

# Stability of Personality Traits over Time: The case of Rural India

Arnaud Natal<sup>\*</sup> & Christophe J. Nordman<sup>†</sup>

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## Abstract

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<sup>\*</sup>Univ. Bordeaux, CNRS, GREThA, UMR 5113, F-33600 PESSAC, FRANCE - [arnaud.natal@u-bordeaux.fr](mailto:arnaud.natal@u-bordeaux.fr)  
<sup>†</sup>IRD, UMR LEDa-DIAL, IFP - [nordman@dial.prd](mailto:nordman@dial.prd)

# 1 Introduction

Since more than a decade, there has been increasing interest in psychology in economics literature, especially through personality traits and cognitive skills (PT&CS). The relevance of such analysis in economics is well documented. Hanushek and Woessmann (2008) show that cognitive skills are correlated with individual earnings, distribution of income and economic growth (and other factors such as well-functioning economic institutions –although enter into growth and may well have stronger effects, may also amplify the effects of cognitive skills). Regarding personality traits, Borghans, Duckworth, Heckman, and ter Weel (2008) examine, for instance, the relevance of this in economics. They show that psychological variables are a good predictor of socioeconomic success and especially on the labour market<sup>1</sup>. Institutions, such as World Bank, collect more and more data<sup>2</sup> on PT&CS because it enables a better understanding of skill requirements in the labour market, backward linkages between skills acquisitions and educational achievement, personality, and social background, and forward linkages between skills acquisitions and living standards, reductions in inequality and poverty, social inclusion, and economic growth (Valerio, Sanchez Puerta, Pierre, Rajadel, & Monroy Taborda, 2014).

**Definition** Used in similar studies, personality traits and cognitive skills measure two distinct skills. Cognitive skills represent the mental processes involved in the acquisition of knowledge, manipulation of information, and reasoning that include the domains of perception, memory, learning, attention, decision-making, and language abilities (Kiely, 2014) while personality is the dynamic organisation within the individual of those psychophysical systems that determine his characteristic behaviour and thought (Allport, 1961). The Big-5 model constitutes the main personality trait taxonomy<sup>3</sup>. It identifies five dimensions of personality: emotional stability –ES– (capacity to experience negative emotions); extraversion –EX– (capacity to experience positive emotions, the tendency to seek stimulation and company from others); open-

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<sup>1</sup>For further details see Almlund, Duckworth, Heckman, and Kautz (2011).

<sup>2</sup>As stated by Laajaj and Macours (2019), the World Bank alone spent 1 billion USD a year for data on PT&CS.

<sup>3</sup>Among the theories of personality, the traits can be defined as thought, emotion and habitual patterns of behaviour (Kassin, 2003).

ness to experience –OP– (capacity to be creative and unstructured); agreeableness –AG– (perceptions of others that are caring, compassionate, and altruistic); conscientiousness –CO– (capacity to display self-discipline, act dutifully, and strive for achievement against measures or outside expectations).

**Exogeneity of personality traits and cognitive skills** The exogeneity of PT&CS is well assumed because of stability over time while there is no consensus in psychology (Ardelt, 2000; Deary, 2014).

For personality traits, according to Costa and McCrae (1997); McCrae et al. (2000) it remains stable, in part, because it is a genetic predisposition that, by definition, cannot be changed over life. Many economists follow this path and the majority of them assume stability over time after the age of 25 (Cobb-Clark & Schurer, 2012) and others verify this stability (Cobb-Clark & Tan, 2011). However, the stability refutes sociological and psychological literature which interesting in the influence of childhood and adulthood socialisation on personality (Moen, Elder Jr., & Lüscher, 1995; Mortimer & Simmons, 1978). Ardel (2000) state that “personality can change over the course of a person’s life, particularly if age at first measurement is low or over 50, if the retest interval is large, if individual personality aspects rather than the overall personality are considered [...].” However, analysis of stability do not provide sufficient information on change in the social environment and Ardel (2000) suggests to analyse personality before and after “unexpected, drastic changes in people’s social environments”. Indeed, such changes can imply a change in the individual personality to adapt to the new environment that they did not select.

Big-5 taxonomy not universal Gurven, von Rueden, Massenkoff, Kaplan, and Vie (2013)

## 2 Data

Our empirical analysis is based on NEEMESIS-1 & NEEMESIS-2 (Networks, Employment, dEbt, Mobilities and Skills in India Survey) surveys carried out respectively in 2016-17, and 2020-21 ([Nordman, Guérin, Michiels, Natal, & Venkatasubramanian, 2019](#); [Nordman et al., 2017](#)). These surveys are the second and third waves of a longitudinal data collection project<sup>4</sup> start in 2010 with RUME (RUral Microfinance and Employment survey) project in ten villages of Tamil Nadu. Located in the Cuddalore and Villupuram districts, a mostly agricultural area, economies benefits from the proximity of two large industrial towns (Neyveli and Cuddalore) and a regional business center (Panruti).

RUME randomly selected 405 households using stratified sample framework based on three dimensions: proximity to small towns (Panruti, Villupuram and Cuddalore), an agro-ecological criterion, and caste affiliation. Thus, half of villages have irrigated land (the other half is dry) and within villages, half of the sample was selected from the mostly upper and middle caste part of the village (Ur) while the other half from the Colony part, where dalits (the ex-untouchables) mainly live. NEEMESIS-1 recovered 388 households (4.19% attrition rate) and randomly selected 104 news households (for a total of 492 households) from these 10 villages, based on the same method. NEEMESIS-2 recovered 485 households (1.42% attrition rate) from 2016-17 and recovered 10 households from 2010 that were not recovered in 2016-17. Moreover, 100 news households were randomly selected (for a total of 595 households).

In NEEMESIS-1 & NEEMESIS-2, two household members, called “ego 1” (mostly household questionnaire respondent) and “ego 2” (one younger household member randomly selected on a criterion of age), are directly addressed individual questionnaires that provide for instance a range of information on PT&CS.

Regarding the reliability, the great expertise of the team<sup>5</sup> helped to formulate questions appropriately. Moreover, the moderate magnitude of the survey, compared to nationally representative datasets, ensures the high quality of the data and the tablet-based mode of data collection improved data quality in including constraints on

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<sup>4</sup>Project took place within two broader research programmes located within the Observatory of Rural Dynamics and Inequalities (<https://odriis.hypotheses.org/>) at the French Institute of Pondicherry, India.

<sup>5</sup>Some members of the research team are present since more than 20 years on the region for numerous quantitative and qualitative surveys.

answers to prevent inconsistencies.

## 3 Methodology

### 3.1 Construction of personality traits & cognitive skills variables

As stated earlier, our survey allows us to construct measures of cognitive skills. It includes three score variables based on literacy test, numeracy test and Raven progressive matrices test<sup>6</sup>. These scores are constructed in adding up the correct answers of a set of four questions for literacy and numeracy test (six for numeracy in 2020-21) and 36 for Raven. Then, we standardise the score to ensure comparability of results between personality traits and cognitive skills.

Regarding personality traits, on the basis of 35 questions referring to Big-5 taxonomy, we averaged answers –based on a Likert scale from 1–“Almost Never” to 5–“Almost always”, that belong to a determined trait after correcting for acquiescence bias<sup>7</sup> (see Appendix A). The resulting mean represents the score on each trait.

McDonald's  $\Omega^8$ , a measure of internal consistency, are mostly satisfactory for 2016-17 data corrected from acquiescence bias: 0.81 for openness; 0.86 for conscientiousness; 0.59 for extraversion; 0.60 for agreeableness and 0.80 for emotional stability (see Figure 4). For 2020-21, the internal validity after correcting for acquiescence bias is not ideal compared to non-corrected items. It implies that results could suffer from measurement error, which would bias our results towards zero.

### 3.2 Factor analysis

As warned by Laajaj et al. (2019), the Big-5 taxonomy is limited in developing countries for several reasons: the enumerator-respondent interactions in face-to-face survey can induce a bias; the low education levels can make questions more difficult to understand and can induce a systematic response patterns, especially the acquiescence bias. The very good knowledge of the field (see section ??) allow us to collect data of high quality

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<sup>6</sup>Raven matrix is “a nonverbal test of mental ability consisting of abstract designs, each of which is missing one part. The participant chooses the missing component from several alternatives to complete each design.” – <https://dictionary.apa.org/ravens-progressive-matrices>. Accessed January 27, 2021.

<sup>7</sup>Acquiescence bias represents the tendency to answer more in one direction (agree or disagree) over the other.

<sup>8</sup>Literature on internal consistency estimators increasingly agrees that Cronbach's  $\alpha$  –the widest used estimator is maybe not very efficient (Bourque, Doucet, LeBlanc, Dupuis, & Nadeau, 2019; Trizano-Hermosilla & Alvarado, 2016).

and avoid a bias due to misunderstanding of questions. Moreover, we implement our own factor analysis of the 35 questions by principal component with promax rotation. To avoid a bias in factor analysis, we do not recode reverse questions because it might force likeness with Big-5 taxonomy. In our dataset, acquiescence bias is measured with a set of reverse questions that are supposed perfectly opposed to another set of questions. However, the assumption of opposition is supportable only in the Big-5 taxonomy. In another layout, pairs of questions can measure different aspects of personality<sup>9</sup>. The resulting factors for 2016-17 data are relatively similar to the Big-5 personality traits with satisfactory McDonald's  $\Omega$ : Factor 1 as Openness-Extraversion ( $\Omega = 0.91$ ); Factor 2 as Conscientiousness ( $\Omega = 0.88$ ); Factor 3 as *Porupillatavan* –Tamil terms for talkative, easily distracted individual– ( $\Omega = 0.69$ ); Factor 4 as Emotional stability ( $\Omega = 0.78$ ) and Factor 5 as Agreeableness ( $\Omega = 0.62$ ) (see Appendix A) while resulting factors for 2020-21 data are very different to the Big-5 taxonomy and to the 2016-17 factors. We do not present results here because we do not use it as personality traits measure (see section ??), however it is available on request.

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<sup>9</sup>Singh, Misra, and Raad (2013) show that in Hindi, the major language spoken in India, three traits different from Big-5 taxonomy firmly stood out.

## 4 Results

Our results show stability for minor part of the population (see Appendix ??). Non-corrected traits, in addition to having globally (2016-17 and 2020-21) higher internal consistency (see Table 4) are less unstable over time without being able to relate stability. Evolution of personality traits can be explained by the fact that NEEMESIS-2 data were collected after the first lockdown<sup>10</sup> (end of 2020) and the associated mental health consequences (Golechha, 2020; Kochhar et al., 2020) can have cause –or at least exacerbated, the non-stability.

Concerning cognitive skills, majority of individuals have higher or equal score in 2020-21 than in 2016-17 (see Appendix ??) which is consistent with the lifelong learning theory –the continuing development of knowledge and skills that people experience after formal education and throughout their lives (London, 2011).

### 4.1 Acquiescence bias

I have calculated acquiescence bias for all egos of 2016-17 (n=953) and 2020-21 (n=1,316). Figure 1 shows cumulative distribution of acquiescence bias. The flatter the curve is, the lower the acquiescence bias is.

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<sup>10</sup>See <https://thewire.in/covid-19-india-timeline> for complete timeline of COVID-19 pandemic in India. Accessed August 16, 2021.

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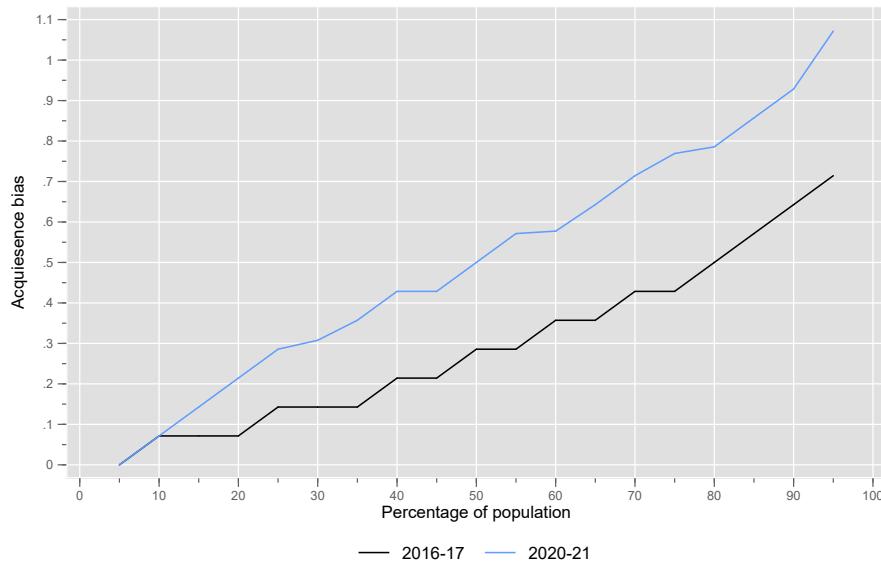
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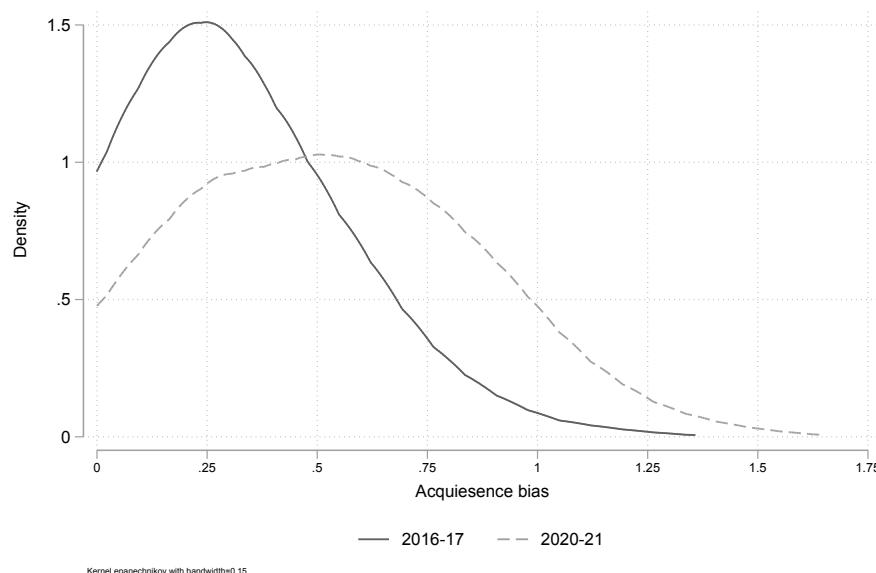
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## Tables and figures



**Figure 1:** Cumulative distribution of acquiescence bias – For 953 individuals in 2016-17 and 1,316 in 2020-21 from rural Tamil Nadu, India.

**Source:** NEEMSIS-1 (2016-17) & NEEMSIS-2 (2020-21); author's calculations.



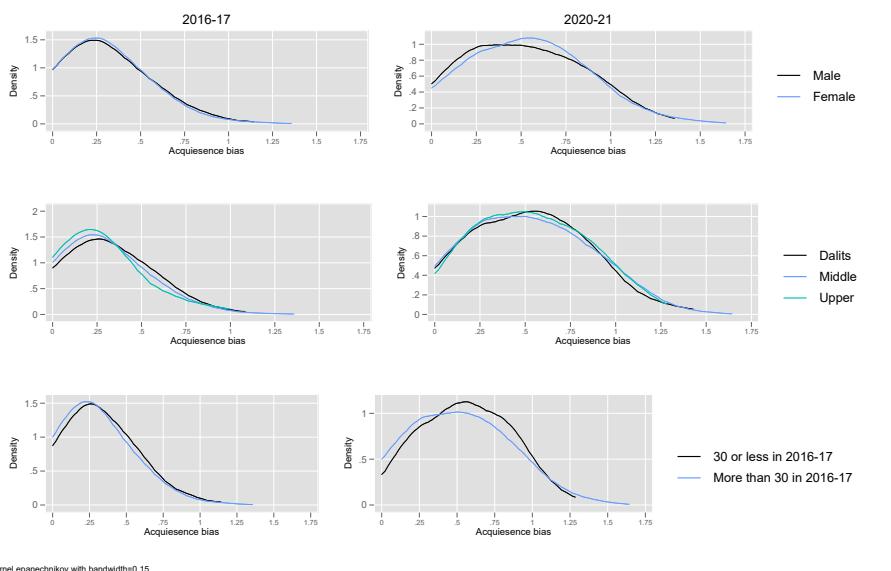
**Figure 2:** Distribution of acquiescence bias according to year – For 953 individuals in 2016-17 and 1,316 in 2020-21 from rural Tamil Nadu, India.

**Source:** NEEMSIS-1 (2016-17) & NEEMSIS-2 (2020-21); author's calculations.

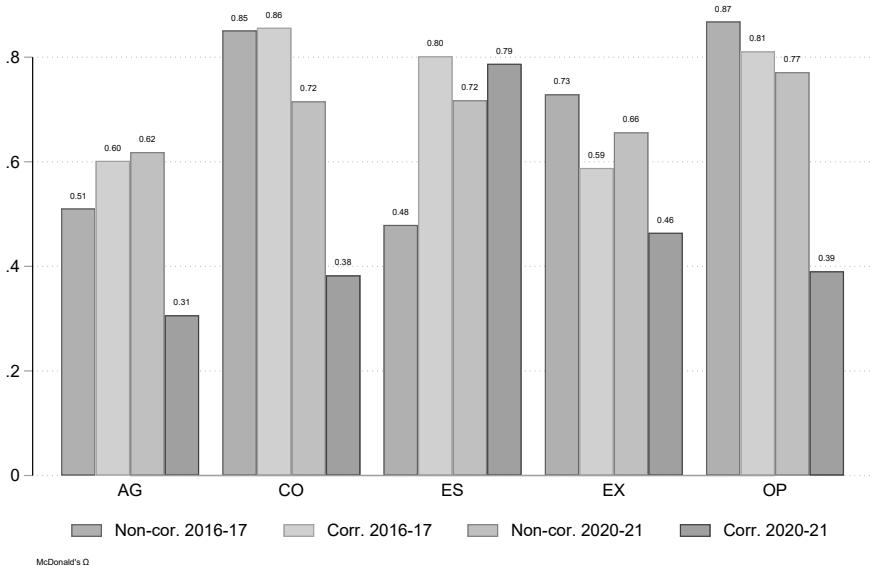
**Table 1:** Details for personality test questions

Variable	Question	Big-5 traits
curious	Are you curious, interested in learning new things?	OP
interestbyart	Are you interested in nature, art or music?	OP
repetitivetasks	Do you prefer work that involves repetitive tasks and routines?	OP
inventive	Are you inventive, and discover new ways of doing things?	OP
liketothink	Do you like to think a lot, and reflect about ideas?	OP
newideas	Do you come up with original or new ideas?	OP
activeimagination	Do you have an active imagination?	OP
organized	Are you organized?	CO
makeplans	Do you make plans and stick to them?	CO
workhard	Do you work hard to do things well and on time?	CO
appointmentontime	Do you get to work and appointments on time?	CO
putoffduties	Do you put off your duties in order to relax?	CO
easilydistracted	Do you get easily distracted?	CO
completedduties	Do you complete your duties on time?	CO
enjoypeople	Do you enjoy being with people?	EX
sharefeelings	Do you easily share your thoughts and feelings with other people?	EX
shywithpeople	Are you shy with people?	EX
enthusiastic	Are you enthusiastic and full of energy?	EX
talktomanypeople	In social gatherings, do you like to talk to many people?	EX
talkative	Are you talkative?	EX
expressedthoughts	Are you comfortable expressing your thoughts and opinions to others?	EX
workwithother	Do you work well with other people?	AG
understandotherfeeling	Do you try to understand how other people feel and think?	AG
trustingofother	Are you generally trusting of other people?	AG
rudetoother	Do you tend to be rude to other people?	AG
toleratefaults	Do you tolerate faults in other people?	AG
forgiveother	Do you forgive other people easily?	AG
helpfulwithothers	Are you helpful with others?	AG
managestress	Do you manage stress well?	ES
nervous	Do you get nervous easily?	ES
changemood	Do you have sudden changes in your mood?	ES
feeldepressed	Do you feel sad, depressed?	ES
easilyupset	Do you get easily upset?	ES
worryalot	Do you worry a lot?	ES
staycalm	Do you stay calm in tense or stressful situations?	ES

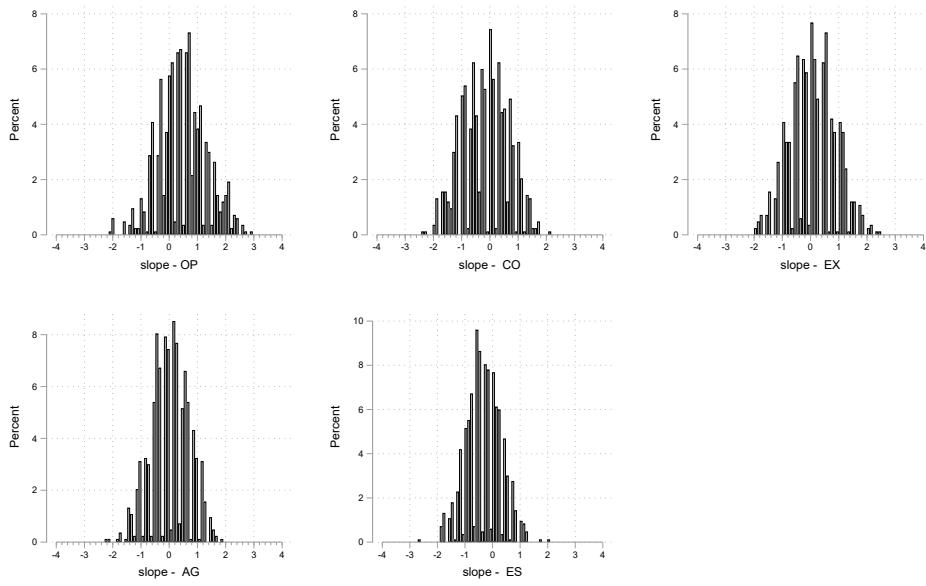
**Source:** NEEMSIS-1 (2016-17) & NEEMSIS-2 (2020-21)



**Figure 3:** Distribution of acquiescence bias according to sex, caste and gender – For 953 individuals in 2016-17 and 1,316 in 2020-21 from rural Tamil Nadu, India.  
**Source:** NEEMESIS-1 (2016-17) & NEEMESIS-2 (2020-21); author's calculations.

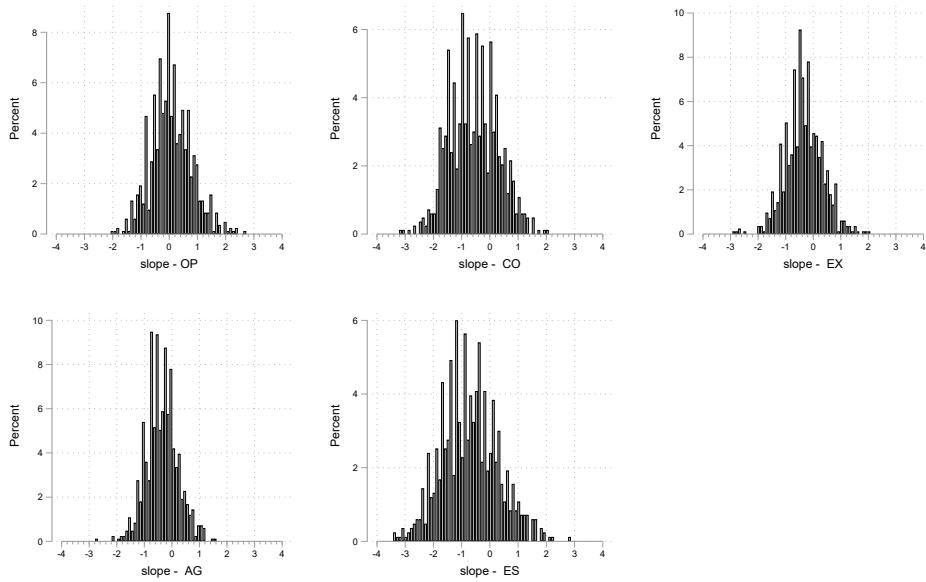


**Figure 4:** Internal consistency of Big-5 personality traits – Distribution of McDonald's  $\Omega$  through time and correction for 953 individuals in 2016-17 and 1,316 in 2020-21 from rural Tamil Nadu, India.  
**Source:** NEEMESIS-1 (2016-17) & NEEMESIS-2 (2020-21); author's calculations.



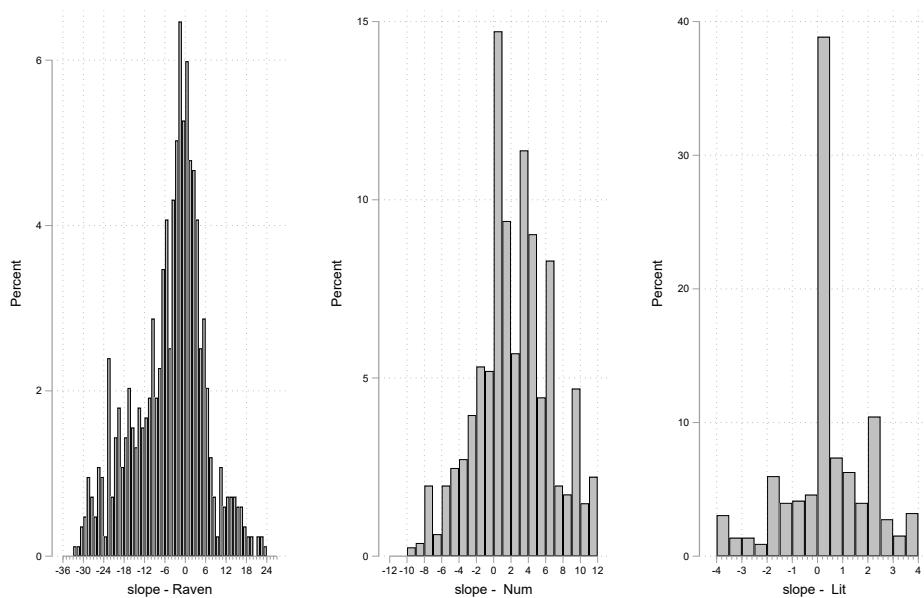
Raw traits (non-corrected from acquiescence bias).

**Figure 5:** Stability over time of Big-5 personality traits non-corrected from acquiescence bias – Distribution of the difference of the score between 2016-17 and 2020-21 for Big-5 personality traits non-corrected from acquiescence bias for 835 individuals from rural Tamil Nadu, India.  
**Source:** NEEMSIS-1 (2016-17) & NEEMSIS-2 (2020-21); author's calculations.



Traits corrected from acquiescence bias.

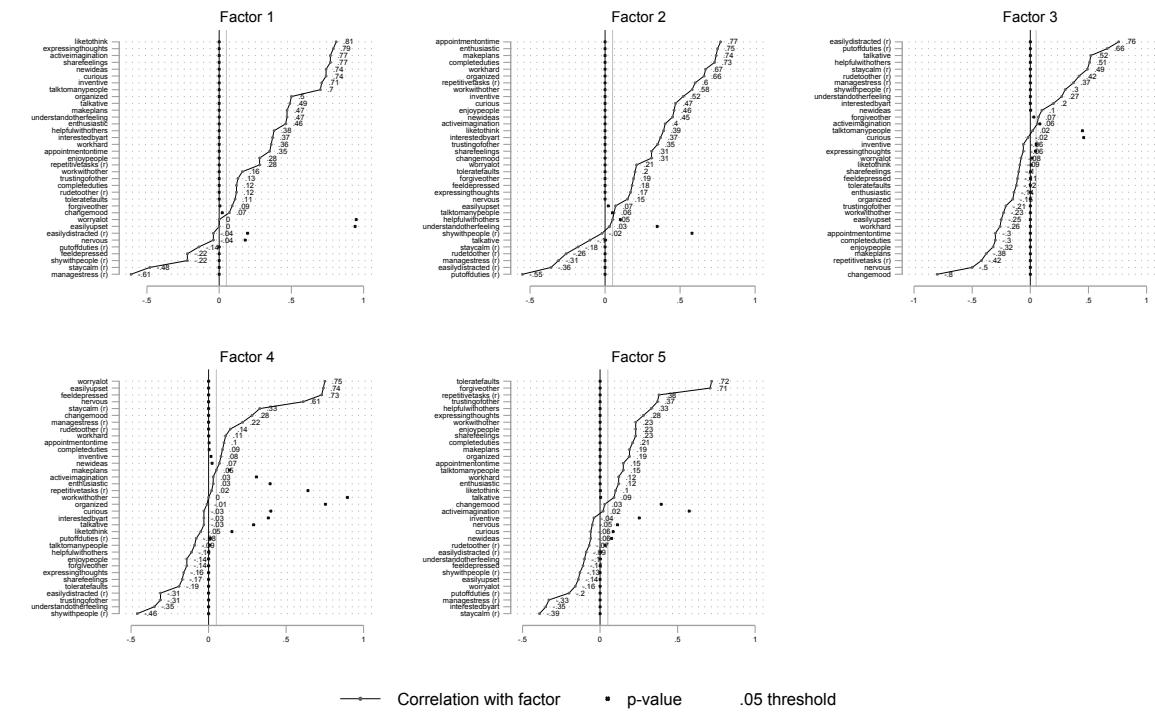
**Figure 6:** Stability over time of Big-5 personality traits corrected from acquiescence bias – Distribution of the difference of the score between 2016-17 and 2020-21 for Big-5 personality traits corrected from acquiescence bias for 835 individuals from rural Tamil Nadu, India.  
**Source:** NEEMSIS-1 (2016-17) & NEEMSIS-2 (2020-21); author's calculations.



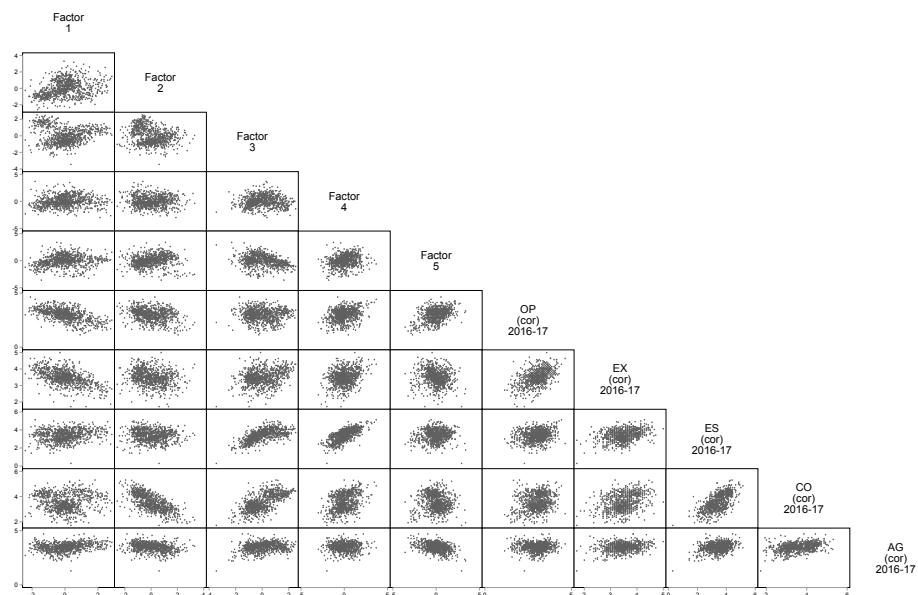
**Figure 7:** Stability over time of cognitive skills – Distribution of the difference of the score between 2016-17 and 2020-21 for three cognitive skills for 835 individuals from rural Tamil Nadu, India.

**Source:** NEEMSIS-1 (2016-17) & NEEMSIS-2 (2020-21); author's calculations.

## A Factor analysis for personality traits



**Figure 8:** Results of factor analysis for 2016-17 raw items  
**Source:** NEEMESIS-1 (2016-17); author's calculations.



**Figure 9:** Correlation between Factor from EFA and Big-5 personality traits  
**Source:** NEEMESIS-1 (2016-17); author's calculations.

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