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How 'Critically Open-Minded' Are We? An Australian Perspective Through the World Values Survey

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Abstract This article introduces 'critical open-mindedness' as a new sociological construct, which can be employed particularly in the studies of social attitudes and attitude change, social values, social identities, cross-cultural relations and social discrimination. By drawing on the data collected through the 2005 World Values Survey in Australia, we have operationalized the construct into an integrative social index, called 'critical open-mindedness index' consisting of five dimensional composite indicators (CIs; i.e. the social, political, cultural, economic, and environmental). We have adopted an integrative approach to constructing these composite indicators in which we pragmatically select and incorporate a variety of techniques with the purpose of maximizing the validity of the end results. The findings with respect to Australians' critical open-mindedness, both in general and in reference to its five dimensions are discussed. We have also developed and examined a social psychological index of 'socio-cognitive open-mindedness' inspired by a number of commonly used international scales and by drawing on the same dataset. We have shown that these two types of open-mindedness are qualitatively different. Our analysis does not support the idea that individuals' social psychological open-mindedness determines their critical open-mindedness. It is rather the opposite which is the case.

Keywords Critical open-mindedness · Socio-cognitive open-mindedness · Integrative social index · World Values Survey · Australia

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1 Introduction

Australian society is known for its strong and official endorsement of multiculturalism as both its core value system and as a guiding general policy framework. As a modern society historically formed by immigration, Australia has become more accommodative and open to a broad range of cultural norms and social traditions. Despite the relatively successful shifts to a more culturally inclusive organization of diverse social relations (Collins 2013), racism, sexism, and negative attitudes towards refugees and ethnic minorities not only persist but also continue to challenge the social cohesion in the country (Poynting and Mason 2008; Markus 2015). The Australian economy and politics have also been significantly reshaped under the influence of corporate globalization forces. Economic globalization, the escalation of population movements of non-Western background into Australia in recent decades, as well as the proliferation of new communication technologies are, at least in theory, expected to enhance people's cultural openness and cosmopolitanism. Despite all these advancements, a number of studies and polls have observed that many Australians exhibit mixed feelings and uncertain, if not fully apprehensive, views about non-Western cultures and their ability to integrate, adopt or accommodate mainstream Western life-style and values (McKay et al. 2012). The economic liberalization trend has been associated with growing socio-economic gaps (Healey 2015) and thereby has posed serious challenges to Australia's multiculturalism, its universally known commitment to egalitarianism and environmental conservationism (Walsh 2014). The impact of these macro-scale changes on the social attitudes and values of Australian citizens in terms of their openness to the changing context and potential progressive responses needs to be explored. This would require the development of notions and indices that help us measure the level of open/closed-mindedness at a sociological level.

In terms of theoretical background, despite a long trajectory of attention to the issue of 'open-mindedness' outside the discipline of sociology (see Sect. 2), and the popularity of many subjects of sociological investigation that are directly related to this issue, little effort has been made to develop a uniquely sociological definition based on a social theory of open-mindedness. Therefore, sociology's contribution to this interdisciplinary field of study remains underdeveloped. Against this context, this article introduces 'critical open-mindedness' as a new 'sociological construct', in contrast to the social psychological formulations of the concept. The new concept can be employed more broadly than the existing ones in the studies of social attitudes and attitude change, social values, social identities, cross-cultural relations and social discriminations. This article then develops an integrated social index, named the critical open-mindedness index (COI) to measure the construct. The index consists of five dimensional composite indicators for quantitative data analyses. Each dimension represents one of the five major domains of societal life, i.e. the social, the cultural, the political, the economic and the ecological. Using the data from the 2005 World Values Survey in Australia, Australians' critical open-mindedness, both in general and in reference to its five relatively independent dimensions, will be investigated. Exploratory factor analysis (EFA), in combination with a few other techniques, are used in the process of developing the dimensional indicators.

Multiple ways of validation are employed, including confirmatory factor analysis (CFA), path analysis and group ranking. In our pragmatic approach to constructing our integrative indices, we have considered a higher validity of the end result as our goal. Therefore, our proposed approach is flexible and open to the use of a combination of existing methods and techniques, in order to maximize validity. Moreover, for the first

time, in order to make a case for the necessity of a sociological notion of open-mindedness, using the same method and dataset, and by drawing on a thorough review of commonly used social psychological scales, we have developed an index of socio-cognitive open-mindedness index (SCOI). Using non-recursive structural equation modelling and CFA we have explored if the two constructs are independent, in terms of both their factor structure and causal relationship. In other words, as part of our research question, we would like to examine whether socio-cognitively open-minded individuals are also sociologically open-minded.

2 Open-Mindedness: Beyond a Social Psychological Concept

The notion of 'open-mindedness' has been widely discussed in philosophy, education studies, organizational studies, and more particularly in social psychological studies. A variety of definitions of this concept have been developed in each of these disciplines in accordance with the nature of their problems and the objectives of their inquiries. In social psychology, open-mindedness is primarily defined as a mode of critical thinking, openness to new experiences, unbiased information processing (Ottati et al. 2015), tolerance for ambiguity, receptivity toward and curiosity about unconventional ideas or 'intellectual non-conformity' (Kruglanski and Boyatzi 2012), and the ability to handle conflictive situations (Pilisuk 1963). Therefore, open-mindedness is largely reduced to an 'intra-individual ideational quality', i.e. an individual's cognitive performance in different situations as opposed to their performance in relation to other individuals. In contrast, political and social psychological studies of dogmatism-intolerance among different social groups have focused on open/closed-mindedness as an individual's cognitive (pre-)disposition more distinctively defined in relation to out-groups, ideologies and social values. In such studies, open-mindedness is dualistically viewed as a psycho-political phenomenon (Etchezahar and Brussino 2013), where there is a lack of a dogmatic and authoritarian attitude, rather than as a positive quality *per se*.

Some of the abovementioned non-sociological efforts to measure open-mindedness deserve a reflexive consideration. To avoid the so-called ideological bias embedded in the F scale developed by Adorno (1950) to measure (fascistic) authoritarian personality, Rokeach (1960) argued for the separation of the structure of ideological systems and their content. In this way, he argued, it would be possible to develop a scale totally based on the 'structure of dogmatism' and therefore to be able to measure dogmatism of any type, even of those who advocate tolerance and social equity in intolerant ways. From his point of view, an open-minded person is less dogmatic, less rigid and less concrete in solving problems, and can more easily change an attitude or not be resistant to change (Rokeach 1951). Moreover, such a person avoids pre-judging others, or in other words, he/she is not "prejudiced" (towards Jews and African-Americans, laborers, communists, or even towards fascists). According to Rokeach, "the objects of these prejudices" may be different but all are nevertheless 'structurally' the same (Rokeach 1951, p. 235). He claimed that the "opposite extremes of the ethnocentrism continuum represent equally pre-judgment systems." Therefore, in Rokeach's (1951, p. 236) terms, closed or open mindedness is an "underlying cognitive organization of aspects of one's social world."

Coser, however, criticized Rokeach's approach for ignoring the sociological fact that cognitive abilities are rooted in (and may reflect) social circumstances and experiences. We agree with Coser that Rokeach's Dogmatism (D) scale represented the middle class way of

valuing the 'desirability of mixing' and lack of commitment to political causes in the post-WWII era of the so-called "end of ideology" (Bell 1960). Therefore despite its self-proclaimed freedom from an ideological bias, the D Scale can still be considered as the product of its own "Zeitgeist" (Coser 1960). Moreover, as acknowledged by Rokeach (1960) himself, what the D scale measures "can hardly be the relative openness of mind but rather its relative emptiness", and thereby it confuses openness with vacuity. We tend to agree with Coser and the anti-individualistic perspectives in social psychology that minds are embedded in a larger world (see Wilson 1995). However, this does not mean that we cannot (or should abandon attempts to) construct notions of cognitive open-mindedness based on a more narrowly individuated set of ideational states. Rokeach has been criticized for presenting a weak sociological imagination in his work. He insisted on the importance of personality variables as opposed to social situational ones. Yet, as Francis (1960, p. 314) argued, "personality is significant for being very open-minded and closed-minded, but that intermediate people rely on the situation for cues."

Open-mindedness as a 'socio-cognitive disposition' seems to be in a dialectical relationship with a 'socially situated open-mindedness', rather than in an either indistinguishable or antithetical relationship (Hosseini 2010, 2012). It is true that minds are embedded in their social settings, but it is in fact the nature of this embeddedness that needs to be explored. Therefore, instead of buying into the dualism of the micro-cognitive vs. the macro-collective, we prefer to explore the relations between these two levels of open-mindedness, i.e. the non-situated socio-cognitive and the more situated sociological level. The latter will be represented by our new indicator of 'COI' whereas the former will be operationalized by developing the SCOI. In this way, we take an open-minded approach to the existing differences between the two major approaches of measuring open-mindedness. Unlike the case of 'socio-cognitive openness' as a rather universally shared human virtue, the definition and method of operationalizing 'critical open-mindedness' is therefore very dependent on the socio-historical context of the study.

Our method of developing the open-mindedness indices is based on a theoretically driven selection and interpretation of a group of questions from the World Values Survey questionnaires conducted in Australia. We have also utilized a range of scales from the classical studies (F and D scales) to later examples (developed by Schwartz 1994; Altemeyer 1981; Ray 1974; Haiman 1964) in this selection process. Therefore, we 'analytically' differentiate between Openness as a socio-cognitive general virtue (by relying on less socially situated questions in the WVS) and critical open-mindedness as an index of the overall societal-attitudinal quality of society and its actors in relation to a number of more concrete and controversial social issues of their own social context; i.e. issues that have preoccupied the minds of Australians in recent years and shaped public discourse and debates.

3 Defining 'Critical' Open-Mindedness: Toward a New Sociological Framework

In this section, in order to make a case for the concept of 'critical open-mindedness' (especially its *criticality* aspect), we would like to address an important challenge from a sociological point of view. Absolute openness to all possible alternative ways of understanding a social issue is both impossible and implausible, as it prevents individuals and

groups from reaching conclusions or making decisions. This raises the question of where we should then put boundaries in our definition of open-mindedness?

This challenge is central to our theoretical endeavor and it seems to have grasped the attention of social philosophers. Let us start with what these experts develop as a definition of openness. According to Hare (2004b) 'open-mindedness', as an intellectual virtue, "means being *critically* receptive to alternative possibilities, being willing to think again despite having formed an opinion, and sincerely trying to avoid those conditions and offset those factors which constrain and distort our reflections" (see also Hare 2009). An open mind of such quality is one that seeks to consider all evidence and arguments before an opinion is formed (Hare 2004a). However, as Lambie (2014, p. xi) argues, openness is also about acknowledging "the fallibility of oneself and others." Or in other words, "it refers to a rare, but undoubtedly real, human capacity that is also seemingly a paradox: the ability both to hold in mind different points of view and 'accept' them, and at the same time rationally criticize and shift between them."

Open-mindedness is more than merely being non-opinionated or being passively receptive to alternative possibilities in one's social attitudes, values or beliefs. Excessive or passive openness would require the denial of the self and lack of commitment to values or beliefs that play significant roles in our personal and social worlds. A person or a group that lacks the ability to reach a conclusion or at least make decisions at the times when action is required, or a person who lacks a self-identity, commitment to a cause, or orientations, would fail to actively relate the new and the old evidence and to be creative or innovative. Creativity, which is a powerful engine behind change, requires the ability to accommodate between the old and the new experiences, to examine new evidence and develop a position with regard to social or personal issues. It is such an apparently contradictory nature of life itself that requires us to differentiate between what kind of open-mindedness takes form ultimately in real life from an idealistic, passive quality or what Lambie calls the 'anything goes' version of openness (Lambie 2014). However, unlike Lambie's notion, as described before, we consider 'critical open-mindedness' as not just a cognitive human capacity, but also a sociological phenomenon. Open/closed mindedness as an attitudinal/behavioural attribute requires the formation of *critical* positions in response to the changing social environment by individuals and collectives as reflexive social agents.

Given the above considerations, we define critical open-mindedness as the capacity of social actors to be: (1) socially inclusive in their relationships with marginalized groups and in their perception of their social self (like the way they define citizenship and extend civil rights to different groups); (2) tolerant of others with different identities and cultural backgrounds while avoiding any prejudgment on the bases of the other's collective identity, as well as being critical of 'essentialist' perceptions of outgroups or other beliefs, faiths, cultures, or languages; (3) committed to democratic rights and to be aware of the necessity of the equal distribution of material or economic resources across social groups as an infrastructural precondition for a meaningful democracy; (4) sensitive to socio-economic injustices and inequalities, to be open to the democratization of the economy, and to be critical of the extreme ideological positions in the politics of economy, such as those of statism and libertarianism; (5) mindful of serious ecological challenges that threaten not only themselves but also more vulnerable communities other than their own, and, to be willing to advocate for, and spend their resources to create, a more ecologically secure and sustainable society for everyone.

4 Critical Open-Mindedness: A New Measure

This section describes how we have operationalized the new construct of critical open-mindedness and the concept of SCOI into composite indices.

4.1 Basic Indicators

The above five features of a critically open mind are the bases for the five dimensions of our construct that are relatively independent of one another. These dimensions address the main domains of societal life, namely the social, the cultural, the political, the economic, and the ecological. Each dimension is of course multidimensional itself and therefore requires the use of composite indicators. The integrated COI is composed of these five dimensional indicators (see Fig. 1 and Table 1). The five dimensional indicators are as follows: (1) social open-mindedness, comprised of trusting specific out-groups, rejection of homophobia, rejection of sexism and ageism, and the acceptance of the secularist separation of the religion and the state; (2) cultural open-mindedness, encompassing a positive attitude towards immigrants and ethnic diversity, inclusiveness towards cultural out-groups, openness towards asylum seekers, and a broad conception of citizenship; (3) political open-mindedness, comprised of valuing democracy, a stress on political rights and

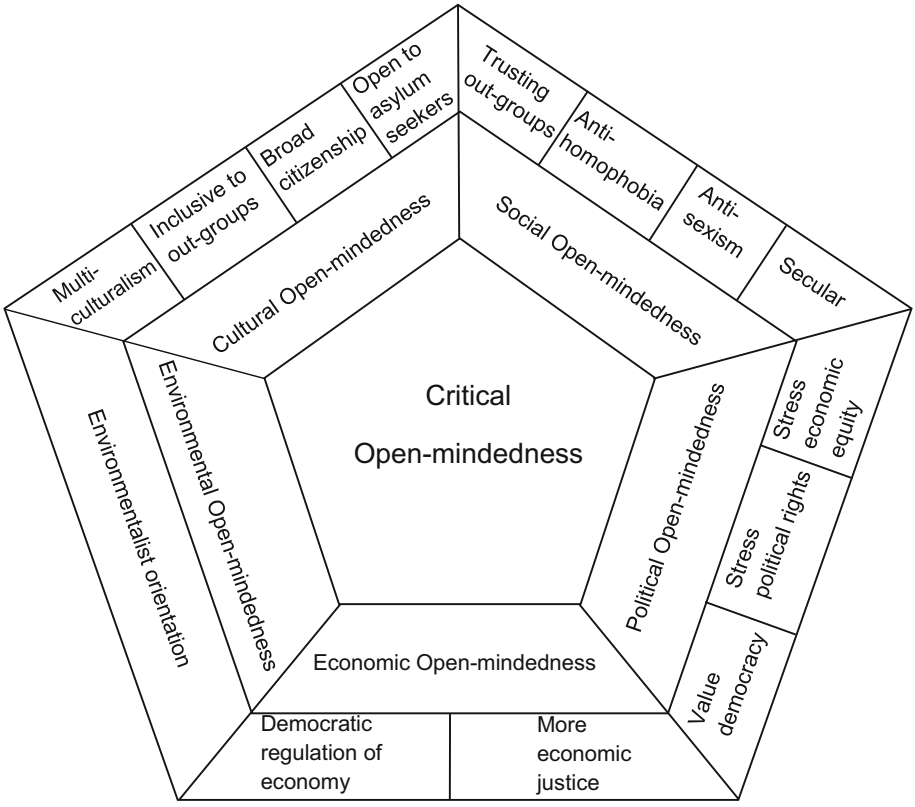

Fig. 1 A graphic presentation of the COI conceptual framework

Table 1 List of basic indicators comprising COI's five dimensional indicators. *Source*: WVS Australia 2005

Code	Survey questions (after correction of wording for direction)	Components (determined by an EFA; principle components, promax rotation method)[a]		
		No.	Name	Loading
1- Dimensional composite indicator: social open-mindedness (KMO = 0.649)				
V129	Trusting people of another religion	2	Trusting out-groups	0.912
V130	Trusting people of another nationality	2	Trusting out-groups	0.909
V36	Positive to have people with AIDS in neighborhood	1	Anti-homophobia	0.752
V38	Positive to have homosexuals in neighborhood	1	Anti-homophobia	0.844
V61	Men not always better political leaders than women	3	Anti-sexism	0.895
V63	Men not always better business executives than women	3	Anti-sexism	0.901
V202	Homosexuality can be justified	1	Anti-homophobia	0.684
V204	Abortion can be justified	4	Secularism	0.719
V194	Atheist politicians can be fit for public office	4	Secularism	0.635
V197	Religious leaders should not influence government decisions	4	Secularism	0.583
2- Dimensional composite indicator: cultural open-mindedness (KMO = 0.838)				
V35	Positive to have people of a different race in neighborhood	2	Inclusive to cultural outgroups (inclusiveness)	0.660
V37	Positive to have immigrants in neighborhood	2	Inclusive to cultural outgroups	0.779
V39	Positive to have people of different religion in neighborhood	2	Inclusive to cultural outgroups	0.715
V42	Positive to have people of different language in neighborhood	2	Inclusive to cultural outgroups	0.783
V221	Ethnic diversity enriches life	1	Positive about immigrants and ethnic diversity (multi-cultural)	0.701
V217	Australian citizenship: no need to have ancestors from Australia	4	Broad definition of citizenship	0.916
V218	Australian citizenship: no need to born on Australian soil	4	Broad definition of citizenship	0.915
V219	Australian citizenship: no need to adopt the customs of Australia	3	Open to asylum seekers	0.718
Q87	Two first statements of a Likert scale measuring attitudes toward asylum seekers	3	Open to asylum seekers	0.774, 0.665
Q87	The last four statements of a Likert scale measuring attitudes toward immigrants in Australia	1	Positive about immigrants and ethnic diversity	0.660, 0.780, 0.715, 0.780
3- Dimensional composite indicator: political open-mindedness (KMO = 0.655)				
V152	Democracy taxes the rich and subsides the poor	1	Stressing economic equity in democracy	0.819
V155	Government benefits for unemployed in a democracy	1	Stressing economic equity in democracy	0.818

Table 1 continued

Code	Survey questions (after correction of wording for direction)	Components (determined by an EFA; principle components, promax rotation method)[a]		
		No.	Name	Loading
V163	How democratic this country is	1	Valuing democracy	1.0
4- Dimensional composite indicator: economic open-mindedness (KMO = 0.611)				
V116	More income equality needed	2	More economic justice	0.968
V117	Critical of private versus public dualism	1	Democratic regulation of economy	0.769
V118	Giving relatively more weight to the democratic regulation of free market	1	Democratic regulation of economy	0.655
V119	Critical of government versus self-responsibility dualism	1	Democratic regulation of economy	0.738
5- Dimensional composite indicator: environmental open-mindedness (KMO = 0.633)				
V88	Caring about nature	1	Environmentalist orientation	0.551
V105	Willingness to give part of income to protect nature	1	Environmentalist orientation	0.605
V106	Willingness to pay extra tax to protect nature	1	Environmentalist orientation	0.844
V104	Give priority to ecology over economy	1	Environmentalist orientation	0.809

[a] Overall KMO = 0.829 > 0.50, overall value of Cronbach's alpha is 0.802

economic equity as the bases of genuine democracy; (4) economic open-mindedness, comprised of the appreciation of more democratic regulations of the economy and more economic justice; and finally (5) environmental open-mindedness which is mainly a general appreciation of environmentalist values, such as caring about nature, giving priority to ecology over economy, and a willingness to support environmentalist causes. While these five dimensions are based on our conceptual framework, the components of each dimension are determined through a factor analysis of each dimension over its basic indicators (see Table 1).

In order to develop the COI and other composite indicators, we have used the 2005 Australian World Values Survey (WVS) dataset. The survey was conducted by a team of researchers from the Australian National University by mailing a self-administered questionnaire (containing 114 questions/variables) to a randomly selected cohort of respondents. Of 3273 eligible sample members who received the survey, 1421 responded, resulting in a response rate of 43%. A more recent survey was also conducted in 2012. However, we found the 2005 data more inclusive and more relevant to the Australian context than the 2012 version, since the former contained the necessary questions we needed for the operationalization of all five dimensions of COI. Therefore, here we have only used the 2005 WVS, since our goal is to create the open-mindedness indices and test their validity rather than portray a more recent profile of open-mindedness in Australian society.

As explained before, we also aim to measure the socio-cognitive notion of open-mindedness as a social psychological construct and explore its causal relationship with critical open-mindedness as a sociological construct. Except for the Schwartz scale for measuring social values, none of the other well-known scales are used in the WVS. However, we sought to construct this CI by relying on a set of socially de-contextualized

Table 2 Four dimensions of the socio-cognitive open-mindedness index (SCOI), specified through an EFA (with varimax rotation) of a number of basic variables. *Source*: WVS Australia 2005

Dimensions[a]	Question (basic variable)	Code	Component no.	Loadings
1. General trust	Most people can be trusted	V23	1	0.756
	Most people would try to be fair to me	V47	1	0.688
	Trusting people met for the first time	V128	1	0.724
2. Anti-authoritarianism	Giving priority to freedom as the first aim of the country over order	V71	2	0.691
	Giving priority to humane society over security	V73	2	0.679
	Do not teach children obedience	V21	2	0.523
3. Anti-elitism	Rejecting an undemocratic leader	V148	3	0.828
	Rejecting technocratic leadership	V149	3	0.868
4. Indeterminism	Traditions not always important	V89	4	0.684
	Critical of fatalism	V122	4	0.517

[a] KMO = 0.619 > 0.5, the overall value of Cronbach's alpha is 0.563

indicators that we found as the closest possible measures to the commonly used social psychological scales discussed in the previous section. Accordingly, the CI measuring 'socio-cognitive openness' (SCOI) was derived from the same WVS questionnaire through an EFA of those questions (see Table 2) in order to explore its dimensions. As the table shows, four components were found. Questions with loadings lower than 0.5 were removed from the scale. These four components correspond to most of what is defined as closed/open-mindedness in the social psychological literature (see Kruglanski and Boyatzi 2012; Nesdale et al. 2012).

4.2 Constructing Integrative Indices of Open-Mindedness: A Pragmatic Approach

After a rather inclusive review of existing methods of CI construction relevant to our topic, we formulated an approach that pragmatically incorporates and integrates different techniques used in these methods (see Hoskins and Mascherini 2009; Hlavsa 2010; Maggino and Zumbo 2012; Wu and Wang 2014; Boccuzzo and Gianecchini 2015; Mazziotta and Pareto 2016). A pragmatic approach, in this context, acknowledges that there are different methods of constructing a composite indicator. However, the choice of method is made to facilitate the achievement of the stated goals. Our goal here is to maximize the external and construct validities of the CIs as predicted variables. The approach therefore consists of the following steps:

Step 1 Data Selection: We first selected a number of basic indicators (survey questions), from the original WVS dataset, which we, in consultation with experts and students, understood to be the most appropriate ones for the conceptual framework developed through a critical review of the literature;
Step 2 Data Manipulation: We made adjustments for directions (manipulation) through recoding the variables based on the interpretation of the answers to survey questions in terms of their connotations for critical open-mindedness in the Australian context, and then we used SPSS MVA to perform the little's 'missing completely at random'

(MCAR) test. The MVA shows that the missing data are randomly distributed across all observations which makes the imputation less necessary. However, MVA also shows a number of variables with more than 5% missing. We estimated that the composite indicators would have higher percentages of missing values up to 20%. This indicates that imputation can slightly improve covariance and decrease the chance of type II error. Therefore, we imputed missing values through an EM (expectation maximization) process. Education is one of the definite predictors of socio-cognitive and critical open-mindedness. We used ANOVA before and after imputation which showed that imputation through EM improves the measure of association between education and open-mindedness indicators (R^2) by almost 2%.[1]

Step 3 Normalization: The values of all the basic indicators were normalized to a range between 0 and 1 through the calculation of what we call here *S-scores*:$S_i = (x_i - min)/(max - min)$, where x represents the basic indicator and i represents case (respondent) numbers; *min* and *max* are the mimimum and maximum values of variable x respectively.

Step 4 Complementary Factor Analysis: Factor analyses of sets of variables selected theory-wise to construct each COI's dimensional indicator were conducted, and only those variables with loadings above 0.50 were kept (see Table 1). Overall, the COI is based on 31 basic indictors. The factor analyses helped us to determine the underlying components (sub-dimensions) for each dimensional indicator and to determine their weights (see Step 5).

In order to construct the SCOI, however, due to the limited number of available basic indicators in the WVS, we only used EFA over a small number of variables relevant to our conceptual definition or what is generally defined as open-mindedness in the social-political psychology literature (see Table 2). Each principal component with an eigenvalue above 1.0 indicates the existence of an underlying dimension. This inspired the naming of dimensions which corresponds to general understandings of open-mindedness as a social psychological phenomenon. The four dimensions found through this analysis are: (1) general trust, (2) anti-authoritarianism, including Schwartz' anti-conformity orientation, and the preference of freedom over social order and security, (3) anti-elitism, and (4) the opposite of Schwartz' value of conservation, traditionalism and fatalism.

Step 5 Aggregation and Weighting: Since the number of basic indicators for constructing SCOI based on the WVS is limited, we had to follow a slightly different path for constructing SCOI compared to COI:

5.1. To construct the dimensional variables of SCOI, the basic variables loaded on each component (dimension) of the construct through EFA were aggregated by computing simple arithmetic means of those variables. In the next step, however, in order to aggregate these dimensional variables further into the integrative indicator of SCOI, we took a data-driven approach by performing an EFA (with a varimax rotation method) of the four dimensions to determine the weights. Two main components were found with a cumulative share of variance above 50% (see Table 3). Weights in this method are the product of the rotated component matrix (Table 4) in absolute values

[1] Moreover, Pearson correlations between critical and socio-cognitive open-mindedness were also increased by 2% due to imputation. The structural equation model used later in the validation process also requires imputation.

Table 3 Selected principal components with a cumulative share of explained variance above 50% for SCOI

Component no.	Initial eigen values	Rotation sums of squared loadings		
	Total	Total	% of variance	Cumulative %
1	1.373	1.291	*Var* 1 = 32.283	32.283
2	0.957	1.039	*Var* 2 = 25.981	58.264
3	0.869			
4	0.800			

Table 4 Rotated component matrix of the dimensional variables of socio-cognitive openness

Dimensional indicators of socio-cognitive openness (D_SCOI) ($r = 1, \ldots, 4$); S-scored	Components ($s = 1, 2$)	
	1	2
General trust [(V23 + V47 + V128)/3]	0.680	0.171
Anti-elitism [(V148 + V149)/2]	0.036	0.921
Anti-authoritarian [(V71 + V73 + V21)/3]	0.525	0.338
Indeterminist [(V89 + V122)/2]	0.743	−0.217

by the matrix of "the share of variance explained by selected components" (see Hlavsa 2010).

$$wj = \sum_{s}^{S} |r_{js}|.var_s$$

w_j is the weight of the dimensional variable, $|r_{js}|$ is the absolute value of the correlation coefficient from the rotated component matrix, $j = 1, \ldots, n$ $(n = 4)$ represents the dimensional variable and $s = 1, 2$ represents selected components (see Table 3 for each component's share of explained variance, Table 4 for correlations between components and the dimensional indicators, and Table 7 for the calculated weights).

Finally, socio-cognitive openness: $SCOI = \frac{\sum_j^n w_j.DSCOI_j}{\sum_j^n w_j}$; ($D\_SCOI_j$ is the dimensional indicator of SCOI, see Table 4).

5.2. In order to construct a COI, instead of simple arithmetic averages, we used EFA from the outset to determine the weights for each basic variable comprising each dimensional indicator, and then again another EFA to determine the weights for each dimensional indicator (see Tables 5 and 6).

$DI_{COI} = \left(\sum_{i=1}^{s} w_i * S_i\right)/(\sum w_i)$; where DI_{COI} is the dimensional indicator of COI; $i = 1,\ldots, s,$ indicates the number of basic indicators comprising a dimensional COI; w_i represents the weight of each of the basic indicators determined through EFA (see Step 5.1); and S represents the normalized (S-scored) basic indicators comprising the dimensional indicator. And then finally:

Table 5 Selected principal components with a cumulative share of explained variance above 50% for COI

Component no.	Initial eigen values	Rotation sums of squared loadings		
	Total	Total	% of variance	Cumulative %
1	1.941	1.722	*Var* 1 = 34.442	34.442
2	0.945	1.165	*Var* 2 = 23.293	57.735
3	0.812			
4	0.751			

Table 6 Rotated component matrix of the dimensional variables of COI

DI_{COI} or dimensional indicators of COI, developed through the first round of EFA, ($r = 1, \ldots, 5$)	Components ($s = 1, 2$)	
	1	2
Social openness	0.541	0.437
Cultural openness	0.688	0.364
Political openness	0.646	0.142
Economic openness	0.034	0.866
Environmental openness	0.733	−0.267

$$COI = \frac{\sum_j^n w_j \cdot DI_{COI\,j}}{\sum_j^n w_j}$$

Here, j = 1, …, n ($n = 5$) indicates the number of dimensional indictors for COI and w_j represents the weight for each dimensional indicator computed through the above EFA process.

However, we note that, alternatively, component/factor variables can be used instead of original variables to compose the CI, while being weighted based on their associated percentage of variance. However, the decision needs to be made as to what method should be adopted depending on the highest external validity of the CI resulting from the use of each method. In the case of our data, the aggregation method led to a more robust result.

The dimensional indicators with lower weights, due to their limited variance, can be concaved. This needs to be decided upon after considering the consequences for the (external) validity of the final CI. Some authors suggest formulas like this: concaved $S_i = S_i - 0.2\ exp\ (-2.\ S_i)$ then weights can be re-estimated (Luzzati and Gucciardi 2015).

Step 6 Disaggregation and Cross-Dimensional Discrepancy: Here the aim is to develop a complementary variable to the COI. The COI is an integrated social index, meaning it is a composite of composite indicators. Therefore, like any other composite index, it is created to acknowledge the multidimensionality of social reality. Recognizing the different dimensions of a social phenomenon is essential as it helps us to address its complexity. However, there seems to be a paradox in this process as we basically start by differentiating between dimensions, normally based on sophisticated conceptual

arguments, and then we end up with aggregating them all back into one totality or measure. Aggregation can be better justified when dimensions are of one nature (or in a geometrical sense, the vectors are within the same plane) but this is not often the case. This weakness can be addressed by: (1) describing the results, in a comparative manner, in terms of the aggregated indicator versus its dimensions at the same time and exploring their predictors separately; and/or (2) developing a complementary index that measures the level of discrepancy across dimensions. Such a measure can be used to penalize the cases/respondents with higher levels of inconsistency if especially the variation/discrepancy across dimensions indicates a lower quality of the composite measure, i.e. here, the lack of a comprehensive critical open-mindedness. Those cases which are inconsistent to a greater or lesser degree across the five different realms of open-mindedness can be considered less critically open-minded.

However, penalization can lead to a reduction in (co-)variances. Therefore, penalization is not always justified unless it helps improve validity. Hence, we suggest that instead of (or in addition to) penalization, an index of discrepancy across dimensions should be developed as a complementary indicator. A composite indicator functions like a measure of central tendency and therefore must be complemented by a measure of dispersion. Certainly very few people might be consistent in terms of their level of openness across different realms of open-mindedness; for example, one may be highly open-minded in the cultural realm but not as much in the economic one. We can think of different methods of measuring discrepancy; methods like measuring SD from the mean of scores across dimensional indicators, or SD from the COI's score across the dimensions (since COI is like a measure of central tendency), or deviation from maximum score across dimensions. We have performed all these three methods and found that in our case, the third method provides us with a measure with higher variance and broader range and therefore higher bivariate correlations (Wu and Wang 2014) and regression coefficients in our causal modellings (see DIS and DR in Table 7).

Table 7 Descriptive statistics concerning SCOI, COI and dimensional indicators, and cross-dimensional discrepancy

	Mean	SD	Min	Max	Skewness	Weights
COI	0.564	0.118	0.15	0.91	−0.167	
COI_{pen}	0.491	0.131	0.02	0.89	−0.201	
Social openness	0.632	0.186	0.00	1.00	−0.734	0.20
Cultural openness	0.557	0.178	0.00	1.00	−0.314	0.23
Political openness	0.532	0.179	0.00	1.00	−0.285	0.17
Economic openness	0.516	0.201	0.00	1.00	−0.246	0.20
Environmental openness	0.581	0.215	0.00	1.00	−0.200	0.20
DIS (discrepancy across dimensions)	0.994	0.445	0.12	2.72	0.746	
DR (discrepancy/penalty rate)	0.082	0.074	0.00	0.65	2.331	
Cognitive openness	0.626	0.149	0.14	1.00	−0.235	
General trust	0.622	0.289	0.00	1.00	−0.199	0.21
Anti-elitism	0.649	0.260	0.00	1.00	−0.452	0.29
Anti-authoritarian	0.533	0.277	0.00	1.00	−0.052	0.20
Indeterminism	0.663	0.211	0.00	1.00	−0.433	0.30

The discrepancy (DIS) for case i will be the variation or SD from the maximum value across dimensional indicators:

$DIS_i = \sum_{j=1}^{n} |S_j - Max\ (S_j)|$, or alternatively $\sqrt{\sum_{j=1}^{n} \left(S_j - Max\left(S_j\right)\right)^2}$

S represents the S-scored dimensional indicators, $j = 1 \ldots n$ indicates the number of dimensional indicators. The discrepancy or penalty rate (DR, conditioned to its positive impact on the validity of CI) is:

$DR_i = DIS_i^2/(n \times Max(DIS))$; n is the number of dimensional indicators, $Max(DIS)$. is the maximum value of variable DIS (Mazziotta and Pareto 2016);

COI_{pen} (COI after the penalization for cross dimensional discrepancy) for case i will be $CIpen_i = CI_i - DR_i$.

5 Results

With respect to our observation, penalization improved the external validity or predictability of our CIs only slightly. However, for the aforementioned reason, the cross-dimensional discrepancy rate remains crucial as a complementary measure. Paired samples T tests between every pair of dimensions show that the differences are statistically significant (with max $p = 0.008$). Tables 7 and 8 present more details of the open-mindedness composite indicators including the cross-dimensional discrepancy variable.

Based on the results, Australian society can be described, in general, as a moderately open-minded nation across all the domains. However, Australians in 2005 also appeared to be slightly less open-minded in domains of cross-cultural relations, politics and economy compared to the other two dimensions. On average, Australians score highest (mean = 0.632) in social open-mindedness (by trusting socially different groups, being sympathetic to gender and sexual equities and secularist values). Compared to other dimensions, Australians achieve the lowest score in economic open-mindedness (0.516)—which is about valuing social justice and supporting democratic regulation of the economy, as well as in the political dimension (0.532). There have been major assaults on democratic socialist and social democratic values/ideologies by the mainstream politics and media since the rise of neoliberalism in the late 1980s, as well as a general shift from the center left to the center right in Australian politics, which was ironically initiated by the labor party. These have caused mixed feelings about the association of social justice and economic freedom in Australia (Lambert 2000; Edwards 2009).

In terms of SCOI, Australian individuals are moderately open-minded, while on average are more indeterminist (less traditionalist) and less anti-authoritarian compared to the other two dimensions (i.e. general trust and anti-elitism). This may indicate that there must be a strong relationship between SCOI and critical open-mindedness (COI), since: (1) the social dimension of COI can be interpreted as the sociological version of indeterminism (by being open to changes to traditions) and (2) the economic and political dimensions of COI can be interpreted as the sociological equivalents of anti-authoritarian personality. Therefore, one may suggest that both types can be integrated into one index. This issue needs to be investigated by further analysis of the data. Moreover, we also need to examine if it is the SCOI that translates into, or influences, the sociological open-mindedness or the opposite. We recommend the use of a non-recursive path analysis and CFA to address these concerns (see Sect. 7).

Table 8 Bivariate Pearson correlations between COI, SCOI, dimensional indicators, and DIS

	General trust	Anti-elitism	Anti-authoritarian	Indeterminism	SCOI	Social openness	Cultural openness	Political openness	Environmental openness	Economic openness	COI	COIpen	DIS ≈
General trust	**1**	**0.106****	**0.177****	**0.175****	0.602**	**0.236****	**0.343****	**0.019**	**0.204****	**0.033**	0.286**	0.284**	−0.11**
Anti-elitism		**1**	**0.103****	**0.050**	0.600**	**0.123****	**0.185****	**0.028**	**0.059***	**0.000**	0.133**	0.125**	−0.02
Anti-authoritarian			**1**	**0.114****	0.548**	**0.304****	**0.350****	**0.182****	**0.241****	**0.238****	0.434**	0.412**	−0.09**
Indeterminism				**1**	0.576**	**0.243****	**0.189****	**0.035**	**0.060***	**0.161****	0.231**	0.231**	−0.10**
SCOI					1	0.378**	0.445**	0.105**	0.229**	0.173**	0.446**	0.433**	−0.13**
Social openness						**1**	**0.421****	**0.070****	**0.239****	**0.175****	0.634**	0.579**	**−0.04**
Cultural openness							**1**	**0.153****	**0.333****	**0.213****	0.720**	0.712**	**−0.27****
Political openness								**1**	**0.116****	**0.274****	0.469**	0.473**	**−0.21****
Environmental openness									**1**	**0.143****	0.621**	0.574**	**−0.07***
Economic openness										**1**	0.594**	0.615**	**−0.33****
COI											1	0.971**	**−0.30****
COIpen												1	−0.52**
DIS													1

* $p < 0.05$, ** $p < 0.01$, coefficients discussed in the text appear in boldface for ease of interpretation

Table 8 presents the Pearson correlations between COI, SCOI, DIS and dimensional indicators. COI has the highest correlation with cultural open-mindedness ($r \approx 0.72$) and the lowest with the political dimension ($r \approx 0.47$). All the correlations between the COI dimensions are statistically significant but not strong. The strongest is between the social and cultural dimensions and the weakest is between the social and political. Together with the fact that Australians are less open-minded in the economic and political realms compared to the socio-cultural and ecological domains, this may indicate a limitation on the society's capability to recognize the interdependence between the material and post-material aspects of social life.

The correlations between SCOI and its dimensions are quite close (between 0.55 and 0.60). The correlations between the dimensions of SCOI are weak, and in the case of the relation between anti-elitism and indeterminism it is statistically insignificant. The correlation between the sociological construct of critical open-mindedness and the social psychological construct of socio-cognitive openness is rather moderate ($r \approx 0.45$). Critical open-mindedness is associated with the anti-authoritarian dimension of socio-cognitive openness more strongly ($r \approx 0.43$) than with other dimensions. This confirms the established tendency in the literature to associate authoritarianism with closed-mindedness. The direction of causal influence however needs to be explored through a non-recursive structural equation model.

In terms of correlations between the dimensional variables of COI and of SCOI, both the political and economic open-mindedness show insignificant and/or very weak relations with SCOI and its dimensions. Stronger correlations happen to be between the social and cultural dimensions of COI, on the one hand, and general trust and anti-authoritarian dimensions of SCOI on the other hand. In general, the political and economic dimensions of COI show more independence from the cultural, the social and the environmental dimensions both in terms of internal relations and of relations with socio-cognitive openness. This is also confirmed through a CFA (see Sect. 6.3, Fig. 3). Moreover, the cross-dimensional discrepancy of COI (i.e. DIS) has a negative and statistically significant correlation with COI. This shows that the less a person is critically open-minded, the more he or she fails to consistently translate his/her openness across the five domains of life. The highest negative correlation is between DIS and economic open-mindedness, highlighting the autonomy of this dimension compared to others and its stronger impact on creating more consistency across the five domains. Those who are less economically open-minded tend to be more inconsistent across the five major realms.

6 Validity of COI and SCOI

In this section, we will discuss the validity of the composite indicators of open-mindedness.

6.1 Concurrent Validity

To establish concurrent validity we employ 'political party preference' as a criterion on which individuals, in the Australian context, are known to differ, and that is relevant to our notions of open-mindedness (Bryman 2012). The major political parties in 2005 Australia were the Liberal Party of Australia, the Australian Labor Party, The National Party of Australia (The Nationals), the Australian Greens, and the Australian Democrats. Liberals

and Nationals have formed a rather stable coalition for many years as they both are ideologically conservative. The Liberal party traditionally represents the interests of the business class and therefore is more economically conservative, whereas the Nationals traditionally represent the regional/rural Australia and are more socially conservative. The Labor party in Australia traditionally (and still in theory) represents the interests of working class, although it has practically moved to the right of center, in terms of economic policies, while maintaining its liberal social values. The Australian Democrats were active only for a few decades until 2015 when their party was deregistered. Representing the values of the urban middle classes, they adopted social liberal values, opposed economic rationalism and advocated for sustainability and direct democracy.

The Greens are further to the left (though not the far left) of the political spectrum among the major parties. They have adopted environmentalist and social democratic values, are opposed to neoliberal or conservative economic policies, and advocate for more social justice compared to the Australian Labor Party. Therefore, the major parties (and expectedly their supporters) can be sorted from the left to the right of the political spectrum, by almost anyone with a minimum knowledge of Australian politics: Greens, Democrats, Labor, Liberals and Nationals. Critical open-mindedness as defined here clearly corresponds with these criteria (political ideologies) very clearly; i.e. the highest open-mindedness should be shown by Greens' supporters and the lowest by the supporters of the coalition. Table 9 shows the results of ranking of the supporters of these parities in terms of COI which clearly matches our expectation. The ranking is done by using One-way ANOVA based on pairwise differences which turned out to be statically significant at $p < 0.000$ except for Labor versus Democrats, and Nationals versus Liberals (the assumption of the homogeneity of variances across groups is satisfied). Therefore, COI can be used to predict election behavior. The rankings in terms of the dimensional indicators of COI are also consistent across the groups.

6.2 External Validity

External validity is about the generalizability of findings to the broader population. It is therefore dependent on the adequacy and the heterogeneity of the sampling. KMO measures calculated through EFA in the process of constructing COI and SCOI are higher than the required minimum 0.60 (see Tables 1 and 2) and Bartlett's test of Sphericity rejects the null hypothesis endorsing the irreducibility of dimensions. This indicates the adequacy of sampling.

6.3 Construct (Convergent and Discriminant) Validity

Construct validity is about the operationalization process. "*Construct validity* refers to the degree to which inferences can legitimately be made from the theoretical constructs on which operationalizations within the study are based" (Mathison 2005, p. 82). To establish this validity, we have taken a multi-operationalist approach by: (1) comparing the results of a Two-way ANOVA of COI on education and gender with the results of a Two-way MANOVA of the COI's dimensions on education and gender; and (2) performing a CFA. The latter will help us to examine the fitness of our conceptual model (Dickes and Valentova 2012) which is based on the separation of the socio-cognitive and sociological open-mindedness, whereas the former can show us to what extent the construction of COI has improved the external validity of our measures compared to an alternative linear combination of dimensions by MANOVA.

Table 9 Ranking of the Australian political parties in terms of their means, concerning the composite and dimensional open-mindedness variables

General party preference (number of supporters)	Scio-cognitive openness	COI	COIpen	Social open-mindedness	Cultural open-mindedness	Political open-mindedness	Economic open-mindedness.	Environmental open-mindedness
Greens (n = 70)	1	1	1	1	1	1	1	1
Australian democrats (n = 30)	2	2	2	2	2	3	2	2
Labor party (n = 463)	3	3	3	3	3	2	3	3
Liberal party (n = 564)	5	4	4	4	4	5	5	4
National party (n = 49)	4	5	5	5	5	4	4	5

MANOVA creates a linear combination of dependent variables (i.e. here five dimensional indicators of COI) which can be considered as an alternative operationalization method and be compared with the results of an ANOVA analysis of the COI over gender and educational groups. The Two-way ANOVA results reveals that the assumption of homogeneity of variances across gender and educational groups is satisfied ($p = 0.268$) whereas according to Two-way MANOVA of dimensional indicators, this assumption is not satisfied ($p = 0.000$). Therefore, our method of operationalization proves to be more satisfactory compared to the alternative linear combination of dimensions in MANOVA. Moreover, ANOVA shows a stronger effect of gender and education on critical open-mindedness (with partial eta squared numbers of 1.7 and 12.2%, respectively, at $p < 0.001$). Women are slightly more critically open-minded compared to men. However, there is no interaction between gender and education, meaning that education increases critical open-mindedness but the gap between men and women does not close significantly (see Fig. 2). In contrast, MANOVA reveals a very low level of impact for education (partial eta squared of only 3.9%) for the linear combination of dimensions which appears to be substantially less realistic. The same validation story is the case with the SCOI we constructed here compared to the linear combination of its four dimensions through MANOVA.

Moreover, the outcomes of the CFA (see Fig. 3) reveal that the model closely corroborates the conceptual structure proposed by theory. The model-fit indices provide us with evidence that our model based on the separation of the social psychological (SCOI) from the sociological form of open-mindedness (COI) is acceptable: CMIN/DF is 2.874

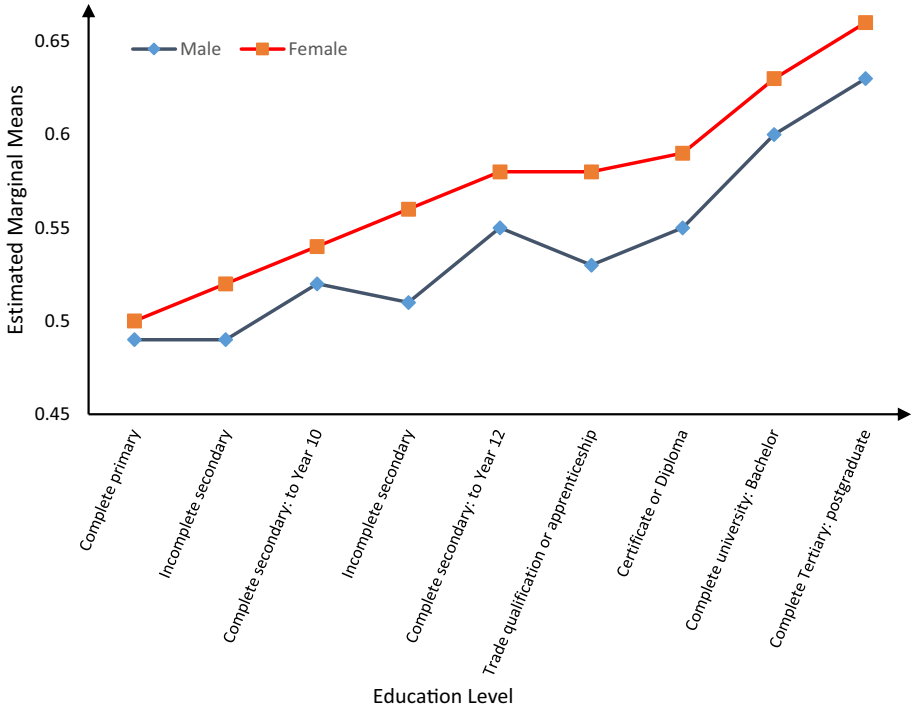

Fig. 2 Two-way ANOVA plot of differences between gender and educational attainment levels in terms of estimated marginal means of COI

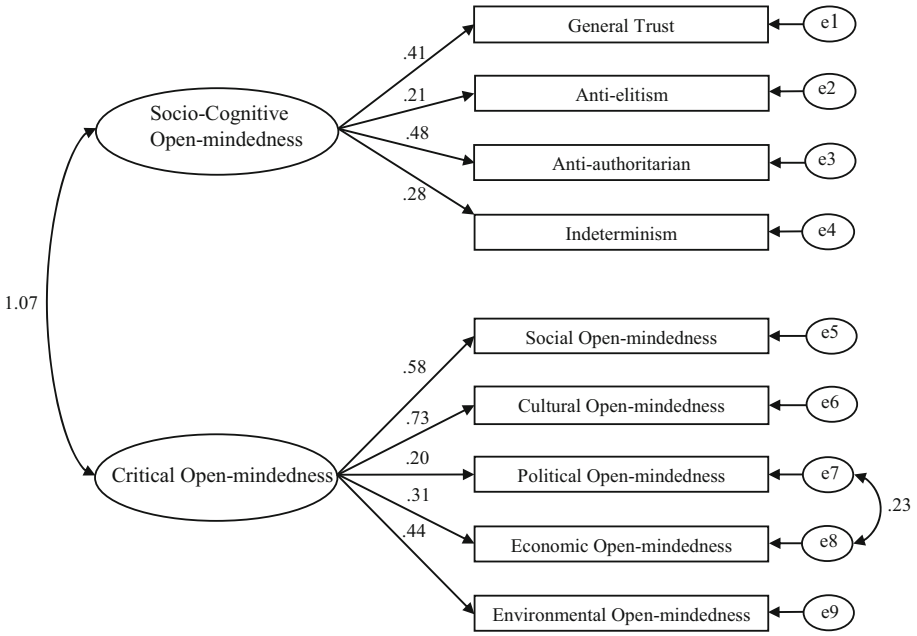

Fig. 3 Confirmatory factor analysis of dimensional indicators. *Source*: WVS Australia 2005

(>1 and <3), CFI = 0.943 ≈ 0.95, RMSEA = 0.0036 (<0.05), PCLOSE = 1.000 (>0.05), and χ^2 is 229.9 ($df = 80$, $p < 0.001$).

7 The Structural Independence of the Socio-Cognitive from the Critical Open-Mindedness Indicators

As we discussed before, open-mindedness has so far been theorized and empirically investigated in the literature through the development of single indices/scales containing a combination of sociological and social psychological attitude statements. We agree with Voas (2014) that, from a sociological point of view, social attitudes as more socially oriented "prescriptive and evaluative perspectives" are qualitatively different from cognitive predispositions (which have been at the center social psychologists attention). Thus, we can argue that it is possible to distinguish between decontextualized personal open-mindedness and the more socially contextualized open-mindedness. We have based our conceptual model on such a distinction. Accordingly, we have drawn upon WVS indicators to develop two separate types of open-mindedness. We have also shown that there is a rather moderate and positive correlation between the two. However, to establish our claim, we need to explore the direction of influence and examine the relative autonomy of these indicators in terms of their predictabilities based on a number of important independent variables. Hence, we have performed a non-recursive path analysis (using SPSS AMOS) of COI and SCOI, both as interrelated dependent variables. This will also help us to further validate our new integrative indices.

A number of independent variables are selected and constructed for the path analysis. No specific theory is used to justify the selection of these variables since the aim here is not

Table 10 Predictor variables developed through exploratory factor analysis with Promax rotation

Composite indicator	Question/variable	Code	Loadings
Left-wing activism factor	Political action: signing a petition	V96	0.704
	Political action: joining in boycotts	V97	0.683
	Political action: attending peaceful demonstrations	V98	0.677
	Political action recently done: joining in boycotts	V101	0.635
	Political left: self-perceived	V114	0.454
Confidence in civil society organizations factor	Confidence in women's organizations	V144	0.750
	Confidence in environmental organizations	V143	0.744
	Confidence in humanitarian organizations	V145	0.703
	Confidence in labor Unions	V135	0.515
System conformism factor	Confidence in government	V138	0.793
	Confidence in political parties	V139	0.747
	Confidence in major companies	V142	0.596
Socio-economic class status	Tasks performed at work are more cognitive than manual	V244	0.690
	The occupation of main wage earner ranked based on social status	V250	0.832
	Subjective class-self categorization	V252	0.818
	Income	V253	0.759

to explain open-mindedness or to test a theory. Rather, we have selected the independent variables after consulting the literature, both the sociological and social psychological studies. Socio-demographic variables of gender, education, ethnicity and social class have been found in the literature as the most influential factors (see Francis 1997; Ollivier 2008; de Regt et al. 2012). Moreover, we have conducted a factor analysis of more than 40 questions measuring demographic, subjective, and social features of the population which led to the recognition of 11 composite indictors in total, out of which we have kept four of the strongest predictors which maximized the model fitness (see Table 10). These four composite variables are the principle components with initial eigen values above 1. Survey items with factor loadings of less than 0.40 were removed. 'Ethnic social distance' is determined based on an adjusted single basic indictor related to a question about the ethnicity of individuals, with Anglo-Australians scored 1, European background scored 2, and Non-Western background, including Australian indigenous people, scored 3.

Figure 4 presents the non-recursive structural equation model tested through a path analysis. The model fits the data very well according to the achieved indices of CFI = 0.984 (>0.95), PCLOSE = 0.859 (>0.05), RMSEA = 0.04 (<0.05) and χ^2 is 52.9 ($df = 15$, $p < 0.001$). We have inductively searched for the strongest predictors of the two open-mindedness indices with the aim of achieving the best model fit. As shown in the Figure, the direction of influence is stronger and positive from COI to SCOI (with the direct impact of 0.48, $p = 0.000$) whereas the impact of SCOI on COI is weaker (−0.06) and statistically insignificant ($p = 0.141$). Among the strongest predictors of SCOI are the *Socio-economic Class Status*, *Ethnic Distance* from Anglo-Australian Background, Education, and Gender (see the list of predictor variables in Table 10). Whereas the most

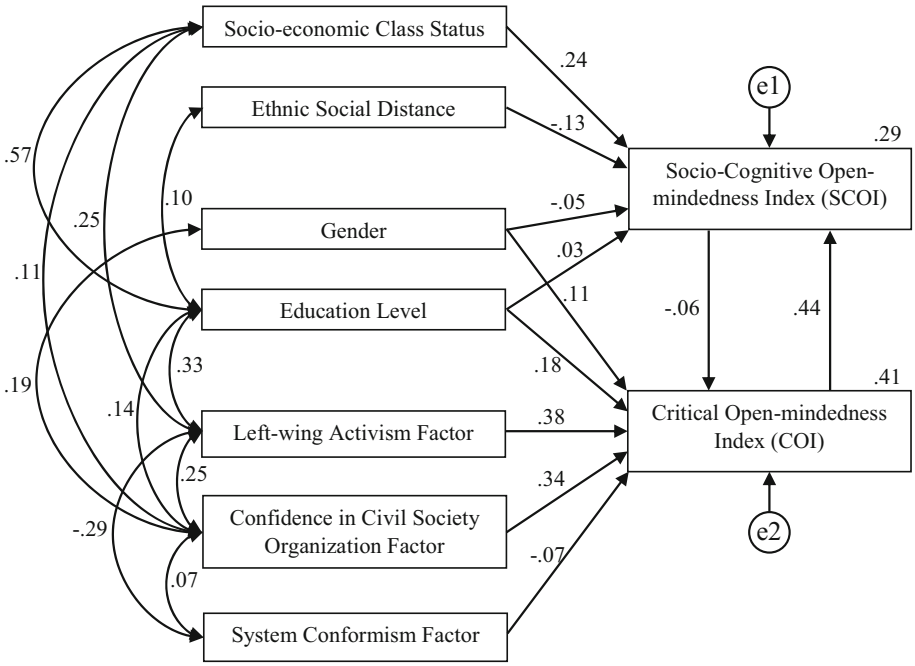

Fig. 4 Graphical output of a non-recursive model examining the causal relations between COI and SCOI with standardized weights/impacts and correlations

influential factors for COI are *Active Sympathy with Political Left*, *Confidence in Civil Society Organizations*, and *System Conformism*.

Clearly, the predictor variables explaining each type of open-mindedness are qualitatively different. While the factors influencing socio-cognitive openness are more socio-demographic and therefore more structural-objective, the factors that shape critical open-mindedness, except for gender, are political, ideological and experiential, such as involvement in activism and educational achievement (see also Vecchione et al. 2015). While being female is associated with a slight reduction in socio-cognitive openness (less trustful, more fatalistic and less anti-authoritarian) compared to men, it is associated with more critical openness (i.e. to be more culturally inclusive, environmentally caring, politically democrat etc.). We can therefore conclude that we are dealing here with two qualitatively different types of open-mindedness. More importantly, in contrast to a commonly held belief (among both experts and the public) that people's individual characters influence their social attitudes and behaviors, our model indicates that the opposite may be true. On the one hand, socio-cognitive openness is more determined by the class and the ethnic status of individuals, and to a lesser extent their gender. On the other hand, critical open-mindedness is determined by those factors that involve socio-political agency, education, and ideological positions (this supports studies like Kam 2006). While changes in the social status of individuals are less likely to happen over a short period of time, it is the changes in their social attitudes and value systems that are more likely to influence their authoritarianist-elitist personality or their level of general trust and fatalism.

8 Conclusion

The present research provides new ways of conceptualizing and operationalizing open-mindedness at the two different but interrelated social psychological and sociological levels. However, one of the limitations of this study is its dependence on secondary data from the WVS which is not originally designed to measure open-mindedness. Nevertheless, we found an adequate number of indicators to create our indices. The results of this study can help us devise more specialized and contextualized scales, beyond the limitations of WVS, to explore open-mindedness in the most recent social environments.

Through this study, we have made important contributions to the existing literature. First, we have developed the new construct of 'critical open-mindedness' as a more suitable sociological concept. Open-mindedness is not only an individual's intellectual virtue in accommodating new information that may weaken prior opinions and positions, but also a collective capacity to be socially inclusive in relation to the Other, and to be tolerant of differences and approving of diversity. It requires avoiding essentialist perceptions of out-groups based on gender, sexual orientation, class, race, ethnicity, and ideology. However, as we have argued, openness cannot be boundlessly or passively open. Such an idealistic openness will be self-contradictory, making it difficult for a person to take positions when needed in a context mired in disparities and inequalities. What defines the contours of open-mindedness is the capacity to be 'critical' of unfairness, injustices and discriminations.

Second, we developed two integrative social indices to separately measure the 'critical open-mindedness' and 'SCOI' constructs. The indices were developed through a pragmatic approach open to different techniques with the primary aim of maximizing the external and construct validities of the end results, i.e. maximizing the correlations between the CIs and their dimensional indicators (Wu and Wang 2014). A combination of theory and quantitative analyses of the data (from the 2005 WVS) was used to determine the components of each construct. In general, Australians appear to be moderately open-minded in all the five dimensions of COI and in terms of their socio-cognitive qualities as well. SCOI tends to be higher in average (0.626) than the critical form of open-mindedness (0.564; Table 7). Both the critical and socio-cognitive types of openness vary across their dimensions. The respondents are, however, more critically open-minded in the social, cultural and environmental realms than in the political and economic ones.

Being politically/economically open-minded is not strongly associated with open-mindedness in the other realms. This may indicate that the social, cultural, and ecological dimensions are more intimately connected and relevant to the day-to-day lived experiences of individuals, as they negotiate their lives. The political, and economic constructs, in contrast, operate at a more sophisticated realm of cognitive complexity, making it difficult for people to engage. However, as shown in our path analysis, by becoming politically active and adopting the values of the political left, one can develop a more comprehensive open mind.

Third, we have taken a step forward in addressing the most common concern or criticism around the multidimensional composite indicators by introducing a 'cross-dimensional discrepancy index' to the literature for the first time. The index functions like a measure of dispersion across the dimensions of a CI. We found that with an increase in critical open-mindedness, the inconsistency across its five components will decrease. All the five main realms of social life are interconnected and, ideally speaking, a critically open-minded individual/society is expected to be coherently open-minded in all these

areas. Considering the sophistication of economic and political realms, as explained before, it is reasonable to expect that open-minded people in these two areas will show lower levels of cross-dimensional discrepancy. This is confirmed by the findings in Table 8.

Fourth, we employed multiple methods of validation as a way to test the robustness of the CIs. A variety of techniques are used relevant to every type of validity. Despite the fact that we had to rely on the WVS questions which were not originally devised for measuring open-mindedness, the findings including the conceptual structure of CIs turned out to be reasonably valid.

And finally, our theoretical model was based on the differentiation between two types of open-mindedness, one operating at a more social psychological level (SCOI), (measuring general trust and tolerance, and skepticism toward traditional and hierarchical social orders) and the other at a more sociologically contextualized level (COI) consisting of attitudes towards concerned social and ecological issues which involve culturally, politically, and economically different *others*. Although no study has ever conceptually differentiated between the two levels, the related empirical research indicates a positive association between the two. For example, political and religious polarizations are presumed to be exacerbated by dogmatic, closed-minded thinking (Price et al. 2015). The direction of the relation between COI and SCOI is difficult to determine a priori, but worthy of exploration.

We observed that such a model can also be confirmed "data-wise" and the direction of influence is more from the sociological level towards the socio-cognitive level. Social psychological research tends to suggest that it is often the individual's socio-cognitive features such as closed prior impressions or notions that may provide them with ingrained capacity to prejudice and stereotype or even give rise to complex acts of exclusion (Kruglanski 2004; Miklikowska 2012). Through a causal model (inductive path analysis), however, we showed that the opposite could be the case. This explored direction is more justified when we realize that the 'cognitive openness' is mostly shaped by pre-existing socio-demographic factors whereas 'critical openness' is mainly determined by collective behaviors, experiences and ideological influences. It is not reasonable to combine these two types of human qualities into one scale since they function differently in terms of their underlying conceptual factor structures, and since they are explained differently in terms of their prior causes.

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References

Adorno, T. W. (1950). *The authoritarian personality*. New York: Harper & Row.

Altemeyer, B. (1981). *Right-wing authoritarianism*. Winnipeg: University of Manitoba Press.

Bell, D. (1960). *The end of ideology: On the exhaustion of political ideas in the fifties*. New York: Glencoe, Ill.: Free Press.

Boccuzzo, G., & Gianecchini, M. (2015). Measuring young graduates' job quality through a composite indicator. *Social Indicators Research, 122*(2), 453–478. doi:10.1007/s11205-014-0695-6.

Bryman, A. (2012). *Social Research Methods*. Oxford; New York: Oxford University Press.

Collins, J. (2013). Multiculturalism and immigrant integration in Australia. *Canadian Ethnic Studies, 45*(3), 133–149.

Coser, L. A. (1960). The open and closed mind by Milton Rokeach. Commentary, (August), 173–174.

de Regt, S., Smits, T., & Mortelmans, D. (2012). The relevance of class in shaping authoritarian attitudes: A cross-national perspective. *Research in Social Stratification and Mobility, 30*(3), 280–295. doi:10.1016/j.rssm.2012.03.001.

Dickes, P., & Valentova, M. (2012). Construction, validation and application of the measurement of social cohesion in 47 european countries and regions. *Social Indicators Research, 113*(3), 827–846. doi:10.1007/s11205-012-0116-7.

Edwards, K. (2009). Disenfranchised not 'deficient': How the (neoliberal) state disenfranchises young people. *Australian Journal of Social Issues, 44*(1), 23–37.

Etchezahar, E., & Brussino, S. (2013). Psychological perspectives in the study of authoritarianism. *Journal of Alternative Perspectives in the Social Sciences, 5*(3), 495–521.

Francis, R. G. (1960). Review: The open and closed mind. by Milton Rokeach. *Journal of Health and Human Behavior, 1*(4), 313–315. doi:10.2307/2948910.

Francis, L. J. (1997). Personal and social correlates of the 'closed mind' among 16 year old adolescents in England. *Educational Studies, 23*(3), 429–437. doi:10.1080/0305569970230308.

Haiman, F. S. (1964). A revised scale for the measurement of open-mindedness. *Speech Monographs, 31*(2), 97–102.

Hare, W. (2004a). Assessing one's own open-mindedness. *Philosophy Now, 47,* 26–28.

Hare, W. (2004b). Open-minded inquiry: A glossary of key concepts. http://www.criticalthinking.org/pages/open-minded-inquiry/579. Accessed 03 May 2015.

Hare, W. (2009). Socratic open-mindedness. *Paideusis, 18*(1), 5–16.

Healey, J. (2015). *Income and wealth inequality (issues in society v.382.)*. Thirroul: The Spinney Press.

Hlavsa, T. (2010). Selected approaches of variables weighting in frame of composite indicator analysis. *Agris On-line Papers in Economics and Informatics, 2*(4), 59–64.

Hoskins, B., & Mascherini, M. (2009). Measuring active citizenship through the development of a composite indicator. *Social Indicators Research, 90*(3), 459–488. doi:10.1007/s11205-008-9271-2.

Hosseini, S. A. H. (2010). Activist knowledge: interrogating the ideational landscape of social movements. *The International Journal of Interdisciplinary Social Sciences, 5*(5), 339–357.

Hosseini, S. A. H. (2012). Theorizing social ideations: beyond the divide between humanities and social sciences. *The International Journal of the Humanities, 9*(5), 53–68.

Kam, C. D. (2006). Political campaigns and open-minded thinking. *Journal of Politics, 68*(4), 931–945.

Kruglanski, A. W. (2004). *The psychology of closed mindedness (essays in social psychology)*. New York: Psychology Press.

Kruglanski, A. W., & Boyatzi, L. M. (2012). The psychology of closed and open mindedness, rationality, and democracy. *Critical Review, 24*(2), 217–232.

Lambert, R. (2000). Globalization and the erosion of class compromise in contemporary australia. *Politics and Society, 28*(1), 93–118.

Lambie, J. (2014). *How to be critically open-minded: A psychological and historical analysis*. New York: Palgrave Macmillan.

Luzzati, T., & Gucciardi, G. (2015). A non-simplistic approach to composite indicators and rankings: An illustration by comparing the sustainability of the eu countries. *Ecological Economics, 113,* 25–38. doi:10.1016/j.ecolecon.2015.02.018.

Maggino, F., & Zumbo, B. D. (2012). Measuring the quality of life and the construction of social indicators. In K. C. Land, A. C. Michalos, & M. J. Sirgy (Eds.), *Handbook of social indicators and quality of life research* (pp. 201–238). Dordrecht: Springer, Netherlands.

Markus, A. (2015). *Mapping social cohesion: The scanlon foundation surveys 2015*. Scanlon Foundation: Caulfield East; Victoria.

Mathison, S. (2005). Construct validity. In S. Mathison (Ed.), *Encyclopedia of evaluation* (p. 81). Thousand Oaks, CA: Sage Publications.

Mazziotta, M., & Pareto, A. (2016). On a generalized non-compensatory composite index for measuring socio-economic phenomena. *Social Indicators Research, 127*(3), 983–1003. doi:10.1007/s11205-015-0998-2.

McKay, F. H., Thomas, S. L., & Kneebone, S. (2012). 'It would be okay if they came through the proper channels': Community perceptions and attitudes toward asylum seekers in Australia. *Journal of Refugee Studies, 25*(1), 113–133. doi:10.1093/Jrs/Fer010.

Miklikowska, M. (2012). Psychological underpinnings of democracy: Empathy, authoritarianism, self-esteem, interpersonal trust, normative identity style, and openness to experience as predictors of support for democratic values. *Personality and Individual Differences, 53*(5), 603–608. doi:10.1016/j.paid.2012.04.032.

Nesdale, D., Robbe, M. D., & Van Oudenhoven, J. P. (2012). Intercultural effectiveness, authoritarianism, and ethnic prejudice. *Journal of Applied Social Psychology, 42*(5), 1173–1191. doi:10.1111/j.1559-1816.2011.00882.x.

Ollivier, M. (2008). Modes of openness to cultural diversity: humanist, populist, practical, and indifferent. *Poetics, 36*(2–3), 120–147. doi:10.1016/j.poetic.2008.02.005.

Ottati, V., Price, E. D., Wilson, C., & Sumaktoyo, N. (2015). When self-perceptions of expertise increase closed-minded cognition: the earned dogmatism effect. *Journal of Experimental Social Psychology, 61,* 131–138. doi:10.1016/j.jesp.2015.08.003.

Pilisuk, M. (1963). Anxiety, self-acceptance, and open-mindedness. *Journal of Clinical Psychology, 19*(4), 387–391. doi:10.1002/1097-4679(196310)19:4<387:AID-JCLP2270190402>3.0.CO;2-D.

Poynting, S., & Mason, V. (2008). The new integrationism, the state and islamophobia: Retreat from multiculturalism in Australia. *International Journal of Law Crime and Justice, 36*(4), 230–246.

Price, E., Ottati, V., Wilson, C., & Kim, S. (2015). Open-minded cognition. *Personality and Social Psychology Bulletin, 41*(11), 1488–1504. doi:10.1177/0146167215600528.

Ray, J. J. (1974). Balanced dogmatism scales. *Australian Journal of Psychology, 26*(1), 9–14.

Rokeach, M. (1951). "Narrow-mindedness" and personality. *Journal of Personality, 20*(2), 234–251. doi:10.1111/j.1467-6494.1951.tb01524.x.

Rokeach, M. (1960). *The open and closed mind: Investigations into the nature of belief systems and personality systems*. New York: Basic Books.

Schwartz, S. H. (1994). Are there universal aspects in the structure and contents of human values? *Journal of Social Issues, 50*(4), 19–45.

Vecchione, M., Schwartz, S. H., Caprara, G. V., Schoen, H., Cieciuch, J., Silvester, J., et al. (2015). Personal values and political activism: A cross-national study. *British Journal Psychology, 106*(1), 84–106. doi:10.1111/bjop.12067.

Voas, D. (2014). Towards a sociology of attitudes. *Sociological Research Online, 19*(1), 1–15. doi:10.5153/sro.3289.

Walsh, J. P. (2014). The marketization of multiculturalism: Neoliberal restructuring and cultural difference in Australia. *Ethnic and Racial Studies, 37*(2), 280–301. doi:10.1080/01419870.2012.720693.

Wilson, R. A. (1995). *Cartesian psychology and physical minds: Individualism and the sciences of the mind (Cambridge studies in philosophy)*. Cambridge; New York: Cambridge University Press.

Wu, W., & Wang, X. (2014). A novel approach to construct a composite indicator by maximizing its sum of squared correlations with sub-indicators. *Journal of Systems Science and Complexity, 28*(4), 925–937. doi:10.1007/s11424-014-3089-6.

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