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Measuring Identity Orientations for Understanding Preferences: A French Validation of the Aspects-of-Identity Questionnaire.*

Rémi Yin[†], Fabrice Étilé[‡]

February 27, 2019

Abstract

Concepts and results from the psychological research on identity may provide better understanding of the formation and dynamics of economic preferences. In this perspective, we propose a French translation of the *Aspect of Identity* (AIQ-IV) psychometric questionnaire, which measures the orientation of subjective identity along personal, relational, public, and collective dimensions (Cheek and Briggs 1982; Cheek and Briggs 2013). The psychometric validation study checks the internal consistency, as well as the four-dimensional factorial structure, of the questionnaire in a representative sample of French young adults (N=1,118). Exploratory and confirmatory factor analyses of item responses reveal a four-factor structure that corresponds to the personal, relational, public, and collective aspects of identity. Individual responses are found to be stable over time. In addition, while being correlated with similar psychological constructs (Self-esteem, Social Self-esteem, Self-consciousness), dimensions of the AIQ also predicts risk, time, and social preferences as measured by Likert scales and hypothetical choices.

Keywords: Individual identity; Aspects of identity; Economic preferences; Psychometric; French Validation

JEL Classification: B41, C38, D91

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1 Introduction

The idea that social identity can affect economic preferences and behaviour is now well accepted in economics.[1] Psychologists have argued that social identity is only one aspect of individual identity. Individuals also have a personal identity, which refers to attributes that distinguish them from other in-group persons Vignoles, Schwartz, and Luyckx (2011) and Turner (1999).

Why does the concept of *individual* identity matter for economists? Standard microeconomics is built on the implicit premise that individuals have a personal identity, as they are distinct from one another and can be re-identified over time (Davis 1995, 2013). Individuation is required to model human beings as autonomous decision-makers with an agency power over their existence and becoming. Re-identification over time is required to analyse inter-temporal decisions in a consequentialist perspective. Individuation and re-identification are thus logically necessary criteria for the ontological existence of individual economic agents, *i.e.* for them to be "the most basic entities (...) said to occupy the world" (Davis 1995, p. 35).[2]

The issues of individuation and re-identification are of practical concern for applied economists, because they point to important research questions: Are preferences stable properties identifying economic agents? Why should people be held accountable, or feel morally responsible, for their past actions? Why do we have self-regarding prudential concerns? How consistent ought our decisions to be over time?[3] These questions emphasise the essential link between individual identity on the one hand, and economic preferences on the other. Economic research on preference formation can therefore benefit from the availability of measures assessing individual variations in identity.[4] In this perspective, we here propose, translate, and validate a French version of the Aspects-of-Identity Questionnaire (AIQ-IV), which has been developed over the past forty years by Jonathan Cheeks and colleagues (Cheek and Briggs 1982; Cheek 1989; Cheek, Smith, and Tropp 2002; Cheek and

[1] Theoretical contributions include the seminal papers of Akerlof and Kranton (2000) and Bisin and Verdier (2001). For empirical studies, see inter alia Benjamin, Choi, and Strickland (2010), Chen and Li (2009), McLeish and Oxoby (2011), Guala, Mittone, and Ploner (2013), and Benjamin, Choi, and Fisher (2016).

[2] According to the Merriam-Webster dictionary, an ontology is either a "branch of metaphysics concerned with the nature and relations of being" or a "particular theory about the nature of being or the kind of things that have existence". The Cambridge dictionary defines ontology as "the part of philosophy that studies what it means to exist". Re-identification here has to be understood as "being the same person". Of course, individuals also have an institutional identity (civil status, fiscal number, etc.) that can re-identify them. But this does not fully inform us about the stability of personal characteristics, such as economic preferences.

[3] See the entry *"Personal Identity and Ethics"* in the Stanford Encyclopedia of Philosophy. Strotz (1956) already raised some of these issues in his pioneering analysis of inconsistency in dynamic decision problems. He implicitly related them to these issues of individuation and re-identification when he argued that "consumer sovereignty has no meaning in the context of the dynamic decision-making problem (because) the individual is an infinity of individuals, and the familiar problems of interpersonal utility comparisons are there to plague us" (p. 179). He also explained the lack of demand for pre-commitment – a strategy ensuring time consistency – to "the presence of risk and uncertainty, both as to future tastes and future opportunities" (p. 173) – i.e. the mere fact that one's future self is not necessarily qualitatively the same as one's present self.

[4] The expanding field of social identity studies may also exploit measures that cover dimensions of individual identity going beyond collective affiliations.

Briggs 2013; Cheek et al. 2014).[5]

The AIQ-IV provides a metric to measure the relative importance that individual grants to four categories of individual attributes when defining themselves: (1) attributes that make her feel unique, or personal identity; (2) attributes that matter for interpersonal relationships, or relational identity; (3) attributes that play a role in public settings, or public identity; and (4) attributes that point to collective affiliations, or collective identity.[6] The development of the Aspects-of-Identity Questionnaire started in 1979 with a selection of attributes from Sampson (1978), which distinguish between private and social aspects of identity. The AIQ was subsequently revised, and its fourth and last version finally distinguishes the personal, relational, public, and collective orientations of identity. Individuals rate the relative importance of thirty-five attribute-related items for their 'sense of who they are'on a 5-point Likert scale from "not at all important"(1) to "extremely important"(5). Ten items relate to personal identity, ten to relational identity, seven to public identity, and eight to collective identity. We applied back-and-forth translation to these items in order to produce a first French version of the questionnaire for the validation procedure (see Table 1 for the wording).

The validation procedure relies on statistical techniques specific to the field of psychometrics (Dickes et al. 1994). A pre-test of the translated version of the questionnaire was implemented to test its understandability. Additional items were also tested in order to improve its psychometric properties. We establish the internal validity of the questionnaire using data from a large sample of French young adults (N=1,118). An exploratory factor analysis is used to select and test the consistency of items relative to the underlying latent structure. It reveals four factors corresponding to the four aspects of identity (personal, relational, public, and collective). A confirmatory factor analysis validates the internal structure of the resulting questionnaire. Results from a test-retest survey in a smaller sample demonstrate the stability of responses over time. The scales corresponding to each of the four factors correlate as expected, with theoretically similar constructs (Self-esteem, Social Self-esteem, Self-consciousness). This demonstrates the external validity of the questionnaire. Last but not least, we display evidence that the four identity scales predict economic preferences measured with Likert scale and hypothetical choices, such as impulsiveness, patience, risk-taking, and pro-social behaviours. We thus propose a new tool to understand how economic preferences are formed, one that is valid in French populations and can also be used in international comparison studies. The validated questionnaire is displayed in Appendix A.

The remainder of the paper is organized as follows. Section 2 develops the conceptual back-

[5] We requested the authors' permission before starting this work.

[6] We believe that using the term "personal" to label the first dimension of identity might be confusing. Although we here adhere to the labels proposed by Cheek and Briggs (2013), personal identity literally refers to all attributes – from the most intimate and private to the most public and social – that we are able to list because we are persons, i.e. human beings with special mental properties such as self-consciousness.

ground of the scale and establishes the link between individual identity and economic preferences. Section 3 describes the empirical procedure. Section 4 presents the results. Section 5 examines the correlations between the four aspects of identity and economic preferences. Section 6 concludes with a brief research agenda.

[Table 1 about here.]

2 Conceptual background

In this section, we first present the four-dimensional model of identity that underlies the Aspects-of-Identity Questionnaire. We then argue that this psychometric tool may be used in empirical work to provide better understanding of the formation and dynamics of preferences.

2.1 Identity in psychology: a four-dimensional model.

Whatever their specific perspectives on the social basis of identity, psychologists agree with the view that an individual's own view on their identity – their answers to the question "Who I am?"– consists in at least two categories of attributes (Sedikides and Brewer 2015; Vignoles, Schwartz, and Luyckx 2011). The first category refers to a personal self that corresponds to the person's sense of unique identity being differentiated from others (Bakan 1966; Markus and Kitayama 1991; Loevinger 1976). This category may include life goals, moral values, emotions (*e.g.* visceral fears), and more generally, all attributes that differentiate the individual from others. This process of self-representation is based on interpersonal comparisons whose valence (positive or negative) can protect or strengthen the person (Brewer and Gardner 1996). The second category refers to social aspects of the self. A first distinction is made between a relational self that derives from interpersonal roles and relationships with significant others (e.g. family members, close friends or workmates), and a collective self that derives from membership of larger social categories. The relational self is associated with the fundamental need of caring, and feeling cared for, through strong and stable interpersonal relationships (Baumeister and Leary 1995; Sedikides and Brewer 2015).[7] Relational identity orientation depends on the importance that individuals place on reflective appreciations from others (Brewer and Gardner 1996). Collective identity only requires a sense of belonging to social groups defined by objective characteristics (gender, profession, etc.). Collective identity entails a depersonalised sense of self, "a shift towards the perception of self as an interchangeable exemplar of some social category and away from the perception of self as a unique

[7] Identity construction is partly based on the integration of significant others to one's own experience. For instance, the Inclusion of Other in the Self scale, which measures interpersonal closeness and intimacy with others, has been found to be correlated with the proportion of first-person plural pronouns used when dating partners wrote about their relationship (Agnew et al. 1998) and with feelings of interdependence measured with items such as *"when I feel close to someone, I typically think of their triumphs as if they are my own"* (Cross and Madson 1997).

person"(see Turner et al. 1987, p. 50). Collective identity orientation often depends on the status of in-group in intergroup comparisons. Cheek and Briggs (2013) add public identity as a third aspect of the social self. The public self reflects how people see themselves in public contexts, e.g. one's appearance, expressive qualities, or reputation. We thus end with a model of the self, made of four distinct dimensions that individuals use to define who they are in terms of their unique traits, interpersonal relationships, public conduct, and group memberships (Sedikides and Brewer 2015; Cheek and Briggs 2013).[8]

2.2 Individual identity and preferences

We now argue that the psychological approach to individual identity is of practical interest for economists. This approach can help relaxing the hypotheses that individual preferences are given and stable, while maintaining the assumptions of individuation and reidentification of agents. The key argument is that individuals develop a self-reflective activity to construct and maintain their identity through time.

In the neo-classical model of human behavior, individual identity boils down to stable and consistent economic preferences revealed through choices made under external constraints. Apparent variations in tastes can be accommodated for by the definition of stable meta-preferences over consumption goods and various forms of capital that accumulate as a consequence of past choices and investments (Stigler and Becker 1977). Individuals are defined by *what* they are in terms of preferences, endowments, and information (Davis 1995; Kirman and Teschl 2004). Ultimately, since Samuelson's reformulation of choices as revealed preferences, individuals are reduced to their observed choices. Two individuals making the same choices, in the same information environment and under the same constraints, are identified by the same preference order. A same individual making different choices in similar contexts at different points in time will not be re-identified as the same economic agent.[9] Hence, revealed preferences cannot be used as a robust criterion for

[8] A number of studies have found that identity orientations predict actual behaviours. For instance, people with strong personal identity orientation are more likely to search for jobs that may help enhance their sense of uniqueness, and they are more likely to choose individual athletic activities; people with strong public identity orientation, on the other hand, are more likely to look for jobs that enhance social status and to choose collective athletic activities (Leary, Wheeler, and Jenkins 1986). Ryder, Alden, and Paulhus (2000) reports that people with strong collective identity orientation are less likely to assimilate to a new culture, and value more their previous backgrounds and group memberships. Regarding health and well-being, people with strong public identity orientation tend to have lower self-esteem (Briggs and Cheek 1986) and are more likely to engage in risky behaviours such as tanning (Leary and Jones 1993) or binge-drinking (Hagger et al. 2007). Public identity oriented individuals are more likely to be motivated by social pressures, and they are more likely to try to meet others' expectations to create a positive impression (Wade and Brittan-Powell 2000). Individuals with strong personal identity are able to behave independently, are not influenced by others, and are confident about who they are. However, they may also be more likely to experience negative emotions resulting from failure to live up to personal standards compared to people who place more value on public aspects of identity (Donahue et al. 1993).

[9] The experimental literature has provided ample evidence that individuals can be time-inconsistent, which appears as a violation of the stability of preferences for the standard neoclassical theory. Individual risk preferences are also moderately stable over time (Schildberg-Hörisch 2018; Mata et al. 2018).

individuation and re-identification.

Davis (2013, 2009) argues that this failure is rooted in the project of neoclassical economists to remove subjectivity, consciousness, and therefore self-reflectivity from economics. Neo-classical economics is not interested in how each individual's experience of the world can shape *who* they are. The cost of eliminating subjectivity is that standard models have little to tell us about why and how individuals act on themselves and develop self-reflective cognitive activity to consciously change *who* they are and, by way of consequence, their preferences. For instance, the Grossman model of health demand assumes that an individual's subjectivity is fundamentally left unaltered by large health shocks (Grossman 1972). Yet experiencing serious chronic diseases unavoidably produces feelings of losing some aspects of oneself, not only in terms of physical or cognitive abilities, but also in terms of autonomy, life goals, and and eventually preferences.[10] In such circumstances, continuing one's existence requires significant psychological adjustments, where dynamics have been shown to depend on the quality of a self-reflective work that leads individuals to produce an account of themselves in their illness and in their own history.[11] The subjective experience of disruptive life shocks cannot be captured within a stable preference modeling framework. On the contrary, asking who the person is "tells not only what she is doing, but also how she evolved toward those choices and how imagination of future ways of being will make her follow a certain path" (Kirman and Teschl 2004, p. 63). Yet, how is re-identification possible when individuals change?

This question points to a conceptual tension between individuation and re-identification. Economists face the challenge of explaining why and how individuals may choose to develop certain preferences while maintaining a sense of persistence and continuity over time. One solution is to fully accept the fact that such decisions arise partly from self-reflective activities that are more intense and frequent at critical life stages: adolescence, leaving the family nest, entering the job market, forming a family, divorcing, losing one's parents, etc. The paradigm of 'motivated beliefs and reasoning', which has developed over the last twenty years through the studies of Roland Benabou and Jean Tirole, may provide an answer (Bénabou and Tirole 2016).[12] Motivated beliefs can serve two purposes: "affective (making oneself or one's future look better) and functional (helpful to achieve certain goals, internal or external)" (Bénabou and Tirole 2016, p. 143). However, while the production of motivated beliefs falls into the category of self-reflective activity, not every self-reflective thought

[10] "To fall suddenly sick implies having to reinvent everything, to grasp again one's own life, to reassess thoroughly the order of one's relationships, one's work, one's own pleasures", Zaoui (2010, p. 79). Some economic research has examined the stability of risk, time, and social preferences (see Golsteyn and Schildberg-Horisch 2017). We are not aware of studies that would have specifically examined the impact of the onset of a chronic illness on preferences.

[11] For instance, ruminating thoughts or attributing causalities to factors that one cannot change do not favor adaptation, while drawing positive lessons from the experience of disease is a factor of resilience (Helgeson and Zajdel 2017).

[12] This paradigm has not been developed in isolation, and is related to a large range of theoretical and empirical works. Interested readers will find many references in Bénabou and Tirole (2011, 2016). Of course behavioral economists have developed a number of other paradigms to account for violations of the standard axioms of neoclassical theory and achieving more empirical realism. For a critical review, see Berg and Gigerenzer (2010).

and reasoning is driven by the need to frame our future choices. As noted by Chater and Loewenstein (2016, p. 136), "even the broadest notions of utility that have been proposed, for example 'ego utility' or 'belief-based utility', fail to account for the enormous time, money and attentional resources that people devote to sense-making". Self-reflection is often oriented toward the past rather than toward the future. Individuals may seek help from a coach or advisor to implement new beliefs for achieving desirable long-term goals (*e.g.* losing weight or quitting smoking). They may also consult a psychotherapist to understand their past choices, to construct a consistent account of their lives, or to produce narratives of their personal history. Self-reflective reasonings are often adaptive response to changing environments (Chater and Loewenstein 2016, pp. 139–140).

Individuation must eventually be construed as a dynamic, self-reflective, and subjective process. Personal identity is constructed from the past, and its usefulness lies in its capacity to make sense of one's own history and to be the foundation for new life plans. The notion of self-reflection is necessary to solve the tension between individuation and re-identification. Individuation is possible when individuals are, to some extent, free to choose their preferences. Self-reflection helps them to construct meaningful links between their past and their present, in a consistent manner, despite changes in revealed preferences.

Finally, personal identity has to be seen as complementary to social aspects of identity. Economic agents are fundamentally embedded in social structures, which create the conditions of reflexivity by providing individuals with social views of themselves (*e.g.* "I" as a woman) and with scripts for interpreting their experiences (Davis 2013, 2009).[13] Individuals develop their identity under the influence of significant others, social affiliations, and institutions. Even personal identity cannot be understood without any reference to inter-personal relationships and to social settings (Singer 2004; McAdams and McLean 2013).

In light of these arguments, we expect the Aspects-of-Identity questionnaire to be a useful tool for investigating the empirical relationships between individual identity and preferences. The questionnaire is based on the four-dimensional representation of individual identity. It has therefore the ability to represent a continuum of identity aspects, from the most personal to the most collective. It addresses explicitly the subjectivity and self-reflection of individuals by asking them to rate the importance of attributes for their sense of who they are. It does not merely intend to elicit *what* people are, but involves their subjective responses to the question "who are you?".

[13]This does not mean that individual identity reduces to social identity à la Akerlof and Kranton (2000). Individuals may have preferences over social affiliations that impose them holding special roles and following prescriptions (Boulu-Reshef 2015; Davis 2006). If individuals were only produced by social structures, and their positions within these structures, then it would be difficult to find a criterion to individuate them (Luchini and Teschl 2005). Individuation requires that individuals be in capacity to choose their social affiliations. But one must necessarily assume the existence of an individual for this capacity to exist. A solution is to see this capacity as a specific 'capability' among other capabilities à la Sen (see also Livet 2006; Luchini and Teschl 2005).

3 Validation of a French version of the AIQ: method

The Aspects-of-Identity questionnaire intends to measure the relative importance that an individual grants to the four dimensions making one's own self: personal, relational, public, and collective identities. The most recent English version (AIQ-IV) includes 35 items. Item responses are used to construct four psychometric scales, one per identity dimension.

3.1 Translation and Back-Translation

The English version of AIQ-IV was submitted to two English-language specialists for a back-and-forth translation, as recommended by the International Test Commission (Brislin 1970; Hambleton, Merenda, and Spielberger 2005). We submitted the original version to the first translator, who provided a first French translation of the English AIQ-IV. Next, a second translator performed a back translation from French to English. These two translations were then compared to ensure both the fidelity to the original tool and the clarity of translated items. Table 1 lists the items and provides a comparison of the English and French versions.

3.2 Population

The questionnaire was administered in May 2017 through the Qualtrics platform to collect answers from a representative sample of the French population aged 18 to 35 years. Respondents to Qualtrics could answer the questionnaire either on their computer or mobile phone. They were paid 4.2€ for a completed questionnaire. The validation sample includes 1,118 individuals, with equal representation of men and women (18–25 years: 49.33%; Male: 50.12%).[14] The resulting data set has a subject/item ratio of $\frac{1{,}118}{35} = 32$, which is much larger than the ratio of at least 4 recommended by MacCallum et al. (1999).

3.3 Questionnaire

Participants were asked to consider how each item in Table 1 applies, and to rate their importance to their sense of who they are. Five response options are proposed, ranked on a semantic scale ranging from 1 – "*Pas du tout important pour l'idée que je me fais de moi-même*" – to 5 – "*Extrêmement important pour l'idée que je me fais de moi-même*".[15] At the beginning of the survey, we emphasised

[14] We had $N = 1,251$ participants. Because we wanted to ensure that subjects remained attentive throughout the questionnaire, we included, at a random position in the list of items, an attention control question asking the participant to tick the box "Peu important pour l'idée que je me fais de moi-même"[Not at all important]. If the subject answered this incorrectly, s/he was not able to finish the questionnaire and would not be paid. We have additionally excluded participants whose duration of survey completion was in the lowest decile of the observed distribution of durations, *i.e.* less than 5 minutes and 15 seconds. The application of these rules explains why the analysis sample eventually includes N=1,118 observations.

[15] The original instruction is "*Not important to my sense of who I am*" and "*Extremely important to my sense of who I am*".

that there were no right or wrong answers: participants were instructed to answer as truthfully and honestly as possible to what is true for them. We also stressed that the questionnaire was anonymous. The order of the presentation of the items was randomized to avoid order effects. The full questionnaire is in Appendix A.

4 Results

4.1 Exploratory Factor Analysis (EFA)

The EFA of the questionnaire is based on a principal component method (PCM with varimax rotation), which is applied to the polychoric correlation matrix of items. As expected, the eigenvalue analysis points to a four-factor solution.[16] The results of the PCM are summarized in Table B.1 in Appendix B.2. The Kaiser–Meyer–Olkin index for the complete model is equal to 0.93, which is evidence that the factorial solution is appropriate.[17] The four factors explain 67.36% of total variance. With a few exceptions, the items cluster as in the English AIQ-IV scale. However, some items tend to load on two factors. In particular, three items of the personal identity dimension also load on the relational dimension but at a lower magnitude (items 3, 5, and 9 in Table 1). As withdrawal of these items affects the internal consistency of the personal identity scale, we decided to keep them for the confirmatory study.[18] Some other items are more problematic, as both of their loadings are similar in magnitude. In particular, items 1 ("*Mes valeurs et mes principes*") and items 4 ("*Mes émotions et mes sentiments*") load positively on the personal factor and on the relational factor. Given the ambiguity of their contents, we decided to drop these items for the confirmatory factor analysis.[19] We also dropped items 27 ("*mon comportement social, comme par exemple, mes manières d'agir quand je rencontre des personnes*") and 32 ("*Mon sentiment d'appartenir à une communauté*"), as they both load on the public and collective dimensions of identity.[20]

4.2 Confirmatory Factor Analysis (CFA)

We performed a CFA to test the latent structure of the questionnaire emerging from the EFA after the withdrawal of items 1, 4, 8, 27, and 32. The CFA tests a latent factor model, where each item

[16] See the complete analysis in Appendix B.1.

[17] See Appendix B.2 for a definition.

[18] One can construct a scale for each of the four aspects of identity by adding responses to the corresponding items – see Appendix A.4. The internal consistency of a scale is measured in psychometric studies through Cronbach's alphas. The Cronbach's alpha is zero for independent items, and equals 1 for perfectly correlated items. A high Cronbach's alpha is evidence that item responses are driven by the same latent theoretical construct – see Appendix C.2.1 and Cronbach's alphas calculations in Appendix B.3, Table B.2.

[19] As these items refer to "private" attributes that may drive actions in situations of interpersonal relationships, the ambiguity of loading perhaps reflects a specificity of French/Catholic culture, whereby the frontier between personal identity and relational identity would be less clear than in Anglo-Saxon/Protestant cultures.

[20] Item 32 may be ambiguous, as it may relate to individuals' acceptance and belonging to a community in which individuals engage interpersonal relationships.

is "forced" to load on the one and only factor according to the theory. The model is estimated by maximum likelihood, where we allow for covariance between latent factors. The estimation results are presented in Figure B.2 of Appendix B.4.

We use several fit indices and rules-of-thumb conventional cut-off criteria to assess the goodness of fit of the hypothesized model. Each fit index relies on the level of correspondence between the estimated and empirical distributions of responses under the null hypothesis that these two distributions are the same. We use absolute fit indices, such as the root mean square error of approximation (RMSEA) and the root mean square residual (RMSR). We also use incremental fit indices, such as the comparative fit index (CFI) and the Tucker-Lewis index (TLI), which measure whether the estimated model provides a better fit than a baseline model that assumes all items are independent. The estimated values of the SRMR and the RMSEA are 0.047 and 0.049, respectively (the closer to zero, the better the fit). Both of these absolute fit indices are smaller than their respective cut-off values of 0.08 and 0.05, indicating a close fitting model (Hu and Bentler 1999). The values of the TLI and the CFI are 0.900 and 0.908, respectively. Values larger than 0.90 for these incremental fit indices are accepted as evidence of a good fit as compared to the baseline model (Bentler and Bonett 1980; Bentler 1990).

The adjustment we propose between the CFA model (derived from the EFA) and the observed data is good as judged by the combined values of the absolute and the incremental fit indices. This result offers additional evidence of the internal validity of the AIQ for measuring an individual identity construct structured around four factors (aspects of identity).

4.3 Test-Retest

By adding the responses to the items corresponding to each identity dimension, one obtains four sub-scales (see Appendix A.4). Test-retest reliabilities of the four sub-scales of the AIQ have been performed on Qualtrics during a two-week interval in May–June 2017 by re-interviewing $N = 124$ individuals who had participated in the original survey. Overall, the questionnaire has a good test-retest reliability in all of its sub-scales, with IntraClass Correlations (ICC) indices ranging from 0.60 to 0.82 at the individual level.[21] The public identity sub-scale has an excellent reliability (0.82 for individual measurement). The personal sub-scale has a very good individual ICC of 0.71. The relational and the collective sub-scale have good individual ICCs of 0.63 and 0.60, respectively.

4.4 Convergent Validity

We eventually assess the convergent validity of AIQ, *i.e.* how it is correlated with psychometric scales that relate to the same theoretical concepts. In a Qualtrics online survey (September 2017),

[21] See Appendix B.5 for definitions.

$N = 150$ participants were administered the French AIQ and other questionnaires that produce scales tapping into the domains of personal and public identity orientations and that had already been validated in French: the Rosenberg Self-Esteem scale (SE), the Social Self-Esteem scale (SSE), the Self-Consciousness scale (SC), and social anxiety (SA).[22] The SE scale is an indicator of acceptance, tolerance, and personal satisfaction with oneself while excluding feelings of superiority and perfection (Rosenberg 1965; Vallieres and Vallerand 1990).[23] The SSE scale measures self-esteem problems related to social interactions (Lawson, Marshall, and McGrath 1979; Gauthier et al. 1981). The SC scale identifies individual differences in public and private aspects of self-consciousness, whereby private self-consciousness refers to the tendency of an individual to think and pay particular attention to hidden and intimate aspects of the self like desires or emotions (Scheier and Carver 1985; Pelletier and Vallerand 1990). SA is a measure of stress in interpersonal/public relationships (Heeren et al. 2012; Heimberg et al. 1999). We expect Self-esteem and private Self-consciousness to be positively correlated with personal identity orientation, while Social Self-esteem, public Self-consciousness, and perhaps Social anxiety should be positively correlated with public identity.

[Table 2 about here.]

The correlations between the four aspects of identity and the four existing scales are displayed in Table 2. The results suggest a good convergent validity, as they confirm the hypothesized relationships between the AIQ sub-scales and the other validated scales: Self-Esteem is positively and significantly correlated with personal identity (.233); Social Self-Esteem and Social Anxiety are both positively correlated with public identity; and Social Self-Esteem is negatively related with social anxiety (-.357).[24] The subjects who score high on public or private self-consciousness have higher scores for personal, relational, and public identity. However, the magnitudes of correlations differ across the scales: public Self-Consciousness correlates significantly more strongly with public identity than with personal identity, and private Self-Consciousness correlates significantly more strongly with personal than with public identity orientation. This is predicted by Self-Consciousness Theory and confirmed by similar findings in U.S. subjects by Cheek and Briggs (1982). The pattern of correlations between the identity personal and public orientations and theoretically similar constructs provides additional evidence regarding the psychometric validity of our French adaptation of the AIQ.

[22] The participants were aged 18–35, with an equal balance between men and women.

[23] It measures the extent to which the individual considers himself to be a valuable person, to possess certain qualities, to not consider himself a failure, etc.

[24] All correlations are significant at the 1% level.

5 Identity and Economic Preferences

In the introduction, we argued that economists may benefit from measures of individual identity in order to better understand how preferences form and change. We now examine the extent to which the identity sub-scales predict preferences. In the initial validation survey, and in two subsequent surveys ($N_2 = 838$ and $N_3 = 1611$), participants answered the AIQ-IV questionnaire and rated from 0 to 10 how the following traits could apply to them: patience; impulsiveness; willingness to take risks in general; and willingness to take risks in the domains of health, consumption, and labour/schooling.[25] These preferences measures are extensively used in large-scale surveys, as they are easy to collect and predict a wide range of behaviours (Dohmen et al. 2005). Pro-social behaviours were also measured through hypothetical choices as in Falk et al. (2016). Reciprocity is assessed by asking participants how much they would be willing to give between 0 and 30 euros to a stranger who helped them in a travel situation. Participants were informed that the act of helping them cost the stranger about 20 euros. Altruism is assessed by asking subjects how much they would be willing to give to a charity if they were unexpectedly given 1000 euros.

Table 3 presents OLS results of preferences measures on the four identity dimensions. P-values ("stars") are adjusted for multiple hypotheses testing over preference measures. The regressions control for age, gender, and education. The estimated coefficients can be compared to the mean sample values of the dependent variable at the bottom of the table. The subjects who grant more importance to their public-identity attributes are significantly less patient ($-.17$ points, $p < .05$), and more willing to take risks in the domains of consumption and health. These results are consistent with evidence from social sciences that peer-pressure has a causal impact on risky behaviours (see *e.g.* Clark and Lohéac 2007). The results are also consistent with evidence in psychology regarding the positive correlation between public identity and risk-taking in consumption and health (see *e.g.* Luo 2005; Leary and Jones 1993). In contrast, personal identity is negatively correlated with risk-taking in health, as in Hagger et al. (2007), while it is positively correlated with risk-taking in labour/schooling. A strong personal identity might perhaps be a factor of economic success. It also worth noting that collective identity is positively correlated with impulsiveness (and less significantly to patience), and with risk-taking in general, in both health and in labour/schooling.

[Table 3 about here.]

We also uncover evidence of significant correlations between identity and altruism or reciprocity. First, relational-oriented individuals reciprocate more (+1.76€, i.e. +10.8% as compared to the mean, $p < 0.01$). This is particularly interesting since the measure of reciprocity here corresponds

[25] We used the Qualtrics online platform. In each survey, the participants were aged 18–35, and the sampling was equally balanced between men and women.

to a dyadic mutual exchange. Although relational identity refers to relationships with close and significant others, our result suggests that this construct may have broader implications for understanding the heterogeneity of behaviours in situations of small-group interactions. The last column also shows that collective identity is positively correlated with altruism: people with a one-standard deviation on the collective identity score have a +32.3% (54.49/168.75) increase in their donation to charities. This is consistent with the idea that individuals with a strong sense of collective identity are more likely to consider having big stakes in collective fate. We also note the negative relationship between public identity and pro-social behaviours. Individuals with strong public identity may contribute less to the extent that the pro-social decisions that are proposed are not publicly made, or that they do not need such behaviours to boost their self-esteem. It would be interesting to test how the four aspects of identity are directly related to social- and self-image motives in pro-social behaviors.

Overall, these correlations show significant relationships between aspects of identity and economic preferences, but much remains to be done to understand the specific correlations between a given aspect of identity and a given aspect of economic preference.

6 Conclusion

The main objective of this paper was to validate a French translation of the Aspect of Identity questionnaire while preserving its theoretical background. The validation process relied on an exploratory factor analysis, a confirmatory factor analysis, a test-retest, and a test of convergent validity. The scale was successfully validated after reformulation and re-arrangement of items. Aspects of identity correlates diversely with proxies of risk, time, and pro-social preferences. We think that this questionnaire can be a relevant tool in economic research. Thanks to its short duration, it is easy to administer during experiments, and short versions with a subset of items can be included in surveys. Further work should propose causal analyses of the relationships between aspects of identity and economic preferences. In addition, it would be worth examining how identity orientation can explain, or be affected by, economic and social behaviours and outcomes, in a world where the broad question of identity is crystallizing dangerous passions.

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Tables and Figures

Table 1: French translation of AIQ-IV items

Item	Original Version (AIQ-IV)	French Version
1 (Pe)	My personal values and moral standards	Mes valeurs et mes principes
2 (Pe)	My dreams and imagination	Mes rêves
3 (Pe)	My personal goals and hopes for the future	Mes projets et aspirations personnels pour l'avenir
4 (Pe)	My emotions and feelings	Mes émotions et mes sentiments
5 (Pe)	My thoughts and ideas	Mes pensées et mes idées
6 (Pe)	The ways I deal with my fears and anxieties	Mes peurs et mes angoisses
7 (Pe)	My feeling of being a unique person, being distinct from others	Mon sentiment d'être une personne unique, d'être différent des autres
8 (Pe)	Knowing that I continue to be essentially the same inside even though life involves many external changes	Savoir qu'au fond de moi, je resterai toujours la même personne
ii (Pe)	My self-knowledge, my ideas about what kind of person I really am	Ma connaissance de moi-même, mes idées sur qui je suis vraiment
10 (Pe)	My personal self-evaluation, the private opinion I have of myself	Mon auto-évaluation, l'opinion privée que j'ai de moi-même
11 (Pe)	My relationships with the people I feel close to	Mes relations avec les personnes dont je me sens proche
12 (Re)	My feeling of connectedness with those I am close to	Mon sentiment de proximité avec mes proches
13 (Re)	Being a good friend to those I really care about	Être un bon ami pour ceux à qui je tiens vraiment
14 (Re)	My commitment to being a concerned relationship partner	Mon engagement à être un conjoint attentionné
15 (Re)	Sharing significant experiences with my close friends	Partager des experiences marquantes avec des amis proches
16 (Re)	Having mutually satisfying personal relationships	Entretenir des relations personnelles mutuellement enrichissantes
17 (Re)	Connecting on an intimate level with another person	Atteindre un certain niveau d'intimite avec une autre personne
18 (Re)	Developing caring relationships with others	Développer des relations bienveillantes avec les autres
19 (Re)	My desire to understand the true thoughts and feelings of my best friend or romantic partner	Ma volonté de comprendre les pensées et sentiments profonds de mon/ma meilleur.e ami.e ou partenaire amoureux
20 (Re)	Having close bonds with other people	Créer des liens forts avec les autres
21 (Pu)	My popularity with other people	Ma popularité
22 (Pu)	The ways in which other people react to what I say and do	La façon dont les gens réagissent a mes propos ou mes actions
23 (Pu)	My physical appearance: my height, my weight, and the shape of my body	Mon apparence physique
24 (Pu)	My reputation, what others think of me	Ma réputation, ce que les autres pensent de moi
25 (Pu)	My attractiveness to other people	L'attrait que je peux susciter chez d'autres personnes
26 (Pu)	My gestures and mannerisms, the impression I make on others	Mes gestes et mes manières, l'impression que je donne aux autres
27 (Pu)	My social behavior, such as the way I act when meeting people	Mon comportement social, comme par exemple mes manières d'agir quand je rencontre des personnes
28 (Co)	Being a part of the many generations of my family	Faire partie d'une longue lignée familiale
29 (Co)	My race or ethnic background	Mes origines sociales et culturelles
30 (Co)	My religion	Ma religion
31 (Co)	Places where I live or where I was raised	Les lieux où j'ai habité et où j'ai grandi
32 (Co)	My feeling of belonging to my community	Mon sentiment d'appartenir à une communauté ou à un collectif
33 (Co)	My feeling of pride in my country, being proud to be a citizen	Mon sentiment de fierté envers mon pays, être fier d'être citoyen
34 (Co)	My commitments on political issues or my political activities	Mes convictions et engagements politiques
35 (Co)	My language, such as my regional accent or dialect or a second language that I know	Mon langage (ma langue natale, mon accent régional, un dialecte ou les langues que j'ai apprises)

Note: Original items of the Aspect of Identity Questionnaire (AIQ-IV) and their French translation. Every item has been translated back and forth by two independent native English speakers. Pe, Re, Pu and Co refer respectively to personal identity, relational identity, social identity and collective identity. The subject has to rate these items on a 5 point scales, from "not at all important to my sense of who I am" to "very important to my sense of who I am"

Table 2: Aspects of identity: correlations with other scales (convergent validity)

Variables	Personal	Relational	Public	Collective	SE	SSE	SA	SC-Pu
Personal Identity	1.000							
Relational Identity	**0.682**	1.000						
	(0.000)							
Public Identity	**0.447**	**0.465**	1.000					
	(0.000)	(0.000)						
Collective Identity	**0.419**	**0.365**	**0.415**	1.000				
	(0.000)	(0.000)	(0.000)					
SE: Self-esteem	**0.233**	0.097	-0.047	0.141	1.000			
	(0.004)	(0.237)	(0.568)	(0.086)				
SSE: Social self-esteem	0.050	0.068	**0.311**	0.090	**-0.233**	1.000		
	(0.540)	(0.410)	(0.000)	(0.272)	(0.004)			
SA: Social Anxiety	-0.098	-0.034	**0.151**	-0.073	**-0.357**	**0.508**	1.000	
	(0.239)	(0.680)	(0.067)	(0.381)	(0.000)	(0.000)		
SC-Pu: Public Self-consciousness	**0.217**	**0.250**	**0.577**	0.071	-0.020	**0.185**	**0.243**	1.000
	(0.008)	(0.002)	(0.000)	(0.394)	(0.811)	(0.024)	(0.003)	
SC-Priv: Private Self-consciousness	**0.309**	**0.220**	**0.255**	0.064	-0.076	**0.356**	**0.174**	**0.482**
	(0.000)	(0.007)	(0.002)	(0.434)	(0.356)	(0.000)	(0.035)	(0.000)

Notes: Significant correlations in bold. All scales have been standardized. All scales are validated in French. SE: Rosenberg Self-Esteem scale (Rosenberg 1965; Vallieres and Vallerand 1990) 1; SSE: Social Self-Esteem Inventory (Lawson, Marshall, and McGrath 1979; Gauthier et al. 1981); SA: social anxiety (Liebowitz/Heeren et al., 2012) , SC-Pu, SC-Priv: subscales of the Self-Consciousness Scale (Scheier and Carver 1985; Pelletier and Vallerand 1990). Personal, Relational, Public and Collective refers to the scores for personal identity, relational identity, social identity and collective identity respectively.

Table 3: Identity and Economic Preferences

VARIABLES	Patience	Impuls.	Risk (General)	Risk (Health)	Risk (Consum.)	Risk (Lab./Sch.)	Recipro.	Altruism
Personal (std)	0,10	0,06	0,10	-0,17**	-0,10	0,21***	0,20	-11,26
	(0,060)	(0,08)	(0,06)	(0,06)	(0,06)	(0,06)	(0,32)	(6,79)
Relational (std)	0,08	0,02	-0,04	-0,15*	0,10	-0,02	1,76***	-10,32
	(0,06)	(0,08)	(0,06)	(0,06)	(0,06)	(0,06)	(0,31)	(6,63)
Public (std)	-0,17**	0,14	-0,04	0,19***	0,17***	-0,11*	-1,01***	-18,88***
	(0,05)	(0,06)	(0,05)	(0,05)	(0,05)	(0,05)	(0,27)	(5,68)
Collective (std)	0,09*	0,29***	0,29***	0,12**	0,03*	0,21***	0,33**	54,49***
	(0,050)	(0,06)	(0,05)	(0,05)	(0,05)	(0,05)	(0,28)	(6,01)
Constant	6,05***	6,25***	5,49***	4,95***	5,59***	5,93***	15,14***	181,71***
	(0,090)	(0,12)	(0,09)	(0,09)	(0,09)	(0,09)	(0,48)	(10,18)
Mean Sample Value	6.45	6.15	5.71	4.99	5.75	6.05	16.26	168.75
Observations	3,693	2,082	3,693	3,693	3,693	3,693	1,611	1,611

Notes: Patience, Impulsivity (Impuls.), Willingness-to-take risks in general and in the domains of health, consumption (Consum.) and labour/schooling (Lab./Sch.) through Likert scales on 11 points from 0 to 10. Reciprocity (Recipro.) is measured through a question asking how much between 0 and 30 euros you would be willing to give to a stranger that helped you when helping you costs the stranger about 20 euros in total. Altruism is measured through the question: "How much you would be willing to donate to a good cause if you were given unexpectedly 1000 euros ". Personal, Relational, Public and Collective (std) are the standardized scores for personal identity, relational identity, public identity and collective identity respectively. The sample sizes vary from one regression to another, because not all preference measures were collected in all studies. OLS regressions controlling for Age-Sex-Education of subjects; Standard errors in parenthese; P-values are adjusted for Multiple Hypotheses Testing (Bonferroni) separately over each of the three families of outcomes: time preferences (patience and impulsiveness), risk preferences (General, health, consumption, lab./sch.) and pro-social behaviours (reciprocity and altruism); * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$;

A French Version of the AIQ-IV

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A.1 Instructions

Le questionnaire suivant porte sur la façon dont vous définissez votre identité, c'est-à-dire la manière dont vous définissez qui vous êtes. Ainsi, il ne comporte en soi ni bonnes ni mauvaises réponses. Nous vous demandons simplement de répondre aussi sincèrement et honnêtement que possible à ce qui est vrai pour vous. Le questionnaire vous propose différents éléments qui se rapportent à différents aspects de votre identité. Nous vous demandons d'évaluer dans quelle mesure chacun de ces éléments est important pour vous, pour l'idée que vous vous faites de vous-même. La durée de ce questionnaire est d'environ 10 minutes. Il y a cinq réponses possibles à chaque proposition, de «pas du tout important » à «extrêmement important» :

(1) «Pas du tout important pour l'idée que je me fais de moi-même »
(2) «Peu important pour l'idée que je me fais que j'ai de moi-même »
(3) «Moyennement important pour l'idée que je me fais de moi-même»
(4) «Très important pour l'idée que je me fais de moi-même»
(5) «Extrêmement important pour l'idée que je me fais de moi-même »

Ce questionnaire est confidentiel et anonyme. Essayez de donner la réponse qui se présente à vous naturellement, sans tenir compte des réponses que vous avez déjà données, même si vous avez l'impression que certaines propositions se répètent ou se contredisent. Nous ne nous intéressons pas aux réponses à des questions particulières, mais à vos réponses considérées toutes ensemble. Répondez aussi sincèrement et honnêtement que possible à ce qui est vrai pour vous. Il n'y a pas de bonne ou mauvaise réponse à donner.

[Note for the interviewer: the order of items should be randomized]

A.2 Items

1. _ Mes valeurs et mes principes
2. _ Mes rêves
3. _ Mes projets et aspirations personnels pour l'avenir
4. _ Mes émotions et mes sentiments
5. _ Mes pensées et mes idées
6. _ Mes peurs et mes angoisses

7. _ Mon sentiment d'être une personne unique, d'être différent.e des autres
8. _ Savoir qu'au fond de moi, je resterai toujours la même personne
9. _ Ma connaissance de moi-même, mes idées sur qui je suis vraiment
10. _ Mon auto-évaluation, l'opinion privée que j'ai de moi-même
11. _ Mes relations avec les personnes dont je me sens proche
12. _ Mon sentiment de proximité avec mes proches
13. _ Être un bon ami pour ceux à qui je tiens vraiment
14. _ Mon engagement à être un conjoint attentionné
15. _ Partager des expériences marquantes avec des amis proches
16. _ Entretenir des relations personnelles mutuellement enrichissantes
17. _ Atteindre un certain niveau d'intimité avec une autre personne
18. _ Développer des relations bienveillantes avec les autres
19. _ Ma volonté de comprendre les pensées et sentiments profonds de mon/ma meilleur.e ami.e ou partenaire amoureux
20. _ Créer des liens forts avec les autres
21. _ Ma popularité
22. _ La façon dont les gens réagissent à mes propos ou à mes actions
23. _ Mon apparence physique
24. _ Ma réputation, ce que les autres pensent de moi
25. _ L'attrait que je peux susciter chez d'autres personnes
26. _ Mes gestes et mes manières, l'impression que je donne aux autres
27. _ Mon comportement social, comme par exemple mes manières d'agir quand je rencontre des personnes
28. _ Faire partie d'une longue lignée familiale
29. _ Mes origines sociales et culturelles
30. _ Ma religion
31. _ Les lieux où j'ai habité et où j'ai grandi
32. _ Mon sentiment d'appartenir à une communauté ou à un collectif
33. _ Mon sentiment de fierté envers mon pays, être fier d'être citoyen
34. _ Mes convictions et engagements politiques
35. _ Mon langage (ma langue natale, mon accent régional, un dialecte ou les langues que j'ai apprises)

A.3 Additional items that were tested

i _ Mes compétences individuelles

ii _ Bien me connaître

iii _ Mes envie, désirs et besoins

iv _ Avoir le sentiment de ne pas dépendre des autres

v _ Mes réussites personnelles

vi _ L'intensité de mes relations avec mes proches

vii _ Mon entourage

viii _ Ressentir souvent un profond sentiment d'unité avec mes proches

ix _ Aimer faire plaisir aux autres autant que je le peux

x _ Me soucier du fait que les gens approuvent mes façons de faire

xi _ L'image que je renvoie aux autres

xii _ La culture dans laquelle j'ai grandi

a _ Attendre des autres qu'ils trouvent des solutions à mes problèmes

b _ Préférer la compagnie des autres aux moments de solitude

c _ Accepter mes rôles sociaux

d _ Mon rôle au sein de ma famille

A.4 Scoring for AIQ IV

One can use the item responses to construct the four following scales:

- (Pe): Personal Identity Orientation
- (Re): Relational Identity Orientation
- (Pb): Public Identity Orientation
- (Co): Collective Identity Orientation

Each of the scale scores is the sum of the answers (1-5) given to the corresponding items.

We offer three models which slightly differ in definition and use:

- Model 1 strictly corresponds to the American validation. It should be used for studies involving international comparisons.
- Model 2 is directly derived from Model 1, but some items were assessed as ambiguous for the French population. It is the model emerging from the validation study.
- Model 3 includes new items and has better psychometric properties than Model 2. However, it cannot be used for international comparisons.

Model 2 (Main text) - Scoring Numbering:

- **Pe**= 2 3 5 6 7 9 10
- **Re**= 11 12 13 14 15 16 17 18 19 20
- **Pb**= 21 22 23 24 25 26
- **Co**= 28 29 30 31 33 34 35

Model 1 (Cheek and Briggs 2013)

- **Pe**=1 2 3 4 5 6 7 8 9 10
- **Re**= 11 12 13 14 15 16 17 18 19 20
- **Pb**= 21 22 23 24 25 26 27
- **Co**= 28 29 30 31 32 33 34 35

Model 3 (cf. Appendix C.1)

- **Pe**= 2 6 7 9 10 iii iii iv v
- **Re**= 11 12 14 15 18 vi vii viii ix
- **Pb**= 21 22 24 25 26 x xi
- **Co**= 28 29 30 31 33 34 35 xii

Measuring Identity Orientations for Understanding Preferences:
A French Validation of the Aspects-of-Identity Questionnaire.

Rémi Yin and Fabrice Etilé, Paris School of Economics and INRA

Web based Appendix

B Main model (Model 2): technical details of the validation study

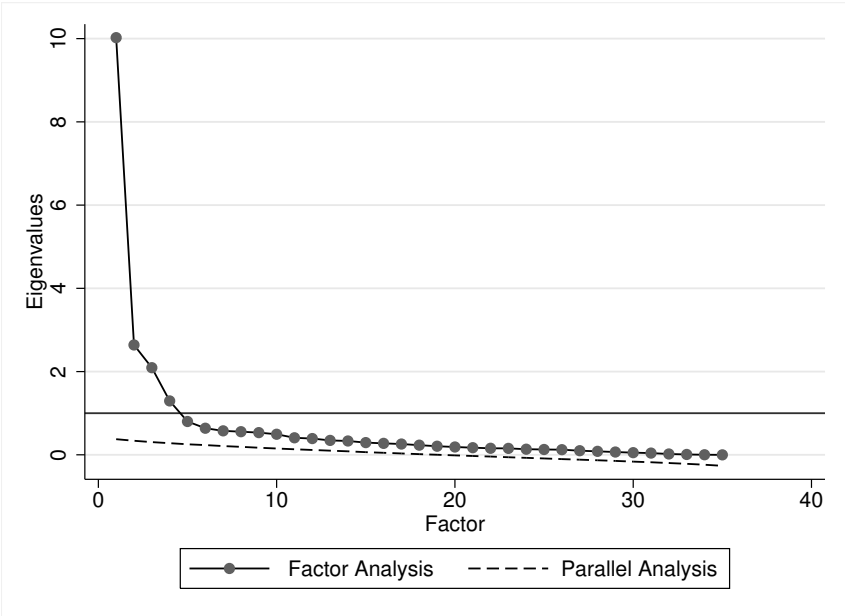
B.1 Eigenvalue analysis

We determine the number of factors to extract from the questionnaire data by using a principal component analysis (PCA) without constraint on the number of factors (also called principal components) and a visual examination of the scree plot of the eigenvalues of the correlation matrix of items. These eigenvalues represent a partitioning of the total variation accounted for by each factor.

The scree plot is a graph presenting the eigenvalues (y-axis) ranked in decreasing order of magnitude (x-axis). The shape of the resulting curve then determine the optimal number of factors that can be used to explain the underlying structure of the data. Two methods can be used to determine the optimal number of factors to extract: the Kaiser's rule, and a parallel analysis. The Kaiser's rule is based on the idea that, in a normed PCA, the average of the sum of the eigenvalues is equal to unity. A factor is therefore considered as relevant when its eigenvalue is higher than 1. In the parallel analysis, the curve of eigenvalues is compared to a curve that is constructed by using the eigenvalues of a random correlation matrix produced by a dataset with the same numbers of observations and variables as the original data. The stopping rule consists in retaining the K first factors whose eigenvalues are distinct from those produced by the parallel solution.

Figure B.1 shows the relevance of retaining a four factors solution according to both rules. Using the Kaiser rule, four factors are retained since the four first eigenvalues are larger than 1. The graph also displays the parallel curve of the average factorial solution arising the analysis of 50 simulated random datasets containing the same number of observations and variables. Again, we distinguish essentially four eigenvalues as, at the 5th eigenvalue, the estimated eigenvalue curve becomes parallel and close to the eigenvalue curve produced by the random datasets.

Figure B.1: Parallel Analysis for Factor Analysis of the Original Questionnaire



Note: This graph plots the eigenvalues of a PCA with unrestricted number of factors. Following Kaiser's rule, the intersection with the solid horizontal line $y = 1$ determines the optimal number of factors. Following the parallel analysis, the comparison with the dashed line determines the optimal number of factors.

B.2 Exploratory Factor Analysis (EFA)

The EFA applies a principal component decomposition to the polychoric correlation matrix of items in order to extract the factorial structure of the data. We ideally want to partition the set of items, so that each distinct subset identifies a unique latent factor. The correlations between items associated to a common latent factor must be fairly high but, at the same time, the items must not be redundant as we want each item to carry some specific information about the latent factor. This can be evaluated through statistics that are displayed in Table B.1. Each line corresponds to one item of the questionnaire (item labels are given in Appendix A), with the associated descriptive statistics in the second and third columns. The next columns provides two statistics: the KMO is the Kaiser-Meyer-Olkin index and the SMC is the Squared Multiple Correlation statistics. They both indicate whether an item is well correlated with some other items, thus indicating whether subsets of items are susceptible to capture common individual latent factors and eventually whether the data are suitable for factor analysis. Ideally, one would like to have items with high KMO and SMC.[26] Columns 6 to 9 display for each item the values of factor loading when they are higher than 0.3, as our rule of thumb was to keep items that have a loading of 0.3 on one factor at least. They reveal the correspondence between subsets of items and factors. In the last column, the uniqueness statistics measures the variance that is specific to an item. We prefer items with fairly large uniqueness, in order to avoid redundancy with other items.

For the rest of the analysis, we drop the items that load on two factors. These items are present in the American version of the questionnaire, but they appear not to correspond to a unique factor when applied to the French population. The items that we keep are displayed in bold in Table B.1.

[26]For instance, Kaiser (1974) proposes the following labels for the KMO values assessing the adequacy of an item: $KMO > 0.90$ - Marvelous; $0.80 \leq KMO \leq 0.89$ - Meritorious; $0.70 \leq KMO \leq 0.79$ - Middling; $0.60 \leq KMO \leq 0.69$ - Mediocre; $0.50 \leq KMO \leq 0.59$ - Miserable; $KMO < 0.49$ - Unacceptable.

Table B.1: Responses to the Aspect of Identity Questionnaire: Explanatory Factor Analysis

	Desc. Stats				Factors				
ITEM	Mean	Std	KMO	SMC	Collective	Relational	Personal	Public	Uniqueness
11 (Re)	3,99	0,91	0,96	0,56		**0,73**			0,40
12 (Re)	3,81	0,94	0,96	0,46		**0,60**			0,55
13 (Re)	4,11	0,91	0,96	0,50		**0,68**			0,47
14 (Re)	3,97	0,99	0,93	0,47		**0,57**			0,60
15 (Re)	3,77	0,95	0,96	0,46		**0,63**			0,54
16 (Re)	3,74	0,94	0,97	0,43		**0,56**			0,58
17 (Re)	3,73	0,99	0,95	0,37		**0,49**			0,68
18 (Re)	3,82	0,93	0,96	0,49		**0,62**			0,52
19 (Re)	3,99	0,97	0,95	0,52		**0,64**	0,31		0,50
20 (Re)	3,65	0,98	0,95	0,51		**0,65**			0,47
1 (Pe)	4,16	0,88	0,96	0,44		0,41	0,51		0,54
2 (Pe)	3,87	0,98	0,96	0,36			**0,51**		0,64
3 (Pe)	3,90	0,94	0,97	0,36		0,35	**0,45**		0,64
4 (Pe)	3,86	0,95	0,98	0,42		0,44	0,45		0,57
5 (Pe)	4,01	0,87	0,95	0,49		0,34	**0,64**		0,47
6 (Pe)	3,63	0,97	0,98	0,29			**0,41**		0,70
7 (Pe)	3,53	1,09	0,96	0,30			**0,44**		0,70
8 (Pe)	3,78	1,04	0,96	0,27		0,31	0,33		0,74
9 (Pe)	3,88	0,94	0,95	0,47		0,30	**0,63**		0,49
10 (Pe)	3,72	1,02	0,95	0,41			**0,59**		0,55
21 (Pu)	2,63	1,10	0,90	0,43				**0,67**	0,52
22 (Pu)	3,32	1,04	0,95	0,42				**0,61**	0,55
23 (Pu)	3,46	1,02	0,95	0,35				**0,52**	0,65
24 (Pu)	3,13	1,18	0,90	0,53				**0,77**	0,38
25 (Pu)	3,19	1,07	0,95	0,43				**0,67**	0,51
26 (Pu)	3,41	1,05	0,94	0,49				**0,66**	0,48
27 (Pu)	3,66	0,95	0,97	0,39		0,40		0,37	0,61
28 (Co)	2,65	1,23	0,89	0,37	**0,63**				0,57
29 (Co)	3,23	1,16	0,92	0,45	**0,67**				0,48
30 (Co)	2,30	1,38	0,83	0,33	**0,57**				0,65
31 (Co)	3,40	1,13	0,95	0,28	**0,45**				0,72
32 (Co)	3,00	1,11	0,95	0,36	0,41			0,36	0,63
33 (Co)	3,18	1,19	0,92	0,38	**0,63**				0,56
34 (Co)	2,85	1,21	0,92	0,20	**0,34**				0,84
35 (Co)	3,45	1,14	0,94	0,37	**0,55**				0,61

Notes: This table presents the results from a principal component analysis of the polychoric correlation matrix of items, using a Varimax rotation and a four factors solution. The PCA explain 67.36% of the variance. The items that we keep for the confirmatory analysis thereafter are displayed in bold. Pe, Re, Pu and Co label the factors that correspond respectively to the personal, relational, public and collective dimensions of identity.

B.3 Internal Consistency

Consider a scale whose score is obtained by adding answers to several items. This scale is said to be consistent (or reliable) when each item k is highly correlated with the other items and with the leave-one out score (obtained by adding item responses but leaving out k from the sum). This happens when individuals answers in a consistent way to all of the items. The Cronbach's alpha coefficient is used to evaluate the internal consistency of items that are supposed to measure the same psychometric construct. Its value tends to zero for independent items, and to one for perfectly correlated items. The commonly accepted rule for assessing internal consistency with Cronbach's alpha is as follows:

- $\alpha \geq 0.90$: Excellent

- $0.80 \leq \alpha \leq 0.90$: Good
- $0.70 \leq \alpha \leq 0.80$: Acceptable
- $0.60 \leq \alpha \leq 0.70$: Questionable
- $0.50 \leq \alpha \leq 0.60$: Poor
- $\alpha \leq .50$: Unacceptable

Table B.2 compares the Cronbach's alpha obtained in this validation study with those from a U.S. validation study by Cheek, Smith, and Tropp (2002). The internal consistency is rated as excellent for relational identity, good for personal and public identities and acceptable for collective identit. Interestingly, we find higher internal consistencies for the personal and collective identity dimensions as compared to the U.S. sample.

Table B.2: Comparison of Cronbach's alpha: U.S. vs. our French validation study

	US sample	Model 2
Personal	0.73	0.83
Relational	0.92	0.90
Public	0.84	0.83
Collective	0.72	0.79

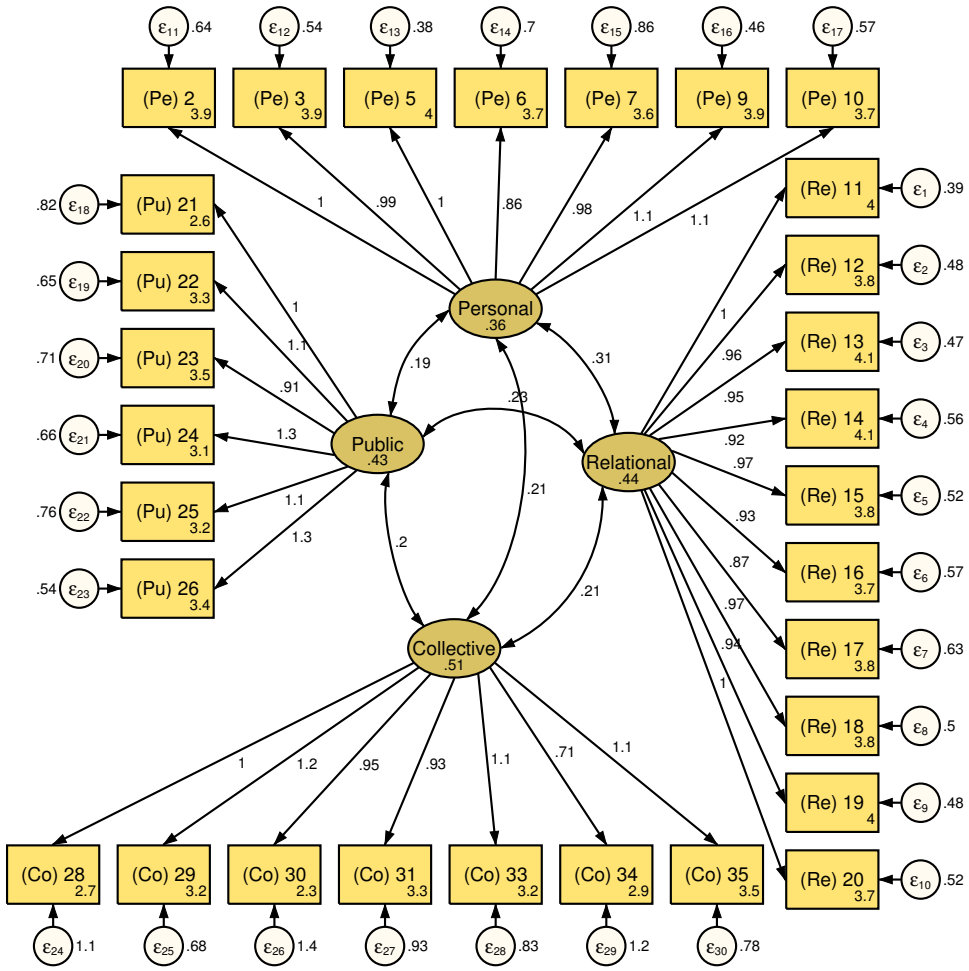
Note: This table displays the Cronbach's alphas of the four subsets of items corresponding to each identity dimension (in the first column), following the model emerging from the EFA. The second column displays the results for the item sets identified in the original US study by Cheek, Smith, and Tropp (2002). Personal, Relational, Public and Collective refers to personal identity, relational identity, social identity and collective identity respectively.

B.4 Confirmatory Factor Analysis (CFA)

The CFA aims at validating the structural equation model (SEM) based on the structure resulting from the EFA. The null hypothesis is that the four subsets of observed items have been generated by the four distinct latent factors that correspond to the four identity dimensions. Figure B.2 proposes a graphical representation of the latent factor model that we postulated after the EFA. It is a path diagram that depicts how the observed items and the latent factors are interrelated. The model is estimated by maximum likelihood, and the parameter values are shown on the graph (see the note below the figure). A population covariance matrix is then derived from the estimated model. This matrix is compared with the empirical covariance matrix fo the data. The CFA validates the hypothesised factorial structure of the data when the difference between the two covariance matrices is minimal according to some goodness-of-fit criterion.

To assess the goodness-of-fit of the structural equation model, several statistical indices with rules-of-thumb cut-off values are used. The first index is the χ^2 statistics. It corresponds to the likelihood ratio between the estimated and observed distribution under the null hypothesis that the observed covariance variance matrix S is similar to the matrix predicted by the model $\Sigma(\hat{\theta})$. A high χ^2 statistics thus suggests that the model poorly fits the observed data. However, many researchers caution the use of the χ^2 as a choice criteria, notably when the data tends to exhibit excess kurtosis, and also because the null hypothesis is very restrictive: it assumes that the model provides a perfect description of the reality. Hence, the probability of rejecting the null mechanically

Figure B.2: Structural equation model for the Confirmatory Factor Analysis



Note: Path diagram for the confirmatory factor analysis of the four-factor model resulting from the Exploratory Factor Analysis. Each structural equation takes the form $x_j = \lambda_{jk} f_j + \varepsilon_{jk}$, where f_j is a latent factor, x_j is an item and ε_{jk} an independent error term with mean zero. The rectangular boxes represent the French items of the AIQ-IV, with their labels and their estimated variances. The round boxes are the measurements errors in each item. The ellipses are the latent factors that are measured by the items (with the variances). The straight arrows link the items to a unique factor (with the estimated coefficients λ_{jk}, one coefficient being normalised to one for each factor). The curved lines shows the covariances between the latent factors.

increases with sample size, even if the discrepancy between the model and the data remains low (Bollen 1989; Kenny 2014). To overcome this inflation, we favour other statistics correcting for degrees of freedom. They are classified into absolute and incremental fit indices.

Absolute fit indices include the Root Mean Square Error of Approximation (RMSEA) and the Root Mean Square Residual (RMSR). The RMSEA is an index of the difference between the observed and the estimated covariance matrices, which is adjusted for the loss of degrees of freedom. It thus penalizes the model complexity, but it tends to over-reject the true model with a bias that decreases when the sample size increases (Hu and Bentler 1998). The RMSEA is currently the most popular measure of model fit. One advantage of the RMSEA lies in the possibility of constructing confidence intervals as the distribution of the statistics is known. A RMSEA below the cut-off of 0.05 or 0.06 indicates a good fit (MacCallum, Browne, and Sugawara 1996; Hu and Bentler 1999). In conjunction of the point estimate, a 95% confidence interval is generally reported for which the

upper limit should be less than 0.08.

The standardized root mean square of residual is the mean absolute value of the covariance residuals (Byrne 1998). It can broadly be interpreted as the euclidean distance between the estimated covariance matrix and the observed covariance. Hu and Bentler (1999) suggest that an adjustment is considered acceptable if the RMSR is less than .08.

Incremental fit indices measure the proportionate improvement in fit by comparing a model with a nested baseline model in which all the observed variables are restricted to be uncorrelated. The rationale for using these indices is that the researcher wants primarily make progresses in her understanding of the structure of the data. Incremental fit indexes include the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI). Both indices are based on a comparison of χ^2 statistics of a baseline model (*e.g.* one assuming independence between items) and the target model. They use slightly different adjustment for degrees-of-freedom, but both produces statistics lying between 0 and 1, where a value greater or equal to 0.9 indicates a good fit.

Table B.3 reports the statistics, which show that the model fit is satisfactory, as judged by the values of the absolute and incremental fit indices.

Table B.3: Structural equation model: goodness-of-fit statistics

Fit Indexes	Model 2
χ^2	1 534.11
SRMR	0.047
RMSEA	0.049
RMSEA [CI 90%]	[0.047 ; 0.052]
TLI	0.900
CFI	0.908

Note: This table displays the goodness-of-fit statistics resulting from the CFA of the structural equation model. We use the χ^2 statistics, the Square Root Mean Residual (SRMR), the Root Mean Square Error of Approximation (RMSEA) and its confidence interval, the Tucker-Lewis Index (TLI), and the Bentler's Comparative Fit Index (CFI).

B.5 Test-retest methodology

Test-retest analyses aims at testing the variation in measurements at different points in time. A reliable instrument should provide very similar measures of a stable psychological construct.

The intraclass correlation (ICC) is a widely used reliability index in test-retest analyses. Here, we use as ICC the single measurement, absolute agreement two-way mixed effect (Koo and Li 2016). We use a two-way mixed effect model rather than a two-way random effect model because repeated measurements are done on the same subjects or raters (they are considered as fixed effects). In addition, absolute agreement definition is used rather than consistency because measurements would be meaningless if there were no agreement between repeated measurements.[27] Cicchetti (1994) provides the following rule of thumb for interpretation of ICC agreement measures:

- $ICC < 0.40$: poor

[27] The analysis of the variance hence relies on the following model: $x_{it} = \mu + r_i + c_t + e_{it}$, where x_{ij} corresponds to the item response for individual i at time t, μ is the population mean, r_i the subject (rater) effect, c_t is the time effect, e_{it} the error term that is independent and normally distributed with mean 0 and variance σ_e^2

- $0.40 \leq ICC \leq 0.59$: fair
- $0.60 \leq ICC \leq 0.74$: good
- $ICC \geq 0.75$: excellent

Table B.4 shows that the Model 2 has a reliable structure, with good to excellent ICC.

Table B.4: ICC of total scores on Aspect of Identity

	Model 2	
	Individual ICC	Average ICC
Personal	0.71	0.83
Relational	0.63	0.77
Public	0.82	0.90
Collective	0.60	0.75

Note: Intraclass correlations (ICC) are calculated using a two-way mixed effects model for both individual and average with absolute agreement measurements. Personal, Relational, Public and Collective stands for the scores of personal identity, relational identity, social identity and collective identity respectively.

C Development of new items and model comparisons

To further improve the psychometric properties of the questionnaire, we came up with new items corresponding to the latent factors that we wanted to elicit. A total of 101 new items were first proposed to improve the original questionnaire. A pre-test on a sample of 400 individuals (aged 18-35 years-old, 50:50 males/females) and a careful examination of the questionnaire responses led us to drop a certain number of items. The items that were dropped were either redundant or they were affected by a social desirability bias or an emotional valence that could contaminate the original questionnaire. We eventually kept only 16 of these items. Table C.1 describes them with their English translation and the dimension into which they are expected to tap.

Table C.1: Additional items

Item	New items - proposal	English Translation	Dimension
i	Mes compétences individuelles	My individual abilities	Personal
ii	Bien me connaître	Knowing myself well	Personal
iii	Mes envies, désirs et besoins	My wishes, desires and needs	Personal
iv	Avoir le sentiment de ne pas dépendre des autres	The feeling of not being dependent of others	Personal
v	Mes réussites personnelles	My personal achievements	Personal
vi	L'intensité de mes relations avec mes proches	The intensity of my relationships with my close ones	Relational
a	Attendre des autres qu'ils trouvent des solutions a mes problèmes	Waiting for others to find solutions to my problems	Relational
vii	Mon entourage	My entourage	Relational
viii	Ressentir souvent un profond sentiment d'unité avec mes proches	Often feeling a deep sense of unity with my loved ones	Relational
ix	Aimer faire plaisir aux autres autant que je le peux	Enjoy pleasing others as much as I can	Relational
b	Préférer la compagnie des autres aux moments de solitude	Prefer the company of others to moments of loneliness	Relational
x	Me soucier du fait que les gens approuvent mes façons de faire	Caring that people approve of my ways of doing things	Public
xi	L'image que je renvoie aux autres	The image I send back to others	Public
c	Accepter mes rôles sociaux	Accepting social roles	Public
xii	La culture dans laquelle j'ai grandi	The culture in which I grew up	Collective
d	Mon rôle au sein de ma famille	My role in my family	Collective

Note: Additional items for the Aspect of Identity Questionnaire (AIQ-IV) and their counterpart English translation. Personal, Relational, Public and Collective refers to personal identity, relational identity, social identity and collective identity respectively.

In this section, we perform an independent validation exercise for the whole set of items. This will produce Model 3. In addition, we also validate the set of items originally present in the American questionnaire. This produces Model 1. We compare Models 1 and 3 to Model 2, which is discussed in the main text and in Section B.

C.1 Exploratory Factor Analysis: definition of Model 3

Table C.2 displays the results of the EFA that exploits the whole set of items. Items KMO indexes range from 0.87 to 0.98 and the KMO index of the complete model equals 0.94, which shows that the data are suitable for factor analysis. As for Model 2, our rule of thumb is to exclude items that do not have a loading of a least 0.3 on one and only one factor. This leads to drop 32, 1, 3, 4, 8,

and 27. We thus obtain Model 3.

Table C.2: Exploratory Factor Analysis with new items

	Des. Stats				Factors				
	Mean	Std	KMO	SMC	Collective	Relational	Public	Personal	Uniqueness
28	2,65	1,23	0,93	0,46	**0,64**				0,54
29	3,23	1,16	0,95	0,52	**0,69**				0,46
30	2,30	1,38	0,87	0,41	**0,60**				0,63
31	3,40	1,13	0,95	0,39	**0,51**				0,65
32	3,00	1,11	0,97	0,45	0,42		0,39		0,59
33	3,18	1,19	0,95	0,45	**0,63**				0,54
34	2,85	1,21	0,93	0,25	**0,32**				0,83
35	3,45	1,14	0,96	0,44	**0,57**				0,58
xii*	3,39	1,14	0,94	0,58	**0,69**				0,42
d*	3,78	1,04	0,97	0,50	0,32	0,53			0,58
1	4,16	0,88	0,97	0,47		0,38		0,52	0,56
2	3,87	0,98	0,97	0,42				**0,55**	0,62
3	3,90	0,94	0,97	0,48		0,32		0,55	0,56
4	3,86	0,95	0,98	0,47		0,45		0,43	0,57
5	4,01	0,87	0,97	0,59		0,32		0,68	0,42
6	3,63	0,97	0,97	0,39				**0,44**	0,65
7	3,53	1,09	0,97	0,38				**0,49**	0,65
8	3,78	1,04	0,97	0,36		0,39		0,34	0,68
9	3,88	0,94	0,96	0,55				**0,65**	0,49
10	3,72	1,02	0,97	0,49				**0,61**	0,54
i*	3,86	0,91	0,97	0,52				**0,64**	0,49
ii*	3,94	0,94	0,95	0,56				**0,63**	0,50
iii*	3,92	0,93	0,96	0,52				**0,59**	0,53
iv*	3,93	1,03	0,97	0,36				**0,48**	0,69
v*	4,01	0,94	0,97	0,52				**0,58**	0,54
21	2,63	1,10	0,94	0,46			**0,63**		0,56
22	3,32	1,04	0,97	0,49			**0,65**		0,51
23	3,46	1,02	0,96	0,42			0,49	0,30	0,63
24	3,13	1,18	0,93	0,63			**0,79**		0,36
25	3,19	1,07	0,96	0,48			**0,67**		0,51
26	3,41	1,05	0,96	0,60			**0,69**		0,43
27	3,66	0,95	0,97	0,47		0,37	0,38	0,33	0,59
x*	3,09	1,13	0,96	0,46			**0,65**		0,53
xi*	3,38	1,10	0,93	0,66			**0,78**		0,35
c*	3,30	1,09	0,97	0,38	0,35		0,32		0,68
11	3,99	0,91	0,97	0,64		**0,73**			0,38
12	3,81	0,94	0,97	0,57		**0,65**			0,47
13*	4,11	0,91	0,97	0,56		0,64		0,31	0,47
14	3,97	0,99	0,95	0,53		**0,57**			0,58
15	3,77	0,95	0,97	0,52		**0,58**			0,56
16	3,74	0,94	0,98	0,44		0,49		0,30	0,61
17	3,73	0,99	0,96	0,43		0,44		0,31	0,67
18	3,82	0,93	0,97	0,53		**0,60**			0,52
19	3,99	0,97	0,97	0,57		0,59		0,40	0,49
20	3,65	0,98	0,97	0,56		0,61	0,31		0,49
vi*	3,85	0,95	0,97	0,64		**0,72**			0,38
a*	2,36	1,14	0,90	0,34	0,32		0,43		0,70
vii*	4,05	0,95	0,97	0,57		**0,68**			0,46
viii*	3,66	1,00	0,98	0,55		**0,64**			0,46
ix*	3,94	0,93	0,98	0,47		**0,61**			0,55
b*	3,16	1,14	0,96	0,35		0,38	0,34		0,70

Note: This table displays results from the principal component analysis (PCA) using Polychoric correlations. The analysis is performed by using a Varimax rotation and we specified a four factors solution. Variables that are used later in the confirmatory analysis are displayed in bold. Personal, Relational, Public, and Collective stands for the factor of personal identity, relational identity, public identity and collective identity respectively. The PCA, using these new items, explains 62.33% of the variance.

C.2 Models comparison

We now compare Model 3 to the "American" model (Model 1: the English version of the AIQ) and the "French" model (Model 2: our validation). The three models are defined as follows:

C.2.1 Comparison of Cronbach's Alphas

We compute for the three models the Cronbach's alphas, in order to compare the internal consistency of the item sets associated to each factor/identity dimensions. The results are displayed in Table **??**. The internal consistencies of the item sets for personal identity and public identity are good for the three models. The internal consistency is excellent for relational identity. For collective identity, internal consistency is good in Models 1 and 3, and acceptable in Model 2.

Table C.3: Comparison of Cronbach's alpha for the competing models

	Model 1	Model 2	Model 3
Personal	0.87	0.83	0.89
Relational	0.90	0.90	0.90
Public	0.84	0.83	0.86
Collective	0.81	0.79	0.82

Note: This table compares the Cronbach's alphas of sets of items for the three models. Personal, Relational, Public and Collective refers to personal identity, relational identity, social identity and collective identity respectively.

C.2.2 Comparison of the Fit Indices from the Confirmatory Factor Analyses

For each model, a CFA is performed by estimating a structural equation model with unconstrained covariance between latent factors. Figure C.1 represents the path diagram for Model 1. Model 2 is represented by Figure B.2 in Appendix B. Figure C.2 represents the path diagram for Model 3.

Table C.4 compares the goodness-of-fit statistics of the models (see Section B.4). First, Model 2 has a better fit than Model 1: the SRMR and the RMSEA of Model 1 are smaller. Moreover, both absolute fit indexes are smaller than the cut-off values of 0.05 for the RMSEA and 0.08 for the SRMR indicating an acceptable model fit. The incremental fit indices also confirms that Model 2 fits the data better than Model 1 as the TLI and CFI values are higher (0.900 and 0.908 respectively for Model 2, as against 0.87 and 0.879 respectively for Model 1).

These estimated adjustment quality measures are satisfactory, as judged by the combined values of the RMSEA and the SRMR, even though the TLI and CFI do not exceed the conventional cut-offs for Model 1. Comparing Model 3 with Models 1 and 2, both the SRMR and the RMSEA are lower than those of Model 1 and Model 2. In addition, the RMSEA is statistically lower than 0.5, and Model 3 improves the CFI and TLI with the new values being equal to 0.928 and 0.923 respectively.

C.2.3 Comparison of the models' Intraclass correlations

Table C.5 compares the intraclass correlations of the four subscales produced by the three competing models. Overall, the individual ICC of the four subscales are roughly similar for the three models. However, the personal subscale of Model 3 has a much lower individual ICC. Based on the

Table C.4: Fit indices from the confirmatory factor analysis for the two competing models

Fit Indexes	Model 1	Model 2	Model 3
χ^2	2375.28	1 534.11	2 576.85
SRMR	0.058	0.047	0.041
RMSEA	0.053	0.049	0.043
RMSEA [CI 90%]	[0.051 ; 0.055]	[0.047 ; 0.052]	[0.041 ; 0.044]
TLI	0.870	0.900	0.923
CFI	0.879	0.908	0.928
CD	1,00	1,00	1,00

Note: This table displays the fit indices resulting from the CFA of the three models. We use the χ^2 statistics, the Square Root Mean Residual (SRMR), the Root Mean Square Error of Approximation (RMSEA) and its confidence interval, the Tucker-Lewis Index (TLI), the Bentler's Comparative Fit Index (CFI) and the coefficient of determination (CD).

classification of Cicchetti (1994), Model 2 seems to have the most reliable structure in test-retest analysis.

Table C.5: ICC of total scores on Aspect of Identity

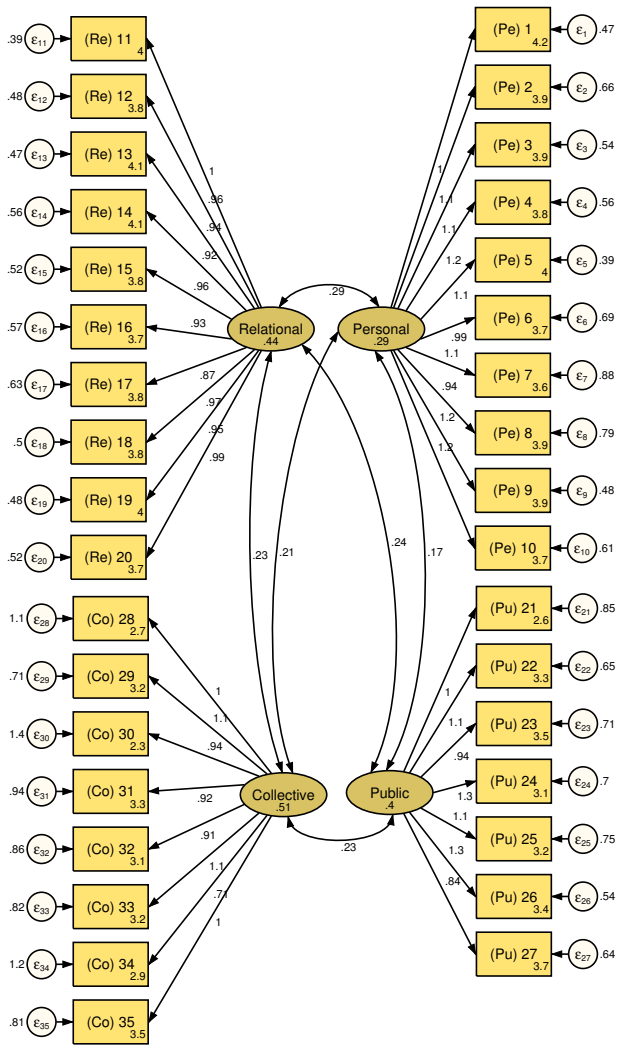
	Model 1		Model 2		Model 3	
	Individual ICC	Average ICC	Individual ICC	Average ICC	Individual ICC	Average ICC
Personal	0.71	0.83	0.71	0.83	0.62	0.77
Relational	0.62	0.77	0.63	0.77	0.59	0.74
Public	0.80	0.89	0.82	0.90	0.83	0.91
Collective	0.57	0.73	0.60	0.75	0.61	0.75

Note: Intraclass correlations (ICC) are calculated using a two-way mixed effects model for both individual and average with absolute agreement measurements. Personal, Relational, Public and Collective stands for the scores of personal identity, relational identity, social identity and collective identity respectively.

C.2.4 Conclusion of the Model Comparisons

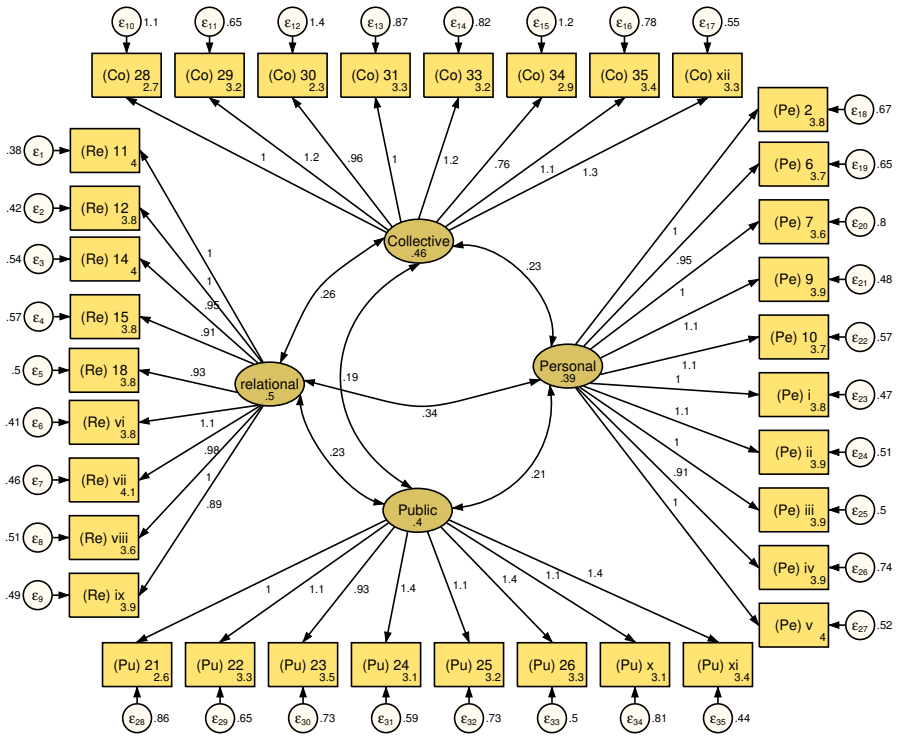
Based on the comparison of the confirmatory analysis, we conclude that Model 2 is more appropriate than Model 1 for subsequent administration of the questionnaire in a French population. Model 3 has better goodness-of-fit statistics. However, Model 2 performs slightly better in the test-retest procedure. In addition to this technical approach, it is worth emphasising that the relevance and the meaning of the items that we added in Model 3 should still be discussed. In particular, one has to be cautious in the use of this amended scale since it is a preliminary work. However, we are confident in the potential improvements that can be done to the AIQ-IV to strengthen its psychometric properties.

Figure C.1: Structural equation model: Model 1 - Cheek and Briggs (2013)



Note: Path diagram for the confirmatory factor analysis of the four-factor model resulting from the Exploratory Factor Analysis. Each structural equation takes the form $x_j = \lambda_{jk} f_j + \varepsilon_{jk}$, where f_j is a latent factor, x_j is an item and ε_{jk} an independent error term with mean zero. The rectangular boxes represent the French items of the AIQ-IV, with their labels and their estimated variances. The round boxes are the measurements errors in each item. The ellipses are the latent factors that are measured by the items (with the variances). The straight arrows link the items to a unique factor (with the estimated coefficients λ_{jk}, one coefficient being normalised to one for each factor). The curved lines shows the covariances between the latent factors.

Figure C.2: Structural equation model: Model 3 - new items



Note: Path diagram for the confirmatory factor analysis of the four-factor model resulting from the Exploratory Factor Analysis. Each structural equation takes the form $x_j = \lambda_{jk} f_j + \varepsilon_{jk}$, where f_j is a latent factor, x_j is an item and ε_{jk} an independent error term with mean zero. The rectangular boxes represent the French items of the AIQ-IV, with their labels and their estimated variances. The round boxes are the measurements errors in each item. The ellipses are the latent factors that are measured by the items (with the variances). The straight arrows link the items to a unique factor (with the estimated coefficients λ_{jk}, one coefficient being normalised to one for each factor). The curved lines shows the covariances between the latent factors.

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