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Validation of the Big Five model in rural developing economies – Evidence from Thailand and Vietnam[*]

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Abstract

The Big Five model is widely used to measure and analyse personality traits in developed countries. However, there exist concerns regarding its validity in developing countries. We use a novel data set on personality traits from rural Thailand and Vietnam on around 4,000 individuals to test the universality of the model. We find that the measures demonstrate internal and external validity, and, that the analysis reveals a five factor structure similar to the Big Five model. In regard to stability of traits, we observe significant differences over time though the magnitude of differences is low. Also, gender and education influence the stability. We further test for acquiescence bias in our sample. While we find evidence for acquiescence bias, our results remain robust to its effect. We conclude that it is possible to employ the Big Five model to examine personality traits in rural Southeast Asia.

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1 Introduction

The importance of personality traits for economic research has been highlighted extensively over the past two decades. However, the measurement of personality is a complex endeavour, since context and sub-group characteristics can hamper the applicability of existing models. The standard measurement model of personality is the Big Five Factor model by Costa and McCrae (1992) that defines personality along five dimensions. The typology and measurement of this model were developed and tested mainly in industrialized countries among highly educated samples.[1] Therefore, it is not self-evident that the structure of this model is universally applicable, i.e. that it also holds in non-WEIRD populations. A handful of recent studies from developing countries provide further ground to these concerns. For instance, Gurven et al. (2013) find only two personality factors instead of the usual five in their data from rural Bolivia. Other papers highlight more issues such as lack of internal consistency, wrong factor loadings and measurement errors (Schmitt et al., 2007; Cheung, 2009; Ludeke and Larsen, 2017). Evidence from Laajaj et al. (2019) shows that the survey mode, i.e. whether the survey is self-administered or not, also plays an important role.

Our study contributes to this string of literature on the measurement and factor structure of personality traits outside WEIRD populations. While studies such as Laajaj et al. (2019) and Schmitt et al. (2007) employ data from students and relatively better educated individuals living in urban centers, we expand the discussion to a rural sample. In particular, we introduce and validate the Big Five measure of personality traits for individuals in rural Southeast Asia. Using a rich panel data set from rural Thailand and Vietnam of some 4,000 individuals,[2] we analyse the internal and external validity of the Big Five factor structure. Therewith, we specifically address whether the factor structure holds, and, if survey measures can be applied in rural samples in Southeast Asia. We further provide insights into the stability of the traits over time using individual-level data.

In this paper, we (i) test the scales for internal consistency; (ii) test the stability of personality traits over time; (iii) test the scales for external validity; (iv) correct our scales for acquiescence bias. The results reveal that the underlying factor structure in our sample population from rural Southeast Asia is similar to the structure of the standard Big Five model. We find five factors that can be largely mapped to the Big Five factors. Results further suggest that the survey measure is internally and externally valid in the context of rural households in Thailand and Vietnam. In line with Laajaj et al. (2019), measures of internal consistency are lower for our sample compared to expected values

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[1] These are also often referred to as western, educated, industrialized, rich, and democratic (WEIRD) countries (Heinrich et al., 2010).
[2] The data were collected under the Thailand Vietnam Socio Economic Panel (TVSEP).

from WEIRD populations. Additionally, results show that retest stability across different survey waves is stronger among higher educated respondents, which matches findings from other studies (e.g. Schmitt et al. (2007)).

The remainder of the paper is organized as follows: Section 2 introduces the data and measurement of personality traits. Section 3 presents the econometric methods and discusses the results. Section 4 concludes.

2   Data and Measurement

We analyse Big Five data from the 7th wave of the Thailand Vietnam Socio Economic Panel (TVSEP), collected in the summer of 2017.[3]   The data were collected in three rural provinces in each country. In Thailand, these are the provinces of Buriram, Nakhon Panom and Ubon Ratchathani and in Vietnam the data are gathered in the provinces of Thua Thien Hue, Ha Tinh and Dak Lak. Figure A.1 in the Appendix exhibits an overview of the survey region. For the purpose of this study, we utilize data on 3,811 individual respondents - 1,913 Thais and 1,898 Vietnamese, who answered the subsection on personality traits.

In both countries, an almost identical household survey is applied. It consists of nine sections covering individual information on household members (e.g. age, education, health, and employment) as well as household-level information (such as household income, housing conditions and experienced shocks). In wave 7 of the TVSEP database, an additional module asking for the established psychological personality inventories was included. These questions allow to study personality traits and their consequences on a large sample of individuals living in rural Thailand and Vietnam, and, to relate them to a rich set of socio-economic variables.

The survey questionnaire includes items that measure personality following the Big Five model developed by Costa and McCrae (1992, 1997). This model is the most cross-culturally validated model of personality traits (Stuetzer et al., 2018). It defines personality along the five following factors: Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. The survey questions included in the TVSEP are based on the Big Five personality inventory questions used in the German Socio Economic Panel (SOEP). Similar questions are used in the British micro panel survey and World Bank surveys across different countries (Guerra et al., 2016). In the respective TVSEP ques-

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[3] The TVSEP is a panel survey that runs since 2007 and regularly administers surveys among rural households in Thailand and Vietnam. Until now, eight waves have been conducted. The survey covers some 4,400 households in 440 villages. The household sample in each province was randomly drawn based on a stratification process considering the heterogeneous agro-ecological conditions within the regions. Please refer to Hardeweg et al. (2013) for a detailed review of the sampling strategy. For more information on the project please visit the project website: https://www.tvsep.de/overview-tvsep.html.

tionnaire section, respondents are asked how much they agree with different statements about themselves. They rank their answers on a 7 point Likert scale ranging from 1 to 7, where 1 means "Does not apply to me at all" and 7 means "Applies to me perfectly". Respondents are presented with 15 survey questions in total. Each factor is captured by three questions. Table A.1 in the appendix illustrates the relation between the personality traits and survey questions. To obtain the Big Five traits, we construct simple averages using three questions for each respective trait.

Additional Data for Stability Testing In Section 3.2 we test stability of the data over time and compare data from wave 7 to the 8th TVSEP wave, that was conducted in the summer of 2019.[4] For this wave, data were collected in Thailand only. Therefore, comparison data for Vietnam are not available. The questions and answer options are identical to the ones in the wave 7 questionnaire. The dataset includes data on personality traits for all three Thai provinces. We identify 933 households with the same respondent in 2017 and 2019. While the same households are interviewed for every TVSEP wave, the respondent within the household may vary over time, e.g. if the household head is not available his or her spouse might answer the survey. Therefore, we only cases, where the respondent was the same in both years. Hence, the lower sample size. The questions and scales on personality traits in the 2019 survey are identical to the ones in the 2017 survey.

3 Results

3.1 Internal Validity

We conduct a series of psychometric indicators to document the internal validity and consistency of our survey measures. Following Laajaj et al. (2019) these indicators include: (i) the within correlation that is the average correlation within the items belonging to one personality trait, (ii) the between correlation that is the average correlation between items of different personality traits, and (iii) the Cronbach's itemized alpha coefficient which tests for the internal consistency of scales across the survey questions and the personality traits. We compute the psychometric indicators separately for Thailand and Vietnam as well as jointly for the whole database.

Within and Between Correlation Table 1 provides the results for the within and between correlations. A strictly positive correlation either in the within or the between correlation coefficient suggests that the indicator captures something that the tested items

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[4] These data sets are used only in this specific Section. Throughout the rest of the paper, we use the full data set from wave 7 for both countries.

have in common rather than just noise. If the expected factor structure exists, the correlation within items belonging to one trait should be positive. Further, the correlation between items of different personality traits should be close to zero. The results show that the within correlation is strictly positive and varies between between 19% to 21%. The between correlation is significantly lower and ranges between 4% to 6%. Other studies using data from developing countries such as Laajaj et al. (2019) report higher within correlations. However, since the between correlation shows there is very little correlation across items belonging to different factors, the factor structure still holds.

Table 1: Psychometric Indicators

	No. of Items	No. of Observations	Within Correlation	Between Correlation	Cronbach's Alpha*
All	15	3090	0.21	0.048	0.45
Thailand	15	1447	0.19	0.040	0.41
Vietnam	15	1643	0.21	0.064	0.43

Note: * average for five character traits. Own calculations with TVSEP data from wave 7.

Cronbach's Alpha   The Cronbach's itemized alpha coefficient (Cronbach, 1951) is one of the most widely used tests of internal consistency (Gosling et al., 2003). It tests the internal consistency of scales across the survey questions and across the five personality traits. The coefficient can take values between 0 and 1 and increases with higher correlation between the items of the same personality trait. Thus, the higher the alpha coefficient, the better the items measure the same underlying factor (Laajaj et al., 2019). The minimum threshold for the alpha coefficient is often set at 0.7. However, the threshold also depends on the extend of the applied measure, with alpha usually increasing with more items (Gosling et al., 2003).[5] The TVSEP questionnaire includes a short measure of 15 questions, which is standard for most household surveys.[6] Therefore, we expect alpha values below 0.7.

The results of the Cronbach's alpha coefficient for each factor are displayed in Table 1 and Table A.2. The individual coefficients range between 0.25 and 0.62 across the different items and factors. As expected, the coefficients are below the 0.7 benchmark. However, the results are similar to that of other Big Five surveys using a short version of the measure (e.g. Schäfer (2016); Laajaj et al. (2019)). The average reliability for the five factors for the whole sample is 0.44. The values per country are slightly lower. Table A.2 in the Appendix displays detailed results per trait. The factors Openness,

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[5] Gosling et al. (2003) suggest to also look at the test-retest correlation as a further reliability check, which we do in the Section 3.2.

[6] Surveys centering on the assessment of the Big Five model often use the 44-item Big-Five Inventory (see for example John and Srivastava (1999)) or the the 60-item NEO Five-Factor Inventory (Costa and McCrae, 1992).

Conscientiousness and Agreeableness display higher values of internal consistency, while the values for Neuroticism and Extraversion are lower.

3.2 Stability

In order to further check the reliability of the data, we test the congruence of the survey results over time. We do so by: (i) comparing the two sample means for each factor; (ii) calculate the test-retest correlation; (iii) present superimposed histograms to take a closer look at the answer distributions. The time difference between the two survey waves is two years. While personality traits are regarded as relatively stable for adults (Cobb-Clark and Schurer, 2012), certain life events as well as changes in demographic factors can lead to a change in personality traits over the course of a lifetime. We would therefore expect to see somewhat stable results.

The results for the mean comparison between wave 7 and wave 8 are presented in Table 2. We observe significant differences in the means between both waves for all five factors. However, these differences are relatively small and mean values are still similar. We also provide results for the test-retest correlations in Table A.3 in the Appendix. The test-retest correlation ranges between 0.21 and 0.25. Other studies observe higher test-retest correlations (see for example Gosling et al. (2003)). We therefore look at sub-samples of the data set and see that our results improve when excluding possible confounding factors, i.e. respondents that may had difficulties understanding the questions.[7] We also see some differences between the three survey provinces, with Ubon Rathchathani pertaining a lower retest correlation for Openness, Neuroticism and Extraversion. We also test the correlations and means per province, but do not find string provincial effects. In order to get a more comprehensive understanding of the differences between waves, we present superimposed histograms in the appendix. They show that answers in wave 8 are on average more moderate, i.e. respondents choose less extreme values, than in wave 7. We think that this might indicate that respondents are getting used to the questions and therefore slightly alter there answer patterns.

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[7] We defined these as respondents with a difference between the test and the retest that is greater than two points on the Likert scale

Table 2: Comparison of Sample Means

	Thailand Wave 7	Thailand Wave 8	Difference
Openness	4.610	4.384	0.225***
Conscientiousness	5.688	5.564	0.124**
Extraversion	4.521	4.410	0.111**
Agreeableness	5.801	5.634	0.167***
Neuroticism	3.313	3.411	-0.098**
Observations	933	933	933

Note: First two columns show results for the sample means. Column three displays results from the two-sided ttests.

Own calculation with TVSEP data from wave 7 and wave 8 in Thailand.

*, ** and *** denote significance at the 10, 5 and 1 percent levels.

Furthermore, we delve deeper into the causes of differences in results between the two waves. We find that males and more educated individuals are less likely to alter their responses over the two years. Studies from other data sets also observe that a higher level of education and literacy in the survey population favours replication and reliability of the Big Five model (e.g. Schmitt et al. (2007); Laajaj et al. (2019)).

Overall, the results show that answers vary over the medium run. However, the differences in are still small and we would expect some variation over a time period of two years, since respondents are exposed to different life events that could possibly change answers. We further see that demographic factors have an influence on the answer stability. Therefore, we recommend to run robustness checks for different subgroups when using the data in an analysis.

3.3 External Validity

We test for the underlying structure of personality traits and the external validity of our survey measures. In particular, we (i) perform a Principal Component Analysis to explore the underlying factor structure in our sample, (ii) correlate our factors to the conventional Big Five personality traits, and (iii) compare our findings with SOEP (Germany), HILDA (Australia) and SAPA (United States of America).

Principal Component Analysis   We conduct a Principal Component Analysis (PCA) to analyse the factor structure in our sample. A PCA is advantageous when data sets contain a large number of variables. It uses the dependencies between the input variables to reduce the dimensionality and creates groups which are homogeneous within themselves and heterogeneous between each other (Backhaus et al., 2011). We base the PCA

on the 15 questions on personality traits administered to respondents in the household questionnaire (see Section 2). To conclude that the factor structure of the Big Five model can be applied to our sample, the PCA should produce five factors and the underlying 15 items should load on the expected factors.

Figure 1 clearly shows the presence of a five-factor structure. The Kaiser criterion (K1) (Ford et al., 1986) which retains all factors with eigenvalues greater or equal to one, is used to determine the number of factors to be retained. Together, these factors explain a total of 56 % of the variance.

Figure 1: Scree Plot of Eigenvalues after PCA
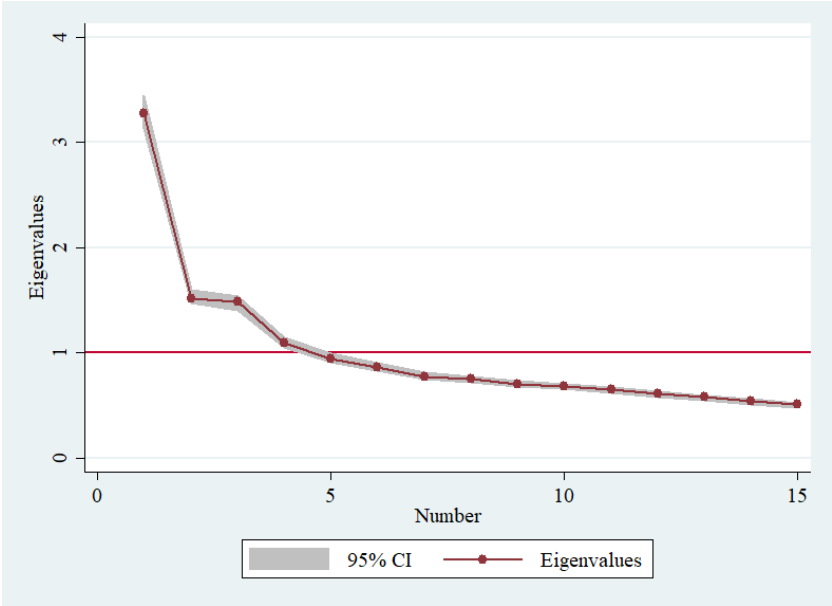
Note: Own illustration with 2017 TVSEP data.

Factor loadings from the PCA are shown in Table 3. Following Hair et al. (2009), only the factors with loadings greater than 0.30, i.e. meeting the minimum practical significance level, are interpreted.

Table 3: Factor Loadings according to PCA

BFI-Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Artistic	**0.30**	-0.27	-0.10	0.01	0.08
New ideas	**0.31**	-0.12	0.12	**0.31**	**-0.35**
Active imagination	**0.32**	-0.26	0.10	0.05	-0.14
Work thoroughly	**0.30**	0.22	0.10	0.04	**-0.39**
Efficient	**0.35**	0.11	-0.08	-0.06	**-0.30**
Lazy (reversed)	0.10	**0.53**	-0.08	0.05	**-0.31**
Talkative	0.24	-0.12	-0.03	**0.45**	0.22
Sociable	**0.32**	-0.02	0.00	**0.30**	**0.30**
Reserved (reversed)	-0.15	0.24	-0.12	**0.65**	0.15
Forgiving	0.28	0.25	0.04	-0.19	**0.48**
Kind	**0.35**	0.23	0.00	-0.18	**0.33**
Rude (reversed)	0.00	**0.53**	-0.14	-0.04	0.06
Worries	0.00	0.15	**0.67**	0.01	-0.01
Nervous	0.00	0.01	**0.66**	-0.02	0.12
Relaxed	**-0.31**	0.12	0.17	**0.32**	0.00

Note: Own calculations with 2017 TVSEP data. We only interpret variables that have factor loadings greater than or equal to 0.30.

Factor 1 has a positive loading in relation to seven items and a negative loading from one item. The positive loading includes all three questions related to the Big Five factor of Openness - artistic, new ideas and active imagination and two items related to Conscientiousness - work thoroughly and efficient. In addition, the positive loadings also include the items sociable and kind. Further, this factor loads negatively on the item relaxed. Thus, Factor 1 is a mix of two Big Five traits. Factor 2 loads positively on two items, hard working and polite. This factor cannot be directly mapped to one of the conventional traits in the Big Five with respect to the items. Factor 3 loads positively on two items, worries and nervous. Therewith, the factor falls into the same category as the Big Five factor of Neuroticism. Factor 4 loads positively on five items. Of these, the three items with the highest positive loadings, talkative, sociable and reserved (reversed), belong to the Big Five factor Extraversion. In addition, this factor also loads positively on the items new ideas and relaxed. While there is a clear congruence with Extraversion, this factor slightly overlaps with Factor 1. Factor 5 loads positively on three and negatively on four items. Among the positive loadings are forgiving and kind. The factor loads negative on the items new ideas, work thoroughly, efficient, and lazy (reversed). Thus, the factor describes a mix of searching for social acceptance while at the same time avoiding hard work. The factor does not seem to be directly related to any of the Big Five factors per

se. Overall, the results from the PCA reveal a five factor structure similar to that of the Big Five Factor model. However, we observe that the items do not always load on the expected factors. This finding is largely in line with a meta study from Schmitt et al. (2007) showing that populations from Asia might diverge from the factor structure as well as the average scores per factor, in relation to other areas of the world. In the next section, we therefore take a closer look at the obtained factors and compare them to the Big Five factors.

Correlations with Big Five Factors   In this part of the analysis, we compare factors obtained from the PCA with the Big Five factors to assess their similarity. As explained in section 2, we construct the Big Five factors using simple averages of the three questions for each respective trait. Table 4 shows the correlations between the two sets of factors.

Table 4: Correlation between Big Five and Factors from PCA

	Openness	**Conscientiousness**	**Extraversion**	**Agreeableness**	**Neuroticism**
Factor 1	**0.76**	**0.63**	0.38	0.50	-0.23
Factor 2	-0.37	**0.51**	0.12	**0.64**	-0.12
Factor 3	-0.02	0.13	-0.06	0.09	**0.92**
Factor 4	0.22	0.08	**0.75**	-0.24	0.11
Factor 5	-0.21	-0.42	0.46	0.32	0.07

Note: Own calculations with 2017 TVSEP data.

Factor 1 is significantly correlated to the factor Openness from the Big Five model. Similarly, Factor 3 can be clearly mapped to the factor Neuroticism, and, Factor 4 to the Big Five factor, Extraversion. However, the trait structure differs with respect to Factor 2, which comprises hard working and polite individuals. Therefore, it correlates with both Big Five factors of Conscientiousness and Agreeableness. Our analysis reveals that these qualities are a particular feature of personality traits in our sample population. Overall, we find that the PCA factors are relatively close to the Big Five factors.

Comparison with other surveys   In general, Southeast Asians score lower on Extraversion and Conscientiousness, and higher on Agreeableness compared to their Western counterparts. The scores reported are very similar in case of Openness and Neuroticism (Schmitt et al., 2007). We inspect if the same patterns are observed in case of our sample. We compare our results for personality traits means with those from three other surveys, namely – the German Socio-Economic Panel (SOEP), the Australian Household Income and Labour Dynamics in Australia (HILDA) and the American Synthetic Aperture Personality Assessment (SAPA) 2015.

Table 5: Comparison between TVSEP and other surveys

Trait	Thailand (rural)	Vietnam (rural)	Germany (SOEP)	Australia (HILDA)	USA (SAPA)
Openness	4.60a,b	4.04a,b	4.49	4.24	x
	(1.26)	(1.37)	(1.169)	(1.052)	
Conscientiousness	5.66a,b,c	5.79a,b,c	5.93	5.15	4.20
	(1.01)	(0.89)	(0.872)	(1.005)	(1.02)
Extraversion	4.48a,b,c	4.55a,b,c	4.82	4.40	3.84
	(1.05)	(1.09)	(1.134)	(1.087)	(0.08)
Agreeableness	5.76a,b,c	5.89a,b,c	5.35	5.40	4.69
	(0.96)	(0.89)	(0.965)	(0.888)	(0.06)
Neuroticism	3.31	4.41	x	x	x
	(1.12)	(1.08))			

Note: Thailand and Vietnam means are calculated by authors based on TVSEP 2017 (NTH = 1,913, NVN = 1,898). German SOEP means are taken from Schäfer (2016) (N = 17,028). Australian HILDA means are taken from Cobb-Clark and Schurer (2012) (N = 6,104). American SAPA 2015 means are taken from Elleman et al. (2018) (N = 134,858). x - Schäfer (2016), Cobb-Clark and Schurer (2012) and Elleman et al. (2018) use a different factor, called Emotional Stability and do not calculate Neuroticism. a – Independent ttest comparison with SOEP.b – Independent ttest comparison between HILDA. c – independent ttest comparison with SAPA 2015.

The results are broadly in line with the aforementioned proposition. The rural population in Thailand reports the highest levels of Openness. However, Germans are more conscientious than all other samples. On average, Thais and Vietnamese tend to be less extroverted and score highest on Agreeableness.

3.4 Acquiescence Bias

Acquiescence is a common bias, where the respondent agrees or disagrees with a question irrespective of the content (Ferrando et al., 2004). For instance, in the TVSEP questionnaire, the questions *'do you see yourself as someone who does tasks efficiently?'* and *'do you see yourself as someone who tends to be lazy?'*, capture Conscientiousness. The second question is coded reversely. If an individual strongly agrees to both these questions, this contradiction indicates Acquiescence Bias (AB). This systematic error can affect the mean levels in item responding, factor structure and hence the overall validity of personality questionnaires (Rammstedt et al., 2017; Danner et al., 2015).

To test for AB in our sample, we construct personality trait factors corrected for AB. This requires that at least one of the questions measuring each factor is reversed. The TVSEP questionnaire does not contain reversed questions for Openness and Agreeableness. Therefore, we estimate the AB for the other factors and subsequently apply the correction to all items. This method is also illustrated in Laajaj et al. (2019). These AB

corrected factors are compared to our Big Five factors. Table 6 shows that all factors are statistically different from each other. This highlights that there is evidence of acquiescence bias in our data. As this could affect our factorial structure and other aspects pertaining to validity, we also execute internal and external validity tests with the Big Five factors corrected for acquiescence bias.

Table 6: Comparison between Sample means and AB corrected sample means

	Mean Sample	Mean AB corrected	Mean Difference
Openness	4.32	4.04	0.28***
Conscientiousness	5.71	5.62	0.09***
Extraversion	4.52	4.42	0.09***
Agreeableness	5.83	5.73	0.09***
Neuroticism	3.86	3.77	0.09***

Note: First two columns show the means. Column three displays results from the two-sided ttests.
Own calculation with TVSEP wave 7 data.
*, ** and *** denote significance at the 10, 5 and 1 percent levels.

We find that the scree plot in Figure 2 and the PCA (refer to table A.4) reveal a five factor structure. The Chronbach's alpha lies at 0.51, which is similar to the original value (refer to Table A.5). Hence, we can conclude that the acquiescence bias does not impact the internal and external validity of our results.

Figure 2: Scree Plot of Eigenvalues after PCA - Acquiescence Bias corrected

Note: Own illustration with 2017 TVSEP data.

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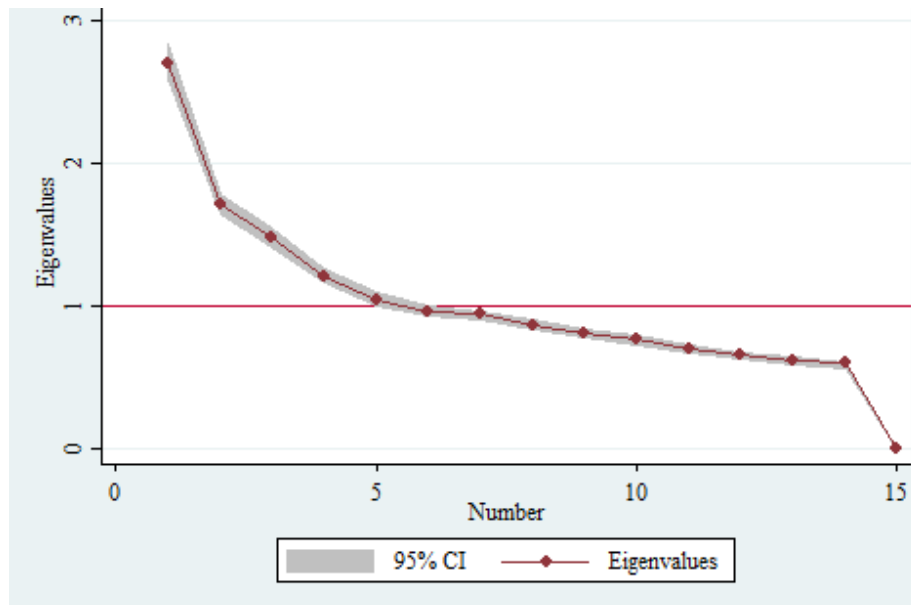
4 Conclusion

This paper validates the Big Five model in a rural developing country setting. Our results suggest that the survey measure is internally and externally valid in the context of rural households in Thailand and Vietnam. We further find that the underlying factor structure is similar to the structure of the Big Five model. In particular, (i) we test the scales for internal consistency, (ii) we test the stability of personality traits over time, (iii) we test the scales for external validity, (iv) we correct our scales for acquiescence bias. For this, we use data on 3,811 individuals collected under the Thailand Vietnam Socio Economic Panel.

The first research objective relates to the internal validity of the sample measures. The psychometric indicators (within correlation, between correlation, and Cronbach's alpha) estimated for the sample indicate that the factor structure holds. Results show very low between correlations. In terms of the alpha values, we see that the factors Openness, Conscientiousness and Agreeableness display higher alpha values and Neuroticism and Extraversion relatively lower values. The fact that the alpha values range below 0.7 is not unusual in sample with a short version of the Big Five measures and is also observed in other data sets with short measures.

Our second research objective examines the stability of the results over time. We compare results from wave 7 and 8 of the TVSEP. We find significant differences in the means between the two waves, with relatively lower values reported in the wave 8. Here, we also show that respondents education level is vital. Individuals with higher education exhibit more stable personality traits over time.

The third research objective was checks the external validity of the model. The PCA and the scree plot reveal a five-factor structure. However, the groups of input variables do not always load on the expected traits. Still, we find high correlations between the factors obtained from the PCA and the factors created using weighted averages of items according to the common Big Five structure. A comparison of sample means for traits from our sample with those from other surveys conducted in other countries further shows that Southeast Asians are less conscientious but more agreeable than their counterparts from WEIRD countries.

Last, we construct acquiescence bias corrected factors and compare these with our Big Five factors. We find evidence for acquiescence bias in our results. However, the bias does not render substantial effects on the internal and external validity of our estimations.

While we acknowledge that we cannot reject all the concerns highlighted by existing studies (e.g., with respect to stability), our results provide substantial evidence on the validity of the Big Five model in a developing country setting. Specifically, they demonstrate that the model is applicable in the context of rural households in Southeast Asia.

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Appendix

A   Additional Tables and Figures

Figure A.1: Overview of Survey Region

Note: The six TVSEP provinces are highlighted in red. The green dots represent internal migrants from the survey rural regions.

Source: Hardeweg et al. (2013), based on ESRI World Map.

Table A.1: Overview of Survey Questions

Do you see yourself as someone who...	Big Five Factor
. . . values artistic, aesthetic experiences? . . . is original, comes up with new ideas? . . . has an active imagination?	Openness
. . . works thoroughly? . . . does tasks efficiently? . . . tends to be lazy?	Conscientiousness
. . . is talkative? . . . is outgoing, sociable? . . . is reserved?	Extraversion
. . . has a forgiving nature? . . . is considerate and kind to almost everyone? . . . is sometimes a bit rude to others?	Agreeableness
. . . worries a lot? . . . gets nervous easily? . . . is relaxed, handles stress well?	Neuroticism

Note: Questions from the The TVSEP survey questionnaire. Same questions were administered for wave 7 and 8, as well as for the Add-on.

Figure A.2: Item Scale TVSEP questionnaire wave 7 and wave 8

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

1 = Does not apply to me at all   **7 = Applies to me perfectly**
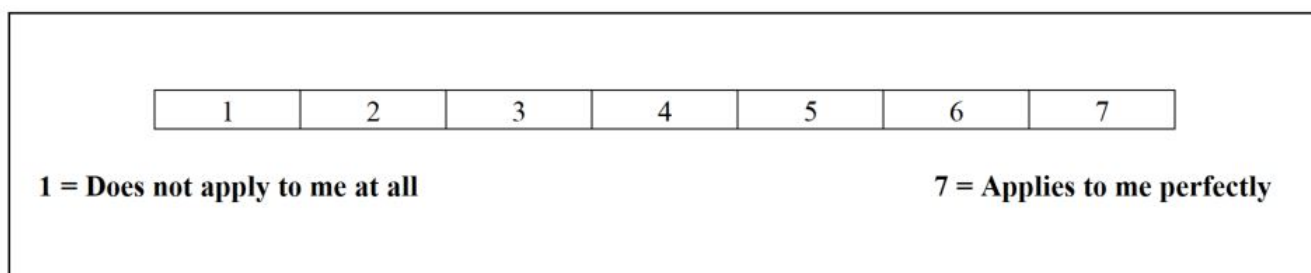
Table A.2: Cronbach's Alpha

| Personality Trait	Cronbach's alpha	No. of items
Openness	0.59	3
Conscientiousness	0.48	3
Extraversion	0.29	3
Agreeableness	0.43	3
Neuroticism	0.48	3
Average	0.45	

Note: Own calculations with TVSEP data from wave 7.

Table A.3: Test-Retest Correlation

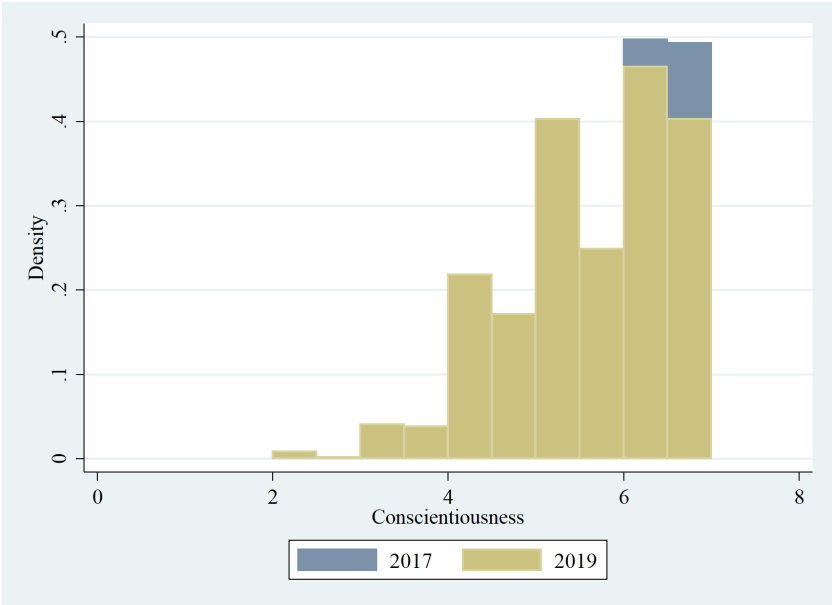|	Test-retest correlation	
	Add-on (N=505)	Wave 8 (N=933)
Openness	0.19	0.21
Conscientiousness	0.24	0.25
Extraversion	0.24	0.24
Agreeableness	0.21	0.25
Neuroticism	0.26	0.23
Average	0.23	0.24

Note: Own calculations with TVSEP data wave 7 and 8, as well as from the Add-on.
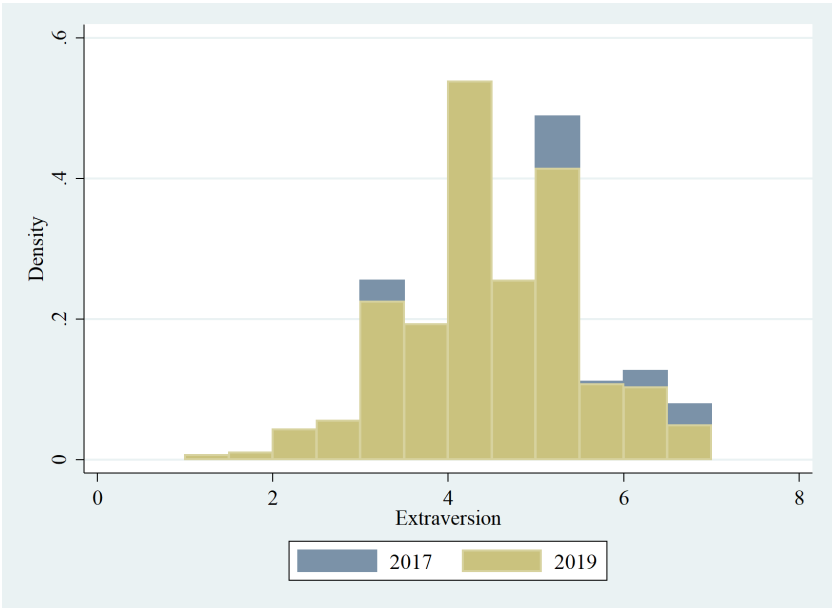
Figure A.3: Openness
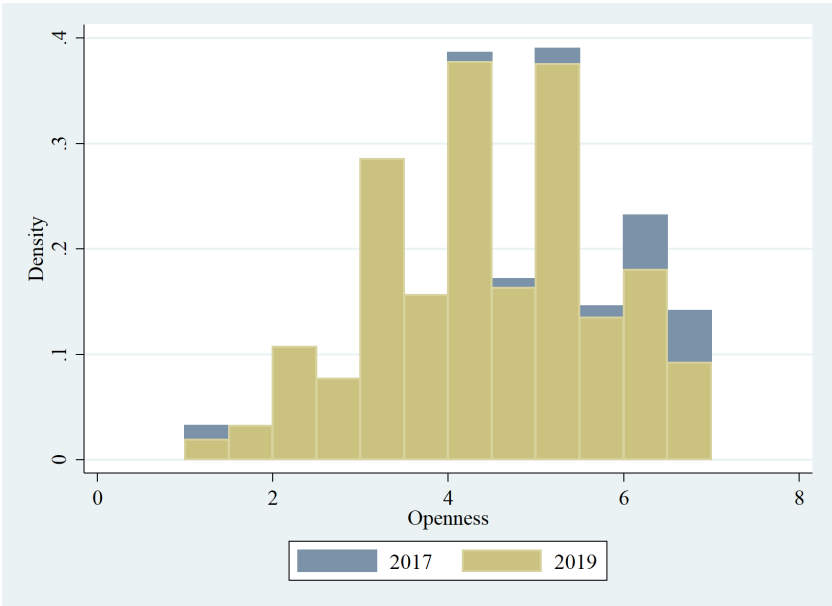
Figure A.4: Conscientiousness
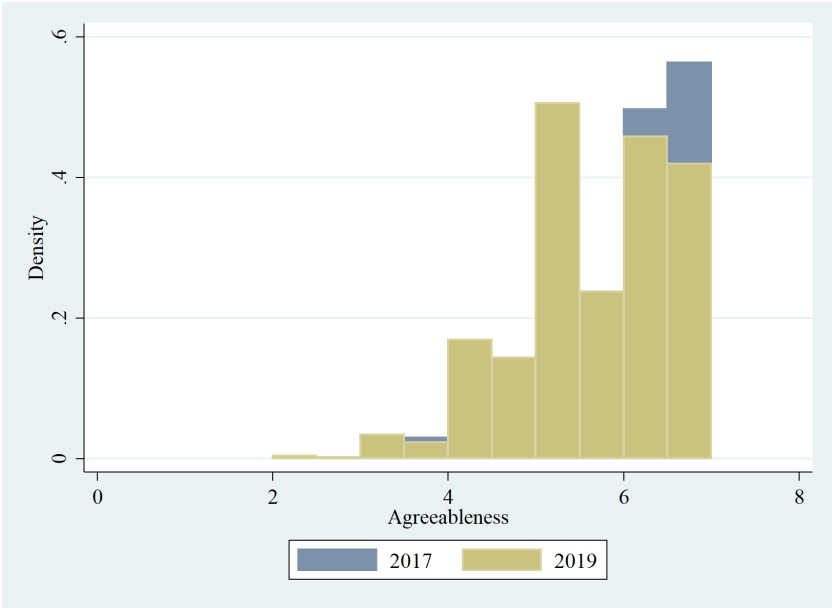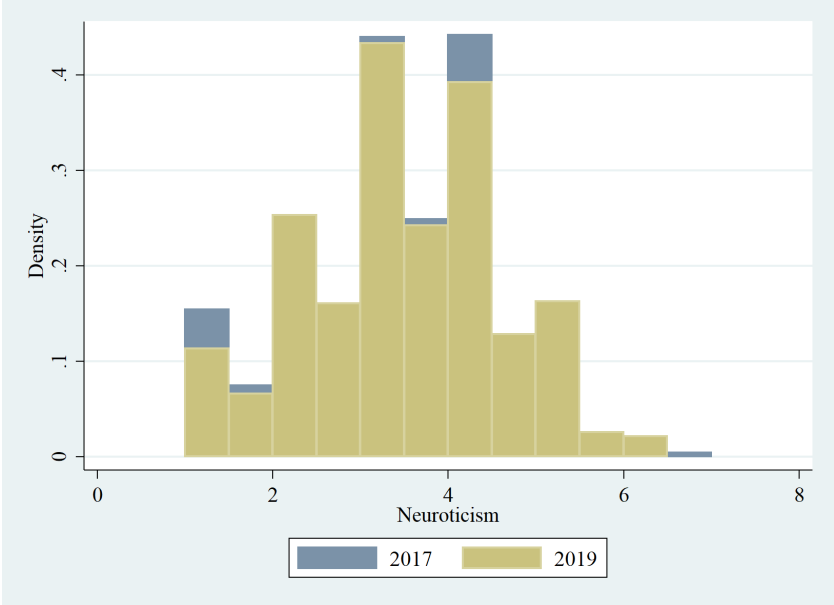
Figure A.5: Extraversion

Note: Own illustration with TVSEP wave 7 and wave 8 data.

Figure A.6: Agreeableness

Note: Own illustration with TVSEP wave 7 and wave 8 data.

Figure A.7: Neuroticism

Note: Own illustration with TVSEP wave 7 and wave 8 data.

Table A.4: Factor Loadings according to PCA - Acquiescence Bias corrected

BFI-Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Artistic	0.2367	0.2395	0.2417	0.1869	**0.3057**
New Ideas	0.2466	0.0717	**0.3626**	**0.3573**	0.0858
Active Imagination	0.2292	0.1214	**0.3202**	**0.4466**	0.1836
Works thoroughly	**0.2921**	0.2388	0.0027	0.0443	**0.4511**
Efficient	**0.3564**	0.0002	0.0090	0.0724	**0.4057**
Lazy (reversed)	**0.3249**	0.1886	0.2479	0.2162	0.2327
Talkative	0.1796	0.0274	**0.3103**	**0.3223**	0.0243
Sociable	0.2832	0.0112	0.1953	0.1568	**0.3927**
Reserved (reversed)	0.1454	0.2201	**0.4653**	**0.4757**	0.1088
Forgiving	0.2547	0.2096	0.2388	0.2883	0.2105
Kind	**0.3497**	0.1592	0.2045	0.2323	0.1620
Rude (reversed)	0.2848	0.1768	**0.3391**	0.1392	**0.4070**
Worries	0.1368	**0.5655**	0.0617	0.1948	0.0206
Nervous	0.1975	**0.4931**	0.0774	0.1848	0.1789
Relaxed (reversed)	0.2304	**0.3427**	0.2672	0.0257	0.0887

Note: Own calculations with TVSEP data from wave 7. Factor loadings greater than or equal to 0.30 are shown in bold.

Table A.5: Cronbach's Alpha - Acquiescence Bias corrected

Personality Trait	Cronbach's alpha	No. of items
Openness	0.49	3
Conscientiousness	0.55	3
Extraversion	0.36	3
Agreeableness	0.56	3
Neuroticism	0.59	3
Average	0.51	

Note: Own calculations with TVSEP data from wave 7.