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Values in Flux: Tracking Human Priorities Shift Through COVID-19 in Europe

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A thesis submitted for the degree of Master of Science
in Applied Social Data Science
in the School of Social Sciences and Philosophy
at the University of Dublin, Trinity College

August 11, 2025

Abstract

This thesis investigates the European-wide shifts in Schwartz's four higher-order values during the period surrounding COVID-19, drawing on data from European Social Survey rounds 9, 10, and 11. Findings show that in the later phase of the pandemic, Conservation, Self-enhancement, and Self-transcendence are no different compared to pre-pandemic levels, while Openness to change increased. Post-pandemic, Openness to Change and Self-Enhancement stayed stable compared to their pandemic levels, whereas Self-Transcendence declined and Conservation rose, consistent with a broader shift toward self-protective value. Younger individuals and those with lower incomes were more vulnerable to value change during the COVID-19 period. To ensure valid longitudinal comparisons of these latent higher-order values, this thesis introduces a programmable structured logic-tree method for rapid and comprehensive measurement invariance testing, enabling large-scale comparative analyses across countries or other units of analysis.

Acknowledgements

First of all, I would like to express my heartfelt gratitude to my friends, my family, and my partner, who have accompanied me on this journey and given me the strength to keep striving for excellence. I am also deeply thankful to all the professors and teaching fellows of the Master's programme at Trinity College Dublin for your dedication to teaching, your inspiration for research, and your promotion of a quantitative yet accessible approach to social science. In particular, I would like to extend my sincere thanks to Dr. Trajche Panov, who went above and beyond to provide me with invaluable feedback on this thesis.

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1 Introduction

The human psyche is one of the most interesting, mysterious and rewarding domains to explore. Over the course of human history, we have charted highly intricate maps of the observable universe, the Earth and our biological body. In comparison, much less is known about the topology of the human mind. The difficulty lies in the subjectivity of human experience and how diverse they are. It is also challenging to conduct large-scale, multi-cultural surveys to formulate a universal theory mapping the structure related to the human mind. Even if it is possible, do the measurement instruments accurately capture such elusive concepts? And how do we even know if our mapping comprehensively covers all the facets in the domain? Fortunately, with the advancement of statistical technique and increased level of global cooperation from the 20^{th} century, the exploration and mapping of the human values concept, which describes human prioritization in life, has advanced considerably.

To date, the most widely accepted theory of human motivation is presented by Schwartz (1992) with a total of 10 facets. This set of values was measured extensively in hundreds of samples across the world, allowing the opportunity to validate the theory and perform cross-culture and longitudinal comparisons of values. Among them, the European Social Survey (ESS) is one of the broadest and long-running data sources tracking the development of human values since its first round inception in 2002. This research will use data from the ESS rounds 9, 10 and 11 to investigate the possible impacts of COVID-19 on value prioritization across Europe. The recent pandemic has claimed the lives of millions, disrupted the global economy and altered the lifestyle of all of us. Due to its extreme nature, the impact of this event has been a popular subject of investigation in the literature of human values. However, most of the research only focuses on a single country and the time horizon only spans up to the later phase of COVID-19, as far as 2022. My research goes beyond a single nation and also uses data after WHO declared the end of the pandemic in May 2023. This will help detect if COVID-19 has left any persistent changes to the value orientation of people in Europe. Aside from the exploration of the European-wide effect, I will also examine whether values of people with more vulnerable backgrounds are more deeply impacted by this tumultuous time.

During the process of longitudinal or cross-cultural comparison of a latent construct measured by multiple question items like values, researchers usually stumble upon issues of measurement invariance. Although the overall measurement invariance verification process reached a consensus in the literature, the details of the process are sometimes ambiguous. Another issue is the wide scope of this research, covering a large number of European countries, making the process of manual verification laborious and error-prone. My research will have a methodological contribution to the literature of measurement invariance by addressing two issues above using a streamlined logic tree, covering all the possible cases so the verification process can be programmed and run automatically.

The studies of values movement are important as they help explain and predict a wide range of behaviors. Individuals are motivated to act in a manner that is resonant with their values and reinforcing the attainment of the goals behind them (Bardi and Schwartz, 2003; Feather, 1995). Miles (2015) showed that values can be used as causal factors for behaviors in multiple

domains including religion, social activities, family, prosocia/antisocial patterns, politics, and leisure time use. Any value changes found in this research potentially represent widespread alteration in how people act in multiple aspects of life.

Regarding the structure of the thesis, I will first present some literature on the development history of human values and the basics of Schwartz's human values. I then moved on to explain theories of how people adapt their values in times of crisis, including the recent COVID-19 period. In the Data and Methodology section, the ESS's value measurement instrument will be explained. I will then introduce the theory behind measurement invariance and the importance of the verification of its status. The structure of the model and my streamlined implementation of the verification method on the ESS data will also be discussed in details. Finally in this section, I presented how the human values changes during COVID-19 are estimated and the method to compare these changes across different income and age groups. The result will then be presented and analyzed, followed by a summarization and discussion of the finding.

2 Literature Review

2.1 Development of the theory of human values

Human values are commonly defined in the social sciences as the reference to which humans justify their actions. A large number of social scientists have shared the view that human values should occupy a centerpiece in unifying the multiple interest of the sciences that studied human behaviors, for example, psychologists (Rokeach, 1973), sociologists (Williams Jr, 1968) and anthropologists (Kluckhohn, 1951). Rokeach (1973) describes the universality of values by pointing out that values are the dependent variable for the studies of psychology, culture and society. On the other hand they are the independent variable of the fields involved with human behavior and attitude. One of the earliest works related to human values is Maslow (1943)'s theory of human motivation. He suggested that human needs are structured into a hierarchy consisting of physiological, safety, love, esteem, and self-actualization in ascending order. When one of the lower needs is satisfied, humans will naturally seek higher needs in the hierarchy. Another notable later work is the classification of values from Rokeach (1973). According to his definition, values are cognitive representations of desirable abstract and transituational goals. It can be divided into 18 types of terminal value which are end-state to be achieved e.g., freedom, pleasure, beauty, security. In contrast, there are also 18 types of instrument values which refers to the modes of behavior or means of achieving terminal values e.g., politeness, ambition, logic. Currently, the most widely used theory in this domain is Schwartz (1992)'s theory on universality of contents and structure of human values. In the development of this theory, Schwartz argued that the values based on the division of terminal and instrumental values may not have the sufficient empirical evidence and one value can be both terminal and instrumental depending on the context. He then derived his theory of motivation categorization from the assumption that values are people's strategy to deal with the three requirements of human existence:"*(1) basic needs of the individual as a biological organism (e.g., stimulation values); (2) requirements of successful interaction among people (e.g., benevolence); (3) requirements for the survival of groups and societies (e.g., conformity)*". The differences in individual's values are the product of genetic makeup and social experience.

2.2 Schwartz's human values

In his 1992 publication, Schwartz formally defined values as follows: *"Values (1) are concepts or beliefs, (2) pertain to desirable end states or behaviors, (3) transcend specific situations, (4) guide the selection or evaluation of behavior and events, and (5) are ordered by relative importance".* He outlined several criteria for the successful construction of a value framework including universality across culture, comprehensiveness and consistency in structure. This value structure is illustrated using a circular model (see Figure 1), in which ten basic values are arranged around a circle. The circular layout implies that adjacent values are psychologically compatible and likely to co-occur within an individual, while opposing values are less likely to be jointly emphasized. For instance, an individual who highly values universalism is also likely to prioritize benevolence and self-direction, whereas power, being an opposing value, is likely to be rated as less important. Pursuing an action that resonates with universalism will

Figure 1: Schwartz's Circular Model of Human Values. Source: Döring, Anna K., et al (2024)

conflict with actions that represent prioritization of power.

The circular structure of ten values has been confirmed empirically across hundreds of samples in a diverse range of cultures across the world. One of the verification methods involves conducting a survey with questions measuring those specific values and then performing a multidimensional scaling (MDS) process which maps the relationship of the survey results into a two dimensional plane. The structure of the measured values can then be interpreted from this plot. Figure 2 illustrates the result of the MDS in Schwartz (1992) where a survey containing 56 measuring items was conducted in 36 samples across 20 countries. The distance between the data points in the figure represents the dissimilarity between the importance placed on each item. Interpreting the spatial structure of the figure, it can be observed that items measuring the same facet of value occupy specific regions in the map and these regions sort themself into a circular structure as postulated by the author. The theory of ten human values was later developed to consist of 19 granular values in Schwartz et al. (2012b), but it does not undermine the validity of the previously found ten-value structure.

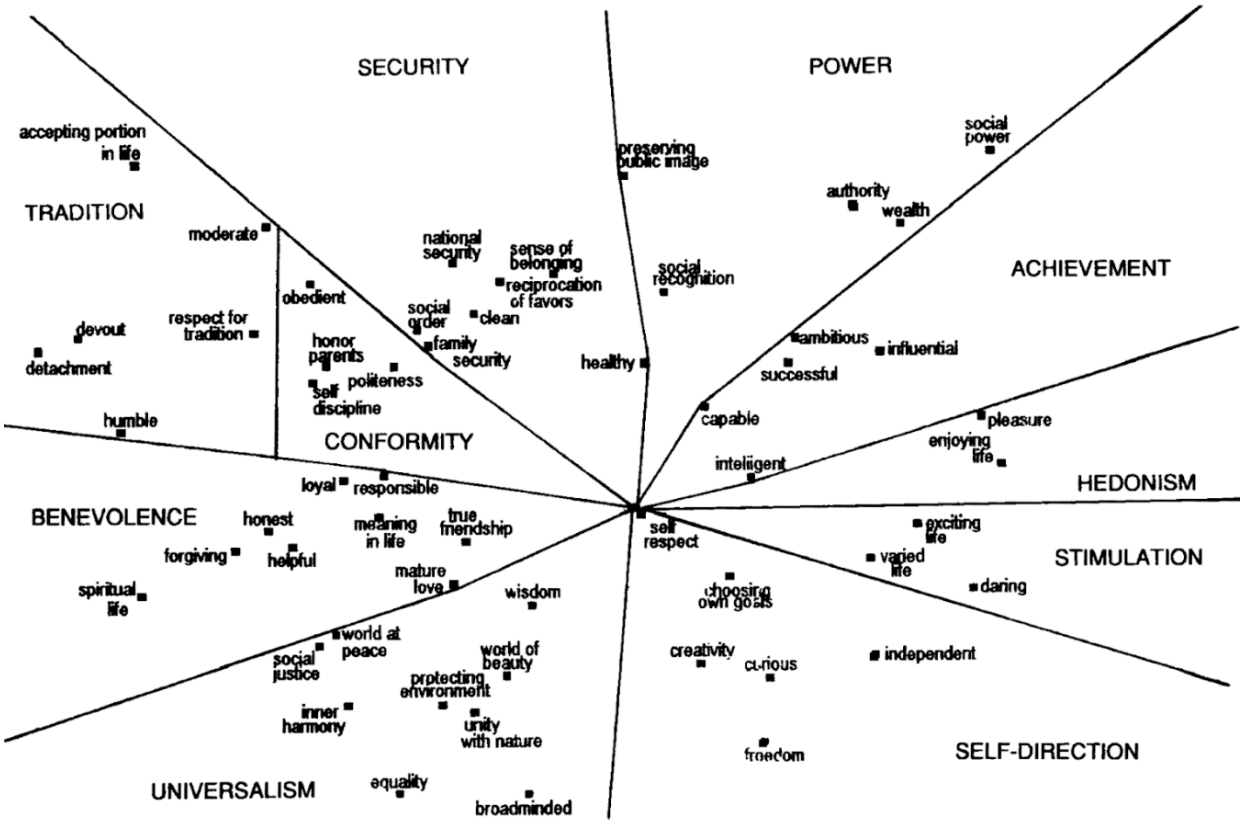

Figure 2: Example of Multidimensional Scaling Results. Source: Schwartz (1992)

To understand the content of the ten values, other than diving into every single one, they can also be viewed as forming two dimensions, representing conflicting groups of values. The first dimension is the opposition between higher-order value openness to changes (combination of self-direction, stimulation and a part of hedonism) and conservation (combination of tradition, conformity and security). On one spectrum, it is the importance of the pursuit of a person's

original actions and thoughts amidst uncertainty. The other end of the spectrum is the focus on order, stability and the preservation of the status quo. The second dimension is between higher-order values self-enhancement (combination of power, achievement and a part of hedonism) and self-transcendence (benevolence and universalism). This dimension demonstrates the extent to which a person places importance on the empowerment of his/her own self (in terms of wealth, social standing or intellectual). In the opposite direction, it is the focus on the betterment of other people, close or distant, as well as the environment. Totally, there are four higher-order values that represent distinctive references for goals in life and they will be used in this thesis for the analysis of value movement. The validity of higher-order values as a construct has been endorsed in Schwartz (1992) using spatial inspection of the values and in Schwartz and Boehnke (2004) using confirmatory factor analysis. Though it can be said that the model with ten values have a greater degree of fit with data that is designed to measure more granular value (the ESS for example), using 4 higher-order values provides a balance between parsimony and comprehensiveness for the analysis of value change.

Schwartz's theory of human values is not without criticism. Some researchers dislike the idea of a circular continuum structure which give rise to multiple configurations of the values concept. In particular, values can be grouped, regrouped or splitted, generating a configuration with only two broard values to a configuration with high-definition 19 values. This number could possibly rise in the future when more research is done to further dissect the space of values. Gouveia et al. (2014) argued that this approach lacks parsimony and theoretical focus. It will also be difficult to perform comparative studies or meta-analysis. He pushed forward a value structure with only six basic values focusing on functionality but this structure has only been confirmed in a small number of samples which hinders its universality. His claims do not refute Schwartz's theory but merely provide a different lens of looking at the human values space. Although I acknowledge Gouveia et al. (2014)'s argument on the lack of focus of the circular continuum model, I think Schwartz's structure provides a flexible framework for different levels of analysis.

It is also interesting to contrast the concept of human values to the seemingly very similar concept of Big Five personality traits (Goldberg, 2013) in the field of psychology. In this model, the personality traits are agreeableness, openness to experience, neuroticism, extroversion and conscientiousness. They represent the stable individual differences in thoughts, emotional states and actions. The traits can usually be evaluated as good or bad, for example scoring high in neuroticism is considered negative while the reverse is positive. Meanwhile there is no such discrimination in the theory of values. They are a person's guiding principles of what is important in life and are all seen as desirable. Nevertheless, there has been research drawing correlation between the two concepts. According to Roccas et al. (2002), some of the found relationships are positive correlation between trait agreeableness and values tradition and benevolence, positive correlation between trait openness to experience with values self-direction and universalism.

2.3 Value changes in time of crisis

A wide range of studies have explored how values change during crises and the processes behind these shifts. Generally, values tend to remain quite stable throughout a person's

life, even during significant events (Schuster et al., 2019). However, some research, such as Thornhill and Fincher (2014)'s evolutionary perspective on infectious diseases, suggests that crises can lead to behavioral adaptations that reduce contact with outsiders, novelty-seeking, and self-direction, resulting in increased conservation values and decreased openness values. The effects on self-transcendence values are more nuanced: higher mortality rates can strengthen the defense of one's cultural values, reducing universality (Burke et al., 2013), while simultaneously reinforcing connections to close others and enhancing benevolence (Heine et al., 2006). Evidence from recent crises supports the idea that such value changes are often temporary, with values returning to baseline within weeks or months after events like the 9/11 attacks (Verkasalo et al., 2006). Additionally, human values in Europe showed resilience during the 2008 Global Financial Crisis, remaining largely unaffected by economic hardship (Reeskens and Vandecasteele, 2017).

Directly related to COVID-19, Bonetto et al. (2021) showed that openness and self-enhancement declined while self-transcendence and conservation increased in France when entering COVID-19. In Austria, at the onset of the pandemic, self-enhancement and self-transcendence showed stability while people placed more importance on conservation in comparison to openness to change (Eder et al., 2022). These studies only investigated the initial shock of the pandemic in 2020, up to early 2021 while COVID-19 is persistent and spans a longer horizon. Although this former phase of COVID-19 is the time of panic, lockdown and disruption, the latter phase is associated with re-opening, vaccine deployment, fatigue, stabilization or possibly overcompensation for the highly restrictive first phase. Conducting research across a longer timeframe, Daniel et al. (2022) used data in late 2020 in Australia to show a pattern of reduction and rebound in openness values while conservation showed a pattern of increase and then decline. Self-transcendence was found to continue decreasing by late 2020 while self-enhancement remained largely unchanged throughout the period. A recent paper by Hannes et al. (2024) collected data at different time points from 2019 to 2022 in Germany indicated that most of the values (he used a different set of values but is still very similar to Schwartz's) either showed a pattern of changes and then returned to pre-pandemic level by 2022 or remained stable for the whole period. Except for value freedom and independence which were found to increase continually. I have found no research examining the impact of COVID-19 in the period after the WHO declared the pandemic is over in May 2023. My thesis will explore the trajectory of higher-order values throughout a longer period than previous literature, covering post-pandemic data from the recently released European Social Survey round 11. Despite the lack of coverage on this topic, we can gain some insights into the movement of COVID-19 after its end by drawing on the literature of post-traumatic growth. Tedeschi and Calhoun (2004) theorize that overcoming highly challenging experiences increases the sense of personal strength and appreciation for life (two aspects related to self-enhancement). Another helpful perspective can be found in tourism spending. Yao et al. (2023) explored the phenomenon of "revenge travelling" showing an increased importance in hedonism and stimulation (two aspects of openness) after the lockdown was lifted.

2.4 Vulnerable socio-demographic groups during COVID-19

COVID-19 affected different people in very dissimilar ways. Looking at the general population alone may not give a full picture of how values change during the pandemic. Little literature has been done on the vulnerability of different socio-demographic groups' value during COVID-19. In this research, I will find out if there are differences in how the pandemic affect people's values based on their age and income. Blundell et al. (2020) pointed out that workers under 25 are two times more likely to work in an interrupted sector during the lockdown. Adams-Prassl et al. (2020) showed that younger and lower-income workers are more likely to suffer job loss or income reduction. In addition, lower-income workers are at higher risk of having poorer mental and physical health conditions even before the pandemic, making them especially vulnerable. The elderly are also amongst the most susceptible group in this period, mostly due to existing health conditions. Comas-Herrera et al. (2020) summarised that 41% of all COVID-19 deaths were care-home residents based on data collected from 21 countries. The elderly were also severely affected by the isolation caused by lockdown and curfew putting them at a greater risk of depression and anxiety (Armitage and Nellums, 2020).

3 Hypotheses

The literature showed a diverse pattern of how value changes during the pandemic in different countries. As this research focuses on finding an European-wide effect, I will make my hypotheses based on the most common patterns found which is reversal during the latter phase of the pandemic. I also theorize that there is a possibility of overcompensation in the post-pandemic time (as seen in the tourism industry). My hypotheses for openness and conservation are:

H1.1: Higher-order values openness to change, by the time of the second phase of COVID-19 (around Mid 2021 to 2022), is no difference than the pre-pandemic level across Europe.

H1.2: Higher-order values openness after the pandemic officially ended (May 2023) is higher than during its second phase across Europe.

H2.1: Higher-order values conservasion, by the time of the second phase of COVID-19 is no difference than the pre-pandemic level across Europe.

H2.2: Higher-order values conservation after the pandemic officially ended is lower than during its second phase across Europe.

For values self-enhancement and self-transcendence, I theorize that they will either follow the reversal patterns or remained stable in the period before and during the pandemic. Both cases resulted in unchanged values between those period, followed by an effect of post-traumatic growth boosting self-enhancement and reduce self-transcendence as these two values tend to traverse in opposite directions. Formally, my hypotheses for these two higher-order values are:

H3.1: Higher-order values self-transcendence, by the time of the second phase of COVID-19 is no difference than the pre-pandemic level across Europe.

H3.2: Higher-order values self-transcendence after the pandemic officially ended is higher than during its second phase across Europe.

H4.1: Higher-order values self-enhancement, by the time of the second phase of COVID-19 is no different than the pre-pandemic level across Europe.

H4.2: Higher-order values self-enhancement after the pandemic officially ended is lower than during its second phase across Europe.

Regarding the vulnerable socio-demographic group analysis, I postulate that as the lower-income, younger and elderly groups faced greater economic, physical and mental health hardship than the rest, they will experience greater adaptation to cope with the harsh conditions. My hypotheses are:

H5.1: Younger people are more vulnerable to values changes around COVID-19 period than people of middle-age in Europe

H5.2: Elderly are more vulnerable to values changes around COVID-19 period than people of middle-age in Europe

H6: Lower income group are more vulnerable to values changes around COVID-19 period than the rest in Europe

4 Data&Methodology

4.1 The Portrait Value Questionnaires

The data chosen for the analysis of values is the set of 21-item Portrait Value Questionnaires (PVQ-21) contained in the European Social Survey (ESS). This set of questionnaires, specially designed to measure ten original values, has been included in every single round of the ESS since its inception. This highlights the importance placed in monitoring the state of the goal orientation of the society in Europe. Each question refers to a facet of a value and requires the respondent to compare how similar they are to a person with that value in a Likert scale from "1. Very much like me" - to "6. Not like me at all". Details of all variables related to the PVQ-21 can be found in Table 4 in the Appendix. Although the most popular and accurate instrument to measure values is the Schwartz Value Survey (SVS) with the full version of 57 items, the PVQ-21 shorter form is much more economical. Another advantage of the PVQ-21 is its questions phrasing are more accessible to the general population, including adolescence and the lower-educated. Though with a lesser degree of precision than the SVS, the PVQ-21 still showed an acceptable level of internal and test-retest reliability (Schwartz, 2003). Three most recent rounds of the ESS represent three periods: round 9 - pre-COVID-19 (2018-2019), round 10 - later phase of pandemic (2021-2022) and round 11 - post-pandemic (2023-2024) will be used for this research. A summary of the timing of the surveys alongside with the development of the pandemic (Council of the European Union, 2025) in Europe are shown in the timeline Figure 3.

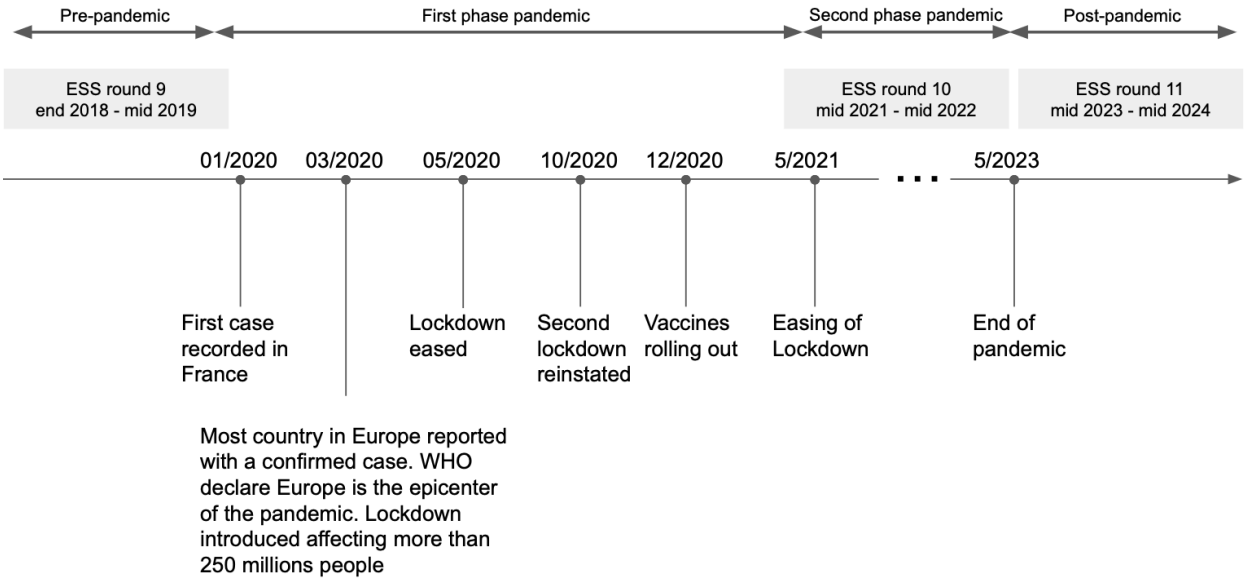

Figure 3: COVID-19 Timeline with ESS Survey Period. Source: Figure created by author

Before using the data for further analysis, a few data cleaning steps need to be performed. First I will filter out any country that does not join all three rounds. 16 European countries covering different regions of Europe remained for analysis. In the Northern Europe region, there are Ireland (IE), Iceland (IS), Finland (FI), Norway (NO) and Great Britain (GB). In

Western Europe, there are Belgium (BE), France (FR), Netherland (NL), Switzerland (CH). In Southern Europe there are Italy (IT) and Portugal (PT). Finally in Eastern Europe there are Croatia (HR), Lithuania (LT), Slovenia (SI), Slovakia (SK), Hungary (HU). In total, there are 78,171 observations at this stage. The next step is to remove respondents with invalid or unanswered responses for the 21 questions resulting in 72,597 valid respondents left. One final step, as suggested by Cieciuch et al. (2018), I removed respondents with more than 16 answers that are similar as this is an indication of low effort. Consequently, there are 70,385 observations remained. The details of the number of respondents before and after data processing by countries can be found in Table 5 in the Appendix. In addition to the above processing, I reverse the scale of the item question to make the analysis more intuitive by taking the value of the item from 7. By doing so, 1 represents "not like me at all" and 6 represents "very much like me".

4.2 Comparison of human values and the problem measurement invariance

After gathering cleaned data, the next step is using confirmatory factor analysis (CFA) with higher-order value as latent variable and the question-item loading into them. However in order to conduct meaningful comparisons between latent variables that were formulated from different survey rounds, it is necessary to show that the latent variables are being measured the same way between those rounds. Only then, we can conclude that changes in talent variables reflect their actual movement and not because of the difference in the way they are measured. This concept is called measurement invariance. A concise definition of measurement invariance by Horn and McArdle (1992) is *'whether or not, under different conditions of observing and studying a phenomenon, measurement operations yield measures of the same attribute'*. The necessity of ensuring this condition before construction comparisons across countries and time has been discussed in multiple papers (Billiet et al., 2003; Harkness et al., 2003; Meredith, 1993). In the data collection period, different groups of people may perceive the same concept differently. This is even exacerbated if surveys were done in different languages. A certain level of meaning is likely lost in translation. Therefore the literature has shown that in most cases scalar invariance (near-highest level of measurement equivalence) are hard to come by in cross-cultural research. In this thesis, when the comparisons are done longitudinally with the same demographic, scalar invariance is much easier to achieve. Davidov (2010) showed scalar invariance between ESS rounds 1 and 3 for 17 countries with some modification of the model specification. My research will face more difficulty as it takes place in the COVID-19 era where the perceived meaning of several survey questions may be altered and I need to establish invariance between 3 ESS rounds instead of 2 rounds. Another point of discussion is the suitability of using a country as a unit of analysis as my research will conduct values comparisons of every single country through time. It can be argued that the same country does not share the same linguistic or cultural frame. At the same time, a single language and culture can span multiple nations. However, each nation does have its own legislative features, economic institutions, government and social norms. I think the homogeneity of a country's population is still very adequate for it to be used as an unit of analysis for measurement invariance.

4.3 Multigroup Factor Analysis (MGCFA)

To show measurement invariance, the most popular technique currently is multigroup factor analysis (MGCFA), a close extension of the original confirmatory factor analysis (CFA). To understand MGCFA, we can start with CFA which can be represented by the matrix equation (1) in a simple case of one latent factor and 3 items (UCLA, 2021):

$$\begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix} = \begin{pmatrix} \tau_1 \\ \tau_2 \\ \tau_3 \end{pmatrix} + \begin{pmatrix} \lambda_1 \\ \lambda_2 \\ \lambda_3 \end{pmatrix} \eta_1 + \begin{pmatrix} \epsilon_1 \\ \epsilon_2 \\ \epsilon_3 \end{pmatrix} \tag{1}$$

Where

τ is the item's intercepts

λ is the item's loadings

η is the latent predictor of the items which is the factor score of the higher-order value in this case

ϵ the residuals of the factor model

y is the is observed variable which is the result of the PVQ-21 survey

The core idea of parameter estimation in CFA is based on the covariance between the items and variance within the item. These can be described by the model-implied covariance matrix (2) (UCLA, 2021)

$$\Sigma(\theta) = \text{Cov}(\mathbf{y}) = \mathbf{\Lambda \Psi \Lambda'} + \mathbf{\Theta}_\epsilon \tag{2}$$

Where

$\mathbf{\Lambda}$ is the factor loading matrix

$\mathbf{\Psi}$ is the variance-covariance matrix of the latent factor

$\mathbf{\Theta}_\epsilon$ is the variance-covariance matrix of the residuals

The estimated parameters can be the loading, the intercept, the variance and covariance of the latent factor, the variance and covariance of the residual, depending on the specification of the CFA model. They will be estimated by finding parameters θ that minimize the discrepancy between $\Sigma(\theta)$ and the sample variance-covariance matrix S. This is achieved by maximizing the likelihood of observing S.

MGCFA extends on this concept by adding the ability to declare specific parameters for each of the groups under analysis. For example, a model with single factor and 3 items for rounds 9 and 10 of the ESS can be represented by a set of two equations (3) and (4), adapted from equation (1):

$$Round9: \begin{pmatrix} y_1^{r9} \\ y_2^{r9} \\ y_3^{r9} \end{pmatrix} = \begin{pmatrix} \tau_1^{r9} \\ \tau_2^{r9} \\ \tau_3^{r9} \end{pmatrix} + \begin{pmatrix} \lambda_1^{r9} \\ \lambda_2^{r9} \\ \lambda_3^{r9} \end{pmatrix} \left(\eta_1^{r9}\right) + \begin{pmatrix} \epsilon_1^{r9} \\ \epsilon_2^{r9} \\ \epsilon_3^{r9} \end{pmatrix} \tag{3}$$

$$Round10: \begin{pmatrix} y_1^{r10} \\ y_2^{r10} \\ y_3^{r10} \end{pmatrix} = \begin{pmatrix} \tau_1^{r10} \\ \tau_2^{r10} \\ \tau_3^{r10} \end{pmatrix} + \begin{pmatrix} \lambda_1^{r10} \\ \lambda_2^{r10} \\ \lambda_3^{r10} \end{pmatrix} \left(\eta_1^{r10}\right) + \begin{pmatrix} \epsilon_1^{r10} \\ \epsilon_2^{r10} \\ \epsilon_3^{r10} \end{pmatrix} \tag{4}$$

Then the user can specify different levels of similarity between the equations which in turn represent different levels of measurement invariance. Configural invariance is the lowest level of measurement invariance. This is to make sure that the general structure of the models is similar between groups. In the two example equations above, both of the rounds have similar structure of the three same items loading into one latent variable. If this model has adequate fit with the observed data, it passes the first level of measurement invariance. The next level is metrics invariance. This can be achieved when a model implies equal loadings of the items between groups ($\lambda_i^{r9} = \lambda_i^{r10}$) does not have a significantly worse fit than the configural invariance model. The third level of measurement invariance is scalar invariance. In order to achieve this, it is necessary to show that the model implying equality of the loadings and intercepts between groups ($\lambda_i^{r9} = \lambda_i^{r10}$ and $\tau_i^{r9} = \tau_i^{r10}$) does not have a much worse fit than the metric invariance model. If scalar invariance is established, the user can confidently compare the differences in the latent variables. An even stricter test can be conducted in which the variance of residuals are also set equal but it is not compulsory for the comparison analysis of this paper. In the cases that a particular level of invariance can not be achieved, we can look for signs of partial invariance by freeing some of the constraints applied on items. Steenkamp and Baumgartner (1998) suggested that ideally more than half of the items on a factor should be invariant. Based on this, I will free no more than half of the items in my implementation. An example of partial metric invariance in the context of equations (3) and (4) is when we accept a model with $\lambda_1^{r9} = \lambda_1^{r10}$ and $\lambda_2^{r9} = \lambda_2^{r10}$ while we set λ_3^{r9} and λ_3^{r10} to be freely estimated.

Criteria for assessing model fit and invariance will be based on the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA). CFI index ranges from 0 to 1 and measures the comparison of the user model to the baseline model. The higher the CFI, the better fit the user's model has in comparison to the baseline model. RMSEA is instead an absolute measure of fit that also takes into account the degree of freedom. RMSEA favors models that have a higher degree of freedom which means it has fewer parameters. Browne (1993) and Bentler and Bonett (1980) suggested a criterion of RMSEA $<= 0.08$ and CFI $>= 0.9$ for an indicator of acceptable model fit. Also in order to support stricter invariance models, they needs to be proved to have fit not significantly worse than the less strict models. Historically, researchers used to perform Chi-square tests between models for this task. But recently, under criticism that Chi-squared index is overly sensitive because it usually detects minor changes as significant due the large sample sizes, researchers have been in favor of using alternative fit indexes for model comparison. Chen (2007) suggested a criterion of a less than 0.01 change in CFI, paired with changes in RMSEA of less than 0.015. I will be using these criteria for assessing if a stricter invariance model is accepted.

4.4 MGCFA model structures and the logic tree for measurement invariance confirmation

Now comes the question of how we should specify the model to reconstruct the circular structure of Schwartz's theory. One obvious strategy is to replicate this structure completely with 21 items, loading into their ten respective values or 4 higher-order values in one single model, with some addition of covariance between items and factors to represent the circular feature. This approach comes with a fair amount of complication. Knoppen and Saris (2009) implied that, due to the PQV-21 design having a constrained number of items while still having to maximise values coverage, produces inadequate discrimination between adjacent values. This leads to a very high chance of positive cross-loading from a single item into multiple adjacent factors. For example, the items *imprich* (Important to be rich, have money, and expensive things) can positively cross load into both power and achievement. Similarly, in a full circular model, negative cross-loading can also happen as an item load on opposite values. For example, the item *imprich* can have positive loading on value power and negative loading on the opposite value universalism. Instead of specifying the complete circular structure, there is a strategy called "magnifying glass" that focuses on a single value or a subset of values at once, which were implemented in many researches (Cieciuch et al., 2014; Cieciuch and Schwartz, 2012; Schwartz and Butenko, 2014; Knoppen and Saris, 2009; Beierlein et al., 2012; Cieciuch et al., 2018). This approach will completely mitigate the misspecification from negative cross-loading and partly reduce the extent of misspecification from positive cross-loading.

Following the "magnifying glass" strategy, I specify four models in which all of the constituents value items directly load to the related higher-order values. This is a deviant from the original use case of the PVQ-21 where the items are used to measure the set of ten values. However, given the theoretical validity of the higher-order value in some past research, it is reasonable to treat each item as if they are exploring a different facet of the higher-order value. Based on the idea in Cieciuch et al. (2018), I will model the fact that some items are correlated with each other because they were originally built to measure the same value. For example, in order to create the model for the higher-order value conservation, six items *impsafe, ipstrgv, ipfrule ,ipbhprp, imptrad, ipmodst* will load directly to it. Appropriate residual covariance will be set free instead of forced to be zero in the default specification. In particular, residual covariance between pairs *impsafe* and *ipstrgv* (both measure security), *imptrad* and *ipmodst* (both measure tradition), *ipfrule* and *ipbhprp* (both measure conformity) are freed. There is a special case related to value universalism where a triplets of items are used for measurement. I will set residual covariance only between the two that measures the level of support for equality and understanding among humans. The one left out measures the level of care for the environment which is rather a different facet. One caveat is that according to Schwartz's circular structure, hedonism values can be reflected in both openness and self-enhancement. I will follow Cieciuch et al. (2018)'s approach in which tests where hedonism belongs to both or only one value will all be conducted[1]. I will then choose the specification that results in

[1]Another complication is when fitting model of higher-order values openness or self-enhancement without hedonism, the total number of observations is 10 (equal to the number of covariance and variance among the observed items) for every ESS round, while the number of estimated parameters is also 10 if we are to free the

the highest number of countries satisfying the chosen condition of acceptable fit. Figure 4 and Figure 5 showcase my model structure for each of the 4 higher-order values.

The four models are applied for every single country, confirming whether invariance or impartial variance is achieved and we can then use the estimated model to calculate the factor scores. However, conducting measurement invariance can be a long process, full of trial and error, especially in this case where my goal is to cover 16 countries across Europe. Theoretically, for each country and higher-order value, we conduct three MGCFA models if no items need to be freed. In the case of no modification, approximately 192 MGCFA models have to be performed. In the literature, researchers performing measurement invariance with human values across countries or time usually have to face similar problems with large numbers of models to perform and evaluate (but often not in this scale). However, there is no discussion of how we should deal with this in a structured and exhaustive way so the whole process can be automated in a programming language. In this thesis, I propose a streamlined logic tree to be implemented in R for the assessment of scalar invariance, full or partial.

The scheme of the logic tree is illustrated in Figure 6. It starts out with checking the configural invariance of the model using Condition 1: RMSEA <= 0.08 and CFI >= 0.9. If this least constrained model is not met, the proposed structure of the item loading and covariance is not a good fit for data from the three rounds overall. Failing at this step means that nothing can be done and the country is prevented from further assessment. As the goal of the research is to examine the European-wide effect, I have chosen Condition 1 in a rather generous manner to have the largest number of countries possible passing the condition. If Condition 1 is satisfied, Condition 2 is checked for metric invariance and then scalar invariance. 1/2a/3a/4a is the shortest path to a satisfactory assessment (refer to Figure 6). However this will not be the majority of the cases. Half of the instance will involve freeing some item's loading or intercept for partial invariance like in 4b, 3b and 4c. In these steps, I will first release iteratively one item at a time and find the model specification that satisfies Condition 2. In case that more than one model satisfies Condition 2, the one with the smallest RMSEA will be chosen[2]. In case releasing one item is not enough for Condition 2, I will iteratively free more items up to the maximum number of items allowed which is no more than half of the items available to the factor. In the case 3b, where loading of an item (or items) X, for example, has already been freed for the partial metric invariance, all models that will be performed down the tree for scalar invariance will always have item X's intercept being freed. It is consistent with the idea that we have freed this item from having to be similar across groups.

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two residual covariance related to the two pairs of items. In this case the degree of freedom is 0 and the fit indexes CFI and RMSEA become meaningless. To gain some degree of freedom. I will free only one residual covariance. To decide which one to free, I refer to the refined value theory (Schwartz et al., 2012a) where the original 10 values are broken down to a more granular continuum of 19 facets. In this model, within openness, value self-directions are broken down into values freedom in thoughts and freedom in actions while value stimulation remains intact. This indicates that we should keep the covariance of residual between item ipcrtiv and item impfree of self-directions equal to 0 and free only the covariance residual of items related to stimulation. Similarly, within value self-enhancement, power is broken down into resources and dominance while achievement remains intact. I will free only the covariance residual of item related to achievement

[2]I made an assumption that using RMSEA or CFI here will produce the same result based on finding of Chen (2007) showing that RMSEA and CFI are equally sensitive to misfit of invariance model

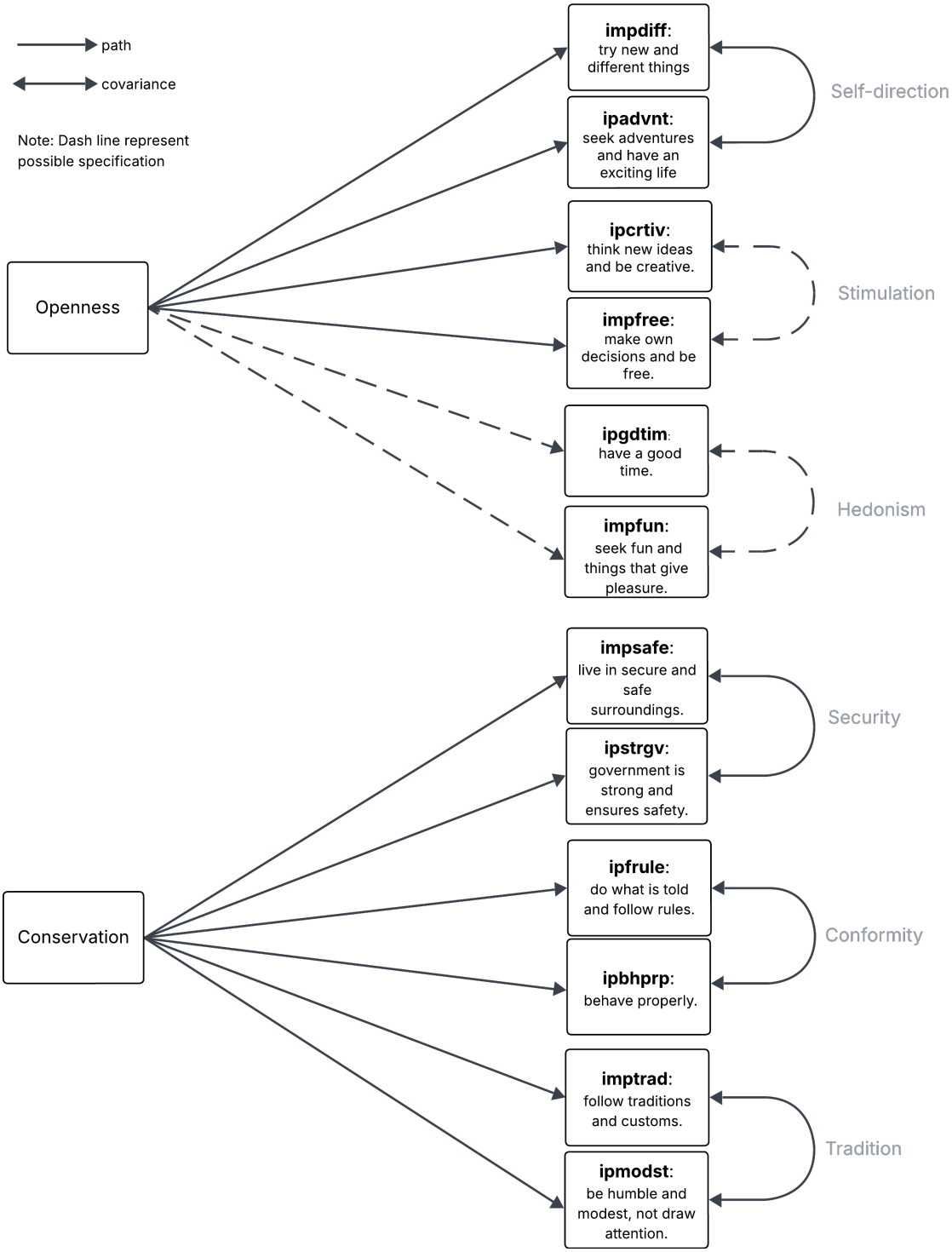

Figure 4: MGCFA Model Structure for Higher-order Values Openness to Change and Conservation. Source: Figure created by author

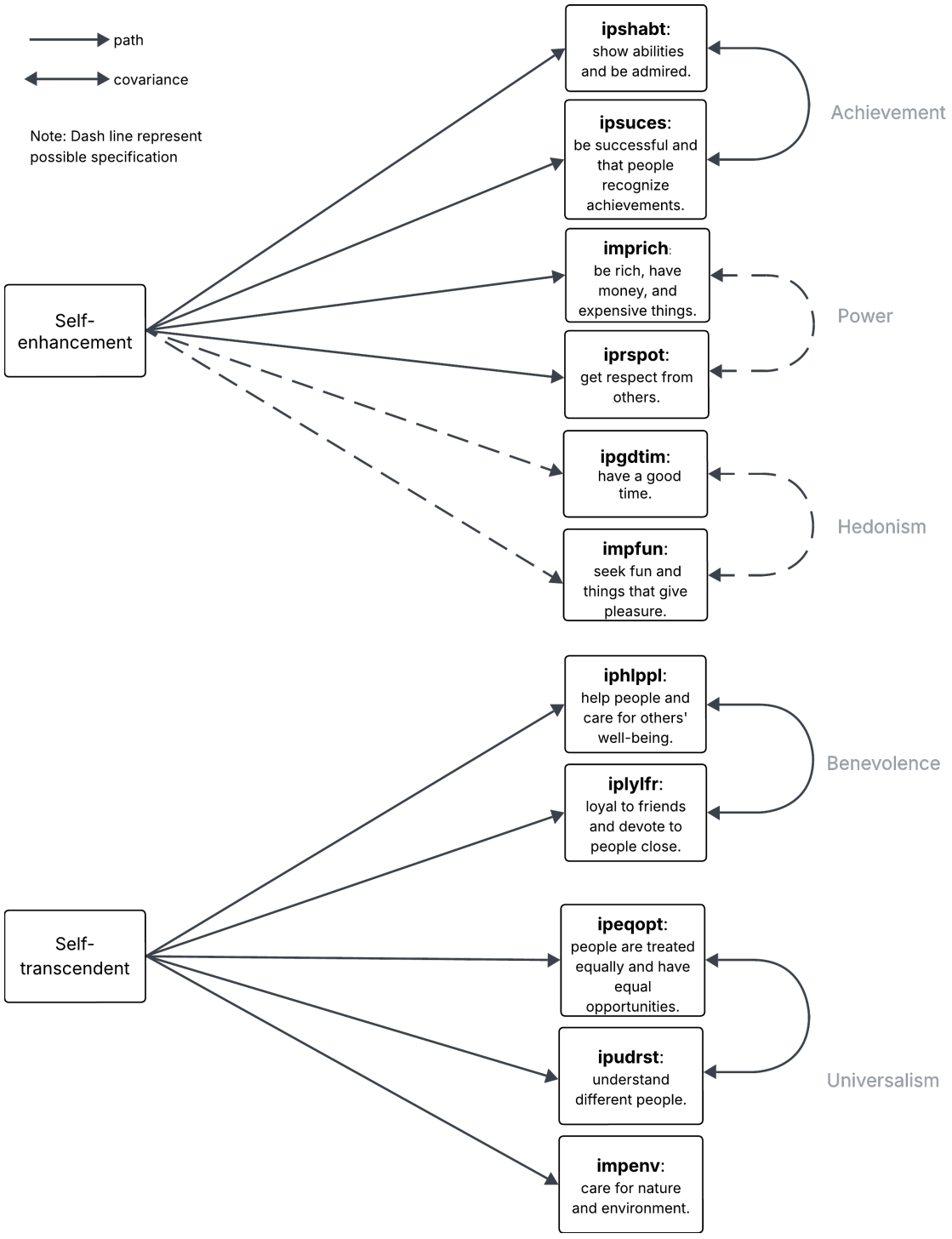

Figure 5: MGCFA Model Structure for Higher-order Values Self-enhancement and Self-transcendence. Source: Figure created by author

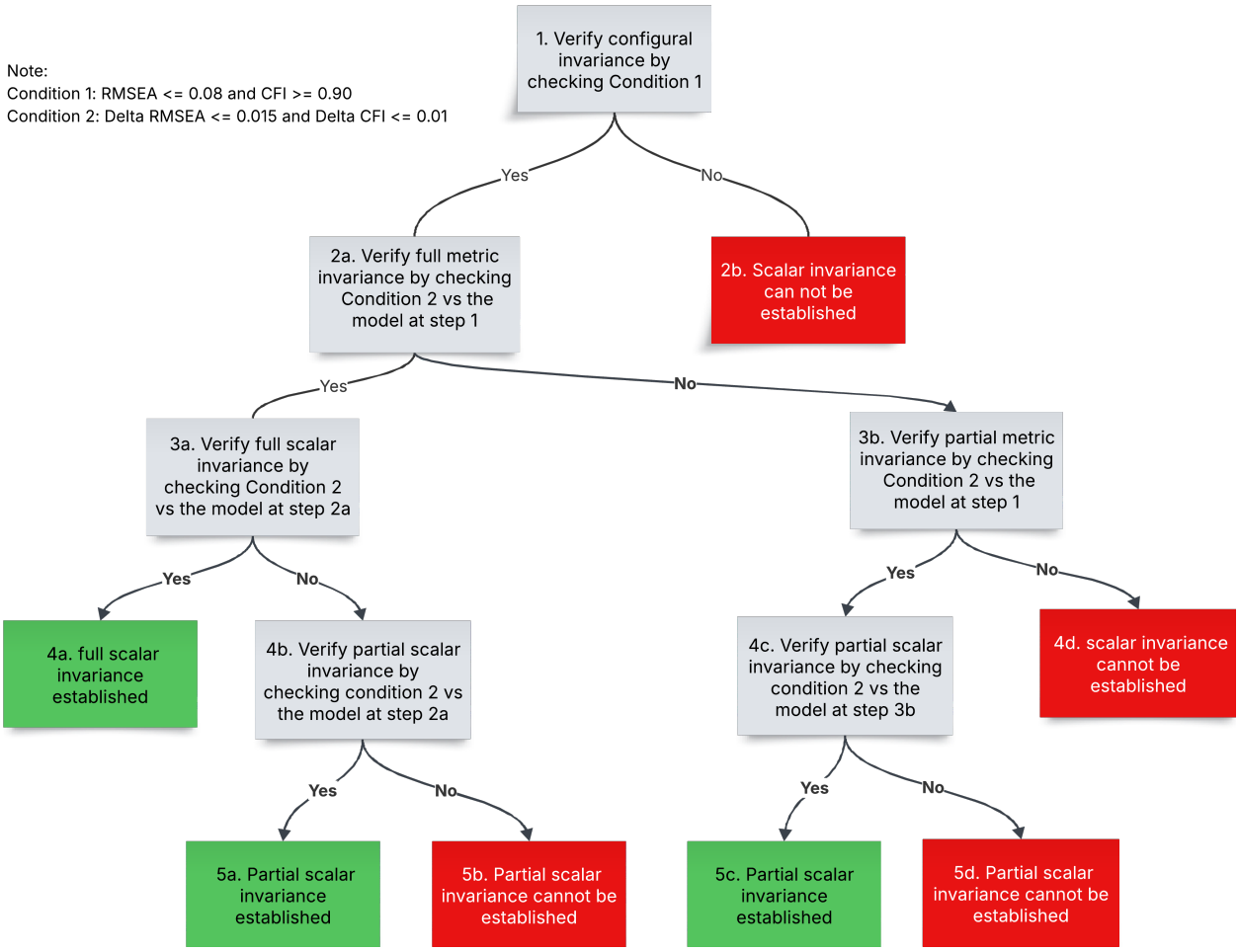

Figure 6: Logic Tree for The Automation of Scalar Variance Verification. Source: Figure created by author

After the above process, it is determined which country's higher-order values are comparable among the three specified ESS rounds and which model to be used for calculation of the factor score. A summary of successful countries and values will be presented in the Results section, followed by some detailed examples of how the logic tree was implemented for further clarification. One extra step to assess the validity of the items in measuring the higher-order values is to check the item's loading. Ideally, we should observe at least half of the item's loading exceeds 0.5. Any items with loading less than 0.4 indicate that it is not a good indicator of the latent factor. Though we should not be too strict with this assessment as higher-order values are very broad concepts that contain multiple facets. We then proceed with calculating the factor score based on the found models.

4.5 Fixed-effect regression and test comparison of marginal effect

The research's final goal is to examine the European-wide values movement when entering/exiting COVID-19 and fixed-effect regression is a powerful tool for this analysis. The magnitude of the entering/exiting COVID-19 effect can be partly influenced by some country-specific factor that are invariant with time. Within Europe, the economic, cultural, geographic, demographic and political landscape in each country are far from uniform and can influence how the effects related to COVID-19 is absorbed. Magun et al. (2015) has done a comprehensive comparison of values differences which can be seen as a proxy for cultural different across EU and found that Nordic and Western European countries score much higher in the growth latent class (a combination of self-transcendence and openness values) in contrast to Mediterranean and Post-Communist countries. There are a wide range of other divisions within Europe when different lenses of view are in place. Volintiru et al. (2024) stated that the East-West division is still very much salient and is stemmed not just from economic disparity but also a decline in democratic process and resurgence of totalitarianism. Guo (2024) pointed out the North-South division in terms of the level of state welfare and intervention. Under the uneven conditions among European nations, it is necessary to control for country-specific features to remove the between-country variation that could render the effect of entering and exiting COVID-19 statistically insignificant.

In the fixed-effect regression models fixing for countries, the factor scores (4 higher-order values) are the dependent variables. Dummy variables entering and exiting COVID-19 are the main independent variables of interest. In the case of entering the pandemic, the variable is created by coding 1 when data belong to ESS round 10 and 0 when data belong to ESS round 9. With the case of exiting the pandemic, the variable takes the value 1 if it belongs to round 11 and 0 if it belongs to round 10. Gender, age and level of education are added as control variables. The variable income was possibly added but data exploration showed that there was a large number of missing values. Out of 70,385 observations, there are 12,885 respondents who gave invalid answers or refused to give answers. Removing or replacing these missing values with other values may lead to bias as the reason for these missing values is very likely not random. Schwartz (1992) stressed the importance of adding a response type covariate to the regression because some respondents have a tendency to consistently answer survey's question particularly higher or lower in the 1-6 Likert scale. The response type variable is created by taking the mean score of all the PVQ-21 items but not including items

related to the value under analysis to avoid bias. For example, in the analysis of conservation, 6 items related to the value are removed from the calculation of the response type. There is some loss of information but the rest of the items will be able to capture a certain level of response type. The equation of the fixed-effect regression is:

$$\text{FactorScore} = \beta_1 \text{TimePhase} + \beta_2 \text{Age} + \beta_3 \text{Education} + \beta_4 \text{Gender} + \beta_5 \text{ResponseType}$$

In order to examine whether younger and elderly groups are more susceptible to value changes. A new variable age group was created by separating people in two 3 groups: less than 30, 30 to 59 and above 60. Fixed effect regression with an interaction term between the time phase dummy and age group is used in the model:

$$\begin{aligned}\text{FactorScore} = \beta_1 \cdot \text{TimePhase} \cdot \text{AgeGroup} + \beta_2 \cdot \text{AgeGroup} + \beta_3 \cdot \text{TimePhase} \\ + \beta_4 \cdot \text{Education} + \beta_5 \cdot \text{Gender} + \beta_6 \cdot \text{ResponseType}\end{aligned}$$

After fitting the model, the marginal effects of the time phase for each group are calculated. The marginal effect of the younger and elderly group will be compared against the middle age group by using t-test. The R package *emmeans* (Lenth, 2025) provides a convenient way to calculate the estimated marginal effect and conduct pairwise comparison of them. To spot the age group with more vulnerability to value changes, the first step is to look for the possible difference in marginal effect between age groups that falls into the two cases: the marginal effects are both statistically significant and in the same directions or one has no statistically significant effect and the other has statistically significant effect. The next step is to confirm the validity of this difference by looking at the comparison t-test result.

The same process is repeated to test if people of lower-income are more sensitive to values change as an effect of the pandemic. The variable income group is created by separating people in the bottom 20th percentile of income to the rest. A fixed effect model with interaction between income group and time phase dummy is fitted:

$$\begin{aligned}\text{FactorScore} = \beta_1 \cdot \text{TimePhase} \cdot \text{IncomeGroup} + \beta_2 \cdot \text{IncomeGroup} + \beta_3 \cdot \text{Age} \\ + \beta_4 \cdot \text{TimePhase} + \beta_5 \cdot \text{Education} + \beta_6 \cdot \text{Gender} + \beta_7 \cdot \text{ResponseType}\end{aligned}$$

After obtaining the estimated marginal effects of each income group, t-test comparison between them is conducted.

5 Results

5.1 Measurement invariance validation results

Table 1: Consolidated Full/Partial Scalar Invariance Status Results for All Countries and Higher-order Values

country	Self-transcendance	Openness	Self-enhancement	Conservation
Belgium	full	NA	full	full
Switzerland	partial (impenv)	partial (impdiff)	full	full
Finland	partial (ipeqopt)	full	full	partial (imptrad)
France	full	full	full	full
UK	partial (ipeqopt)	partial (impdiff)	full	full
Croatia	full	partial (impdiff,impfree)	NA	full
Hungary	NA	partial (ipcrtiv)	full	partial (impsafe)
Ireland	full	full	full	full
Iceland	partial (impenv)	partial (impdiff)	full	full
Italy	full	partial (impfree)	NA	partial (imptrad,ipmodst)
Lithuania	partial (ipudrst,impenv)	partial (ipadvnt)	partial (ipshabt,impfun)	partial (ipmodst)
Netherland	full	full	full	partial (impsafe)
Norway	partial (ipeqopt,impenv)	full	full	full
Portugal	partial (ipeqopt)	partial (ipadvnt)	partial (imprich,iprspot)	full
Slovenia	full	full	partial (imprich)	full
Slovakia	full	partial (ipcrtiv)	full	full

After testing with different model structures, the model with hedonism value included in self-enhancement but not in openness resulted in the highest number of success instances with full/partial scalar invariance. Table 1 shows consolidated results of the scalar invariance testing for each higher-order value and country using the this model structure. *Full* status means full scalar invariance is achieved. *Partial (item1, item2)* status means that partial scalar invariance is achieved after freeing item 1 and item 2. *NA* means that full or partial scalar invariance cannot be achieved. To further illustrate how the results were produced using the programmed logic tree, I will follow the verification process for 3 different cases. Details of the CFI, RMSEA and the status of different levels of scalar invariance can be found in Table 6-Table 9 in the Appendix. The first illustration is self-transcendence in Belgium. Referring to the logic tree, step 1 is to obtain the RMSEA and CFI of the unrestricted configural model which are 0.99 and 0.047. This is an excellent fit and satisfies Condition 1. I proceed to step 2a, performing the metric invariance model where we fix the loading to be equal. The RMSEA and CFI of this model is 0.988 and 0.038 respectively. The fit indexes indicate this is not a significantly worse fit than than the previous model and satisfies Condition 2. I can now proceed to step 3a, fitting a scalar invariance model with both the loading and the intercept fixed to be equal in all three rounds. The fit index was satisfactory of Condition 2 with CFI and RMSEA being 0.987 and 0.0414 respectively. Full scalar invariance is achieved in this instance. The second case is self-enhancement in Italy. Checking Condition 1 in step 1 results in CFI equal to 0.938 and RMSEA equal to 0.116. The RMSEA does not pass the threshold of 0.08 thus I have to conclude that scalar invariance cannot be established. The final more complicated case is Italy's conservation higher-order values. This instance satisfies

full metric invariance (up to step 2a). However at step 3a, full scalar invariance can not be achieved. I will then check for partial scalar invariance by freeing one item's intercept at a time (*impsafe, ipstrgv, ipfrule, ipbhprp, imptrad, ipmodst*). No case of freeing one item produces a model that satisfies Condition 2. I will proceed to free two items. I can choose two items among six items to be freed so there are 15 combinations available. Within these choices, there are five pairs that satisfy Condition 2. The best candidate from these five pairs is *imptrad* and *ipmodst* with the lowest RMSEA. Partial scalar invariance is achieved and the best possible model was chosen. Going back to the overall assessment of the scalar invariance status achieved. There are a total 64 combinations of country and higher-order values to be tested and 36 of them achieved full scalar invariance status, 24 achieved partial scalar invariance status and only four cannot reach scalar invariance. These four cases were spread across different values and regions in Europe but the conservation higher-order value fit particularly well with no failed test.

In addition to the confirmation from the scalar invariance test, it is also prudent to check for the standardized loading value to assess how relevant the items are in measuring the higher-order values concept. The detailed item's loading by country, grouped by latent factor are presented in Figure 7. For openness value, items related to being creative and different load very well on the factor while items related to being free and adventurous load at acceptable levels. Conservation value showing most items with fair to good loading with items related to proper behavior having a very good fit. Self-enhancement value reports a wide range of load quality. Items related to success and abilities have excellent loading, the rich and respected facet have good loading while there are fair loadings for the fun and good time items. For self-transcendence value, all the items on average have good loadings. Overall, there is a clear differentiation of how powerful items are in measuring the latent factor, except for the case of self-transcendence. Also in the majority of the case, the loading quality ranged from fair to excellent.

5.2 European-wide regression results

After being confident with the MGCFA models, I can obtain the factor score for each higher-order value. I then conduct fixed-effect regression to identify any European-wide values change associated with the COVID-19 pandemic. Figure 8 illustrates the European-wide regression result for all values. Detailed result of the models can be found in Table10 and Table11 in the Appendix.

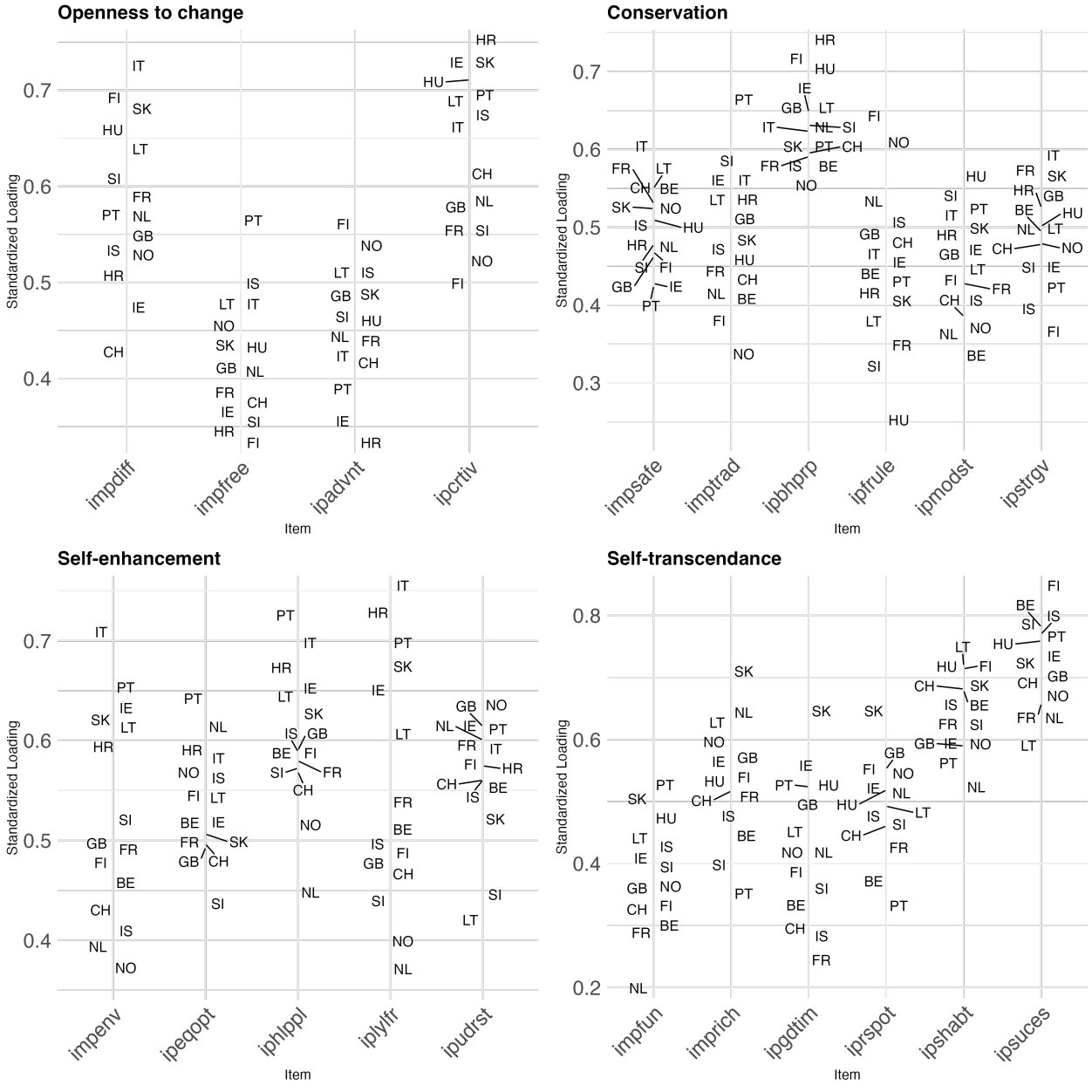

Figure 7: Average Loading of Items per Countries for All Higher-order Values

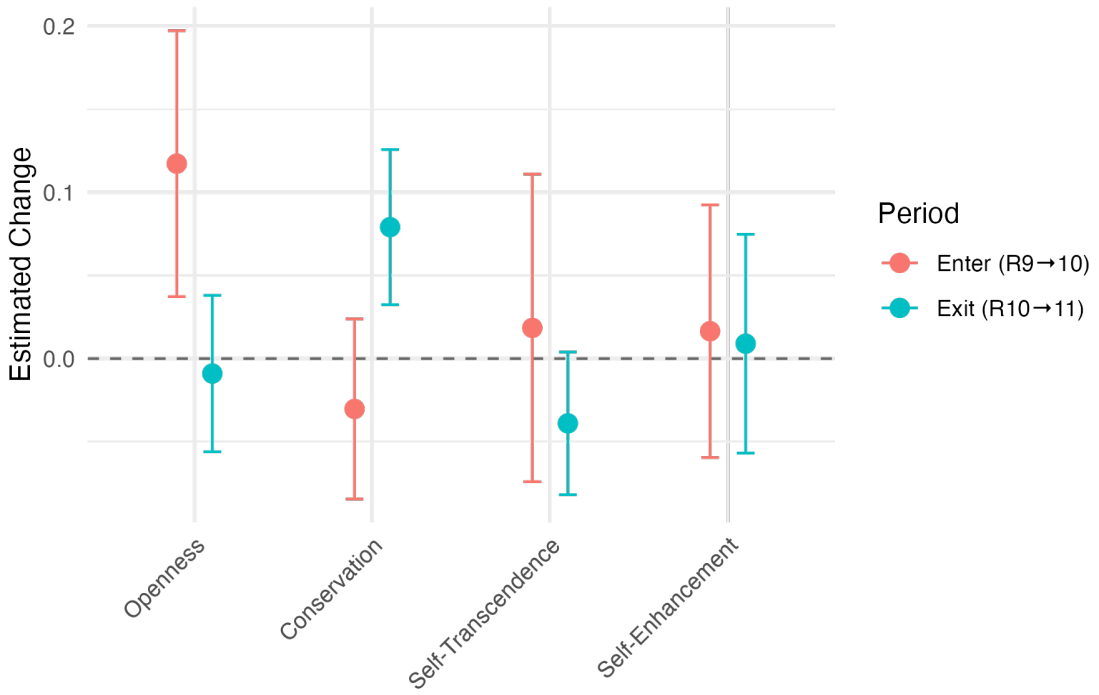

Figure 8: European-wide Changes in Higher-order Values at Different Timephase

Contrary to my H1.1 and H1.2, there is an increase in openness entering the pandemic and no changes after the pandemic. To explain this discrepancy, my theory is that the values still follows a patterns of overcompensation and post-pandemic growth, though it arrived much earlier than my hypothesis predicted. By the second phase of the pandemic, openness has already rebounded higher than the pre-pandemic level and remained at this threshold after the pandemic. For higher-order value conservation, when entering the second pandemic phase, the value had returned to the pre-pandemic level which is inline with H2.1. However the trajectory when COVID-19 ended for this value is positive which is in the opposite direction of H2.2. It seems that there are no or little overcompensation effects that decrease conservation and the overall effect was driven by another force much stronger that reinforced conservation. Self-transcendence when entering the pandemic latter phase supports H3.1 with no changes compared to the pre-pandemic level. There is weak evidence that the trajectory after the pandemic was negative (p-value = 0.07), again, in the opposite direction of my hypothesis H3.2. Similar to conservation, I think there was another greater causal force that put downward pressure on self-transcendence. Self-enhancement results too, only support my hypothesis H4.1 when entering COVID-19 second phase, remained unchanged. After the pandemic, there were no significant changes detected which means H4.2 is not supported. Akin to openness but not to the same extent, it is possible that the post-traumatic growth effects have reflected fully in the rebound period of the second COVID-19 phase and the higher-order value continued to maintain at this level after the pandemic ended.

In the analysis of European-wide effect, no changes detected could mean that there is a

stability of values across Europe but it could also mean that the changes happened in different directions among constituent countries. We further investigate the movement of higher-order values in different regions of Europe to gain a more detailed picture. The regression results of four regions in Europe are presented in Figure 9. Details of the regression's estimate result for each region can be examined in Table 12 in the Appendix

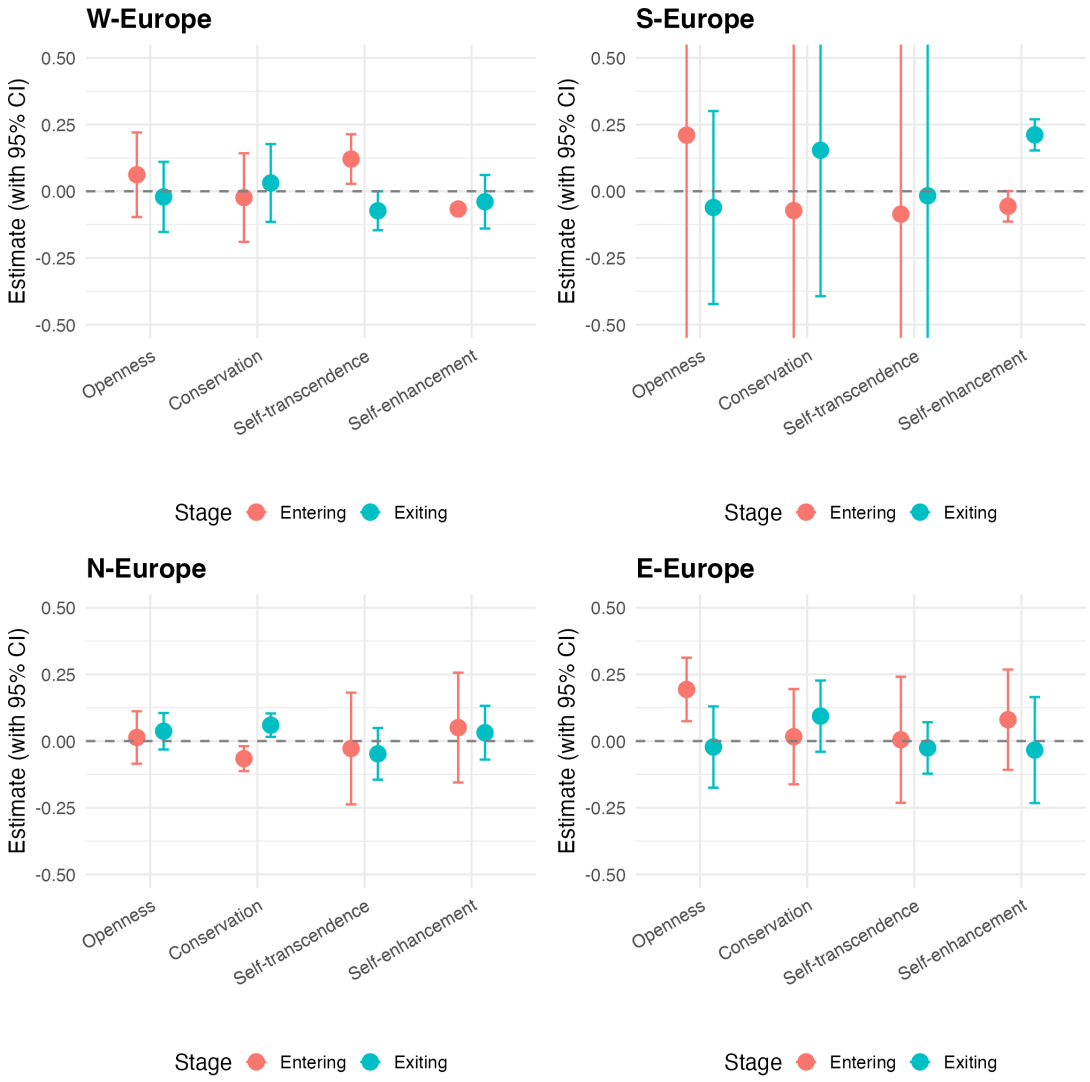

Figure 9: Changes in Higher-order Values During and After COVID-19 Across European Regions

Overall, there is a consistent direction of changes when comparing the same higher-order values between regions, at least in a way that does not conflict with each other. For example, higher-order value openness when entering the pandemic either increased or stayed unchanged and conservation when exiting the pandemic either increased or remained unchanged. This is evidence of the existence of a common causal mechanism influencing values changes in

Europe and the constituent countries within it respond more or less in the same way to this causal factor. This strengthens the result of the European-wide regression in Figure 8 as a convincing representative of the whole of Europe.

5.3 Age group comparison results

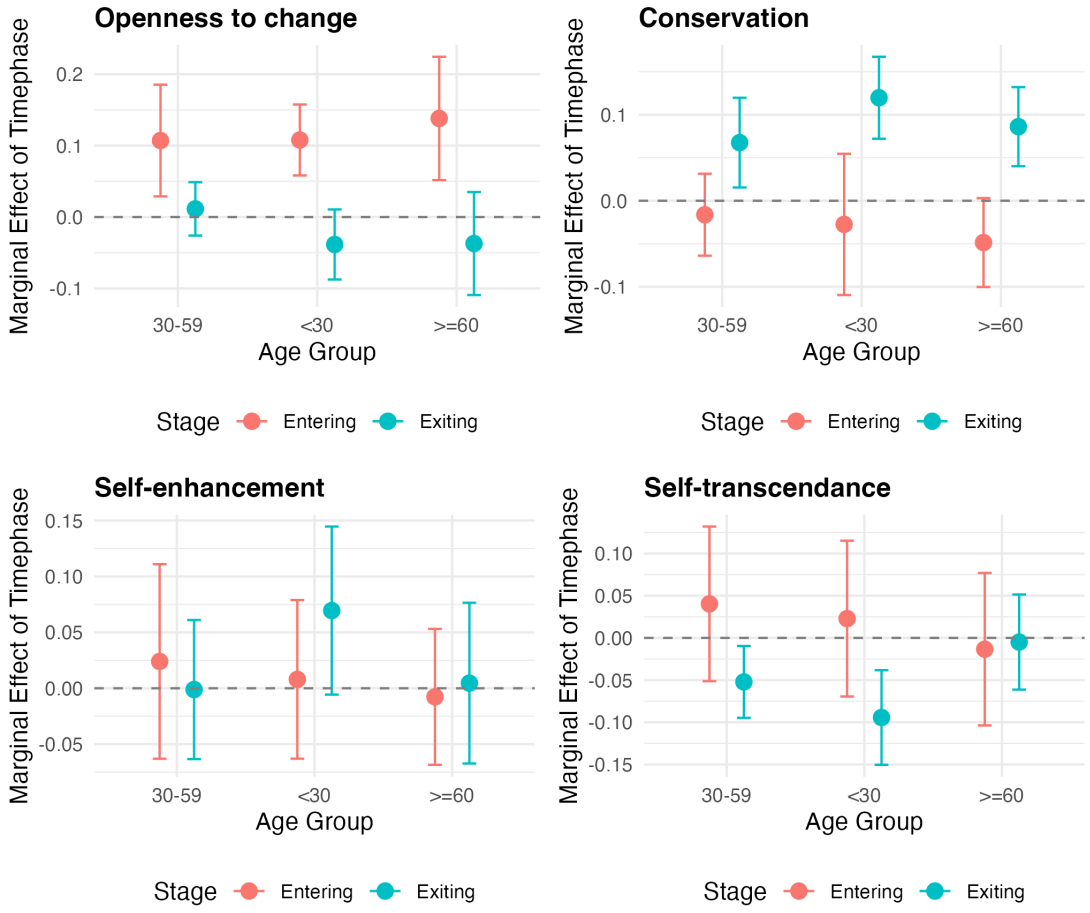

Figure 10: Marginal Effects of COVID-19 Stage by Age Group on Human Values

Table 2: Test Result of The Pairwise Difference Test between The Marginal Rffect of Age Groups

contrast	value	stage	estimate	p.value	significant
<30 - (30-59)	openness_to_change	Entering	0.001	1.000	
<30 - (30-59)	openness_to_change	Exiting	-0.050	0.090	.
<30 - (30-59)	conservation	Entering	-0.011	0.915	
<30 - (30-59)	conservation	Exiting	0.052	0.013	*
<30 - (30-59)	self_enhancement	Entering	-0.016	0.817	
<30 - (30-59)	self_enhancement	Exiting	0.071	0.098	.
<30 - (30-59)	self_transcendence	Entering	-0.017	0.870	
<30 - (30-59)	self_transcendence	Exiting	-0.042	0.508	
>=60 - (30-59)	openness_to_change	Entering	0.031	0.210	
>=60 - (30-59)	openness_to_change	Exiting	-0.049	0.176	
>=60 - (30-59)	conservation	Entering	-0.032	0.131	
>=60 - (30-59)	conservation	Exiting	0.019	0.562	
>=60 - (30-59)	self_enhancement	Entering	-0.032	0.474	
>=60 - (30-59)	self_enhancement	Exiting	0.006	0.971	
>=60 - (30-59)	self_transcendence	Entering	-0.054	0.054	.
>=60 - (30-59)	self_transcendence	Exiting	0.047	0.086	.

In the regression model, the middle age group (30-59) was set as the baseline. We first look for signs of difference in the marginal effect between groups in Figure 10 and then turn to Table 2 to confirm if the difference is statistically significant. The detailed marginal effect results for all age groups is presented in Table 13 in the Appendix. In summary, for younger respondents, openness to changes are more negatively affected when exiting the pandemic (10% significant level). Both conservation and self-enhancement are more positively affected when exiting the pandemic (both at 10% significant level). For the older age group, self-transcendence value are even more stable than the baseline group when exiting the pandemic. There is no other instant where we find that the baseline group experienced larger value changes. To sum up, there is some evidence to support my hypothesis H5.1 that younger groups are more susceptible to value changes around the time of pandemic but there is no evidence support that the same hypothesis H5.2 for older respondents.

5.4 Income group comparison results

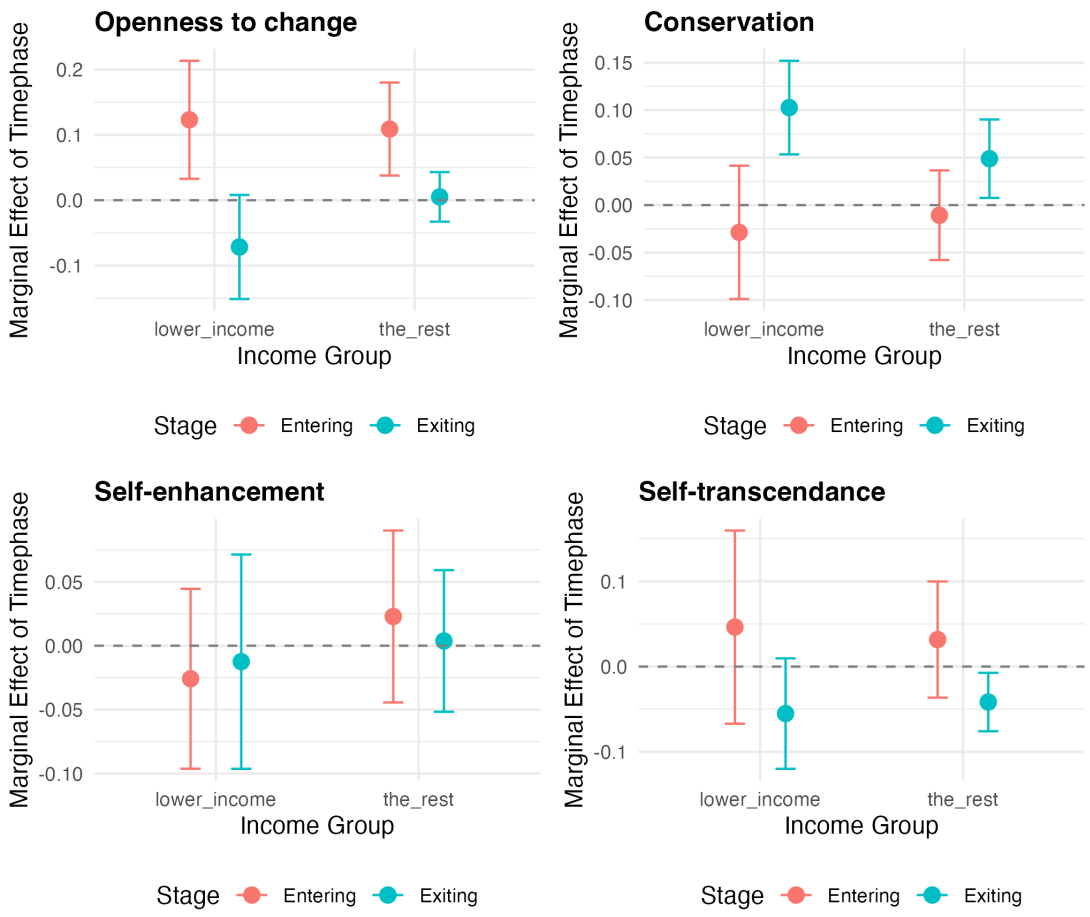

Figure 11: Marginal Effects of COVID-19 Stage by Income Group on Human Values

Table 3: Test Result of The Pairwise Difference Test between The Marginal Effect of Income Groups

contrast	value	stage	estimate	p.value	significant
the_rest - lower_income	openness_to_change	Entering	-0.014	0.653	
the_rest - lower_income	openness_to_change	Exiting	0.077	0.004	*
the_rest - lower_income	conservation	Entering	0.018	0.411	
the_rest - lower_income	conservation	Exiting	-0.054	0.035	*
the_rest - lower_income	self_enhancement	Entering	0.049	0.010	*
the_rest - lower_income	self_enhancement	Exiting	0.016	0.576	
the_rest - lower_income	self_transcendence	Entering	-0.015	0.735	
the_rest - lower_income	self_transcendence	Exiting	0.014	0.642	

Figure 11 illustrates the marginal effect of different time phases by income group. Detailed results are shown in Table 14 in the Appendix**.** Table 3 presents the comparison of pairs of marginal effects between income groups. We can see lower-income group have marginal effect changes more negatively compared to the rest in higher-order value openness when exiting COVID-19. In contrast, conservation value rose stronger for lower-income group when exiting the pandemic. We also found no instance where the rest of the income group is more sensitive to value changes than the lower-income group. Overall, there is some evidence to support my hypothesis H6 that lower-income group is more susceptible to value changes.

6 Discussion&Conclusion

Reviewing the eight hypotheses I made about European-wide higher-order values movement into and after the COVID-19 pandemic, only three of them were supported. All of them pointed to the fact that motivational orientations in Europe during the pandemic latter phase are no different from what they were before COVID-19 hit. These findings are inline with most of the crisis literature and COVID-19 literature in particular, where the values have a tendency to revert back to their original level after a disruptive period. The trajectories after the pandemic ended are where my four other hypotheses of overcompensation were not supported. The "revenge consumption"-like effect and post-traumatic growth effect may not have been as strong and persistent as I anticipated. They seem to play a role only during the latter phase of the pandemic where those effects helped values return to their original pre-pandemic level. Openness to change might be the only instance where we find an exceptional strong influence of these effects. This higher-order values reached higher level during the second phase of the pandemic and has not been changed again after the pandemic ended. While self-enhancement have remained unchanged during the whole period of analysis, there seems to be some influential factors reducing self-transcendence and increasing conservation in recent years. These trajectories are consistent with the narrative of rising self-protection and falling growth class which are the two broadest level of classification for value explained in Schwartz et al. (2012b). During the 2023-2024 period of ESS round 11, economic uncertainty, geopolitical conflict, the rise of nationalist movements or even the widespread of artificial intelligence technology could all contribute to this direction in Europe. We should also be aware that the analysis in the thesis does not claim causality of the effect of the pandemic on values, but merely imply associations. An interesting avenue for future research is to explore movement of values during the same period in other highly dissimilar cultures like Africa and Asia to see how similar the trajectory is.

Regarding the hypotheses about the vulnerable socio-demographic group, I have found some evidence of the higher sensitivity to stressors for the younger population and lower-income group. There is no evidence to support that elders' value are more vulnerable. In contrast, this group was found to be more resilient than the middle-aged group in self-transcendence value. The results remind us to look past the population-wide trend which could mask the heterogeneity of the effect of the pandemic on different groups in society.

Before arriving at the analysis of values movement, measurement invariance need to be confirmed for the validity of cross-sample comparison of values. This kind of latent structure comparison should be proceeded with care and indeed the confirmation of measurement invariance is sometimes overlooked. Since the verification process is laborious if large number of latent variables and samples are considered, this thesis has introduced a structured approach to automate the process of confirming measurement invariance. Hundreds of models can be quickly fitted allowing researchers to instead focus more on experimenting with different structure of latent variables. A point to note is that the model searching processes in some steps are purely data-driven where RMSEA is minimized. In a smaller scale analysis, researcher should conduct the model search based on theoretical justification if possible, for examples which items to be freed in the partial invariance confirmation.

7 Replication Materials

Material for the replication of the results in this thesis can be found in this GitHub Repository

8 Appendix

Table 4: ESS 21-item Potrait Value Questionaire Variables

Higher order values	Values	Variables
Openness to change	Self-Direction	ipcrtiv: Important to think new ideas and be creative.
Openness to change	Self-Direction	impfree: Important to make own decisions and be free.
Openness to change	Stimulation	impdiff: Important to try new and different things in life.
Openness to change	Stimulation	ipadvnt: Important to seek adventures and have an exciting life.
Openness to change	Hedonism (Partial 1)	ipgdtim: Important to have a good time.
Openness to change	Hedonism (Partial 1)	impfun: Important to seek fun and things that give pleasure.
Self-enhancement	Hedonism (Partial 2)	ipgdtim: Important to have a good time.
Self-enhancement	Hedonism (Partial 2)	impfun: Important to seek fun and things that give pleasure.
Self-enhancement	Achievement	ipshabt: Important to show abilities and be admired.
Self-enhancement	Achievement	ipsuces: Important to be successful and that people recognize achievements.
Self-enhancement	Power	imprich: Important to be rich, have money, and expensive things.
Self-enhancement	Power	iprspot: Important to get respect from others.
Conservation	Security	impsafe: Important to live in secure and safe surroundings.
Conservation	Security	ipstrgv: Important that government is strong and ensures safety.
Conservation	Conformity	ipfrule: Important to do what is told and follow rules.
Conservation	Conformity	ipbhprp: Important to behave properly.
Conservation	Tradition	imptrad: Important to follow traditions and customs.
Conservation	Tradition	ipmodst: Important to be humble and modest, not draw attention.
Self-transcendance	Benevolence	iphlppl: Important to help people and care for others' well-being.
Self-transcendance	Benevolence	iplylfr: Important to be loyal to friends and devote to people close.
Self-transcendance	Universalism	ipeqopt: Important that people are treated equally and have equal opportunities.
Self-transcendance	Universalism	ipudrst: Important to understand different people.
Self-transcendance	Universalism	impenv: Important to care for nature and environment.

Table 5: Number of Respondents by Country and Round Before and After Data Processing

cntry	round9_obs_before	round10_obs_before	round11_obs_before	round9_obs_after	round10_obs_after	round11_obs_after
BE	1767	1341	1594	1671	1262	1500
CH	1542	1523	1384	1403	1412	1279
FI	1755	1577	1563	1662	1506	1463
FR	2010	1977	1771	1773	1808	1608
GB	2204	1149	1684	2087	1087	1327
HR	1810	1592	1563	1532	1392	1401
HU	1661	1849	2118	1500	1611	1898
IE	2216	1770	2017	1965	1528	1819
IS	861	903	842	783	817	792
IT	2745	2640	2865	2352	2280	2498
LT	1835	1659	1365	1462	1424	1176
NL	1673	1470	1695	1571	1377	1615
NO	1406	1411	1337	1345	1352	1271
PT	1055	1838	1373	966	1731	1274
SI	1318	1252	1248	1134	1093	1069
SK	1083	1418	1442	972	1243	1294

Table 6: Openness MGCFA Detail Results

country	configural_status	metric_status	scalar_status	cfi_config	rmsea_config	cfi_metric	rmsea_metric	cfi_scalar	rmsea_scalar
BE	satisfied	full	NA	0.9996	0.0143	1.0000	0.0000	NA	NA
CH	satisfied	full	partial (impdiff)	1.0000	0.0000	1.0000	0.0000	1.0000	0.0000
FI	satisfied	full	full	0.9951	0.0520	0.9947	0.0314	0.9884	0.0360
FR	satisfied	full	full	0.9933	0.0497	0.9912	0.0329	0.9869	0.0311
GB	satisfied	full	partial (impdiff)	0.9946	0.0509	0.9967	0.0229	0.9953	0.0230
HR	satisfied	full	partial (impdiff,impfree)	1.0000	0.0000	1.0000	0.0000	1.0000	0.0000
HU	satisfied	full	partial (ipcrtiv)	0.9964	0.0461	0.9924	0.0389	0.9898	0.0375
IE	satisfied	full	full	0.9997	0.0114	0.9958	0.0265	0.9931	0.0262
IS	satisfied	full	partial (impdiff)	0.9971	0.0450	0.9963	0.0295	0.9941	0.0311
IT	satisfied	full	partial (impfree)	0.9980	0.0331	0.9973	0.0224	0.9903	0.0353
LT	satisfied	full	partial (ipadvnt)	0.9966	0.0490	0.9931	0.0406	0.9937	0.0322
NL	satisfied	full	full	0.9905	0.0693	0.9910	0.0390	0.9867	0.0367
NO	satisfied	full	full	0.9932	0.0652	0.9938	0.0359	0.9880	0.0388
PT	satisfied	full	partial (ipadvnt)	0.9948	0.0571	0.9966	0.0268	0.9900	0.0382
SI	satisfied	full	full	0.9888	0.0691	0.9891	0.0393	0.9802	0.0411
SK	satisfied	full	partial (ipcrtiv)	0.9991	0.0241	0.9955	0.0317	0.9893	0.0407

Note:
CFI = 1 and RMSEA = 0 can occur when Chi-square index for the model is larger than the degree of freedom. This usually happenes when degree of freedom is one

Table 7: Conservasion MGCFA Detail Results

country	configural_status	metric_status	scalar_status	cfi_config	rmsea_config	cfi_metric	rmsea_metric	cfi_scalar	rmsea_scalar
BE	satisfied	full	full	0.9917	0.0286	0.9913	0.0235	0.9892	0.0225
CH	satisfied	full	full	0.9695	0.0590	0.9685	0.0481	0.9587	0.0473
FI	satisfied	full	partial (imptrad)	0.9964	0.0216	0.9981	0.0124	0.9893	0.0262
FR	satisfied	full	full	0.9731	0.0550	0.9703	0.0464	0.9585	0.0471
GB	satisfied	full	full	0.9867	0.0421	0.9847	0.0362	0.9726	0.0416
HR	satisfied	full	full	0.9867	0.0446	0.9854	0.0376	0.9803	0.0374
HU	satisfied	full	partial (impsafe)	0.9640	0.0706	0.9582	0.0610	0.9442	0.0622
IE	satisfied	full	full	0.9884	0.0410	0.9861	0.0358	0.9835	0.0336
IS	satisfied	full	full	0.9871	0.0361	0.9876	0.0284	0.9728	0.0361
IT	satisfied	full	partial (imptrad,ipmodst)	0.9960	0.0268	0.9946	0.0250	0.9863	0.0360
LT	satisfied	full	partial (ipmodst)	0.9763	0.0589	0.9642	0.0580	0.9528	0.0587
NL	satisfied	full	partial (impsafe)	0.9866	0.0391	0.9844	0.0338	0.9735	0.0389
NO	satisfied	full	full	0.9888	0.0352	0.9853	0.0324	0.9783	0.0338
PT	satisfied	full	full	0.9640	0.0742	0.9648	0.0588	0.9553	0.0569
SI	satisfied	full	full	0.9903	0.0346	0.9865	0.0328	0.9858	0.0289
SK	satisfied	full	full	0.9888	0.0408	0.9878	0.0342	0.9750	0.0420

Table 8: Self-transcendance MGCFA Detail Results

country	configural_status	metric_status	scalar_status	cfi_config	rmsea_config	cfi_metric	rmsea_metric	cfi_scalar	rmsea_scalar
BE	satisfied	full	full	0.9898	0.0472	0.9877	0.0377	0.9782	0.0414
CH	satisfied	full	partial (impenv)	0.9951	0.0296	0.9932	0.0254	0.9803	0.0374
FI	satisfied	full	partial (ipeqopt)	0.9838	0.0615	0.9851	0.0429	0.9758	0.0470
FR	satisfied	full	full	0.9905	0.0477	0.9899	0.0359	0.9772	0.0444
GB	satisfied	full	partial (ipeqopt)	0.9897	0.0492	0.9907	0.0341	0.9859	0.0360
HR	satisfied	full	full	0.9889	0.0667	0.9875	0.0515	0.9772	0.0572
HU	not satisfied	NA	NA	0.9680	0.1032	NA	NA	NA	NA
IE	satisfied	full	full	0.9962	0.0371	0.9953	0.0303	0.9871	0.0412
IS	satisfied	full	partial (impenv)	0.9940	0.0354	0.9950	0.0234	0.9953	0.0195
IT	satisfied	full	full	0.9878	0.0758	0.9847	0.0619	0.9716	0.0694
LT	satisfied	full	partial (ipudrst,impenv)	0.9939	0.0409	0.9904	0.0374	0.9819	0.0462
NL	satisfied	full	full	0.9892	0.0421	0.9851	0.0359	0.9798	0.0344
NO	satisfied	full	partial (ipeqopt,impenv	0.9980	0.0180	0.9956	0.0194	0.9933	0.0215
PT	satisfied	full	partial (ipeqopt)	0.9965	0.0401	0.9926	0.0425	0.9833	0.0547
SI	satisfied	full	full	0.9968	0.0223	0.9961	0.0178	0.9849	0.0290
SK	satisfied	full	full	0.9858	0.0665	0.9838	0.0515	0.9768	0.0509

Table 9: Self-enhancement MGCFA Detail Results

country	configural_status	metric_status	scalar_status	cfi_config	rmsea_config	cfi_metric	rmsea_metric	cfi_scalar	rmsea_scalar
BE	satisfied	full	full	0.9922	0.0345	0.9921	0.0279	0.9900	0.0270
CH	satisfied	full	full	0.9959	0.0263	0.9950	0.0233	0.9939	0.0221
FI	satisfied	full	full	0.9904	0.0492	0.9890	0.0423	0.9848	0.0426
FR	satisfied	full	full	0.9870	0.0440	0.9830	0.0403	0.9781	0.0392
GB	satisfied	full	full	0.9881	0.0490	0.9849	0.0441	0.9825	0.0408
HR	not satisfied	NA	NA	0.9541	0.0892	NA	NA	NA	NA
HU	satisfied	full	full	0.9872	0.0530	0.9839	0.0477	0.9814	0.0441
IE	satisfied	full	full	0.9799	0.0627	0.9788	0.0517	0.9677	0.0547
IS	satisfied	full	full	0.9888	0.0468	0.9818	0.0478	0.9731	0.0499
IT	not satisfied	NA	NA	0.9383	0.1160	NA	NA	NA	NA
LT	satisfied	full	partial (ipshabt,impfun)	0.9709	0.0766	0.9666	0.0657	0.9520	0.0715
NL	satisfied	full	full	0.9687	0.0702	0.9672	0.0577	0.9621	0.0532
NO	satisfied	full	full	0.9803	0.0617	0.9779	0.0525	0.9699	0.0525
PT	satisfied	full	partial (imprich,iprspot)	0.9854	0.0513	0.9810	0.0470	0.9682	0.0552
SI	satisfied	full	partial (imprich)	0.9820	0.0524	0.9789	0.0455	0.9707	0.0472
SK	satisfied	full	full	0.9898	0.0547	0.9883	0.0470	0.9856	0.0448

Table 10: European-wide Regression Results for Openness and Conservasion

	openness_to_change_enter	openness_to_change_exit	conservation_enter	conservation_exit
agea	-0.01 ***	-0.01 ***	0.01 ***	0.01 ***
	(0.00)	(0.00)	(0.00)	(0.00)
enter_covid_effect	0.12 **		-0.03	
	(0.04)		(0.03)	
eisced	0.05 ***	0.06 ***	-0.06 ***	-0.06 ***
	(0.01)	(0.01)	(0.01)	(0.01)
gndr	-0.05 ***	-0.05 **	0.11 ***	0.10 ***
	(0.01)	(0.01)	(0.02)	(0.02)
mean_restype	0.58 ***	0.61 ***	0.51 ***	0.52 ***
	(0.03)	(0.04)	(0.04)	(0.04)
exit_covid_effect		-0.01		0.08 **
		(0.02)		(0.02)
Num. obs.	43648	42986	46567	45717
Num. groups: cntry	15	15	16	16
R^2 (full model)	0.26	0.29	0.17	0.19
R^2 (proj model)	0.25	0.26	0.16	0.17
Adj. R^2 (full model)	0.26	0.29	0.17	0.19
Adj. R^2 (proj model)	0.25	0.26	0.16	0.17

*** p < 0.001; ** p < 0.01; * p < 0.05; . p < 0.1

Table 11: European-wide Regression Results for Self-enhancement and Self-transcendance

	self_enhancement_enter	self_enhancement_exit	self_transcendence_enter	self_transcendence_exit
agea	-0.01 ***	-0.01 ***	0.00 *	0.00 *
	(0.00)	(0.00)	(0.00)	(0.00)
enter_covid_effect	0.02		0.02	
	(0.04)		(0.04)	
eisced	0.02 *	0.02 *	0.04 ***	0.05 ***
	(0.01)	(0.01)	(0.00)	(0.00)
gndr	-0.21 ***	-0.19 ***	0.24 ***	0.24 ***
	(0.02)	(0.02)	(0.02)	(0.02)
mean_restype	0.63 ***	0.69 ***	0.67 ***	0.68 ***
	(0.03)	(0.04)	(0.05)	(0.05)
exit_covid_effect		0.01		-0.04 .
		(0.03)		(0.02)
Num. obs.	39149	38271	43466	42245
Num. groups: cntry	14	14	15	15
R^2 (full model)	0.25	0.28	0.24	0.26
R^2 (proj model)	0.24	0.26	0.23	0.23
Adj. R^2 (full model)	0.25	0.28	0.24	0.26
Adj. R^2 (proj model)	0.24	0.26	0.23	0.23

*** p < 0.001; ** p < 0.01; * p < 0.05; . p < 0.1

Table 12: European Region Model Results of the Timephase Term

region	value	term	estimate	p.value	significant
W-Europe	Openness	enter_covid_effect	0.0620164	0.2345427	
W-Europe	Openness	exit_covid_effect	-0.0211246	0.5606888	
W-Europe	Conservation	enter_covid_effect	-0.0235176	0.6828016	
W-Europe	Conservation	exit_covid_effect	0.0311645	0.5452902	
W-Europe	Self-transcendence	enter_covid_effect	0.1208343	0.0257043	*
W-Europe	Self-transcendence	exit_covid_effect	-0.0730738	0.0499753	*
W-Europe	Self-enhancement	enter_covid_effect	-0.0664597	0.0014669	*
W-Europe	Self-enhancement	exit_covid_effect	-0.0392917	0.3019487	
S-Europe	Openness	enter_covid_effect	0.2106885	0.3585349	
S-Europe	Openness	exit_covid_effect	-0.0608223	0.2786585	
S-Europe	Conservation	enter_covid_effect	-0.0722757	0.4465492	
S-Europe	Conservation	exit_covid_effect	0.1537499	0.1738330	
S-Europe	Self-transcendence	enter_covid_effect	-0.0855535	0.7400137	
S-Europe	Self-transcendence	exit_covid_effect	-0.0167861	0.8524776	
S-Europe	Self-enhancement	enter_covid_effect	-0.0563574	0.0533807	.
S-Europe	Self-enhancement	exit_covid_effect	0.2115949	0.0000000	*
N-Europe	Openness	enter_covid_effect	0.0133878	0.7247516	
N-Europe	Openness	exit_covid_effect	0.0368169	0.2092348	
N-Europe	Conservation	enter_covid_effect	-0.0658562	0.0173458	*
N-Europe	Conservation	exit_covid_effect	0.0597142	0.0196064	*
N-Europe	Self-transcendence	enter_covid_effect	-0.0278265	0.7308207	
N-Europe	Self-transcendence	exit_covid_effect	-0.0478522	0.2417914	
N-Europe	Self-enhancement	enter_covid_effect	0.0505671	0.5329137	
N-Europe	Self-enhancement	exit_covid_effect	0.0313432	0.4368106	
E-Europe	Openness	enter_covid_effect	0.1934930	0.0107227	*
E-Europe	Openness	exit_covid_effect	-0.0223493	0.7050173	
E-Europe	Conservation	enter_covid_effect	0.0164976	0.8102895	
E-Europe	Conservation	exit_covid_effect	0.0934580	0.1238631	
E-Europe	Self-transcendence	enter_covid_effect	0.0047758	0.9527710	
E-Europe	Self-transcendence	exit_covid_effect	-0.0258009	0.4574944	
E-Europe	Self-enhancement	enter_covid_effect	0.0801943	0.2676563	
E-Europe	Self-enhancement	exit_covid_effect	-0.0338268	0.6255927	

Table 13: Age Group Marginal Effects Details

age_group	value	stage	marginal_effect	p.value	significant
30-59	openness_to_change	Entering	0.1071511	0.0072512	*
<30	openness_to_change	Entering	0.1079126	0.0000207	*
>=60	openness_to_change	Entering	0.1380978	0.0017235	*
30-59	openness_to_change	Exiting	0.0114401	0.5490395	
<30	openness_to_change	Exiting	-0.0384204	0.1249055	
>=60	openness_to_change	Exiting	-0.0371011	0.3132812	
30-59	conservation	Entering	-0.0162436	0.5041021	
<30	conservation	Entering	-0.0274980	0.5115891	
>=60	conservation	Entering	-0.0486042	0.0653806	.
30-59	conservation	Exiting	0.0675769	0.0110929	*
<30	conservation	Exiting	0.1197741	0.0000008	*
>=60	conservation	Exiting	0.0861456	0.0002410	*
30-59	self_enhancement	Entering	0.0239780	0.5889240	
<30	self_enhancement	Entering	0.0079569	0.8259247	
>=60	self_enhancement	Entering	-0.0076611	0.8048055	
30-59	self_enhancement	Exiting	-0.0011536	0.9709862	
<30	self_enhancement	Exiting	0.0694677	0.0699588	.
>=60	self_enhancement	Exiting	0.0045893	0.9004029	
30-59	self_transcendence	Entering	0.0403761	0.3876736	
<30	self_transcendence	Entering	0.0228887	0.6269358	
>=60	self_transcendence	Entering	-0.0133741	0.7716548	
30-59	self_transcendence	Exiting	-0.0521505	0.0164204	*
<30	self_transcendence	Exiting	-0.0943088	0.0009747	*
>=60	self_transcendence	Exiting	-0.0049079	0.8644684	

Table 14: Income Group Marginal Effects Details

income_group	value	stage	marginal_effect	p.value	significant
lower_income	openness_to_change	Entering	0.1231092	0.0075747	*
the_rest	openness_to_change	Entering	0.1089477	0.0026968	*
lower_income	openness_to_change	Exiting	-0.0715975	0.0781792	.
the_rest	openness_to_change	Exiting	0.0050858	0.7927881	
lower_income	conservation	Entering	-0.0287138	0.4228220	
the_rest	conservation	Entering	-0.0107051	0.6565491	
lower_income	conservation	Exiting	0.1026785	0.0000448	*
the_rest	conservation	Exiting	0.0488560	0.0204357	*
lower_income	self_enhancement	Entering	-0.0258765	0.4711347	
the_rest	self_enhancement	Entering	0.0228743	0.5051152	
lower_income	self_enhancement	Exiting	-0.0124758	0.7705855	
the_rest	self_enhancement	Exiting	0.0037115	0.8956067	
lower_income	self_transcendence	Entering	0.0462944	0.4228869	
the_rest	self_transcendence	Entering	0.0316731	0.3620028	
lower_income	self_transcendence	Exiting	-0.0551095	0.0952353	.
the_rest	self_transcendence	Exiting	-0.0415805	0.0173415	*

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