

Poier, Stefan

Article

How stable is your customer? Individual and ipsative consistency of consumers' Big Five personality traits

Contemporary Economics

Provided in Cooperation with:

University of Finance and Management, Warsaw

Suggested Citation: Poier, Stefan (2022) : How stable is your customer? Individual and ipsative consistency of consumers' Big Five personality traits, Contemporary Economics, ISSN 2300-8814, University of Finance and Management in Warsaw, Faculty of Management and Finance, Warsaw, Vol. 16, Iss. 3, pp. 297-316,
<https://doi.org/10.5709/ce.1897-9254.483>

This Version is available at:

<https://hdl.handle.net/10419/297606>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/4.0/>

Primary submission: 12.10.2021 | Final acceptance: 09.11.2021

How Stable is Your Customer? Individual and Ipsative Consistency of Consumers' Big Five Personality Traits

Stefan Poier

ABSTRACT

In purchase behavior research, the personal dispositions of consumers can play a decisive role. This becomes relevant especially in very narrow target groups when socio-demographic constraints are very similar. In the present study, three types of continuity and change in the Big Five personality traits are investigated. While the Big Five personality traits have been extensively studied at the population level over the last decades, there is very little research at the individual level. This study is intended to fill the gap by investigating individual change and ipsative stability using representative panel data. Across four assessments, separated by four years, of the German Socio-Economic Panel (SOEP) from 2005 to 2017, a total of 58,502 participants (ages 16–103, 53% female) completed a 16-item personality short test. An exploratory structural equation analysis revealed very good model fit over age in all four observations. Individual change of a trait is examined by Asendorpf's IS indicator while ipsative stability is measured by the double-entry intra-class correlation coefficient. The results showed that in both domains, stability showed an inverse u-shape with a peak between the ages of 40 and 50.

KEY WORDS: big five, ipsative consistency, individual stability, consumer behavior.

JEL Classification: D11, D91, M31.

Faculty of Economics, University of Gdańsk, Gdansk, Poland

1. Introduction

From a marketing perspective, there is nothing more important than the widest possible knowledge about the consumer. While, in the past, market research institutes have attempted to collect as many facts about target groups as possible, in the Internet age, the individual consumer is increasingly becoming the focus. Corporations such as Google and Facebook record the surfing behavior of users in order to draw conclusions about their preferences. Online shopping portals evaluate purchase histories in order to generate potential

follow-up purchases via collaborative filtering, which means correlated purchases by similar users (Das, et al., 2007). Economists typically explain consumer behavior using models of utility maximization (Neumann & Morgenstern, 2007). While these normative rather than descriptive concepts help to create ideal models because of their relative simplicity, they fail to predict real-world behavior for the same reason. In the past few decades, however, this way of thinking has changed. Prospect Theory, for example, includes individual cognitive biases (Kahneman & Tversky, 1979, 1984).

Correspondence concerning this article should be addressed to:

Stefan Poier, University of Gdansk, Faculty of Economics,

Armii Krajowej 119/121, 81-824 Sopot, Poland.

E-mail: s.poier.125@studms.ug.edu.pl

Since the 1980s, there has been a growing interest in the psychological dispositions of individuals, especially personality traits. Although there are several classifications of individuals, only those related to consumer behavior are of economic interest. The most well-known and widely used model for classifying personality traits, known as the Big Five, can be traced to the work of Costa and McCrae (Costa & McCrae, 1976; John et al., 2010; McCrae et al., 1999; McCrae & Costa, 1999; McCrae & John, 1992; Roberts, et al., 2006). For marketers and consumer researchers, psychological traits can be useful only when they are predictable. This does not necessarily mean that they must be invariant over time or age, but these changes should have some systematic consistency. Numerous studies have focused on stability and change of personality traits; for an overview, see Roberts et al. (2006). Many of these investigated small, clinical, or student samples (McCrae et al., 1980; Terracciano et al., 2010). They all have in common that they are not representative; for example, student samples are skewed to younger, well-educated people, and clinical studies often focus on people with mental disorders. In contrast, fewer studies use data from large, representative panels such as Australia's HILDA (Cobb-Clark & Schurer, 2012; Lucas & Donnellan, 2009), the SOEP in Germany (Specht et al., 2011; Wagner et al., 2019), and the BHPS/UKHLS in the United Kingdom (Donnellan & Lucas, 2008).

Economists are interested in the question of whether a certain target group or consumer will behave in a proposed manner. As far as personality traits are concerned, this means that they should be stable – that is, they should either not change or develop in a systematic way. While the Big Five at the population level has been adequately studied over the past 2 decades, little research exists on stability at the individual level. The aim of this study is to narrow this gap and to shed light on the question if personality on the individual level is suitable as a predictor of consumer behavior. For this purpose, it will be examined whether individual and ipsative stability of personality traits over time or age is present using data from four observations of the SOEP from the years 2005, 2009, 2013, and 2017.

The remainder of this article is organized as fol-

lows: a literature review with the formulation of hypotheses is provided in chapter 2, followed by an explanation of data collection, and methodology in chapter 3. After that, the results are presented in chapter 4, followed by a discussion of the results and the limitations of the study in chapter 5. The article ends with the conclusions.

2. Research Background

In the seventies and eighties of the last century, the consumer with his or her individual characteristics moved into the focus of economic research (Kahneman & Tversky, 1979; Simon, 1955; Thaler, 1985). At the same time, the rather normative model of the always rational "homo oeconomicus", who has access to all information and the capacity to process it, lost importance. With the steadily increasing popularity of behavioral economics, interest in the personal dispositions of individuals and thus in the possibility of distinguishing consumer groups according to individual differences and predicting their behavior grew over the last decades. In differential psychology, personality traits are used along with values and intelligence to characterize individuals, while in consumer behavior research they are referred to as psychographics along with values and lifestyle (Hoyer et al., 2013; Williamson, 2018). Aaker (1997) used facets of the Big Five to create a brand personality scale with the goal of achieving as close a match as possible between brand or product personality and consumer personality. Borghans et al. (2008) concluded in their article that personality measures should be included in economic studies in order to improve causal models through their predictive power. Thus, like other psychological and sociological constructs (such as e.g., beliefs, attitudes, norms, intentions), the Big Five personality traits became determinants of behavior and their influence on consumer behavior has been investigated in a large number of studies.

2.1. Big Five Personality Traits

Personality traits, and especially the Big Five, represent constructs to describe individuals. A number of definitions of personality traits

can be found in the literature. DeYoung (2015), for example, described them as “probabilistic descriptions of relatively stable patterns of emotion, motivation, cognition, and behavior, in response to classes of stimuli that have been present in human cultures over evolutionary time.” Following John et al. (2010) and Valchev et al. (2013), they are habitual patterns of behavior, thought, and emotion that are stable over time and in comparable situations. What all definitions have in common is “the emphasis on the relative consistency of behavioral predispositions to behave in a particular manner across situations” (Fischer, 2018). In the last few decades, researchers have developed several frameworks to describe the personalities of individuals using descriptive terms for patterns of behavior with different numbers of dimensions. In the early 2000s, Ashton and Lee built upon the research of Costa and McCrae (2008) and Goldberg (1993) and introduced honesty-humility as an additional factor to the five existing traits (Ashton et al., 2004; Ashton & Lee, 2007). This six-factor model is known as the HEXACO model, derived from the initial letters of the factors (Ashton & Lee, 2009).

The most frequently used and best known models in contemporary research consist of five personality traits or factors and are known as five-factor models (FFM) or the Big Five (Goldberg et al., 2006; McCrae & Costa, 1999; McCrae & John, 1992). Costa and McCrae identified neuroticism, extraversion, and openness to experience as three factors of 16 in a first step (Costa & McCrae, 1976). Some years later, they added agreeableness and

conscientiousness to the model, which became the NEO-Personality Inventory Revised (NEO PI-R) after several revisions (Costa & McCrae, 2008). The five traits can be measured with a number of inventories including the original 45-item Big Five Inventory (BFI) (Benet-Martínez & John, 1998), the revised 60-item version BFI-2 (Soto & John, 2017), the 60-item NEO-FFI (McCrae & Costa, 2004), and the 240-item NEO-PI-R (Costa, 1996; Costa & McCrae, 2008). Table 1 shows the five factors, each one consisting of six facets.

2.2. Personality Traits and Consumer Behavior

Numerous studies have looked at the contribution of the Big Five to consumer behavior – including economic behavior or buying behavior. Borghans et al. (2008) found that not all personality traits need be equally important for economic models and that generalization was therefore difficult. In a four-country study on the role of consumer personality, Zabkar et al. (2017) tested the relationship between personality traits and global brand purchase intentions. They found that openness to experience, conscientiousness, extraversion, and neuroticism indirectly affected purchase intentions mediated through the consumers' brand associations. Gohary and Hanzae (2014) examined the influence of the Big Five on different types of shopping motivation and found effects of conscientiousness, neuroticism and openness as predictors of compulsive buying, impulsive buying, and utilitarian shopping motivation. In the context of energy use, Brick and Lewis (2016) found emissions-reducing

Table 1

Big-Five Personality traits acc. to NEO-FFI

Personality traits	Personality trait facets
Openness to experience	Fantasy, Aesthetics, Feelings, Actions, Ideas, Values
Conscientiousness	Competence, Order, Dutifulness, Achievement Striving, Self-Discipline, Deliberation
Extraversion	Warmth, Gregariousness, Assertiveness, Activity, Excitement-Seeking, Positive Emotions
Agreeableness	Trust, Straightforwardness, Altruism, Compliance, Modesty, Tender-mindedness
Neuroticism	Anxiety, Hostility, Depression, Self-consciousness, Impulsiveness, Vulnerability

Source: McCrae and Costa (1999)

behavior most strongly predicted by openness, conscientiousness, and extraversion. (Busic-Sontic & Brick, 2018) and (Poier, 2021) could demonstrate weak but significant mediator effects of the Big Five on the purchase of green energy installations and photovoltaic plants, respectively.

However, not only the effect of personality on purchasing behavior is of economic interest. Decisions affecting household finances are also influenced by personality traits. In a representative study of Dutch households, Pinjisakikool (2018) found that financial household decisions were indirectly influenced by personality traits via the household's financial risk tolerance. All traits had an effect on financial risk tolerance. In another study using data from the British Household Panel Survey, Brown and Taylor (2011) could demonstrate effects of extraversion and openness on household debts and assets. In addition, openness supported high-risk investments.

2.3. Stability of Personality Traits

If there were no stability (i.e., either immutability or predictable development) in the Big Five, they would be useless as determinants of behavior. However, assuming a certain stability, the Big Five could be useful for describing and even predicting human behavior, in particular, consumer or purchase behavior. Cobb-Clark and Schurer (2012) and Specht et al. (2011) could prove stability of the Big Five during adulthood at the population level using representative household panels from Australia and Germany, respectively. Stability does not mean the absence of mutability. Personality can steadily evolve over time and, thereby, it demonstrates properties of plasticity rather than stability. Consequently, consistency or continuity are more accurate expressions (Roberts et al., 2010; Terracciano et al., 2010).

An ongoing controversy exists regarding the contributions of environmental or genetic factors to temporal stability and change of personality. While essentialists state that the reason for stability and change is biological and the result of brain maturation (McCrae & Costa, 2010), contextualists claim that it is a reaction to environmental factors such as role behavior or

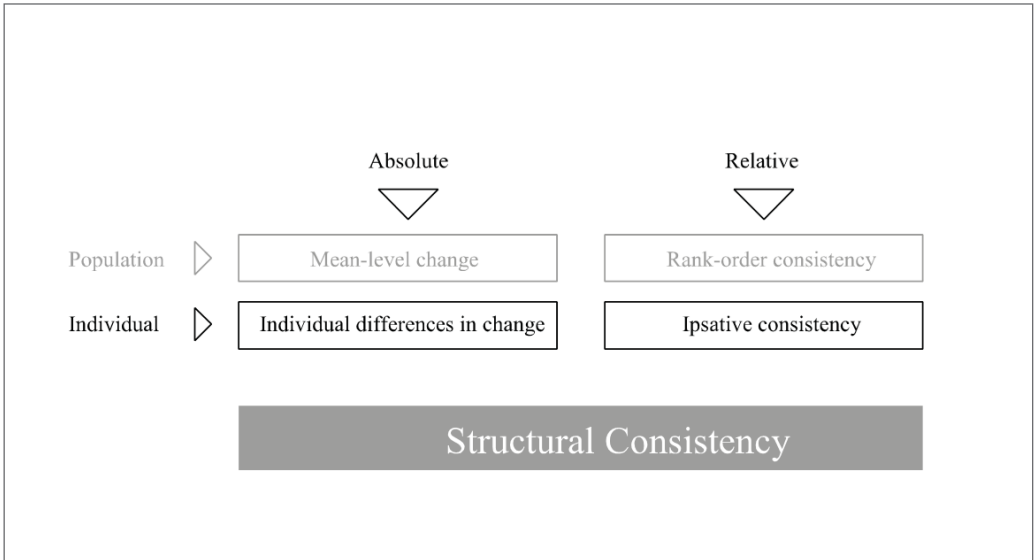
identity formation (Neyer & Asendorpf, 2001). Another debate revolves around the question of whether, at some point, personality will remain more or less stable or whether there will be a continual change in personality traits (Ibáñez et al., 2016; Löckenhoff et al., 2008; Mõttus et al., 2012; Terracciano et al., 2010). McCrae and Costa (1990) originally claimed that personality traits mature over time during adolescence and young adulthood and then remain relatively stable.

In the literature, the categorization of Roberts, Wood, and Caspi (2010) is of particular interest (Figure 1).

Structural consistency builds the foundation of stability research (Roberts et al., 2010). It describes the degree to which correlational patterns of trait facets persist over time. Most studies in the field of personality stability focus on the population level (Costa, et al. 2008; Donnellan & Lucas, 2008; Lucas & Donnellan, 2009; McCrae & Terracciano, 2005; Milojev & Sibley, 2014). Rank-order consistency determines the stability or variability of the relative order of individuals within a population and is usually expressed by Pearson's test-retest correlation between two measurements. Mean-level change of personality traits refers to changes in the amount of an individual's traits over time or age on the population level or the difference between two averaged scores over several administrations. It is also referred to as normative change because it determines a general level within a sample. Rank-order and mean-level consistency are independent constructs, namely, a sample mean can remain stable over time although individuals change their rank order (Figure 2a). On the other hand, individuals' relative positions may persist over time but increase equally in score and, thus, the sample's mean level will increase (Figure 2b).

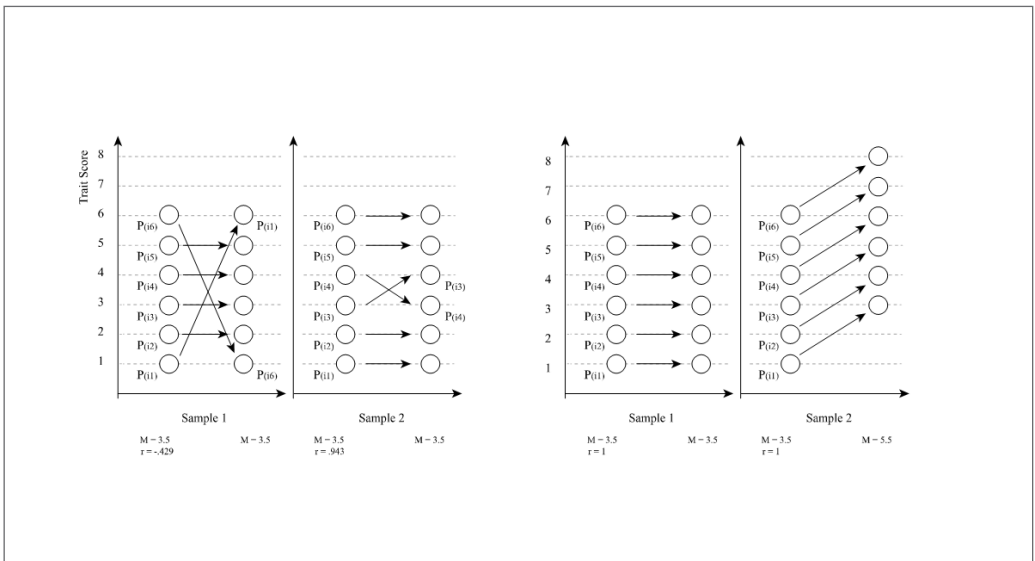
Only a few researchers have investigated personality stability on the level of the individual (Conley, 1985; McCrae et al., 1999; Terracciano et al., 2010). Individual differences in change refer to the absolute increase or decrease of a single trait an individual experiences over time. Figure 3 shows the development of a characteristic of 6 individuals. Pearson's correlation is the same

Figure 1
Organizational Scheme for the Basics of Continuity and Change



Note: The figure shows five types of stability and change. They are categorized according to the dimensions absolute and relative stability as well as population or individual level.

Figure 2
Mean-Level and Rank-Order Mutability



Note: The figure shows two samples and their stability and change over time. The left side is an example of a constant mean value (M) with a variable rank order coefficient (r). The right side shows an example of a changing mean value (M) with a constant rank order coefficient (r).

in both samples and both mean values show an identical development, although the development in the first sample is more heterogeneous and is caused by fewer individuals. Consequently, the transformed IS indicator shows different values on while r is identical.

While rank-order consistency is a measure of the stability of the individual's positions within a sample over time for every personality trait, ipsative or profile stability "refers to the stability of the configuration of personality traits within each individual" (Terracciano et al., 2010). This means that it is not the rank order of individuals that is compared but the rank order of the traits within the individuals. Figure 4 shows two samples, each comprising two individuals. Trait T1 of both individuals shows no change in either sample, so its mean value remains the same. However, since individual 2 in the second sample shows a change

in the other two traits, its profile stability is reduced.

2.4. Hypotheses

Based on the existing literature, mainly based on studies of stability at the population level, the following premise will be formulated for the present study: Individual and ipsative stability increases in the first years after adolescence, then reaches a relatively stable plateau and decreases again after reaching retirement age.

The hypotheses that can be deduced from this are as follows:

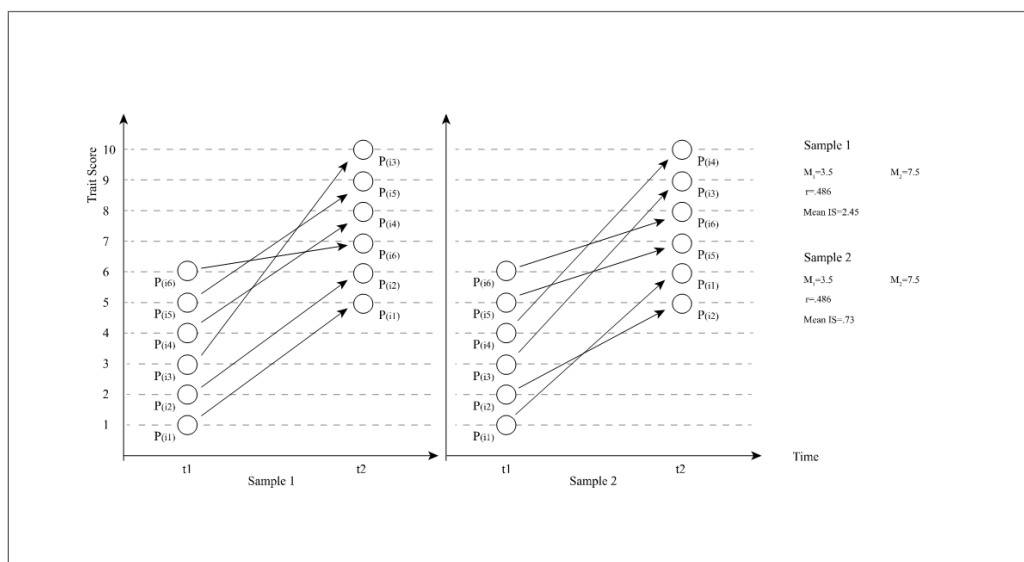
H1: The curve for individual stability shows an inverted U-shape.

H2: The curve for ipsative (profile) stability shows an inverted U-shape.

3. Methodology

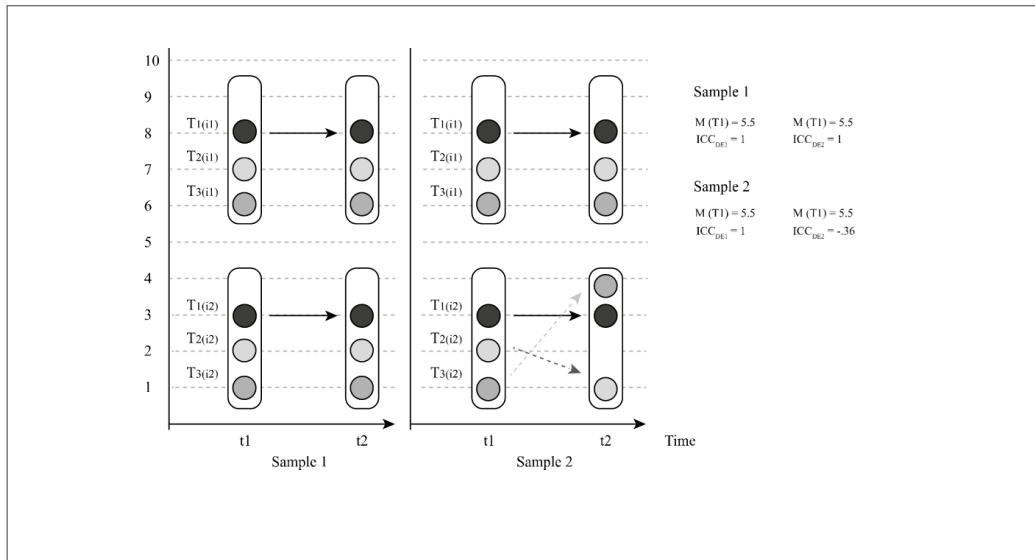
The German Socio-Economic Panel (SOEP) is a representative, nationwide survey across nearly 15,000 pri-

Figure 3
Individual Stability with Mean-Level Change and Rank-Order Immutability



Note: The figure shows two samples and their stability and change over time. In both cases, the mean (M) changes while the rank order coefficient (r) remains the same. However, the Individual Stability Indicator (IS) is more pronounced on the left side. Own visualization based on Asendorpf (1992).

Figure 4
Ipsative or Profile Stability



Note: The figure shows two samples with two individuals each and the development of their personality traits over time. In both cases, the mean value of trait 1 ($M(T1)$) remains constant. While the measure of profile stability (ICC_{DE}) remains the same in the first sample, it changes its value in sample 2.

vate households. In this wide-range longitudinal study, about 30,000 respondents are interviewed year by year. The survey started in 1984; wave 34 contains the most actual data ($N=32,485$, mean age=45.98, 51.4% female) from 2017 (Goebel et al., 2019; Liebig et al., 2017). While most studies focusing on personality traits investigate student samples, which involves a bias toward young adults with a higher level of education, the great advantage of nationwide studies is their representativeness. In addition to the questions that are components of every wave of the survey, special topics also flow into the investigation. Among many others, the SOEP contains variables about the Big Five personality traits, risk preferences, and concerns in several domains and many other psychological items. The data can be retrieved from the German Institute for Economic Research (Deutsches Institut für Wirtschaftsforschung, DIW) at no cost and are reserved exclusively for academic use and for registered researchers.

In the years 2005, 2009, 2013, and 2017, a self-completion questionnaire for the Big Five personality traits was part of the SOEP study (DIW Berlin, 2007). A brief

version of the Big Five Inventory with 15 questions, called the Big Five Inventory Short (BFI-S), was used in 2005 for the first time. In 2009, a 4th item, "being inquisitive," was added to Openness so that the BFI-S finally consisted of 16 questions. The items each consisted of a descriptive statement about the participant ("I am someone who ...). Answers were given using a 7-level Likert scale, where 1 denoted "Does not apply at all" and 7 meant "Fully applies". In the initial sample, 20,434 individuals (52.1% female) answered all items concerning the Big Five. In the following assessment, 14,105 of these (52.2% female) again answered all items. In survey year 2017, there were still 6,954 participants (52.9% female) from the initial sample who answered all the questions. Before the BFI-S was added to the SOEP panel, its external validity was tested, and the BFI-S was considered sufficient for capturing users' personality traits compared to the NEO-PI-R (Dehne & Schupp, 2007). The scores for Cronbach's alpha for all four waves are presented in Table 2. The enormous size of the questionnaire in such large panels makes it necessary to reduce the size of the question batteries on individual topics

Table 2
Descriptive Statistics for the Big Five Traits in All Four Waves

		O	C	E	A	N
2005						
n	Valid	20,768	20,866	20,940	20,943	20,921
	Missing	337	239	165	162	184
Mean		4.4985	5.9009	4.8295	5.4548	3.9604
Std. Deviation		1.21199	.94023	1.13865	.97935	1.22248
Cronbach's α		.63	.61	.66	.50	.60
2009						
n	Valid	20,430	20,550	20,592	20,605	20,612
	Missing	362	242	200	187	180
Mean		4.6404	5.8204	4.7738	5.3455	3.8278
Std. Deviation		1.10536	.94960	1.14187	.97998	1.22135
Cronbach's α		.67	.58	.66	.49	.62
2013						
n	Valid	18,820	18,967	18,995	19,004	18,985
	Missing	12,136	11,989	11,961	11,952	11,971
Mean		4.8077	5.8324	4.8590	5.3953	3.7631
Std. Deviation		1.06218	.91979	1.10973	.96065	1.21925
Cronbach's α		.66	.57	.66	.48	.62
2017						
n	Valid	28,990	29,325	29,445	29,435	29,446
	Missing	3,495	3,160	3,040	3,050	3,039
Mean		4.9692	5.7971	4.9504	5.4925	3.7831
Std. Deviation		1.08228	.95501	1.14725	.99539	1.24137
Cronbach's α		.66	.61	.65	.50	.59

Note: O=Openness to Experience (for 2005, the 3-item trait is described), C=Conscientiousness, E=Extraversion, A=Agreeableness, N=Neuroticism; Means and standard deviations are calculated for cases with all items completed; Cronbach's alpha calculated for all facets. Source: own elaboration.

and, thus, to accept compromises in terms of reliability.

The Big Five traits were measured in 2005, 2009, 2013, and 2017. After deleting all cases from the other years, a total of 105,338 cases remained for the four assessments (52.6% female, mean age = 47.34). The number of participants for the individual observations (20,792 \leq n \leq 32,485) can be found in Table 2. Every trait was measured by three items, while for "openness to experience," a fourth item was added in 2009. For each individual, a Big Five personality trait was calculated only when all belonging items were answered. Because in 2005, openness to experience consisted of only 3 items (O3), both versions of openness are regarded, whenever necessary. From 2009 to 2017, the mean scores of the 3-item and 4-item traits for openness (O4) developed similarly, in-

creasing with almost constant distance. The 4-item trait for O scores higher because the additional facet, "being inquisitive," scores nearly 1 point higher (5.50) than the remaining three items on average (4.57).

Participants were grouped by age decades, and age classes were restricted to those with more than 40 individuals because if an age group comprises too few members, the effect of outliers is much too high (Donnellan & Lucas, 2008; Lucas & Donnellan, 2009; Specht et al., 2011). Consequently, the final sample ranges from 18 to 87 years when results are dependent on age. When results were attributed to age groups, individuals younger than 18 were assigned to the first age group (18–27 years of age) and individuals older than 87 were assigned to the last group (Terracciano et al., 2010).

4. Results

4.1. Structural Stability

Structural stability over time represents the invariance of measurement for different assessments. It was tested using structural equation modelling across all four observations. For every single trait a measurement model was constructed comprising four correlated latent factors (one for every assessment). Each factor was measured by three items per observation - except the 4-item openness to experience from 2009 to 2017. The error terms of the observed items were allowed to correlate across time points. As the models are defined in terms of strict factorial invariance, it can be expected that if a trait changes it is not due to changes in measurement but as a result of the change of the latent factor (see also Specht et al. (2011)). Thus, residual variances, factor loadings, and intercepts were constrained to be equal over time. The estimations were computed with MPLUS 8.4 (Muthén & Muthén, 1998-2020).

With RMSEA values of .018 to .25, an excellent model fit can be concluded (MacCallum, Browne, & Sugawara, 1996). The SRMR values ($\leq .038$) as well as CFI ($\geq .971$) and TLI ($\geq .964$) are also very sufficient. The results suggest that for all five personality traits, structural stability over four observations could be proved (Table 3).

In addition to the longitudinal test of measurement invariance, also the cross-sectional stability of the factor structure should be examined. Cross-sectional structural stability used to be measured by confirmatory factor analysis (CFA) in the early days of personality psychology. However, CFA was not able to confirm the structure with satisfactory reliability, so that some researchers already doubted the five factor model. Borkenau and Ostendorf (1990) suspected two reasons: the restrictiveness of CFA that items are only allowed to load on one factor and the assumption that all variance is caused by the model itself. Indeed, CFA failed to prove the five factor structure for the present investigation.

Asparouhov and Muthén (2009) introduced exploratory structural equation modeling (ESEM) as a more powerful method to estimate the models with a better model fit (Marsh et al., 2010). The main advantage of ESEM is that the observed variables are not only allowed to their assigned factor. They can also load on the remaining factors but the factor-loadings are constrained close to zero. This not only better reflects the results of the exploratory factor analysis but is also more realistic. The latent factors according to the five factor theory are openness, conscientiousness, extraversion, agreeableness, and neuroticism. Each latent factor consists of three observed items in the first administration. In the years 2009, 2013, and 2017, open-

Table 3
Model-Fit Indices for Structural Stability over Time

Trait Dimension	Obs	χ^2	df	RMSEA [.90 CI]	SRMR	CFI	TLI
Openness (3-item)	49,888	1,120.369	54	.020 [.019; .021]	.023	.984	.980
Openness (4-item)	44,010	1,626.829	61	.024 [.023; .025]	.038	.977	.975
Conscientiousness	49,917	1,368.364	54	.022 [.021; .023]	.036	.979	.975
Extraversion	49,915	951.811	54	.018 [.017; .019]	.029	.989	.987
Agreeableness	49,928	1,153.223	54	.020 [.019; .021]	.034	.975	.970
Neuroticism	49,919	1,775.226	54	.025 [.024; .026]	.033	.971	.964

Note: Table presents model fit indices for longitudinal measurement invariance from 2005 to 2017 (4-item openness from 2009 to 2017); Obs = observations, CFI = comparative fit index, TLI = Tucker–Lewis index, RMSEA = root-mean-square error of approximation, SRMR = standardized root mean square residual. Source: own elaboration.

ness was measured by four items. Latent factors were allowed to covary. Measured items were assumed to have no intercorrelations between each other. Cases with missing items were treated using full-information-maximum-likelihood (FIML).

Although the answers on a Likert scale are, strictly speaking, not continuous but ordinal variables, they are treated as continuous variables in this study. According to Raykov and Marcoulides (2011) and Rhemtulla, Brosseau-Liard, and Savalei (2012), this can be done if the scale has at least 5 gradations. The model fit results of the ESEM for each measurement are presented in Table 3 with the commonly used fit indices: χ^2 , RMSEA, SRMR, CFI, and TLI. As the chi-square index is directly proportional to sample size, it is listed only for the sake of completeness. Hu and Bentler (1999) recommended an RSMEA value of $<.06$ for excellent model fit. Further cut-off values for a good to excellent model fit for the other indices are for SRMR $<.06$, CFI $\geq .90$, and for TLI $\geq .95$ (Morin, Arens, & Marsh, 2016).

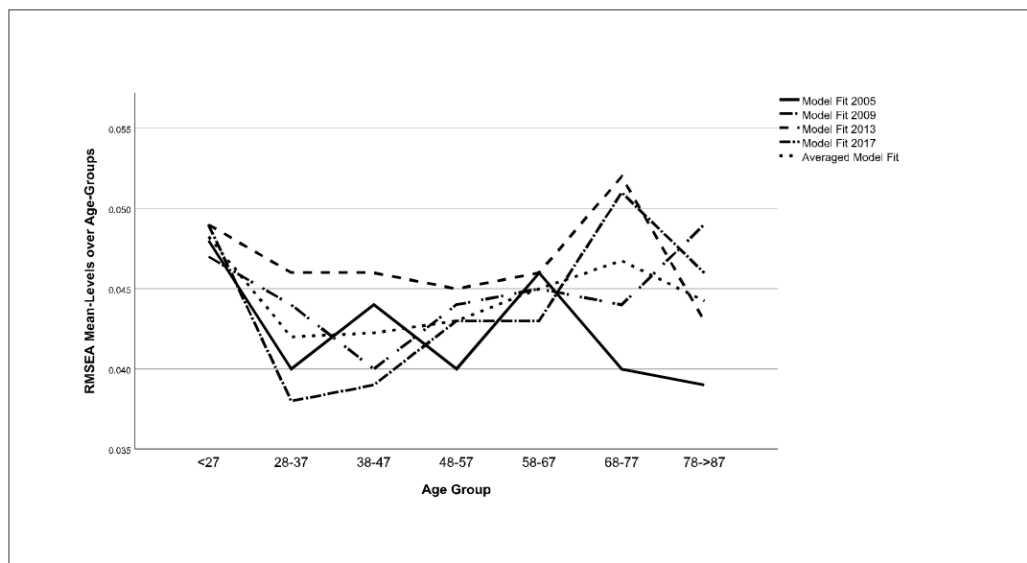
Thus, with RMSEA values of .039 to .52, an excellent model fit can be concluded (MacCallum et al., 1996). The SRMR values ($\leq .021$) as well as CFI ($\geq .959$) and TLI

($\geq .903$) are also very sufficient. All in all, it can be concluded that for all four observations and in every age-group, the five factor structure could be proved. Regarding age, it can be concluded that RMSEA and SRMR reach a minimum (best model fit) between the late 20s and the late 50s – or, on average, in the early 50s with a peak (lowest model fit) in the 70s. Thus, it can be stated that, also focusing on the working years, the structure of the Big Five could be confirmed with high reliability (Table 4).

4.2. Individual Stability and Change

While mean-level consistency provides information about the normative stability of a certain trait on the population level, there is no information about the amount of this trait's variability on the individual level. Asendorpf (1992) introduced an indicator for consistency/change of a certain trait at the individual level. It is calculated as $i_{12} = 1 - (z_1 - z_2)^2/2$, where z_1 and z_2 denote the z-transformed Big Five personality trait scores at time 1 and time 2. Thus, an indicator of 1 denotes perfect immutability of a certain trait between two assessments and more-negative scores mean an increase in change. The standardization makes it insensitive to mean-level change. Because the individual stability

Figure 5
RMSEA Model Fit Indices 2005–2017 from Exploratory SEM



Note: The figure shows the development of the root mean square error of approximation (RMSEA) values over the age classes, separately for the observation years 2005, 2009, 2013, and 2017.

Table 4*Model-Fit Indices for Structural Stability (Administrations 2005–2017)*

	N	χ^2	df	RMSEA [.90 CI]	SRMR	CFI	TLI
ESEM 2005							
<27	3,405	350.609	40	.048 [.043; .052]	.018	.971	.923
28-37	3,189	249.216	40	.040 [.036; .045]	.015	.977	.940
38-47	4,371	380.504	40	.044 [.040; .048]	.017	.973	.928
48-57	3,713	279.889	40	.040 [.036; .045]	.015	.978	.943
58-67	3,244	309.532	40	.046 [.041; .050]	.018	.972	.927
68-77	2,176	182.737	40	.040 [.035; .047]	.017	.979	.944
78->87	946	96.840	40	.039 [.029; .049]	.018	.983	.956
Total	21,044	1,585.35	40	.043 [.041; .045]	.016	.976	.936
ESEM 2009							
<27	2,780	356.782	50	.047 [.042; .052]	.019	.967	.920
28-37	2,652	304.921	50	.044 [.039; .049]	.018	.968	.923
38-47	4,081	374.067	50	.040 [.036; .044]	.016	.974	.938
48-57	3,884	434.155	50	.044 [.041; .048]	.018	.968	.922
58-67	3,249	382.837	50	.045 [.041; .050]	.018	.968	.923
68-77	2,875	328.821	50	.044 [.040; .049]	.018	.969	.926
78->87	1,202	196.453	50	.049 [.042; .057]	.021	.968	.923
Total	20,723	2,033.345	50	.044 [.042; .045]	.017	.970	.927
ESEM 2013							
<27	2,178	312.340	50	.049 [.044; .054]	.021	.962	.909
28-37	2,251	292.150	50	.046 [.041; .052]	.019	.965	.917
38-47	3,048	365.714	50	.046 [.041; .050]	.019	.966	.917
48-57	3,793	439.054	50	.045 [.041; .049]	.018	.969	.925
58-67	3,376	399.721	50	.046 [.041; .050]	.019	.967	.920
68-77	3,056	462.325	50	.052 [.048; .056]	.021	.959	.903
78->87	1,381	176.290	50	.043 [.036; .050]	.018	.974	.937
Total	19,083	2,109.501	50	.046 [.045; .048]	.018	.966	.918
ESEM 2017							
<27	4,487	585.931	50	.049 [.045; .052]	.019	.965	.915
28-37	4,870	401.306	50	.038 [.035; .041]	.015	.977	.945
38-47	5,951	501.307	50	.039 [.036; .042]	.015	.975	.940
48-57	5,886	595.461	50	.043 [.040; .046]	.017	.971	.930
58-67	4,019	424.362	50	.043 [.039; .047]	.017	.970	.928
68-77	2,751	409.792	50	.051 [.047; .056]	.021	.959	.903
78->87	1,571	216.012	50	.046 [.040; .052]	.020	.968	.922
Total	29,535	2,562.50	50	.041 [.040; .043]	.016	.973	.935

Note: Table presents model fit indices for cross-sectional measurements; ESEM = exploratory structural equation modeling, CFI = comparative fit index, TLI = Tucker–Lewis index, RMSEA = root-mean-square error of approximation. Source: own elaboration.

coefficient (IS) tends to be strongly skewed to the left, Asendorpf (1990) suggested a strictly monotonic transformation:

$$T_{i_{12}} = \begin{cases} \frac{1}{2} \ln \left(\frac{1.001 + i_{12}}{1.001 - i_{12}} \right) & \text{for } 0 \leq i_{12} \leq 1 \\ \ln \left(\frac{1}{1 - i_{12}} \right) & \text{for } i_{12} < 0 \end{cases}$$

After the transformation, the advantage of this indicator is – in contrast to rank-order correlation – that it reflects the strength of the individuals’ changes of the traits’ scores, that is, that in samples with different heterogeneity of the individual scores between two observations, the correlation r may be equal but the mean of individual stability i is different. Individual stability is computed for each Big Five personality trait for each pair of administrations.

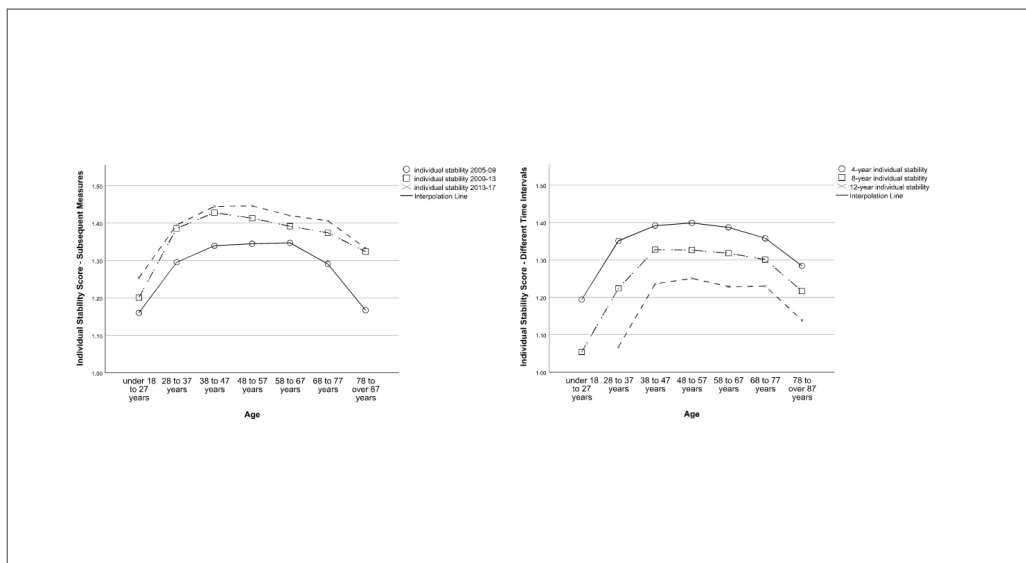
Similar to rank-order consistency, individual stability increases from adolescence until the age of about 40 and decreases in old age (Figure 5). For openness, conscientiousness, and agreeableness, a peak is reached at the age of 40, followed by a steady decline until old age. For extraversion and neuroticism, a relatively stable plateau is reached from the age of 40 to 70. Thus, for all Big Five traits, an inverse u-shape over the life course can be observed. This means

that, during the period of the working years, individual trait stability between two assessments is highest, while the most change occurs before the age of 40 and in old age.

The course of the averaged individual stability is similar to that of the rank-order stability on the population level. This is clear because Asendorpf has constructed the untransformed IS coefficient in such a way that the average IS coefficient is comparable with the rank-order correlation (Asendorpf, 1992, p. 110). This suggests that, during phases of rather low mean-level changes, the relative position of individuals in the sample changes the least and vice versa; in addition, these are the periods when the mean-level changes fluctuate around the zero line and when homogeneity reaches a maximum. The retest interval has a negative effect on IS.

In addition to individual stability scores on a per-trait level, a global individual stability score is computed as the mean of all non-missing traits IS per individual (Terracciano et al., 2010). This can be interpreted as the participant’s average trait stability. After calculation, mean scores are computed for each age group and for the entire sample. Again, an inverse u-shaped course can be found (Figure 6).

Figure 6
Global IS Between Subsequent Measures and over Time Intervals



Note: The figure shows the development of the Global Individual Stability (Global IS) indicator over the life course. The left-hand side shows the change between two successive measurements. The right side shows the average change at 4-year, 8-year, and 12-year intervals.

The global IS scores and the curve shapes reveal that stability not only increases slightly from older administrations to more recent ones but also decreases more strongly with retest interval. There is a clear increase in individual stability between the ages of 20 and 40, followed by a period of continuity, more or less, until the age of 70 and, finally, a decrease in old age. A t-test for mean-level equality reveals that the 12-year and 8-year intervals cannot be distinguished significantly by gender ($p=.88$ and $.79$), while for the 4-year interval, there is a significant effect ($p=.01$). A linear regression for individuals from 18 to 87 years was conducted including age, age3 and $\ln(\text{age})$. Because of multicollinearity, age2 was excluded from the regression (Table 5). The larger the test interval, the greater the change in individuals' trait levels for nearly every age group. For conscientiousness, agreeableness, and neuroticism, the changes during the 12-year interval are larger for all age-groups.

4.3. Ipsative Consistency

While rank-order stability measures the relative position of subjects between two assessments for a certain trait at the population level, ipsative consistency determines the relative stability of all trait levels for a certain individual between two time points. Following Terracciano et al. (2010) and McCrae (2008), the double-entry intra-class correlation coefficient (ICCDE) across the standardized Big Five traits is used as a measure for ipsative (profile) stability. The double-entry method represents a Pearson correlation across the five trait dimensions between two administrations, where the trait values for an individual at time 2 are added under the values

at time 1 and vice versa. An ICCDE between .5 and .75 is considered an acceptable profile stability; a score between .75 and .9 is good; and $>.9$ can be considered excellent (Koo & Li, 2016). The calculation of the ICCDE scores follows the instructions of Furr (2010), where X denotes the (standardized) score at first assessment and Y the (standardized) score at the second administration.

$$r_{ICC} = \frac{2\sigma_{XY} - \frac{1}{2}(\bar{X} - \bar{Y})^2}{\sigma_X^2 + \sigma_Y^2 + \frac{1}{2}(\bar{X} - \bar{Y})^2}$$

The results show that, for all three comparisons, the ICCDE stability scores for the standardized traits rise from about .36 to .41 in adolescence to .38 to .46 in the decade of the 50s. From this peak, the scores decline until reaching .30 to .38 in old age. What stands out is that, again, the stability level increases continuously from the first to the third pair of observations (Figure 7).

To compute scores for 4-year and 8-year test intervals, mean scores for the corresponding intervals were calculated, and again, the scores decrease with the increasing length of the test interval (Table 6).

A t-test for similarity of mean values reveals that original ICC scores can be significantly distinguished by gender for all time intervals, while standardized ICC scores cannot. In order to predict ICC scores from standardized values, a linear regression is conducted (Table 7).

5. Discussion and Limitations

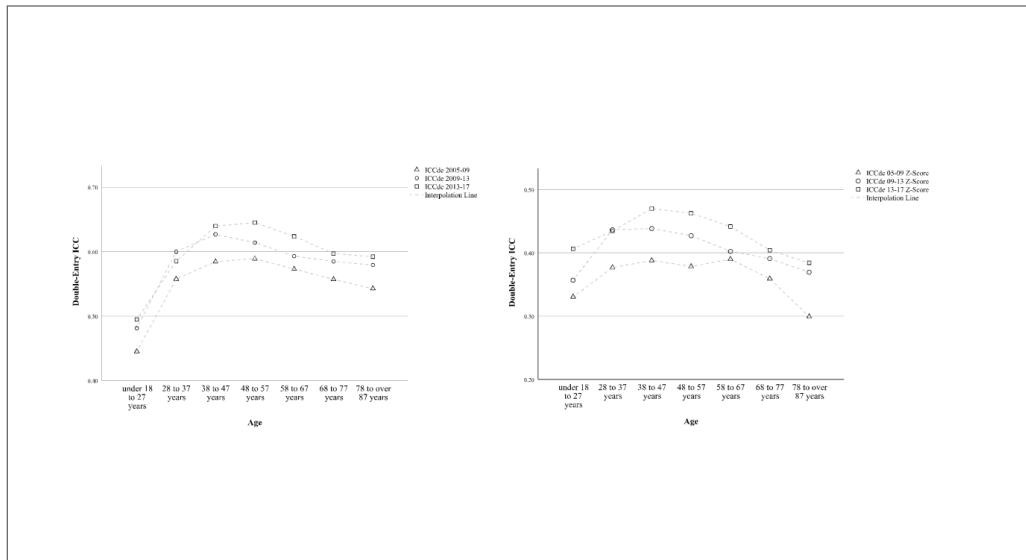
The present study examined the effects of age on stability and change on the individual level, starting from structural stability, over individual differences to ipsative consistency.

Table 5
Linear Regressions Linking Age to Global Individual Stability

	4-year test interval	8-year test interval	12-year test interval
Intercept	-1.877 [.368]***	-3.405 [.825]***	-5.574 [1.840]**
Age	-.026 [.005]***	-.038 [.010]***	-.052 [.020]**
Age ³	3.7518E-7 [.000]	6.8175E-7 [.000]	8.8678E-7 [.000]
$\ln(\text{Age})$	1.163 [.149]**	1.678 [.323]***	2.380 [.703]***
Gender	.016 [.006]*	.002 [.009]	.006 [.014]

Note: unstandardized coefficients are reported for global individual stability scores regressed on age, for individuals from 18 to 87 years; standard errors in parentheses; *** $p < .001$, ** $p < .01$, * $p < .05$. Source: own elaboration.

Figure 7
 Double-Entry ICC between subsequent Measures (Raw and Z-Scores)



Note: The figure shows the development of the double-entry ICC over the life course. The left side shows the development of the raw values, the right side shows z-scores.

Table 6
 Double-Entry Intra-Class Correlations (Standardized and Raw Scores)

ICC _{DE}	18 to 27	28 to 37	38 to 47	48 to 57	58 to 67	68 to 77	78 to 87	Total
4-year interval	.471	.581	.613	.618	.600	.582	.578	.590
	[.361]	[.412]	[.424]	[.420]	[.410]	[.383]	[.351]	[.402]
N	2,702	4,538	6,549	7,929	7,053	6,215	3,005	37,991
8-year interval	.382	.514	.581	.578	.570	.553	.545	.557
	[.263]	[.335]	[.385]	[.373]	[.360]	[.341]	[.310]	[.354]
N	463	1,907	2,804	4,050	3,681	3,193	1,685	17,783
12-year interval	-	.416	.542	.555	.538	.518	.516	.526
	-	[.252]	[.345]	[.339]	[.331]	[.302]	[.277]	[.316]
N	-	583	963	1,630	1,630	1,382	822	6,956

Note: presented are double-entry ICC mean scores of Big Five personality traits for individuals' profiles over time intervals; double-entry ICC mean scores of standardized Big Five personality traits in brackets. Source: own elaboration.

Table 7*Linear Regressions Linking Age to Double-Entry ICC (Standardized Scores)*

	4-year test interval	8-year test interval	12-year test interval
Intercept	-1.070 [.243]***	-2.544 [.535]***	-3.595 [1.219]**
Age	-.014 [.003]***	-.027 [.006]***	-.032[.013]*
Age ³	2.8676E-7 [.000]*	6.2491E-7 [.000]**	6.1423E-7 [.000]
ln (Age)	.557 [.098]***	1.075 [.208]***	1.401 [.462]**

Note: unstandardized coefficients are reported for double entry ICC scores for standardized values of individuals from 18 to 87 years; standard errors in parentheses; *** $p < .001$, ** $p < .01$, * $p < .05$. Source: own elaboration.

It was found that, for both types, stability increases from the age of 18 years until the age of about 40 and then declines. Thus, both hypotheses could be confirmed. Age has a complex and distinct effect on every Big Five personality trait. The results for individual differences in change corroborate the findings from studies on the population level. For all traits, a peak is reached between 40 and 50 years of age, with a plateau period until the age of 70 for extraversion and neuroticism and a steady decline for openness, conscientiousness, and agreeableness. For profile stability, the results are similar. The composition of the individuals' profiles varies most before the age of 40 and, after that, declines until old age.

All in all, it may be stated that the Big Five personality traits can be assumed to be predictable or even stable for a time span of 4 to 12 years from the age of 40 years until 70 years for the individual level. This is a highly significant finding not only for research related to personality psychology but also for the field of consumer behavior. If, for example, it is possible to derive personality from behavior and behavior from personality, then there is a window of at least 30 years within which one could employ the knowledge of personality traits to shape or to understand a certain behavior.

As interesting as the Big Five traits are for microeconomic research on consumer behavior, it should be emphasized that consumer personality is a complex construct that is made up of a wide variety of building blocks with the Big Five representing only one facet of personality and that behavior is also always dependent on the situational context (Funder, 2010). However, each individual component contributes to a better understanding of the consumers' behavior: Understanding consumers – their needs and motivations, their drives and psychological constitutions – is fundamental to marketing in the B2C sector and con-

sumer research. A necessary condition here is the stability or predictability of the personality traits, otherwise a cause-effect conclusion based on the user personality is not possible. Especially when other factors of the purchase decision such as socio-economic variables or situational factors are equal or very similar, the individual dispositions of consumers can play a decisive role.

An important field of research in consumer behavior is also the reverse approach, namely the identification of personality traits from certain patterns of behavior. Youyou et al. (2015), Kosinski, Wang, Lakkaraju, and Leskovec (2016), and Kosinski, Stillwell, and Graepel (2013) have already shown that personality can be derived from the digital footprint of individuals. This research should be extended, for example with the evaluation of shopping baskets and the measurement of traits with validated short scales during analog shopping. In a further step, the reverse conclusion could then be investigated, that is, whether individuals with certain personality traits show similar shopping behavior. These studies should consider not only habitual low-intersect purchases but also decisions about expensive consumer goods such as electric cars or energy efficiency measures for the home.

A question remains about the worldwide validity and comparability of results: there is a broad consensus in the scientific literature that the Big Five personality traits are similarly expressed around the world because they are innate to people and remain largely stable as they progress (Parks-Leduc et al., 2015, p. 5). This contrasts them with, for example, Schwartz's basic human values (Cieciuch et al., 2015). These values are learned through culture, upbringing, and socialization and thus differ between cultures and peoples (Parks & Guay, 2009, p. 676). Nevertheless, there is the possibility of cross-cultural differences in self-assessment. Terracciano et al. (2005) were able to

show that although there are differences in the assessment of personality traits of other nationalities, these differences were not reflected in the empirical study. It would be a challenging endeavor to continue to conduct nationwide representative studies such as the SOEP also in other cultures to investigate whether the expressions differ from the American and European results.

6. Conclusion

This article aimed to narrow the research gap regarding the stability of personality traits at the level of the individual. The present study offers an investigation of two stability indicators, using data from a representative German sample with new insights for research and applied psychology and consumer behavior. Both the stability of an individual's traits and his or her (ipsative) profile stability show inverse U-shapes over the life course, with an increase in stability up to about age 40 and a plateau between ages 40 and 70. These results show that an individual's personality traits not only remain relatively unchangeable in adulthood but are also subject to systemic development, that is, they are not arbitrary. In the field of purchasing behavior research, these findings can be of great importance when dealing with a very narrowly defined target group with otherwise very similar parameters. This is the case, for example, with owners of photovoltaic systems who have to decide whether or not to buy an electricity storage system. However, further research is needed to verify the results on concrete use cases. These can be cross sectional as well as long-term studies. To the best of the author's knowledge, the few studies to date that have examined stability and change in the Big Five at the individual level have come from the European and American regions. Researchers from the rest of the world should feel encouraged to investigate this topic for their culture.

References

- Aaker, J. L. (1997). Dimensions of brand personality. *Journal of Marketing Research*, 34(3), 347. <https://doi.org/10.2307/3151897>
- Asendorpf, J. B. (1990). The measurement of individual consistency. *Methodika*, 4, 1–23.
- Asendorpf, J. B. (1992). Beyond stability: Predicting inter-individual differences in intra-individual change. *European Journal of Personality*, 6(2), 103–117. <https://doi.org/10.1002/per.2410060204>
- Ashton, M. C., & Lee, K. (2007). Empirical, theoretical, and practical advantages of the HEXACO model of personality structure. *Personality & Social Psychology Review*, 11(2), 150–166. <https://doi.org/10.1177/1088868306294907>
- Ashton, M. C., & Lee, K. (2009). The HEXACO-60: A short measure of the major dimensions of personality. *Journal of Personality Assessment*, 91(4), 340–345. <https://doi.org/10.1080/00223890902935878>
- Ashton, M. C., Lee, K., Perugini, M., Szarota, P., Vries, R. E. de, Di Blas, L., . . . Raad, B. de (2004). A six-factor structure of personality-descriptive adjectives: Solutions from psycholexical studies in seven languages. *Journal of Personality & Social Psychology*, 86(2), 356–366. <https://doi.org/10.1037/0022-3514.86.2.356>
- Asparouhov, T., & Muthén, B. (2009). Exploratory structural equation modeling. *Structural Equation Modeling: A Multidisciplinary Journal*, 16(3), 397–438. <https://doi.org/10.1080/10705510903008204>
- Benet-Martínez, V., & John, O. P. (1998). Los Cinco Grandes across cultures and ethnic groups: Multitrait-multimethod analyses of the Big Five in Spanish and English. *Journal of Personality & Social Psychology*, 75(3), 729–750. <https://doi.org/10.1037/0022-3514.75.3.729>
- Borghans, L., Duckworth, A. L., Heckman, J. J., & ter Weel, B. (2008). The economics and psychology of personality traits. *Journal of Human Resources*, 43(4), 972–1059. <https://doi.org/10.3368/jhr.43.4.972>
- Borkenau, P., & Ostendorf, F. (1990). Comparing exploratory and confirmatory factor analysis: A study on the 5-factor model of personality. *Personality and Individual Differences*, 11(5), 515–524. [https://doi.org/10.1016/0191-8869\(90\)90065-Y](https://doi.org/10.1016/0191-8869(90)90065-Y)
- Brick, C., & Lewis, G. J. (2016). Unearthing the “green” personality: Core traits predict environmentally friendly behavior. *Environment and Behavior*, 48(5), 635–658. <https://doi.org/10.1177/0013916514554695>
- Brown, S., & Taylor, K. (2011). *Household finances and the 'Big Five' personality traits* (IZA Discussion Papers, Teil 6191). Bonn: Forschungsinstitut zur Zukunft der Arbeit GmbH. Retrieved from Forschungsinstitut zur Zukunft der Arbeit GmbH website: <http://nbn-resolving.de/urn:nbn:de:101:1-201201104053>; <http://d-nb>.

- info/1018678646/34; <http://ftp.iza.org/dp6191.pdf>
- Basic-Sontic, A., & Brick, C. (2018). Personality trait effects on green household installations. *Collabra: Psychology*, 4(1), 8. <https://doi.org/10.1525/collabra.120>
- Cieciuch, J., Davidov, E., Schmidt, P., Algesheimer, R., & Schwartz, S. H. (2015). Comparing results of an exact vs. an approximate (Bayesian) measurement invariance test: a cross-country illustration with a scale to measure 19 human values. In A. D. Beuckelaer, P. Schmidt, & R. van de Schoot (Eds.), *Measurement invariance* (pp. 59–68). s.l.: Frontiers Media SA. <https://doi.org/10.3389/fpsyg.2014.00982>
- Cobb-Clark, D. A., & Schurer, S. (2012). The stability of big-five personality traits. *Economics Letters*, 115(1), 11–15. <https://doi.org/10.1016/j.econlet.2011.11.015>
- Conley, J. J. (1985). Longitudinal stability of personality traits: A multitrait-multimethod-multioccasion analysis. *Journal of Personality & Social Psychology*, 49(5), 1266–1282.
- Costa, P. T. (1996). Work and personality: Use of the NEO-PI-R in Industrial/Organisational Psychology. *Applied Psychology*, 45(3), 225–241. <https://doi.org/10.1111/j.1464-0597.1996.tb00766.x>
- Costa, P. T., & McCrae, R. R. (1976). Age differences in personality structure: A cluster analytic approach. *Journal of Gerontology*, 31(5), 564–570.
- Costa, P. T., & McCrae, R. R. (2008). The revised NEO personality inventory (NEO-PI-R). In G. J. Boyle, G. Matthews, & D. H. Saklofske (Eds.), *The SAGE handbook of personality theory and assessment: Personality measurement and testing (Volume 2)* (1st ed., pp. 179–198). London, United Kingdom: Sage Publications Ltd. <https://doi.org/10.4135/9781849200479.n9>
- Costa, P. T., McCrae, R. R., & Terracciano, A. (2008). Personality traits: Stability and change with age. *Geriatrics and Aging*, 11(8), 474–478.
- Das, A. S., Datar, M., Garg, A., & Rajaram, S. (2007). Google news personalization. In C. Williamson, M. E. Zurko, P. Patel-Schneider, & P. Shenoy (Eds.), *Proceedings of the 16th international conference on World Wide Web - WWW '07* (p. 271). New York, New York, USA: ACM Press. <https://doi.org/10.1145/1242572.1242610>
- Dehne, M., & Schupp, J. (2007). *Persönlichkeitsmerkmale im Sozio-oekonomischen Panel (SOEP) - Konzept, Umsetzung und empirische Eigenschaften*. Berlin.
- DeYoung, C. G. (2015). Cybernetic Big Five Theory. *Journal of Research in Personality*, 56, 33–58. <https://doi.org/10.1016/j.jrp.2014.07.004>
- DIW Berlin (2007). DIW Berlin: Über uns. Retrieved from http://www.diw.de/de/diw_02.c.221178.de/ueber_uns.html#299767
- Donnellan, M. B., & Lucas, R. E. (2008). Age differences in the Big Five across the life span: Evidence from two national samples. *Psychology and Aging*, 23(3), 558–566. <https://doi.org/10.1037/a0012897>
- Fischer, R. (2018). *Personality, values, culture: An evolutionary approach. Culture and psychology*. Cambridge: Cambridge University Press. Retrieved from <https://doi.org/10.1017/9781316091944> <https://doi.org/10.1017/9781316091944>
- Funder, D. C. (2010). *The personality puzzle* (5. ed.). New York, NY: Norton.
- Furr, R. M. (2010). The double-entry intraclass correlation as an index of profile similarity: Meaning, limitations, and alternatives. *Journal of Personality Assessment*, 92(1), 1–15. <https://doi.org/10.1080/00223890903379134>
- Goebel, J., Grabka, M. M., Liebig, S., Kroh, M., Richter, D., Schröder, C., & Schupp, J. (2019). The German Socio-Economic Panel (SOEP). *Jahrbücher Für Nationalökonomie Und Statistik*, 239(2), 345–360. <https://doi.org/10.1515/jbnst-2018-0022>
- Gohary, A., & Hanzaae, K. H. (2014). Personality traits as predictors of shopping motivations and Behaviors: A canonical correlation analysis. *Arab Economic and Business Journal*, 9(2), 166–174. <https://doi.org/10.1016/j.aebj.2014.10.001>
- Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist*, 48(1), 26–34. <https://doi.org/10.1037/0003-066X.48.1.26>
- Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. G. (2006). The international personality item pool and the future of public-domain personality measures. *Journal of Research in Personality*, 40(1), 84–97. <https://doi.org/10.1016/j.jrp.2005.08.007>
- Hoyer, W. D., MacInnis, D. J., & Pieters, R. (2013). *Consumer behavior* (6. ed., internat. ed.). South-Western Cengage Learning.
- Hu, L.-t., & Bentler, P. M. (1999). Cutoff criteria

- for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>
- Ibáñez, M. I., Viruela, A. M., Mezquita, L., Moya, J., Villa, H., Camacho, L., & Ortet, G. (2016). An investigation of five types of personality trait continuity: A two-wave longitudinal study of Spanish adolescents from age 12 to age 15. *Frontiers in Psychology*, 7, 512. <https://doi.org/10.3389/fpsyg.2016.00512>
- John, O. P., Naumann, L. P., & Soto, C. J. (2010). Paradigm shift to the integrative Big Five taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 114–158). Guilford Press.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47(2), 263–292. <https://doi.org/10.2307/1914185>
- Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. *American Psychologist*, 39(4), 341–350. <https://doi.org/10.1037/0003-066X.39.4.341>
- Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine*, 15(2), 155–163. <https://doi.org/10.1016/j.jcm.2016.02.012>
- Kosinski, M., Stillwell, D. J., & Graepel, T. (2013). Private traits and attributes are predictable from digital records of human behavior. *Proceedings of the National Academy of Sciences of the United States of America*, 110(15), 5802–5805. <https://doi.org/10.1073/pnas.1218772110>
- Kosinski, M., Wang, Y., Lakkaraju, H., & Leskovec, J. (2016). Mining big data to extract patterns and predict real-life outcomes. *Psychological Methods*, 21(4), 493–506. <https://doi.org/10.1037/met0000105>
- Liebig, S., Schupp, J., Goebel, J., Richter, D., Schröder, C., Bartels, C., . . . Deutsches Institut für Wirtschaftsforschung e.V. (2017). *Socio-Economic Panel (SOEP), data from 1984-2017*. SOEP Socio-Economic Panel Study. <https://doi.org/10.5684/SOEP.V34>
- Löckenhoff, C. E., Terracciano, A., Bievenu, O. J., Patriciu, N. S., Nestadt, G., McCrae, R. R., . . . Costa, P. T. (2008). Ethnicity, education, and the temporal stability of personality traits in the East Baltimore epidemiologic catchment area study. *Journal of Research in Personality*, 42(3), 577–598. <https://doi.org/10.1016/j.jrp.2007.09.004>
- Lucas, R. E., & Donnellan, M. B. (2009). Age differences in personality: Evidence from a nationally representative Australian sample. *Developmental Psychology*, 45(5), 1353–1363. <https://doi.org/10.1037/a0013914>
- MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, 1(2), 130–149. <https://doi.org/10.1037/1082-989X.1.2.130>
- Marsh, H. W., Lüdtke, O., Muthén, B., Asparouhov, T., Morin, A. J. S., Trautwein, U., & Nagengast, B. (2010). A new look at the big five factor structure through exploratory structural equation modeling. *Psychological Assessment*, 22(3), 471–491. <https://doi.org/10.1037/a0019227>
- McCrae, R. R. (2008). A note on some measures of profile agreement. *Journal of Personality Assessment*, 90(2), 105–109. <https://doi.org/10.1080/00223890701845104>
- McCrae, R. R., & Costa, P. T. (1990). *Personality in adulthood*. Guilford Press. <http://www.loc.gov/catdir/bios/guilford051/89078494.html>
- McCrae, R. R., & Costa, P. T. (1999). A five-factor theory of personality. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 139–153). New York, NY: Guilford Press.
- McCrae, R. R., & Costa, P. T. (2010). The five-factor theory of personality. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 159–181). Guilford Press.
- McCrae, R. R., Costa, P. T., & Arenberg, D. (1980). Constancy of adult personality structure in males: Longitudinal, cross-sectional and times-of-measurement analyses. *Journal of Gerontology*, 35(6), 877–883. <https://doi.org/10.1093/geronj/35.6.877>
- McCrae, R. R., Costa, P. T., Lima, M. P. de, Simões, A., Ostendorf, F., Angleitner, A., . . . Piedmont, R. L. (1999). Age differences in personality across the adult life span: Parallels in five cultures. *Developmental Psychology*, 35(2), 466–477. <https://doi.org/10.1037/0012-1649.35.2.466>

- McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of Personality*, *60*(2), 175–215. <https://doi.org/10.1111/j.1467-6494.1992.tb00970.x>
- McCrae, R. R., & Terracciano, A. (2005). Personality profiles of cultures: Aggregate personality traits. *Journal of Personality & Social Psychology*, *89*(3), 407–425. <https://doi.org/10.1037/0022-3514.89.3.407>
- Milosevic, P., & Sibley, C. G. (2014). The stability of adult personality varies across age: Evidence from a two-year longitudinal sample of adult New Zealanders. *Journal of Research in Personality*, *51*, 29–37. <https://doi.org/10.1016/j.jrp.2014.04.005>
- Morin, A. J. S., Arens, A. K., & Marsh, H. W. (2016). A bifactor exploratory structural equation modeling framework for the identification of distinct sources of construct-relevant psychometric multidimensionality. *Structural Equation Modeling: A Multidisciplinary Journal*, *23*(1), 116–139. <https://doi.org/10.1080/10705511.2014.961800>
- Möttus, R., Johnson, W., & Deary, I. J. (2012). Personality traits in old age: Measurement and rank-order stability and some mean-level change. *Psychology and Aging*, *27*(1), 243–249. <https://doi.org/10.1037/a0023690>
- Neumann, J. von, & Morgenstern, O. (2007). *Theory of games and economic behavior* (60th anniversary ed.). Princeton classic editions. Princeton: Princeton University Press. Retrieved from <http://www.jstor.org/stable/10.2307/j.ctt1r2gkx> <https://doi.org/10.2307/j.ctt1r2gkx>
- Neyer, F. J., & Asendorpf, J. B. (2001). Personality-relationship transaction in young adulthood. *Journal of Personality & Social Psychology*, *81*(6), 1190–1204. <https://doi.org/10.1037/0022-3514.81.6.1190>
- Parks, L., & Guay, R. P. (2009). Personality, values, and motivation. *Personality and Individual Differences*, *47*(7), 675–684. <https://doi.org/10.1016/j.paid.2009.06.002>
- Parks-Leduc, L., Feldman, G., & Bardi, A. (2015). Personality traits and personal values: A meta-analysis. *Personality & Social Psychology Review*, *19*(1), 3–29. <https://doi.org/10.1177/1088868314538548>
- Pinjisakikool, T. (2018). The influence of personality traits on households' financial risk Tolerance and financial behaviour. *Journal of Interdisciplinary Economics*, *30*(1), 32–54. <https://doi.org/10.1177/0260107917731034>
- Poier, S. (2021). Towards a psychology of solar energy: Analyzing the effects of the Big Five personality traits on household solar energy adoption in Germany. *Energy Research & Social Science*, *77*, 102087. <https://doi.org/10.1016/j.erss.2021.102087>
- Raykov, T., & Marcoulides, G. A. (2011). *Introduction to psychometric theory*. Routledge. <http://gbv.eblib.com/patron/FullRecord.aspx?p=668336>
- Rhemtulla, M., Brosseau-Liard, P. É., & Savalei, V. (2012). When can categorical variables be treated as continuous? A comparison of robust continuous and categorical SEM estimation methods under suboptimal conditions. *Psychological Methods*, *17*(3), 354–373. <https://doi.org/10.1037/a0029315>
- Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of mean-level change in personality traits across the life course: A meta-analysis of longitudinal studies. *Psychological Bulletin*, *132*(1), 1–25. <https://doi.org/10.1037/0033-2909.132.1.1>
- Roberts, B. W., Wood, D., & Caspi, A. (2010). The development of personality traits in adulthood. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 375–398). Guilford Press.
- Simon, H. A. (1955). A behavioral model of rational choice. *The Quarterly Journal of Economics*, *69*(1), 99. <https://doi.org/10.2307/1884852>
- Soto, C. J., & John, O. P. (2017). The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal of Personality and Social Psychology*, *113*(1), 117–143. <https://doi.org/10.1037/pspp0000096>
- Specht, J., Egloff, B., & Schmukle, S. C. (2011). Stability and change of personality across the life course: The impact of age and major life events on mean-level and rank-order stability of the Big Five. *Journal of Personality and Social Psychology*, *101*(4), 862–882. <https://doi.org/10.1037/a0024950>
- Terracciano, A., Abdel-Khalek, A. M., Adám, N., Adamovová, L., Ahn, C.-k., Ahn, H.-n., . . . McCrae, R. R. (2005). National character does not reflect mean personality trait levels in 49 cultures. *Science (New York, N.Y.)*, *310*(5745), 96–100. <https://doi.org/10.1126/science.1117199>

- Terracciano, A., McCrae, R. R., & Costa, P. T. (2010). Intra-individual change in personality stability and age. *Journal of Research in Personality*, *44*(1), 31–37. <https://doi.org/10.1016/j.jrp.2009.09.006>
- Thaler, R. H. (1985). Mental accounting and consumer choice. *Marketing Science*, *4*(3), 199–214. <https://doi.org/10.1287/mksc.4.3.199>
- Valchev, V. H., van de Vijver, F. J. R., Nel, J. A., Rothmann, S., & Meiring, D. (2013). The use of traits and contextual information in free personality descriptions across ethnocultural groups in South Africa. *Journal of Personality and Social Psychology*, *104*(6), 1077–1091. <https://doi.org/10.1037/a0032276>
- Wagner, J., Lüdtke, O., & Robitzsch, A. (2019). Does personality become more stable with age? Disentangling state and trait effects for the big five across the life span using local structural equation modeling. *Journal of Personality and Social Psychology*, *116*(4), 666–680. <https://doi.org/10.1037/pspp0000203>
- Williamson, J. M. (2018). *Teaching to individual differences in science and engineering librarianship: Adapting library instruction to learning styles and personality characteristics*. Chandos Publishing is an imprint of Elsevier. Retrieved from <http://www.sciencedirect.com/science/book/9780081018811>
- Youyou, W., Kosinski, M., & Stillwell, D. J. (2015). Computer-based personality judgments are more accurate than those made by humans. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(4), 1036–1040. <https://doi.org/10.1073/pnas.1418680112>
- Zabkar, V., Arslanagic-Kalajdzic, M., Diamantopoulos, A., & Florack, A. (2017). Brothers in blood, yet strangers to global brand purchase: A four-country study of the role of consumer personality. *Journal of Business Research*, *80*, 228–235. <https://doi.org/10.1016/j.jbusres.2017.06.006>