{ik}\lambda_{kjl}$.[1] Therefore, the Grade of Membership model accounts for both *typical* and *unique* analytical aspects and offers a bridge linking general patterns to their individual manifestations of a phenomenon (Manton et. al. 1994). The λ_{kjl} and g_{ik} are iteratively estimated. In the first step, a set of λ_{kjl} is fixed and a likelihood function is maximized and a set of g_{ik} is generated; then, the set of g_{ik} is fixed and likelihood is maximized to estimate a new set of λ_{kjl}; the process is repeated until the likelihood function $L = \prod_{i=1}^{\mathrm{I}} \prod_{j=1}^{\mathrm{J}} \prod_{l=1}^{\mathrm{L_j}} \left(\sum_{k=1}^{\mathrm{K}} g_{ik}\lambda_{kjl}\right)^{y_{ijl}}$ is maximized.

OBJECTIVES

I propose a new validity test for Inglehart's Modernization-Postmodernization dimensionality. Using the Grade of Membership model, I intend to know whether responses to a pool of values questions tend to converge in direction of expected values types presented in Ronald Inglehart's works.

The Grade of Membership model seems a promising approach for the study of values for a handful of reasons. First, grade of membership is a data analysis technique developed specifically to handle categorical data, and a large part of value variables are, or can be analyzed as, discrete variables. Second, GOM allows us to assess empirically whether the patterns of value variables converge into type and thus test theoretical constructs validity. Third, g_{ik} parameters set aside possibilities to test value heterogeneity in a sample or population without problems of truncated variance since it can assume infinite values from 0 to 1. Fourth, as a consequence of how λ_{kjl} parameters are estimated and interpreted, GOM

[1] Y_{ijl} is a random variable and y_{ijl} is its empirical realization (Manton et. at. 1994).

seems to present less restriction for the analysis of ranking data than the majority of data techniques.

DATA AND METHODS

Dataset I analyze data from the Belo Horizonte Area Survey (BHAS), collected in 2002.[2] Its sample is representative of the Belo Horizonte Metropolitan Area adult population. The sample was based on a three-level selection: in the first stage, census tracts were randomly selected with probability proportional to their sizes; then, households were selected from every previously selected census tract; finally, a respondent was randomly chosen from the adult members of the household. BHAS is conducted every three years by the Center for Quantitative Research in Social Sciences at the Federal University of Minas Gerais, Brazil. The initial sample design was composed of 1,270 cases, and the total of successfully completed interviews was 1,029.

BHAS questionnaire value questions BHAS 2002 replicated twenty-four questions (see Appendix for questions wording, response categories, and frequencies) on values from Inglehart's previous World Value Survey waves. These questions were selected from those presenting more discriminant power to differentiate values priorities (see, for instance, Inglehart 1997, p. 82). BHAS questionnaire includes the "classical" four-item ranking questions about priorities, and other questions on values such as interpersonal trust, happiness, national pride, what people should teach to children, abortion and homosexuality acceptability, opinion on different political regimes, participation in political actions,[3] and importance of money, god, work, and respect to authority. I included all but the question on

[2] Belo Horizonte is the capital and largest city of Brazilian state of Minas Gerais. In 2002, Belo Horizonte was the third largest Brazilian city; its metropolitan area had around 4.7 millions of inhabitants.

[3] Despite political activism might be (correctly) considered as a behavioral dimension, the way the questions are formulated allows us to interpret them as indicators of cognitive mobilization and of acceptability of some kinds of political action. The results we obtained, presented in the next section, corroborate this interpretation.

god's importance in the analysis. This variable was excluded because it presented a quite low variance and would not bring substantive analytical gains.[4]

Grade of Membership My empirical analysis intends to apply the Grade of Membership model to assess the validity of Ronald Inglehart's values types. I run the GOM3 algorithm to fit the GOM model presented above to our data and to estimate its parameters.[5] Since I expect to find two response patterns in the data, Modern and Postmodern, I adjust our GOM model to extract two extreme profiles; that is, $K = 2$ in our analysis. I expect that responses to "modern" categories tend to load in one extreme profile, and responses to "postmodern" categories lean to load in the other one.

As stated above, two different parameters are calculated: λ_{kjl}, which estimate the probability of each l category from question jth be selected by a member with the kth extreme profile; and g_{ik}, which are the grade of membership of each individual ith in data to each kth extreme profile. GOM3 algorithm produces both kinds of information, λ_{kjl} and g_{ik}. λ_{kjl} coefficients are analyzed to understand profiles main traits (more details in next paragraph). Since we test a model with two extreme profiles, GOM3 generates two variables: g_{i1} means i's membership to profile 1 and g_{i2} to profile 2; and, as stated above, $\sum_{k=1}^{K} g_{ik} = 1$, for each i.

To run and interpret this test, suppose the following situation: Let's assume a one-dimensional space S where individuals' values V_i are distributed. In an extreme pole of such a space S, we have "Modern" pure type, we name M; in the symmetrically opposite pole, we have "Postmodern" pure type we name P. V_i may take any position in S: it may be in M pole,

[4] The question on god's importance was – just as the ones about abortion and homosexuality acceptability were – a 10 point scale, in which 1 means "not important at all" and 10 means "very important", and the respondents were asked to assign a point corresponding to their opinions. The only points to achieve more than one percent of responses were: 8 (1.9%), 9 (2.0%), and 10 (93.3%). These three points, indicating god as very important in respondent's life, summed up 97.3% of responses.

[5] GOM3.exe, a MSDOS-based program developed by Peter Charpentier and Burton H. Singer, fits the Grade of Membership model as described by Woodbury and Clive (1975) to discrete data. GOM3 is a freeware; a package including software and supporting documentation are available for free download from StatLib at Carnegie Mellon University at http://lib.stat.cmu.edu/DOS/general/.index.html.

presenting membership equals 1 to Modern pure type and equals 0 to Postmodern pure type; it may be in *P* pole, presenting membership equals 1 to Postmodern pure type and equals 0 to Modern pure type; it may be in a half distance of both two extremes, presenting membership 0.5 to both *M* and *P*; or it may have any other position between *M* and *P*, presenting memberships, for instance, $M = 0.7$ and $P = 0.3$, $M = 0.45$ and $P = 0.55$. This way, assuming modern and postmodern priorities and values as extreme points in a values and priorities continuum, we would have two polar types and a multitude of intermediate positions. Extremes would be the Modern and Postmodern individuals, and intermediate positions would correspond to Inglehart "mixed category", yet people in between positions could present tendencies toward one or another type, or even being "true mixed", in the sense of being roughly equidistant from poles.

Analyzing the λ_{kjl} coefficients we can assess the structure of profiles and interpret their meanings, making sense of what each profile represents (in a similar way of naming factors in factor analysis). To assess and to interpret the main traits of a profile, each λ_{kjl} for l category of jth question in profile kth is divided by the relative frequency of the respective response category in the dataset. This operation allows us to know the "load" of certain response category in kth profile. If the quotient (what I name "quantity of interest" hereafter and in table A1) is larger than one, it means that such a response category is more salient to that profile than it is to the sample as a whole. The larger is the quotient, the stronger is the salience. If the quotient is smaller than one, it means just the contrary; and if the quotient is close to one, it means that the trait represented by the response category does not differentiate the kth profile from the sample. In this analysis, a response category is considered a strong distinctive characteristic of a profile if its quantity of interest is at least equal or higher than fifteen percent for a profile than its relative frequency for the sample. That is, if a quantity of interest for category l in question j in profile k is equal or higher than 1.15, such a category l considered as a strong distinctive trait of profile k; quantities of interest between 1.0 and 1.15 also characterize profile k yet with lesser discriminant power. Quantities of interest equal or lower than 1 are not distinctive for profile k.

Validity test To test the validity of the extreme types obtained from the GOM model, I conduct some regression analyses in which I regress g_{ik} coefficients on some individual-level values determinants discussed in the literature. According to the theory presented above, membership to multiple fuzzy sets (or extreme profiles, as we name it in this paper) sums up to one. Since we have just two profiles, and the greater i's membership to one profile the

lesser *i*'s membership to the other one, these two profiles are perfectly negatively correlated. Thus, it is not necessary to test both extreme profiles: if one variable presents a positive coefficient for one profile, the same variable would necessarily present a negative coefficient for the other one. In this validity test, I analyze g_{ik} coefficient representing membership to Postmodern extreme profile.

Missing data and results presentation To avoid possible biases in analysis due to missing cases, I imputed data using *Amelia II* (Honaker et. al. 2005-2009; King et. al. 2001). Missing is not a serious problem neither concerning the values variables (from 0.2% to 8.9% of missing cases) nor for the use of a GOM model [that can be successfully applied just including an extra category for missing in variables (Manton et. al. 1994)]. However, it could lead to biased estimations for regression coefficients since some covariates present moderate presence of missing (around 10%) and, when put together, they could result in a major lost of data through listwise deletion procedure.[6] I generated five "full" datasets using *Amelia II*, including all variables used in analysis as well as some auxiliary variables to improve the estimations for cells with missing values.[7] For both data description and GOM models, the obtained results for each dataset were averaged and present and interpret such average values.[8] For regression analysis, I use Zelig package for R (Imai et. at. 2009) to bundle our imputed dataset and to run OLS regression models.

FINDINGS

First, I present and interpret the pure types extracted using the Grade of Membership model adjusted for two profiles. After, membership to the postmodern profile is regressed on some individual-level values determinants discussed in the literature (e.g. Inglehart 1971, 1981; Davis and Davenport 1999; Davis 2000).

[6] Only one variable – respondent's father schooling – presented high level of missing cases, close to 20%.

[7] Details about imputation process are available upon request.

[8] For this procedure, sometimes absolute values will not round up to integers and sums of percents will not sum up to 100% every time.

DESCRIPTION OF EXTREME PROFILES

In this section, I present and discuss the results from the Grade of Membership analysis for the Modernization-Postmodernization types proposed by Inglehart. As pointed before, I adjusted the GoM model for two profiles based on Inglehart theory, expecting that one construct would be congruent to the Postmodern type and the other one to the Modern type. The results obtained from the Grade of Membership analysis are summarized in table 1 (full results, as well as questions, response categories, and frequencies, can be found in Appendix table A1). The first variables presented correspond to Inglehart's four-item battery, to make clear the correspondence of each profile to Inglehart's typology.

TABLE 1 ABOUT HERE

Statistically, the model presents a very good fit to the data. The -2 log-likelihood (approximately χ^2 distributed) of 45,955 is quite larger than the critical chi-square value for the degrees of freedom of the model (*d.f.* = 1,118; critical χ^2 = 1,041). More importantly, the substantive findings are as theoretically expected.

Description of extreme profiles presented in table 1 strongly corroborates Ronald Inglehart's typology of values. Postmoderns tend to: be less oriented toward economic and security priorities and more oriented to self-expression, be more liberal, trust in people in general, believe it would be good if people give less emphasis on work, on money and material possession, and on authority, be happier, be politically active, and support democratic political values. Moderns, on the contrary, tend to be less oriented to self-expression and more oriented toward economic and security priorities, more conservative, distrust people in general and trust only in few people, believe it would be good if people still give emphasis on work, on money and material possession, and on authority, unhappy, politically apathetic, and support authoritarian and non-democratic political values.

A short note on trust measurement In addition to this general picture of values patterns, findings allow us to advance in the interpretation of some specific aspects about values measurement. Here, I focus in discussion of trust questions. BHAS 2002 tested two different formats for the question on trust. World Values Survey has been consistently pointing to

Brazil as the country presenting the lowest rates of generalized trust, the dimension of trust measured in WVS questionnaire (e.g. Inglehart 1997, p. 172-4). This experiment intended to test whether the original question format[9] would "contaminate" such a result since the "distrustful" response category original wording, "need to be very careful", when translate to Portuguese, has a very close meaning to a Brazilian popular saying, "caution is never in excess."[10] A half of 2002 BHAS respondents answered a version of questionnaire (let's name it Version A) containing this formulation, while the other half answered a questionnaire version (Version B) in which the "distrustful" response category is "just few people can be trusted", expression which meaning in Portuguese is quite different from the popular saying referred above.[11]

TABLE 2 ABOUT HERE

Concerning response frequency, both items presented a very similar empirical performance (see Table 2). Based on such a result, it could be hypothesized that question wording does not affect responses for generalized trust questions. Nevertheless, when the GOM quantities of interest for both question versions are compared, we note that the "distrustful" category wording is similar to the popular saying does not "load" (that is, it is very close to one) in neither of two profile. It could be interpreted that, despite postmoderns belief that most people can be trusted, they are as "aware" as moderns, what would prevent that this category "load" in the modern profile. On the other hand, each category of alternative formulation "loads" in a different profile, meaning that while postmoderns tend to present more generalized trust, moderns hold that just few people are worthy of trust (probably people close to the respondent, just like friends and, especially, family). From these results, we can speculate that, while question wording might not change frequency distribution, it could

[9] Original question wording: "Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?" Answer categories: "most people can be trusted" and "need to be very careful."

[10] Free translation for Brazilian saying "cuidado nunca é demais."

[11] In both versions of BHAS 2002, as well as the WVS questionnaire, "trustful" response category is "most people can be trusted."

affect the relation between a questionnaire item and a latent dimension and, consequently, affect construct validity – especially content validity – despite its apparent face validity.

REGRESSION ANALYSIS

Results presented above support Inglehart's Modernization-Postmodernization typology. However, it is still a question whether membership to one or other extreme profile is predicted as expected by theory. To perform this validity test, I examine the relation between scores in the extreme profiles and theoretically relevant predictors. Membership to postmodern profile in regressed on some theoretically relevant values predictors to test, in an individual-level, Inglehart's scarcity-socialization, and generational replacement hypotheses (Inglehart 1971, 1981). Scarcity and socialization are tested together using variables on individual's and parents' schooling. I assume that both respondent's and parents' schooling reflect socioeconomic status during respondent's childhood and youth. Higher parents' schooling would mean a more affluent familiar situation during socializing years, and educational achievement is sometimes considered a function of family socioeconomic position. Age is a proxy for generational replacement, and I assume, as Inglehart, that younger cohorts are socialized in a more affluent social environment, where there are less threat of poverty and physical insecurity.[12] To test a potential concurrent hypothesis, that adhesion to postmodernism would be reflect of current economic situation (e.g. Duch and Taylor 1993), postmodernism is regressed on household income. I run, then, three different regression models, each including one of these "causes" of postmodernism. Finally, I run a model with all these variables together and including extra control variables – gender, have

[12] Inglehart formulated this hypothesis to analyze advanced industrial countries, yet it could also be applied to interpret values in Brazil. Unfortunately, I do not have space for a proper development of this statement here. Nevertheless, one fact might support the pertinence of such hypotheses for Brazilian case: From 1960s to mid-1990, Brazil faced high annual inflation rates; especially during the 1980s and the first half of 1990s, Brazil suffered high three-digit inflation. After 1994, prices in Brazilian economy were successfully kept under control by *Plano Real* and have been around 5% or less per year since then. So, it is possible to assume that younger cohorts, especially people under 25 years old, were socialized in a stable economic situation.

children or not, marital status, and religion (due to space constraints, I do not report coefficients for these controls).

TABLE 3 ABOUT HERE

A brief analysis of regression models 1 and 2 shows significant coefficients as expected by Inglehart' dual-hypothesis model. Age is negatively correlated to postmodernism, pointing that older people tend to present lower membership to postmodern profile (or, conversely, higher membership to modern one). Respondent's and parents' schooling[13] are positively correlated to postmodernism: people socialized in more affluent families tends to be more postmoderns. These two models support Inglehart's generational replacement and scarcity-socializing hypothesis, respectively.

Regression model 3 shows that household income, as a proxy for individual's current economic situation, is also positively and significantly correlated to postmodernism. This would indicate that scarcity and economic insecurity during adulthood might still be a motor toward a modern profile, what is consistent to Maslow's theory. Inglehart (1981) shows that current economic events affect response to values survey questions toward modern options, yet even in this circumstance younger cohorts express more postmodern trends than elder ones. Two other potential reasons for the effect of household income are: (1) household income strongly correlates to respondent's (r = 0.6) and moderately parents' schooling (r = 0.35 and r = 0.41 for father's and mother's education, respectively), and income effect would be a reflection of these correlations; (2) current income might be a function of formal education, that would be a function of parents' socioeconomic position during respondent's childhood and youth. These questions deserve further tests, and their potential effect might be interpreted as the cause of results from the model four.

Fourth model includes variables of the other three regressions and extra control variables. In this regression, household income, and respondent's age and education are still significant at 5 percent. However, parents' education lost significance when controlled by other variables -- father's schooling is statistically significant only at 10 percent, meaning that evidence is less

[13] Correlation between father's and mother's schooling is 0.64.

strong than those for other variables, while it is still substantively significant. Reasons for such a loss of statistical significance for parents' schooling coefficients are the same speculated in former paragraph. All extra control variables except religion do not present statistical significance. Marital status, have or do not have children (variables used as proxies for different stages in the life cycle), gender, and even unemployment[14] do not present significant coefficients. Some religious affiliations, just like practicing Catholic, Spiritism, Protestant, and Jehovah's Witnesses presented negative and significant effects on postmodernism when compared to non-practicing Catholic, the reference category; other religions (Orixás, New Age, Messianic, Buddhism/Hinduism, and no religious affiliation) do not presented significant effect.

Using Zelig package for R (Imai et. al.2009), I estimated predicted effect of schooling on membership for postmodern profile for people with different ages, based on coefficients for the fourth regression model presented in table 2. Schooling was selected due to its relevance for Inglehart's scarcity-socialization dual hypothesis. I compared predicted values for respondents holding four (corresponding to first half of Brazilian elementary education) and 15 (corresponding to college degree) complete years of schooling for all age range. Results are presented in Graph 1 which provides a substantive additional support for Inglehart's theory. We can note that individuals with more formal education present higher membership to postmodern profile than people with less schooling years for all ages, at the same time that such a predicted membership systematically decreases as people grow older. This result supports scarcity-socializing thesis.

GRAPH 1 ABOUT HERE

DISCUSSION

In this paper, I proposed to test Inglehart' values typology applying a method that – to the best of my knowledge – had never been used in studies about the issue. Due to space constraints, I could neither present a detailed development of fuzzy set theory supporting the

[14] Clark and Dutt (1991) and Clark et. at. (1999) argued that unemployment would affect response to priority questions.

Grade of Membership model and its pertinence to research on values nor report more tests and results to validate and support my findings. However, the most important is that these preliminary results using the Grade of Membership approach for the study of values corroborate Inglehart's values typology. Responses converged as theoretically expected for the two extreme profiles: Modern categories "load" in one profile and Postmodern categories in another. It is also worth to notice that we do not find "cross loading"; that is, no "modern" category presented high quantity of interest in the postmodern profile, and no "postmodern" category presented it in the modern profile. These findings are strongly congruent to Inglehart's theory and previous works. This fit between Inglehart's and my findings are especially interesting because I am testing his propositions using different dataset and a different method than those Inglehart has been using. I believe this might be interpreted as a validation of his findings and theory.

Validity test also shows that, in general, prediction of membership to postmodern profile was as expected. We find a result that could be interpreted as divergent of the theory: when controlled by other variables, parents' schooling does not present statistically significant effect. However, I interpret it as, at least in part, a consequence of either correlation among parents' schooling and other covariates and of the regression model I applied. Further tests using other models, for instance structural equations, may be necessary to verify my interpretation.

Two major tasks are to be developed from now on. First, I analyze just one cross-sectional dataset in this paper. It would be interesting the application of the GOM model on other datasets, comparing results for data from different countries and at different points of time. Second, it is necessary to run GOM models with different numbers of profiles to assess whether there is values heterogeneity inside either moderns or postmoderns.

REFERENCES

Clarke, Harold D., Nitish Dutt. 1991. "Measuring Value Change in Western Industrialized Societies: The Impact of Unemployment." *American Political Science Review* 85 (September): 905-920.

Clarke, Harold D., Nitish Dutt, and Jonathan Rapkin. 1997. "Conversations in Context: The (Mis)Measurement of Value Change in Advanced Industrial Societies." *Political Behavior* 19 (March): 19-39.

Clarke, Harold D. Allan Kornberg, Chris McIntyre, Petra Bauer-Kaase, Max Kaase. 1999. "The Effect of Economic Priorities on the Measurement of Value Change: New Experimental Evidence." *American Political Science Review* 93 (September): 637-47.

Davis, Darren W. 2000. "Individual Level Examination of Postmaterialism in the U.S.: Political Tolerance, Racial Attitudes, Environmentalism, and Participatory Norms." *Political Research Quarterly* 53 (September): 455-75.

Davis, Darren W., Christian Davenport. 1999. "Assessing the Validity of the Postmaterialism Index." *American Political Science Review* 93 (September): 649-64.

Duch, Raymond M., Michaell A. Taylor. 1993. "Postmaterialism and the Economic Condition." *American Journal of Political Science* 37 (August): 747-79,

Flanagan, Scott C. 1987. "Value Change in Industrial Societies." *American Political Science Review* 81: 1303-19.

Honaker, James, Anne Joseph, Gary King, and Matthew Blackwell. 2005-2009. *Amelia II: Missing Imputation*. http://gking.harvard.edu/amelia

Imai, Kosuke, Gary King, and Olivia Lau. 2009. "Zelig: Everyone's Statistical Software." http://gking.harvard.edu/zelig

Inglehart, Ronald. 1971. "The Silent Revolution in Europe: Intergenerational Change in Post-Industrial Societies." *American Political Science Review* 65 (December): 991-1017.

Inglehart, Ronald. 1981. "Post-Materialism in an Environment of Insecurity." *American Political Science Review* 75 (December): 880-900.

Inglehart, Ronald. 1997. *Modernization and Postmodernization: Cultural, Economic, and Political Change in 43 Societies*. Princeton, NJ: Princeton University Press.

King, Gary, James Honaker, Anne Joseph, and Kenneth Scheve. 2001. "Analyzing Incomplete Political Science Data: An Alternative Algorithm for Multiple Imputation." *American Political Science Review* 95 (March): 49-69.

Manton, Kenneth G., Max A. Woodbury, and H. Dennis Tolley. 1994. *Statistical Applications Using Fuzzy Sets*. New York: John Wiley & Sons, Inc.

Maslow, Abraham H. 1943. "A Theory of Human Motivation." *Psychological Review* 50(4): 370-96.

Moors, Guy. 2003. "The Two Faces of (Post)Materialism: A Decomposition Approach." *International Journal of Public Opinion Research* 15 (4): 397-412.

Moors, Guy, Jeroen Vermunt. 2007. "Heterogeneity in Post-materialist Value Priorities. Evidence from a Latent Class Discrete Choice Approach." *European Sociological Review* 23 (5): 631-48.

Sacchi, Stefan. "The Dimensionality of Postmaterialism: An Application of Factor Analysis to Ranked Preference Data." *European Sociological Review* 14 (2): 151-175.

Smithson, Michael, Jay Verkuilen 2006. *Fuzzy Set Theory: Applications in the Social Sciences*. (Sage University Paper series on Quantitative Applications in the Social Sciences, series no. 07-147). Thousand Oaks, CA: Sage.

Woodbury, Max A., Jonathan Clive. 1974, "Clinical Pure Type as a Fuzzy Partition." *Journal of Cybernetics* 4:111-121.

Zadeh, Lofti A. 1965. "Fuzzy Sets." *Information and Control* 8: 338-53.

Table 1. Description of Modern and Postmodern extreme profiles

A. Postmodern profile main characteristics	B. Modern profile main characteristics
(a) The most important goals are "giving the people more say in political decisions" and "protect freedom of speech";	(a) The most important goals are "maintain order in the country" and "fighting rising prices";
(b) They are happy, yet not very or completely happy, people;	(b) Consider themselves as not very or not at all happy people;
(c) Most people can be trusted;	(c) Just few people can be trusted;
(d) The most important qualities that children can be encouraged to learn at home are independence and determination;	(d) The most important qualities that children can be encouraged to learn at home are obedience and religious faith;
(e) They are politically active people: they have already signed petitions, and have taken or would take part in boycotts, demonstrations, strikes, and have already occupied or would occupy public buildings;	(e) They are not political active people: they never have signed a petition yet could do that, and have never taken nor would take part in boycotts, demonstrations, strikes, or occupation of public buildings;
(f) It would be a good thing if people give less emphasis on money and material possession;	(f) It would be bad (or would not make a difference) if people give less emphasis on money and material possession;
(g) It would be a good thing if people give less emphasis on work;	(g) It would be a bad thing if people give less emphasis on work;
(h) It would be a bad thing (or would not make a difference) if people have greater respect for authority;	(h) It would be a good thing if people have greater respect for authority;
(i) Abortion and homosexuality are acceptable;	(i) Abortion and homosexuality are never acceptable;
(j) They are not so proud of being Brazilians;	(j) They are very or not at all proud of being Brazilians;
(k) They tend to support democratic political values, yet still worried about govern efficiency: democracy is classified very good while it is also very good having experts, and not politicians, making decisions, and strongly reject military regimes and strong leaders who does not have to bother with parliament and elections.	(k) They tend to present non-democratic political orientations: military regime and having a strong leader who does not have to bother with parliament and elections are classified as good or very good, having experts, and not politicians, making decisions is considered bad or very bad; and democracy is considered bad or very bad, yet it might be good.
-2 log-likelihood: 45,955.691. Degrees of freedom: 1,118.	

Source: BHAS 2002.

Table 2. Generalized trust, by questionnaire version			
Version A	%	Version B	%
Most people can be trusted	8.8	Most people can be trusted	8.6
Extra careful is never too much	90.9	Just few people can be trusted	90.7
Missing	0.4	Missing	0.7

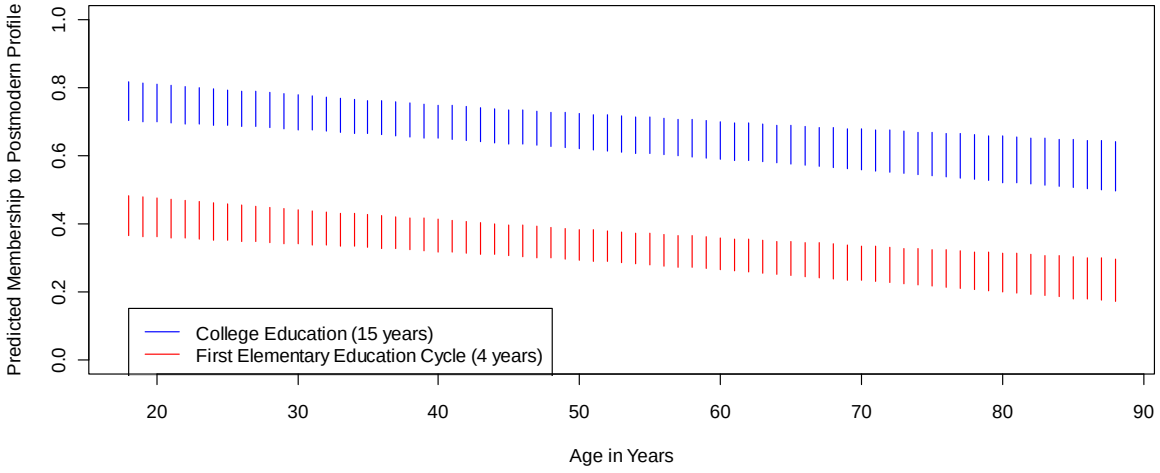
Frequencies prior data imputation.

Source: BHAS 2002.

Table 3. Ordinary Least Squares Analysis of Factors Affecting Postmodernism								
	1. Age		2. Parents and schooling		3. Income		4. Full model	
	B	p-value	B	p-value	B	p-value	B	p-value
Constant	0.741 (0.028)	0.000	0.103 (0.027)	0.004	0.229 (0.028)	0.000	0.374 (0.060)	0.000
Age (in years)	-0.006 (0.001)	0.000					-0.003 (0.001)	0.000
Father's schooling (9-point scale)			0.011 (0.005)	0.046			0.009 (0.005)	0.100
Mother's schooling (9-point scale)			0.015 (0.006)	0.007			0.006 (0.006)	0.282
Schooling (in years)			0.039 (0.002)	0.000			0.030 (0.003)	0.000
Household income (9-point scale)					0.057 (0.004)	0.000	0.017 (0.004)	0.000
R^2	0.089		0.398		0.205		0.443	

Source: BHAS 2002.

Graph 1. Effect of Education and Age on Postmodernization



APPENDIX: RESULTS FOR GRADE OF MEMBERSHIP MODEL

Table A1: Frequencies and Results for the Grade of Membership Model

Response	Frequency		λ_{kjl} for extreme profiles		Quantity of interest	
	Absolute	Relative	Post-moderns	Modern	Post-modern	Modern
If you had to choose, which one of these things would you say is the most important?						
Maintaining order in the nation	334.2	0.325	0.262	0.381	0.806	**1.172**
Give people more say in government decisions	272.6	0.265	0.555	0.000	**2.099**	0.000
Fighting rising prices	262.8	0.256	0.000	0.490	0.000	**1.916**
Protecting freedom of speech	159.4	0.155	0.183	0.129	**1.179**	0.832
And which would be the next most important?						
Maintaining order in the nation	213	0.207	0.133	0.279	0.641	**1.348**
Give people more say in government decisions	212.8	0.207	0.211	0.202	1.022	0.979
Fighting rising prices	317	0.308	0.262	0.352	0.851	1.144
Protecting freedom of speech	286.2	0.278	0.394	0.166	**1.416**	0.597
Taking all things together, would you say you are:						
Very happy	295	0.287	0.277	0.296	0.966	1.031
Happy	557.8	0.542	0.636	0.451	**1.173**	0.832
Not so happy	149.2	0.145	0.080	0.208	0.552	**1.436**
Not at all happy	27	0.026	0.007	0.045	0.265	**1.728**
Generally speaking, would you say that most people can be trusted or that caution never is exceeding?						
Most people can be trusted	44	0.043	0.087	0.000	**2.016**	0.000
Extra careful is never too much	481	0.467	0.469	0.466	1.005	0.999
(Not applicable)	504	0.490	0.444	0.534	0.906	1.089
Generally speaking, would you say that most people can be trusted or that just few people can be trusted?						
Most people can be trusted	45.2	0.044	0.067	0.022	**1.515**	0.487

Just few people can be trusted	458.2	0.445	0.372	0.516	0.835	**1.158**
(Not applicable)	525.6	0.511	0.561	0.463	1.099	0.907
I'm going to read out a list of qualities that children can be encouraged to learn at home. Among them, which are the two things you consider more important?						
Independence						
Mentioned	0.286	0.286	0.435	0.139	**1.522**	0.486
Do not mentioned	0.714	0.714	0.565	0.861	0.791	**1.206**
Obedience						
Mentioned	0.556	0.556	0.205	0.916	0.369	**1.646**
Do not mentioned	0.444	0.444	0.795	0.085	**1.791**	0.190
Determination, perseverance						
Mentioned	628.6	0.611	1.000	0.199	**1.638**	0.326
Do not mentioned	400.4	0.389	0.000	0.801	0.000	**2.057**
Religious faith						
Mentioned	558.2	0.542	0.329	0.758	0.606	**1.398**
Do not mentioned	470.8	0.458	0.671	0.242	**1.467**	0.529
I'm going to read out some different forms of political action that people can take. I'd like you to tell me, for each one, whether you have actually done any of these things, whether you might do it or would never, under any circumstances, do it.						
Signing a petition						
Have done	602.6	0.586	0.928	0.234	**1.584**	0.400
Might do	260.2	0.253	0.072	0.439	0.286	**1.735**
Would never do	166.2	0.161	0.000	0.327	0.000	**2.027**
Joining in boycotts						
Have done	260.6	0.254	0.502	0.002	**1.981**	0.010
Might do	412.8	0.401	0.498	0.306	**1.242**	0.763
Would never do	355.6	0.346	0.000	0.692	0.000	**2.001**
Attending demonstrations						
Have done	271	0.263	0.508	0.000	**1.932**	0.000
Might do	355.2	0.345	0.492	0.188	**1.425**	0.545
Would never do	402.8	0.392	0.000	0.812	0.000	**2.072**
Joining strikes						
Have done	215.2	0.209	0.413	0.000	**1.972**	0.000
Might do	309.2	0.300	0.587	0.000	**1.957**	0.000
Would never do	504.6	0.491	0.000	1.000	0.000	**2.038**
Occupying buildings, factories, schools.						
Have done	32.8	0.032	0.055	0.010	**1.727**	0.299
Might do	111.6	0.109	0.221	0.000	**2.035**	0.000
Would never do	884.6	0.860	0.724	0.991	0.842	**1.152**
I'm going to read out a list of various changes in our way of life that might take place in the near future. Do you think that … would be a good thing, a bad thing, or don't you mind?						
People give less emphasis on money and material possessions						

Good	763.8	0.742	0.961	0.526	**1.295**	0.708
Bad	137.2	0.133	0.039	0.228	0.292	**1.708**
It doesn't matter	128	0.124	0.000	0.247	0.000	**1.990**
Less importance placed on work in our lives						
Good	212.2	0.206	0.327	0.089	**1.585**	0.433
Bad	766.8	0.745	0.620	0.867	0.832	**1.163**
It doesn't matter	50	0.049	0.053	0.044	1.090	0.900
People feel a greater respect for authority						
Good	892.8	0.868	0.776	0.956	0.894	1.101
Bad	59.2	0.057	0.090	0.026	**1.567**	0.462
It doesn't matter	77	0.075	0.134	0.018	**1.793**	0.238
Do you think it is always acceptable, never acceptable, or do you have an intermediate opinion?						
Never	269.8	0.262	0.007	0.508	0.026	**1.941**
2	24.8	0.024	0.016	0.023	0.654	0.945
3	34.4	0.033	0.044	0.024	**1.312**	0.704
4	44.4	0.043	0.043	0.044	0.981	1.015
5	167.8	0.163	0.222	0.110	**1.361**	0.673
6	61.8	0.060	0.113	0.009	**1.894**	0.144
7	55.2	0.053	0.082	0.027	**1.533**	0.506
8	78.2	0.076	0.119	0.035	**1.563**	0.460
9	31.6	0.031	0.052	0.010	**1.697**	0.330
Always	261	0.254	0.304	0.211	**1.197**	0.831
And what about abort? Do you think it is always acceptable, never acceptable, or an intermediate opinion?						
Never	658.8	0.640	0.278	0.976	0.435	**1.526**
2	38	0.037	0.076	0.000	**2.057**	0.000
3	50	0.049	0.101	0.000	**2.053**	0.000
4	26.2	0.025	0.052	0.000	**2.072**	0.000
5	121.4	0.118	0.252	0.000	**2.130**	0.000
6	32.2	0.031	0.064	0.000	**2.062**	0.000
7	31.2	0.030	0.062	0.000	**2.063**	0.000
8	28.2	0.027	0.056	0.000	**2.068**	0.000
9	8	0.008	0.013	0.000	**1.578**	0.000
Always	35	0.034	0.045	0.024	**1.321**	0.696
And what about being Brazilian? How do you feel?						
Very proud	436	0.424	0.342	0.505	0.806	**1.191**
Proud	402.8	0.392	0.405	0.377	1.033	0.963
Not so proud	126.6	0.123	0.227	0.021	**1.854**	0.173
Not at all proud	63.6	0.062	0.026	0.097	0.425	**1.570**
What do you think about each one of these ways of governing a country? Do you think that ... is a very good, good, bad, or very bad way of governing a country?						
Having a strong leader who does not have to bother with parliament and elections						

Very good	134	0.130	0.017	0.237	0.131	**1.824**
Good	348.4	0.338	0.137	0.520	0.405	**1.536**
Bad	336.2	0.327	0.455	0.213	**1.391**	0.651
Very bad	210.4	0.204	0.391	0.030	**1.914**	0.148
Having experts, not government, make decisions according to what they think is best for the country						
Very good	232.6	0.226	0.284	0.169	**1.258**	0.748
Good	526.4	0.511	0.527	0.496	1.031	0.970
Bad	205	0.199	0.152	0.246	0.766	**1.235**
Very bad	65	0.063	0.036	0.089	0.579	**1.417**
Having a military regime						
Very good	76.4	0.074	0.002	0.144	0.021	**1.930**
Good	283.6	0.276	0.000	0.524	0.000	**1.900**
Bad	379.4	0.368	0.471	0.277	**1.278**	0.751
Very bad	289.6	0.282	0.528	0.056	**1.874**	0.200
Having a democratic political system						
Very good	321.4	0.312	0.584	0.055	**1.869**	0.175
Good	522.2	0.507	0.400	0.608	0.788	**1.198**
Bad	145	0.141	0.000	0.276	0.000	**1.961**
Very bad	40.4	0.039	0.017	0.061	0.421	**1.552**

Values in bold characters represent quantities of interest at least 1.15 times higher than category frequency in the sample. This threshold is the one used to determine the major traits in each profile. Quantities of interest between 1.0 and 1.15 are also interpreted as profiles characteristics; however, they present lesser discriminant power.

Source: BHAS 2002.