Chapter #9

THE USEFULNESS OF PHANTOM LATENT VARIABLES IN PREDICTING CHANGES IN THE EFFECTS AMONG STRUCTURAL RELATIONS
An example of modeling food attitude and human values

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ABSTRACT
The goal of this study was to examine the usefulness of phantom latent variables of models with structural relations. Phantom latent variables are defined as latent variables with no observed indicators (Rindskopf, 1984) and take form by making constraints on structural relations into latent variables path models. The constraints in applied psychology have the purpose to explore and simulate unrevealed aspects of psychological theories with latent variables. As a consequence, the phantom latent variables have the purpose to model the respondents' *alteration* to such constraints and to provide proxy of new effects that take into account the constraints and the alterations, simultaneously. In this respect, an example of the application of phantom latent variables was proposed to an attitude model towards buying sustainable food products in Italy, with second-order dimensions of Schwartz's taxonomy of basic human values (1992) as predictors. To this end, phantom latent variables were introduced as mediators into the model with the purpose of simulating what would have happened to the model respondents if the openness to change dimension of the Schwartz's taxonomy had been restricted to be greater than, less than, or equal to, specified constants in predicting the attitude.

Keywords: phantom latent variables, structural equation modeling, mediation analysis, Schwartz's theory of basic human values.

1. INTRODUCTION

Phantom latent variables were initially defined by David Rindskopf (1984) as "latent variables with no observed indicators…These variables are of no interest themselves, but only exist for the purpose of implementing the constraints" (p. 38). Let me extend this definition with stating that: the constraints themselves *give rise to* the phantom latent variables for the purpose of modeling the respondents' *alteration* to those constraints.

I define *alteration* as the way the respondents react to constraints on structural relations. In applied psychology, to make constraints on structural relations is a means of testing unrevealed aspects of psychological theories with latent traits. These unrevealed aspects may consist in: something that is possibly obscured by the complexity of the model relations, or something that exists but the researcher was unable to measure, or still something that the researcher forgot to take into account, and so forth. Basically, anything unexplored that might be hypothesized to have an influence on theories with latent variables has a subsequent phantom latent effect on the respondents. *Phantom* because it is something that was ignored until revealed through constraints and *latent effect* because it is an unobserved outcome that affects the respondents. This phantom latent effect is modeled by both imposing constraints and introducing phantom latent variables into structural models. Hence, the program re-estimates the model-implied matrix parameters that are a function of constraints and phantom latent variables. These re-estimated parameters are phantom parameters that simulate *what* would have happened to respondents according to the theory *if* those constraints were present. A nice example of this counterpart between constraints and phantom latent variables is the work of Macho and Ledermann (2011) in which an entire phantom model is presented so as to handle specific effects of subclass of mediators in structural relations. The phantom approach of the two authors was to bring out the hidden effects of complex connections within a structural model. Some recent applications of phantom latent variables have focused on the following: a) composite reliability of latent effects (Black, Yang, Beitra, & McCaffrey, 2014; Gignac, 2014a; 2014b; Thurber & Bonynge, 2011), also in longitudinal studies (Hancock, Mao, & Kher, 2013); b) mediation effects (Davinson, Babson, Bonn-Miller, Souter, & Vannoy, 2013; Lau & Cheung, 2012; Liew, Kwok, Chang, Chang, & Yeh, 2014; Schrodt & Shimkowski, 2013), including in longitudinal studies (Caprara, Alessandri, Barbaranelli, & Vecchione, 2013); c) interactions and feedback loops (Woody & Sadler, 2005).

The objective of this work is to present an application of phantom latent variables as mediators within a latent variable path model following Rindskopf's methods (1984). The hypothesized model will be an attitude model towards buying sustainable food products in Italy, with second-order dimensions of the Schwartz's taxonomy of basic human values (Schwartz, 1992) as predictors. As a consequence, the psychological theory/model under inspection will be Schwartz's theory of basic human values (1992) applied to food choices. To this end, I have used food preferences as a real data example, but this application can be easily extended to other types of latent path models, theories and contexts.

The next section will at first illustrate how the proposed type of phantom latent variables are generally hypothesized, how they work and what information they are able to provide. Secondly it will illustrate how such variables will be introduced in the attitude model as specific phantom hypotheses.

2. BACKGROUND

2.1. General phantom hypotheses

Starting from the structural relation (with structural parameter β_{21}) between two latent constructs, η_1 and η_2, depicted in figure 1, the first phantom relation involves using one phantom latent variable as a mediator between these two latent variables, as depicted in the next figure 2a. The unrevealed aspect to bring out or explore with this phantom mediation is to simulate how an expected direct change (i.e., β_{21}) in η_2 for a one-unit change in η_1 would be needed to be greater than, or equal to, a specified constant k (Rindskopf, 1984). In practice, how the respondents would react if β_{21} was greater than, or equal to, a specified constant k. This constant k can be determined based on previous information/research and/or theoretical reasons the researcher may want to explore.

Figure 1. Conceptual model with two latent variables.

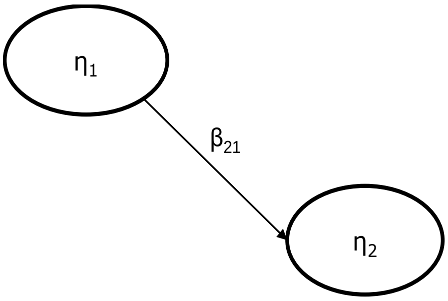
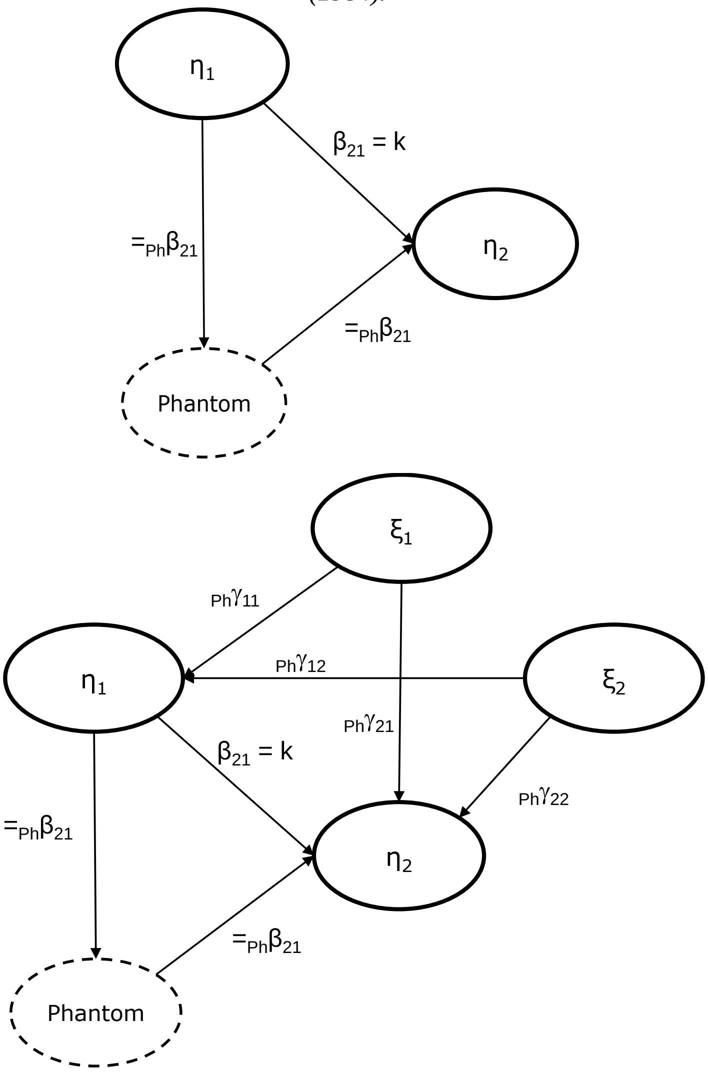


Figure 2. Conceptual models with 1 phantom latent variable and respectively with 2 latent variables (model a,) and more than 2 latent variables (model b), adapted from Rindskopf (1984).

a

b



Alternatively, if this previous knowledge on constant k is not available, it is possible to simulate a gradual increasing and/or decreasing sequence of constants k until reasonable model results are reached.

In order to make this first simulation possible (figure 2a) it would be necessary to create a linkage of constraints as follows: 1) to constraint the unstandardized structural parameter β_{21} to be equal to k; 2) to introduce one phantom latent variable, setting its variance to zero; 3) to constraint the structural parameter from η_1 to phantom to be equal (i.e., $=_{Ph}\beta_{21}$) to the structural parameter from phantom to η_2. The structural parameter $=_{Ph}\beta_{21}$ is a new phantom parameter that represents the indirect effect of η_1 on η_2 mediated by the phantom with taking into account the initial restriction β_{21}=k. Indeed, $=_{Ph}\beta_{21}$ is the *alteration* that is occurring to the sample under the restriction k and it reveals how much of β_{21} would be needed, in the sample, to overcome that restriction. As a result, the quantity ($=_{Ph}\beta_{21}^2$ + k) represents the total effect (i.e., sum of all direct effects with all indirect effects. These latter are obtained by multiplying all mediated paths; see Bollen, 1989, p. 37) of η_1 on η_2 and it is a proxy of a new direct effect of η_1 on η_2 under the hypothesis of $\beta_{21} \geq$ k. This proxy conveys sense to the phantom latent variable that here is a "what…if" $\beta_{21} \geq$ k scenario. If $=_{Ph}\beta_{21}$ is statistically significantly different from zero it means that the *alteration* is acting and the sample is able to overcome the initial restriction k on β_{21} with providing a new direct effect of ($=_{Ph}\beta_{21}^2$ + k). On the contrary, if $=_{Ph}\beta_{21}$ is not statistically significantly different from zero, the new direct effect is exactly k.

Moreover, should the latent variables involved in the phantom path restriction regress on further latent variables, as the example depicted in figure 2b, the phantom restrictions $=_{Ph}\beta_{21}$ may alter the other unrestricted structural parameters that are free to vary.

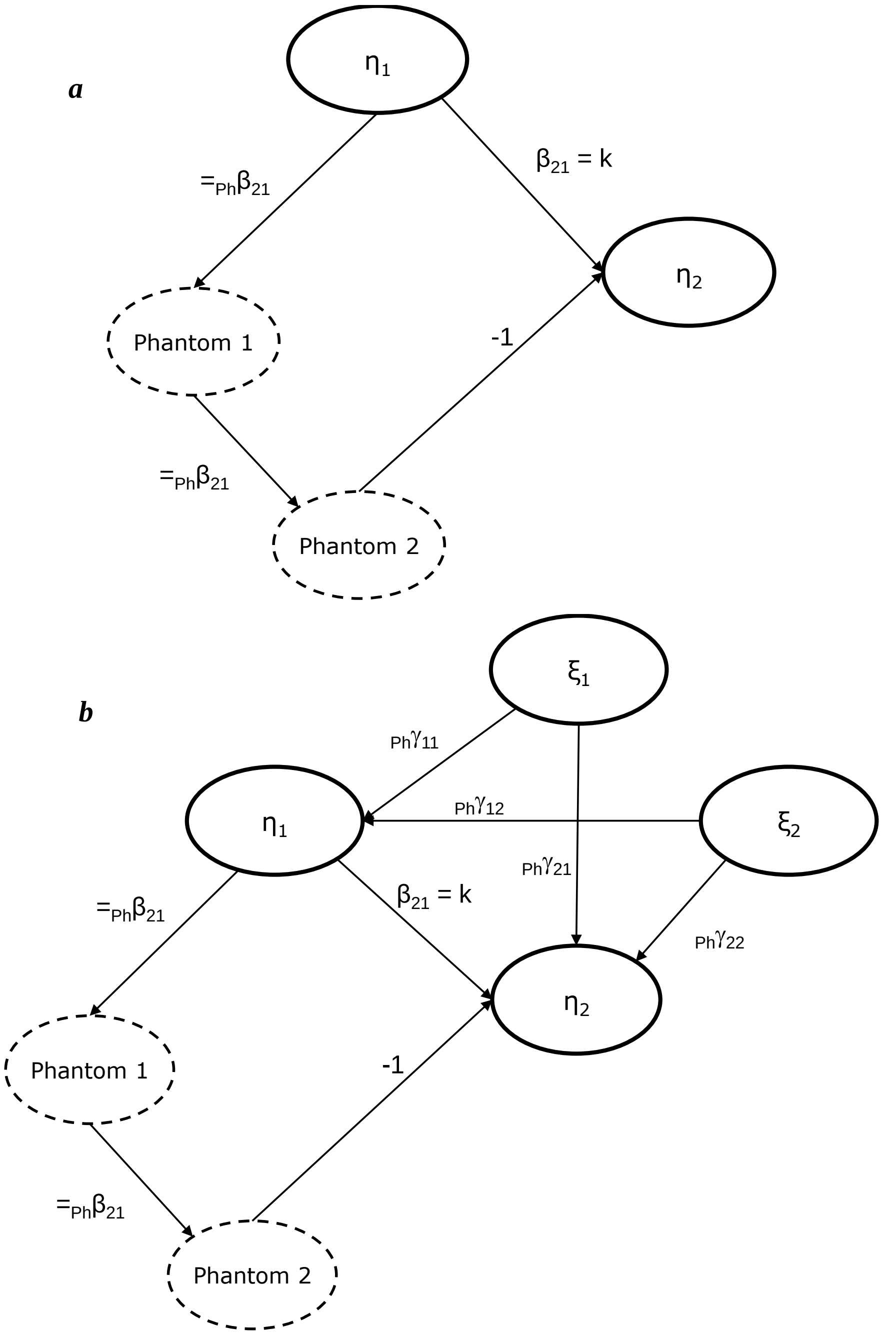
These other structural parameters become phantom parameters as well (i.e., $_{Ph}\gamma_{ij}$) because they are influenced by the restrictions β_{21}=k and $=_{Ph}\beta_{21}$.

In sum, the first and the second general (hereafter g) phantom hypotheses are:

$_{Ph}H_{1g}$ = how much of β_{21} would be needed, if $\beta_{21} \geq$ k (see figure 2a);
$_{Ph}H_{2g}$ = how $_{Ph}\gamma_{ij}$ changes when $\beta_{21} \geq$ k (see figure 2b).

The second phantom relation considered in this study relates now to two phantom latent variables, depicted in figure 3a, as mediators between the two latent constructs η_1 and η_2, already hypothesized in figure 1, with structural parameter β_{21}. This constraint operates in the same way, although in opposite direction, as the first phantom relation shown in figure 2a. The unrevealed aspect to bring out or explore with this second phantom mediation is to simulate how an expected direct change (i.e., β_{21}) in η_2 for a one-unit change in η_1 would be needed to be less than, or equal to, a specified constant k (Rindskopf, 1984).

Figure 3. Conceptual models with 2 phantom latent variables and respectively with 2 latent variables (model a,) and more than 2 latent variables (model b), adapted from Rindskopf (1984).



In order to make this second simulation possible it would be necessary to create a linkage of constraints as follows: 1) to constraint the unstandardized structural parameter β_{21} to be equal to k; 2) to introduce two phantom latent variables, setting their variance to zero; 3) to constraint the structural parameter from η_1 to phantom 1 to be equal (i.e., $=_{Ph}\beta_{21}$) to the structural parameter from phantom 1 to phantom 2; 4) to constraint the structural parameter from phantom 2 to η_2 to -1. As in the first simulation, the structural parameter $=_{Ph}\beta_{21}$ is the *alteration*. Therefore the quantity ($k - =_{Ph}\beta_{21}{}^2$) represents the total effect of η_1 on η_2 (equal to k if $=_{Ph}\beta_{21}$ is not statistically significantly different from zero) that is a proxy of a new direct effect of η_1 on η_2 under the hypothesis of $\beta_{21} \leq$ k. Also in this case the phantom restrictions $=_{Ph}\beta_{21}$ may alter the other unrestricted structural parameters that are free to vary (see figure 3b).

In sum, the third and the fourth general phantom hypotheses are:

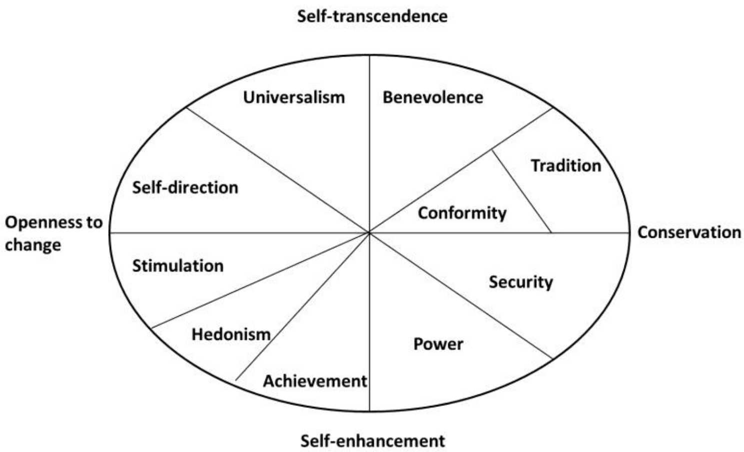
${}_{Ph}H_{3g}$ = how much of β_{21} would be needed, if $\beta_{21} \leq$ k (see figure 3a);

${}_{Ph}H_{4g}$ = how ${}_{Ph}\gamma_{ij}$ changes when $\beta_{21} \leq$ k (see figure 3b).

2.2. The Schwartz's theory of basic human values applied to an attitude model towards buying sustainable food products: Specific phantom hypotheses

In this sub-paragraph the well-known Schwartz's theory of basic human values (1992) will be introduced as well as the attitude model and the specific phantom hypotheses. Briefly speaking, this theory of human values postulates the existence of ten motivational types of value domains that are distinct (i.e., benevolence, universalism, self-direction, stimulation, hedonism, achievement, power, security, conformity, tradition). These domains are assumed to be recognized in all cultures, are latent in nature and organized in a precise, quasi-circular-elliptical taxonomy depicted in figure 4.

Figure 4. Schwartz's taxonomy of value domains adapted from Schwartz (1992).



Two orthogonal axes with four dimensions (i.e., self-transcendence - self-enhancement, openness to change - conservation) summarize the ten value domains in higher order levels of abstraction. Because this coherent structure arises from social and psychological harmony, or disharmony, between values that people experience in everyday decisions, it can help in explaining why such decisions are made and why such attitudes and behaviors are declared and put into practice (Schwartz, 1992). In this respect, an attitude model to explain why individuals buy sustainable food products was developed and successfully verified in Italy using the four dimensions of the Schwartz's taxonomy coupled with past experience in purchasing such products as predictors (Vassallo & Saba, 2015). On the other hand, simulations on this attitude model have never been tested.

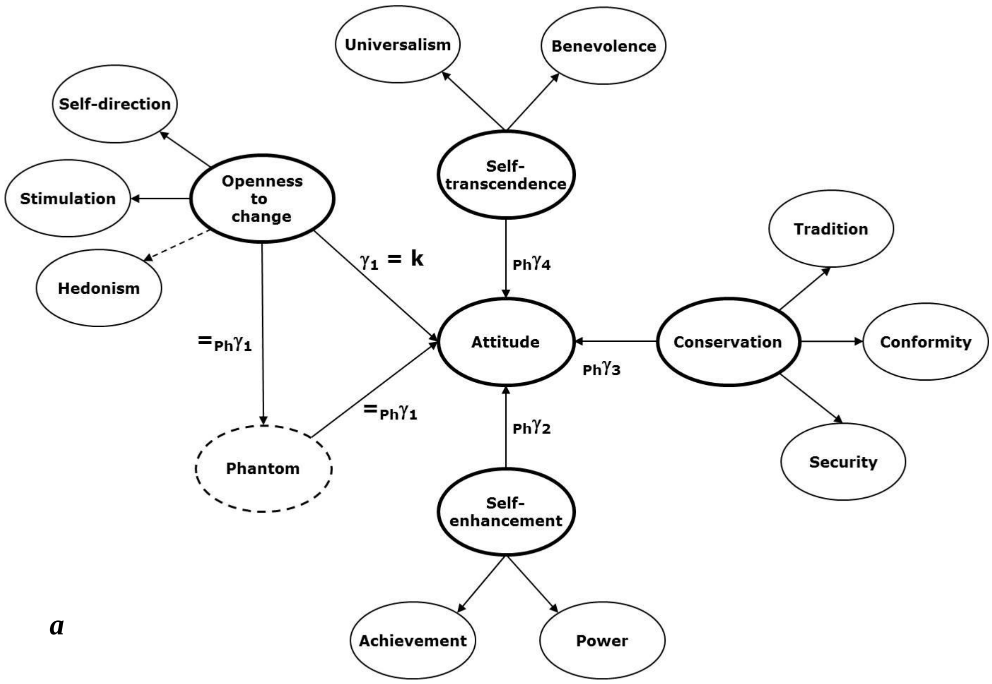
The simulations will focus on the use of phantom latent variables, taken from Rindskopf's methods (1984) and previously shown in figures 2a and 3a. The phantom relations will be directly added to the main attitude model involving the openness to change dimension and with the exclusion of past experience, as depicted in figures 5a and 5b. The rationale of imposing constraints and thus phantom relations on the openness to change dimension is due to the fact that its parameter in predicting attitude towards buying sustainable food products was not statistically significant (neither was the self-enhancement parameter) in the main model (Vassallo & Saba, 2015). Hypotheses and results will be presented on the openness to change dimension only, although such phantom simulations can be made on all the other three dimensions as well. In sum, the first and the second specific (hereafter s) phantom hypotheses are based on the general ones (see figures 2a and 2b) and are simultaneously included in the attitude model as follows (see figure 5a):

${}_{Ph}H_{1s}$ = how much of γ_1 would be needed, if $\gamma_1 \geq k$;
${}_{Ph}H_{2s}$ = how ${}_{Ph}\gamma_i$ (with i=2, 3, 4) changes when $\gamma_1 \geq k$;

The third and the fourth specific phantom hypotheses are also based on the general ones (see figures 3a and 3b) and are simultaneously included in the attitude model as follows (see figure 5b):

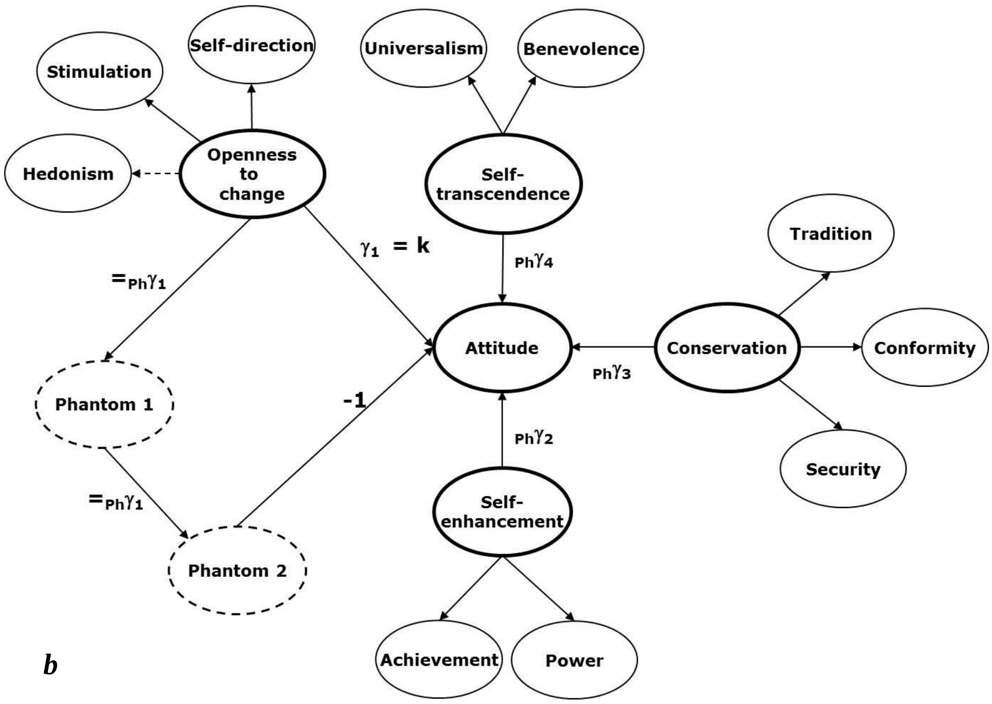
${}_{Ph}H_{3s}$ = how much of γ_1 would be needed, if $\gamma_1 \leq k$;
${}_{Ph}H_{4s}$ = how ${}_{Ph}\gamma_i$ (with i=2, 3, 4) changes when $\gamma_1 \leq k$;

Figure 5a. Conceptual attitude models with phantom latent variables to respectively simulate openness to change parameter to be greater than (model a) and less than (model b) a constant k .



a

Figure 5b. Conceptual attitude models with phantom latent variables to respectively simulate openness to change parameter to be greater than (model a) and less than (model b) a constant k. (cont.)



3. METHODS

3.1. Subjects and design

The study was conducted on 3,004 Italian food consumers in June 2011 by a professional agency (i.e., PRAGMA – market research company) using a three-step quota-based sampling procedure. The sample was representative on a regional basis and according to age categories (i.e., 18-30; 31-64; over 64) as first two steps. In the third step, a random sample of households was visited by interviewers by means of the random-walk technique in order to select only one member of the family over 18 years of age who was solely or jointly responsible for the family's food expenditure. The sample was 60% female and 40% male, with a mean age of 48 years (SD = 16.75); 45% had a high school educational level, 31% had completed primary education only, 14% had a university degree (1.4% a postgraduate degree), 9% had no formal or less than primary education, and 0.3% were missing. A self-administrated questionnaire was handed out to the respondents selected at the third step and it included three sections together with demographics: a) Theory of Planned Behavior (TPB; Ajzen & Fishbein, 1980) variables towards a consumption of products deriving from a sustainable and local agricultural system; b) questions measuring eating habits; c) the validated Italian version of the Portrait Value Questionnaire (PVQ; Capanna, Vecchione, & Schwartz, 2005).

3.2. Measures and data analysis

The PVQ is one of the instruments used to measure the Schwartz value domains (Schwartz et al., 2001). It encompasses 40 descriptions/items for each value domain. Each description draws attention to the importance of a value. For example: "It is important to him/her to respond to the needs of others. He/she tries to support those he/she knows" describes a person to whom benevolence values are important. The associated question "How much like you is this person?" (not like me at all, not like me, a little like me, somewhat like me, like me, very much like me), with codes from 1 to 6, quantifies each description. Attitude towards buying eco-sustainable food products was measured with three items adapted from Vermeir and Verbeke (2008): "Buying eco-sustainable food products is" (bad/good, unwise/wise and useless/meaningful) with codes from 1 to 7.

Data were analyzed by means of LISREL 8.80 for windows (Jöreskog & Sörbom, 2007) with maximum likelihood method of estimation. Listwise deletion was used for accommodating observations with incomplete information in order to have complete records only. The effective sample size was composed of 2785 respondents.

4. RESULTS

4.1. Summary statistics

Due to space constraints, summary statistics regarding the Schwartz's human values items will not be reported: please refer to Vassallo and Saba (2015) and Vassallo (2015) for more details. Attitude towards sustainable food products resulted, on average, positive for all three measures (i.e., bad/good: mean score 5.98 (SD = 1.18); unwise/wise: mean score 6.00 (SD = 1.20); useless/meaningful: mean score 5.96 (SD = 1.21)).

4.2. Inferential statistics

Also here, due to space constraints, only results regarding the structural part of the aforementioned attitude model modified with phantom latent variables are presented. Please refer to Vassallo and Saba (2015) for all other details concerning multi-normality check and assessment of measurement models.

In table 1, first row, the direct effects of the Schwartz's taxonomy four dimensions on attitude model are presented for the model a depicted in figure 5a. After that, phantom (hereafter ph) indirect effects, total ph indirect effects and total ph effects of the openness to change (hereafter o-t-c) mediated by ph latent variable(s) are computed by imposing a progressive increasing sequence of constants k on the direct effect, because no specific previous knowledge on the value of k was available. The general model fit is assessed by the Normal Theory Weighted Least Squares Chi-Square (NT Chi-Square) as a descriptive goodness of fit index. Usually, low and not-significant Chi-Square values are symptom of good fit. Nevertheless, it is well-known that Chi-Square values are sensitive to sample size and therefore will result significant almost every time in presence of large samples. Other fit indices are commonly considered: the Comparative Fix Index (CFI), the Non-Normed Fit Index (NNFI), the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Squared Residual (SRMR). Cut-off values greater than .90 for CFI and NNFI were considered adequate for a good model fit (Bentler, 1990), although values approaching and over .95 were preferred (Hu & Bentler, 1999). Values of RMSEA equal to or less than .05 were considered a good fit (Hu & Bentler, 1999), in the range between .05 to .08 marginal, and greater than .10 a poor fit (Browne & Cudeck, 1993). In good models, the SRMR should be below .09 (Hu & Bentler, 1999).

*Table 1. Unstandardized (std) effects of openness to change (o-t-c), conservation (co), self-transcendence (s-t), self-enhancement (s-e) on attitude for restricting o-t-c parameter γ_1 to be greater than a specified constant k. (*not significant at the 95% confidence level).*

Model a; $\gamma_1 \geq$ k	k	o-t-c		co	s-t	s-e
Initial	-	Direct effect	-.13*(-.09)	-1.11 (-.58)	1.83 (.73)	.08*(.06)
Steps		Chi-Sq(838)=9212.88; RMSEA=.060; CFI=.96; TLI=.95; SRMR=.075				
1	-.10	Direct effect Ph Indirect effects Total Ph Indirect effect Total Ph effect	-.10 (-.10) .77 (.70; .83) .59 (.58) .49 (.48)	-.08* (-.06)	.50 (.38)	-1.02 (-1.03)
		Chi-Sq(839)=17405.11; RMSEA=.084; CFI=.94; TLI=.93; SRMR=.11				
2	.10	Direct effect Ph Indirect effects Total Ph Indirect effect Total Ph effect	.10 (.10) .78 (.70; .84) .61 (.59) .71 (.69)	.24 (.18)	.13* (.10)	-1.24 (-1.25)
		Chi-Sq(839)=17848.62; RMSEA=.085; CFI=.94; TLI=.93; SRMR=.11				
3	.50	Direct effect Ph Indirect effects Total Ph Indirect effect Total Ph effect	.50 (.50) .79 (.74; .84) .62 (.62) 1.12 (1.12)	1.38 (1.02)	-1.20 (-.87)	-1.82 (-1.83)
		Chi-Sq(839)=24559.91; RMSEA=.10; CFI=.92; TLI=.92; SRMR=.13				
4	1.00	Direct effect Ph Indirect effects Total Ph Indirect effect Total Ph effect	1.00 (1.00) .80 (.77; .84) .64 (.65) 1.64 (1.65)	2.96 (2.14)	-3.07 (-2.13)	-2.57 (-2.55)
		Chi-Sq(839)=68260.93; RMSEA=.17; CFI=.88; TLI=.87; SRMR=.14				

The diagnostics of the initial model are satisfactory for an acceptable fit because they satisfy the aforementioned cut-off values: Chi-sq(838)=9212.88, p<.000; RMSEA=.060; CFI=.96; TLI=.95; SRMR=.075. In the first simulation step the direct effect k starts with imposing a value of -.10, slightly greater than the initial not significant value of -.13. The diagnostics worsen, although still tenable: Chi-sq(839)=17405.11, p<.000; RMSEA=.084; CFI=.94; TLI=.93; SRMR=.11. The unstandardized path from o-t-c to ph, fixed to be equal to the path from ph to attitude, is .77. This value is the *alteration* that occurred to the sample while imposing k=-.10 and it is statistically significantly different from zero. It provides a total ph indirect effect of .59 (i.e., .77 x .77), for a subsequent total ph effect of o-t-c on attitude of .49 (i.e., -.10 + .59). The other unstandardized coefficients strongly change their impact on attitude: conservation's direct effect negatively decreases from -1.11 to the not significant value of -.08, self-transcendence's direct effect positively decreases from 1.83 to .50, self-enhancement's direct effect negatively increases from not significant value of .08 to the significant value of -1.02. These results suggest that if a researcher wants to increase the impact (i.e., direct effect) of o-t-c on attitude to more than -.10, he/she will obtain from the sample an alteration of .77 (it associates, see table 1, two standardized values of .70 and .83 because only the unstandardized values have been fixed to be equal between the two mediated paths) with a total ph positive effect of .49 (i.e., proxy of new direct effect with standard value of .58 =.70 x .83). These latter results also lead to a strong reduction respectively of the negative impact of conservation and the positive impact of self-transcendence together with a stronger negative impact of self-enhancement.

This trend becomes even more apparent when simulating more and increasing the constant k and it stops when the constrained model diagnostics worsened too much in comparison to the ones of the previous step model. In the case of model a, the process was stopped between the third and the fourth step as the diagnostics started to become unacceptable: they worsened too much in reference to the cut-off criteria. As a consequence, the first two specific phantom hypotheses, ${}_{Ph}H_{1s}$ and ${}_{Ph}H_{2s}$ are satisfied until those steps and o-t-c parameter γ_1 may be reasonable hypothesized to vary from -.10 to .50.

In practical words, it means that the sample is able to afford an increasing of o-t-c until that range in order to be in favor of an attitude towards sustainable food products.

On the other hand, if the inverse process starts (table 2 and model b depicted in figure 5b), by constraining the o-t-c parameter γ_1 to be less than -.13, beginning from k=-.20, conservation, self-transcendence and self-enhancement respectively increase their negative and positive direct effect on attitude. However, in this simulation the process may continue other than imposing k=-1.50, as the diagnostics at the fourth step are still acceptable. As a consequence, the third and the fourth specific phantom hypotheses, ${}_{Ph}H_{3s}$ and ${}_{Ph}H_{4s}$, are satisfied at all times. This means that the sample prefers to be conservative and not open to change to a positive attitude towards buying sustainable food products.

Table 2. Unstandardized (std) effects of openness to change (o-t-c), conservation (co), self-transcendence (s-t), self-enhancement (s-e) on attitude for restricting o-t-c parameter γ_1 to be less than a specified constant k. (not significant at the 95% confidence level. The ph indirect effects have three std values because three mediated paths are involved here).*

Model b; $\gamma_1 \leq$ k	k	o-t-c		co	s-t	s-e
Step	-	Direct effect	-.13*(-.09)	-1.11 (-.58)	1.83 (.73)	.08*(.06)
Initial		Chi-Sq(838)=9212.88; RMSEA=.060; CFI=.96; TLI=.95; SRMR=.075				
1	-.20	Direct effect Ph Indirect effects Total Ph Indirect effect Total Ph effect	-.20 (-.16) .71 (.68; 1; -.60) -.50 (-.41) -.70 (-.57)	-2.55 (-1.50)	3.58 (2.07)	1.04 (.83)
		C-Sq(839)=10898.65; RMSEA=.066; CFI=.95; TLI=.95; SRMR=.086				
2	-.50	Direct effect Ph Indirect effects Total Ph Indirect effect Total Ph effect	-.50 (-.40) .70 (.66; 1; -59) -.49 (-.39) -.99 (-.79)	-2.92 (-1.70)	4.03 (2.30)	1.27 (1.01)
		Chi-Sq(839)=10485.34; RMSEA=.064; CFI=.95; TLI=.95; SRMR=.084				
3	-1.00	Direct effect Ph Indirect effects Total Ph Indirect effect Total Ph effect	-1.00 (-.79) .68 (.64; 1; -.56) -.46 (-.36) -1.46 (-1.15)	-3.54 (-2.03)	4.78 (2.78)	1.66 (1.30)
		Chi-Sq(839)=10030.48; RMSEA=.063; CFI=.95; TLI=.95; SRMR=.081				
4	-1.50	Direct effect Ph Indirect effects Total Ph Indirect effect Total Ph effect	-1.50 (-1.16) .65 (.62; 1; -.54) -.42 (-.33) -1.92 (-1.49)	-4.16 (-2.36)	5.53 (3.06)	2.05 (1.59)
		Chi-Sq(839)=9751.00; RMSEA=.062; CFI=.95; TLI=.95; SRMR=.079				

4. FUTURE RESEARCH DIRECTIONS

The use of phantom latent variables should be focused on quantitatively exploring unrevealed features (i.e., constraints) of psychological theories such as: unexpected conditions, concealed aspects, or even omitted information. To this end, future perspectives should aim at integrating phantom simulations as a part of further empirical validation of psychological theories in terms of testing their stability, or their evolution over time.

5. CONCLUSION/DISCUSSION

The goal of this work was to encourage the use of phantom latent variables for making simulations through constraints among parameters in latent path models. Phantom latent variables are latent variables with no observed measures, and thus zero variance, and they serve as “what if” proxies of potential outcomes regarding constraints on structural parameters of interest. Testing constraints in applied psychology with using phantom latent variables basically means to simulate how previous, or potential, knowledge about a cognitive phenomenon can possibly alter people’s responses to that phenomenon. In this latter respect, by means of structural equation modeling (SEM), it is possible to model people’s *alteration* to responses at such constraints through phantom effects. In the case of having phantom latent variables as mediators, the phantom indirect effects are the *alterations* under the restrictions, whereas the total phantom effects are proxies of new direct effects under the alterations and the restrictions. To my knowledge, there is no other methodological way to model this *alteration* when dealing with causal connections among latent factors that underlie psychological theories.

Specifically for this study, but it can be reasonably extended to any other area of modeling applied psychology, two phantom simulations were run on a latent path model of attitude towards buying sustainable food products in Italy using Schwartz’s (1992) taxonomy of basic human values dimensions (second-order level of abstraction) as attitude antecedents. Such simulations were used to test whether the direct effect of openness to change on attitude would be greater/less than specified restrictions (i.e., constants) and therefore were used to test for change in the structural parameters of the other three dimensions left. In other words, the simulations were used to test how the sample would react to overcome such restrictions in terms of how the four dimensions of the Schwartz’s theory would react to such constraints in predicting the attitude. As a practical result, if any food policy had forced Italian consumers to increase their expected direct effect of openness to change on attitude towards buying sustainable food products, it would have required an increase of conservation values, coupled with a decrease in self-transcendence and self-enhancement value dimensions. This would have been *the price* of such increase. Conversely, should a food policy have forced Italian consumers to reduce their openness to change in favor of sustainable food products, their conservation would be reduced as well and the motivational values of self-transcendence and self-enhancement would be increased.

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