



## Real estate and personality



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### ABSTRACT

This paper explores preferences and choices in the real estate market from a personality perspective. First, we employ micro-level data on individual scores on the Big Five personality test and personal financial real estate preferences to evaluate the role of personality in individual real estate market-related preferences. Empirical results provide solid evidence for an association between personality traits and individual preferences on a series of housing tenure, mortgage, and real estate investment attributes. Moreover, based on cross-sectional state-level aggregate personality scores and macro real estate market indicators, we find evidence indicating that the detected micro-level personality-preferences association conveys macro consequences on real estate market equilibrium outcomes. Research findings thus provide a new perspective for understanding individual preferences and equilibrium outcomes in the real estate market.

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### 1. Introduction

Applied studies of personality show that personality traits can predict various dimensions of human behavior, preferences, and affects. It has been found, for example, that personality traits correlate with sales performance (Furnham and Fudge, 2008), career success and work satisfaction (Boudreau, Boswell, and Judge, 2001), earnings (Nyhus and Pons, 2005), academic success (O'Connor and Paunonen, 2007), political opinions (Barbaranelli et al., 2007; Riemann et al., 1993), car accident involvement (Arthur and Graziano, 2006), willingness to buy counterfeit products (Swami, Chamorro-Premuzic, and Furnham, 2009), alcohol consumption (Kuntsche, von Fischer, and Gmel, 2008), and the decision to get tattoos or body piercings (Tate and Shelton, 2008).

Personality traits are further found to explain economic decision making: personality traits may predict participants' cooperation when faced with the "prisoner's dilemma" paradigm (Hirsh and Peterson, 2009), anchoring heuristic behavior (McElroy and Dowd,

2007), availability and disposition heuristic effects (Durand et al., 2013), and attitudes toward materialism and money (Shafer, 2000). Within the financial arena specifically, personality traits are shown to correlate with the amount of risk assumed by investors and their portfolio achievements (Durand et al., 2013; Durand, Newby, and Sanghani, 2008) and with short-term versus long-term investment choices (Mayfield, Perdue, and Wooten, 2008.).

Studies also show that personality patterns exhibit regional differences (e.g., McCrae, 2001; McCrae and Terracciano, 2008; Schmitt et al., 2007; and Steel and Ones, 2002 for cross-national variation, and Krug and Kulhavy, 1973; Plaut, Markus, and Lachman, 2002; and Rentfrow, Gosling, and Potter, 2008 for geographical variation within the U.S.). These regional personality differences are, in turn, shown to be associated with geographical variation in socio-economic and demographic indicators. For example, Rentfrow et al. (2013) provide evidence showing that regional-level aggregate personality scores correlate with state-level variation in political, economic, social, and health variables.<sup>1</sup>

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<sup>1</sup> See also, among other recent studies on the correlation of state-level personality and socio-economic variables, Rentfrow (2010), de Vries, Gosling, and Potter (2011), and Obschonka et al. (2013).

It is interesting to note, however, that to the best of our knowledge there is no personality literature related to preferences and choices in the real estate market. We seek to fill this void by exploring the correlation between personality traits and individual preferences regarding housing tenure, mortgage, and real estate investment attributes.<sup>2</sup> Moreover, we examine the consequences of the micro-level personality-preference association on real estate market equilibrium outcomes.

Micro-level data for the analysis is based on an online survey that includes the Big Five Inventory (BFI) personality test (see description in Section 2), a series of individual ratings of preferences on real estate-related issues, and control information on personal background and socio-economic and demographic characteristics. A total of 1138 subjects – well distributed across gender, marital status, age, and income – participated in the survey. For the macro-level analysis, we use Rentfrow et al.'s (2013) cross-sectional state-level aggregate personality scores, along with state-level indicators on macro housing and mortgage attributes.

Our findings provide solid evidence on the correlation between personality traits and individual preferences over real estate topics. Specifically, we find that openness, conscientiousness, neuroticism, agreeableness, and extraversion associate with preferences over mortgage attributes such as loan-to-value level, fixed versus adjustable interest rate, and mortgage duration and housing attributes such as homeownership versus rental tenure modes. Moreover, we find evidence indicating that the detected micro-level personality-preference association conveys macro consequences on real estate market equilibrium outcomes. Specifically, we show that state-level aggregate personality scores associate with real estate market indicators such as homeownership rate, average loan-to-value ratio, and market share of adjustable-rate mortgages. We discuss our evidence in the context of the outcomes that emerged from previous empirical studies of personality. Our empirical results propose a new perspective for understanding individual and household preferences and choices and their effect on real estate market equilibrium.

The paper proceeds as follows. Section 2 provides background on the Big Five personality traits and the implied hypotheses for our research. Section 3 examines the association between personality and individual preferences in the real estate market, whereas Section 4 explores the association between state-level aggregate personality scores and real estate market indicators. Finally, Section 5 provides a summary and conclusion.

## 2. The Big Five personality traits: background and hypotheses

In contrast to being an evolutionary outcome of a purely psychologically based theory, the Big Five model emerges from a systematic taxonomy and factorial analysis of adjectives in the spoken language. That is, under the assumption that personality differences are reflected in the language, adjectives that describe traits are put into correlative personality trait clusters. This allows

categorization and differentiation among essential traits – keys to a reliable personality model.

The original work of Allport and Odbert (1936) specified 18,000 adjectives in the English lexicon describing individual differences. The work on adjectives continued with Cattle (1943, 1945), Fiske (1949), Tupes and Christal (1961), Norman (1963), Borgatta (1964), Digman and Takemoto-Chock (1981), Costa and McCrae (1985), Goldberg (1990), and, more recently, Costa and McCrae (1992) and John and Srivastava (1999). From these efforts, the list of adjectives was clustered into five dimensions, known as the Big Five: (a) extraversion (versus introversion); (b) agreeableness (versus antagonism); (c) conscientiousness (versus lack of direction); (d) neuroticism (versus emotional stability); and (e) openness (versus closedness) to experience.<sup>3</sup>

Several self-reporting questionnaires (inventories) on the Big Five personality traits are suggested in the literature. These inventories differ in the substance and the number of facets that are chosen to represent each personality dimension. Personality inventories thus range from 10 to 240 questions. In this study, we use a relatively short self-reporting questionnaire (the BFI) that includes 44 questions and refers to 8–10 facets of each personality dimension. According to John and Srivastava (1999), the major advantages of the BFI are that it is clear and understandable to self-reporters and is sufficiently comprehensive to reliably evaluate personality, even though it is relatively short. The output of the BFI is a score on a continuous index ranging from one to five in each personality dimension.<sup>4</sup>

Following Costa and McCrae (1992), people scoring high on *Neuroticism* tend to feel tense, irritable, discontented, shy, moody, and not self-confident. Neuroticism is further characterized, among other features, as the degree to which a person experiences the world as threatening and beyond one's control (Hogan and Hogan, 2007). Lauriola and Levin (2001) and Paunonen and Jackson (1996) show that neuroticism negatively correlates with risk seeking. Correspondingly, in the tenure choice literature, homeownership (compared to rental) associates with a sense of security and stability (e.g., Ben-Shahar, 2007; Megbolugbe and Linneman, 1993; Colic-Peisker and Johnson, 2012), insuring against housing price fluctuations (Ben-Shahar, 1998, and Sinai and Souleles, 2005). Similarly, in the mortgage literature, adjustable-rate (compared to fixed-rate) mortgages impose greater interest rate risk on the borrower, whereas high loan-to-value ratio (LTV) imposes a greater financial burden in repaying the loan and thus greater default risk [see, for example, Campbell and Cocco, 2003 and Coulibaly and Li, 2009]. Finally, in the investments literature, real estate (compared to stock) investment is commonly perceived as less risky, offering diversification opportunities of the investment portfolio [e.g., Goodman, 2003 and Lorenz and Truck, 2008]. In light of the above, we hypothesize that, due to risk considerations, neuroticism, *ceteris paribus*, associates with the preference of homeownership over rental, fixed- over adjustable-rate mortgages, lower LTV levels, and real estate over stock investment.

*Conscientiousness* associates with efficient, organized, thorough, not careless, not lazy, and not impulsive [Costa and McCrae, 1992]. Empirically, it is also found to negatively correlate with alcohol

<sup>2</sup> To that end, our proposed personality approach greatly differs from the traditional rationality-based approach to studying preferences in the real estate market. See, for example, Brueckner and Follain (1988), Campbell and Cocco (2003), Ben-Shahar and Feldman (2003), Coulibaly and Li (2009), and Fortowsky et al. (2011) for a partial list of rationality-based studies of mortgage choice; and see Rouwendal and Meijer (2001), Hofman, Halman, and Ion (2006), and Raya and Garcia (2012) for a partial list of rationality-based studies of housing attribute preferences. For behavioral- and psychological-based (although not personality-based) studies of preferences in the real estate market, see, for example, Ben-Shahar (2007) and Mori et al. (2010).

<sup>3</sup> A similar classification was found in various languages, including Hebrew, Dutch, Turkish, Italian, and Russian (See, for example, John and Srivastava, 1999).

<sup>4</sup> It should be noted that while many scholars adopt the Big Five classification and find significant evidence that correlates the Big Five personality traits with behavior, preferences, and affects (see the evidence reported in Section 1 above), several studies criticize the use of the Big Five. See Block (1995), Waller and Ben-Porath (1987), and Eysenck (1991). Responses to the critique and further support of the Big Five may be found, however, in Goldberg (1990, 1992), Costa and McCrae (1992), Trull and Widiger (1997), Hofstee (1994), and Digman (1997).

consumption (Kuntsche, von Fischer, and Gmel, 2008) and history of a car accident (Arthur and Graziano, 2006). In our context, these may indirectly imply a possible association between conscientiousness and risk avoidance. We thus hypothesize that conscientiousness, like neuroticism, is likely to associate, *ceteris paribus*, with the preference of homeownership over rental, fixed-over adjustable-rate mortgages, lower LTV levels, and real estate over stock investment. Further, studies show that conscientiousness associates with the ability to postpone gratification (e.g., Jensen-Campbell et al., 2002; and Orvis, Dudley, and Cortina, 2008). As a shorter mortgage loan duration carries greater periodic repayments, leaving less for the consumption of other goods and thus requiring the ability to postpone gratification, it is likely that higher scores on the conscientiousness trait further associate with the preference for relatively short-term mortgage loans.

*Openness* is related to descriptors such as curious, imaginative, artistic, having wide interests, excitable, and unconventional [Costa and McCrae, 1992]. Mayfield, Perdue, and Wooten (2008) find that openness correlates with long-term investment choice. Correspondingly, as real estate is generally perceived as a relatively illiquid and long-term investment, we hypothesize that openness associates with the preference for real estate over stock investment. Individuals with a high score on *Agreeableness* tend to be characterized as forgiving, undemanding, warm, sympathetic, not stubborn, and not a show-off [Costa and McCrae, 1992]. Kowert and Hermann (1997) provide evidence that agreeableness correlates with unwillingness to assume risk. Correspondingly, we hypothesize that conscientiousness is likely to associate, *ceteris paribus*, with the preference of homeownership over rental, fixed-over adjustable-rate mortgages, lower LTV levels, and real estate over stock investment. Finally, *Extraversion* relates to adjectives such as sociable, forceful, energetic, adventurous, enthusiastic, and outgoing. Following past empirical evidence, we cannot, *ex ante*, intuitively generate any hypotheses with regard to the correlation between extraversion and the examined real estate-related preferences.

### 3. Personality and individual real estate preferences

We examine whether micro-level preferences on real estate-related issues correlate with individual personality traits.

#### 3.1. Sample

To assess the correlation between personality traits and preferences in the real estate market, we developed a unique micro dataset of individual scores on the Big Five personality trait test combined with a series of individual ratings of preferences on real estate market-related issues and information on personal background and socio-economic and demographic characteristics. Our dataset contains a total of 1138 observations and is based on an online survey.<sup>5</sup>

<sup>5</sup> The online edition of *The Marker* ([www.themarker.com](http://www.themarker.com)), an economic section of a leading daily newspaper in Israel, reported on our study and produced a link to a web page where the survey could be voluntarily filled out electronically. While it could be argued that our sample is not representative of the entire population, it should be noted that the sample is well distributed across gender, marital status, age, and income (see Table 1). Moreover, as further described below, in our analysis we control for a series of socio-economic and demographic characteristics and for the individuals' assessment of their own knowledge of economic issues. Further, while it is still possible that the preferences reported in the sample are not representative, there is no reason to suspect that the correlation between the Big Five scores and these preferences is unique to our sample. In fact, had all of the respondents shared identical control variables and only varied in their personality traits, the sample

Table 1 presents the list of dependent variables in the dataset and their summary statistics. Each subject was presented with five statements, each describing a preference on a real estate market-related issue. The participants were asked to indicate the degree of agreement with the statement on a scale of 1–5 (1 indicates strong disagreement, 3 indifference, and 5 strong agreement). The statements portray preferences on mortgage loan attributes: adjustable-rate versus fixed-rate, loan duration, and loan-to-value ratio (see variables *AdjRate*, *Long.Dur*, and *LTV*, respectively); real estate versus stock investment (*RE.Invest*); and tenure mode – homeownership or rental (*Rent.Tenure*).

Table 2 presents the list of explanatory variables in the dataset and their summary statistics. We observe the individual score on the Big Five Inventory of personality traits: extraversion (*E*), agreeableness (*A*), conscientiousness (*C*), neuroticism (*N*), and openness (*O*). We also asked about personal background and socio-economic and demographic characteristics of the participants. We then classified each generated personal information variable into two or more categories and represented each by a dummy (categorical) variable. These variables include gender (see the variable *Female*), age (*Age1–Age3*), religiousness (*Religious1* and *Religious2*), number of children (*Children1–Children4*), number of years of education (*Education1–Education4*), income (*Income1–Income4*), marital status (*Status1–Status3*), occupation (*Occupation1–Occupation5*), current tenure mode (*Homeowner1* and *Homeowner2*), dominant tenure mode experienced in childhood (*ChildTenure*), and, finally, the individual's assessment of his or her own knowledge of economic issues (*EconKnowledgeH* and *EconKnowledgeL*).<sup>6</sup> We used the personal information as control variables in the estimation of the correlation between personality traits and preferences regarding real estate market-related issues.<sup>7</sup>

#### 3.2. Method and results

Consider the following specification:

$$\phi(\text{Preference}_{ij}) = \beta_{0i} + \beta_{1i} \text{PersonalityTraits}_{1ij} + \beta_{2i} \text{Controls}_{1ij} + u_{1ij}, \quad (1)$$

where  $\phi$  represents the differences among values of a cumulative normal distribution that corresponds to the respective estimated probabilities, and  $\text{Preference}_i$  is an ordinal variable measuring the degree of individual preference (with five categories on a scale of 1–5, where 1 stands for “strong disagreement” and 5 “strong agreement” with a statement that represents a particular preference) on housing tenure, mortgage, and investment-related issue  $i$  – where the index  $i$  correspondingly stands for *AdjRate*, *LTV*, *Long.Dur*, *RE.Invest*, and *Rent.Tenure* (once again, see Table 1 for variable definitions). Also, the index  $j$  represents individuals observed in

would have perfectly served our analysis, as no controls would have been required. Finally, the generalization of the micro estimation in Section 4 below may serve as additional reassurance for the employed micro sample. We thank Arik Mirovsky for the invaluable newspaper support for the study. Altogether, 1318 subjects filled out the questionnaire; however, after omitting observations due to missing values in the personality trait test, the sample included 1138 observations.

<sup>6</sup> As preferences on different real estate-related topics often associate with economic considerations, we wished to control for participants' knowledge of economic issues. Also, the rationale for collecting information on childhood experience is that current preferences might reflect conscious or unconscious past experience.

<sup>7</sup> The correlation matrix of all variables displays a low Pearson correlation among the explanatory variables in most cases. The highest correlation is found between *Homeowner1* and *Status1* (–0.49), *Homeowner1* and *Status2* (0.47), *Occupation1* and *Status1* (0.49), *Occupation1* and *Status2* (–0.44), and *ChildHousing* and *ChildEnvironment1* (–0.44). Also, consistent with previous literature (see, for example, John and Srivastava, 1999), the personality traits are uncorrelated with each other. The correlation matrix is available upon request.

**Table 1**  
List of dependent variables, definitions, and summary statistics.

Variable	Description (statement)	Avg.	Std.	Min.	Max.
<i>Long_Dur</i>	"In general, I prefer to spread the mortgage repayments over a long period of time."	2.56	1.30	1	5
<i>AdjRate</i>	"If a fixed-rate mortgage and an adjustable-rate mortgage were known to have similar interest rates, I would rather choose an adjustable-rate mortgage."	2.35	1.24	1	5
<i>LTV</i>	"I would never take a mortgage for more than ____of the price of the house." (1) 0–20%; (2) 21–40%; (3) 41–60%; (4) 61–80%; (5) 81–100%.	3.26	1.38	1	5
<i>RE_Invest</i>	"If I had the savings, I would rather invest in stocks rather than real estate."	2.33	1.23	1	5
<i>Rent_Tenure</i>	"If I knew that renting was economically superior over homeownership, I would prefer to rent rather than own."	3.18	1.45	1	5

Notes: The variables in Table 2 represent the degree of agreement with a series of statements describing preferences on mortgage attributes and real estate as an investment instrument. The level of agreement is on a scale of 1 to 5 (where 1 indicates "strong disagreement," 5 indicates "strong agreement"). The variable LTV is exceptional where the 1–5 scale represents ordinal ranges rather than ordinal agreement levels.

**Table 2**  
List of explanatory variables, definitions, and summary statistics.

Variable	Description	Avg.	Std.	Min.	Max.
<i>A</i>	Personality trait–Agreeableness	3.63	0.58	1.67	5.00
<i>C</i>	Personality trait–Conscientiousness	3.82	0.63	1.78	5.00
<i>E</i>	Personality trait–Extraversion	3.36	0.64	1.25	4.88
<i>N</i>	Personality trait–Neuroticism	2.54	0.78	1.00	5.00
<i>O</i>	Personality trait–Openness	3.94	0.57	1.70	5.00
<i>Age1</i>	Dummy variable equals 1 if age between 26 and 35; 0 otherwise	0.49	0.50	0	1
<i>Age2</i>	Dummy variable equals 1 if age between 36 and 45; 0 otherwise	0.20	0.40	0	1
<i>Age3</i>	Dummy variable equals 1 if age is 46 or more; 0 otherwise	0.15	0.35	0	1
<i>ChildTenure</i>	Dummy variable equals 1 if either strongly agree or agree with the statement "I predominantly lived in an owned housing unit until age 18"; 0 otherwise	0.87	0.34	0	1
<i>Children1</i>	Dummy variable equals 1 if the subject is a parent to 1 child; 0 otherwise	0.10	0.30	0	1
<i>Children2</i>	Dummy variable equals 1 if the subject is a parent to 2 children; 0 otherwise	0.17	0.38	0	1
<i>Children3</i>	Dummy variable equals 1 if the subject is a parent to 3 children; 0 otherwise	0.12	0.32	0	1
<i>Children4</i>	Dummy variable equals 1 if the subject is a parent to 4 children or more; 0 otherwise	0.06	0.26	0	1
<i>EconKnowledgeH</i>	Dummy variable equals 1 if strongly agree or agree with the statement "I am knowledgeable about economic issues"; 0 otherwise	0.72	0.45	0	1
<i>EconKnowledgeL</i>	Dummy variable equals 1 if disagree or strongly disagree with the statement "I am knowledgeable about economic issues"; 0 otherwise	0.12	0.33	0	1
<i>Education1</i>	Dummy variable equals 1 if number of years of education is 12; 0 otherwise	0.11	0.31	0	1
<i>Education2</i>	Dummy variable equals 1 if number of years of education is 13–15; 0 otherwise	0.54	0.50	0	1
<i>Education3</i>	Dummy variable equals 1 if number of years of education is 16–17; 0 otherwise	0.24	0.43	0	1
<i>Education4</i>	Dummy variable equals 1 if number of years of education is 18 or more; 0 otherwise	0.10	0.30	0	1
<i>Female</i>	Dummy variable equals 1 if the subject is a female; 0 otherwise	0.29	0.45	0	1
<i>Homeowner1</i>	Dummy variable equals 1 if the subject is currently a homeowner; 0 otherwise	0.45	0.50	0	1
<i>Homeowner2</i>	Dummy variable equals 1 if the subject was a homeowner in the past, but not today; 0 otherwise	0.05	0.22	0	1
<i>Income1</i>	Dummy variable equals 1 if monthly gross income is in the 4001–7000 NIS range; 0 otherwise	0.15	0.36	0	1
<i>Income2</i>	Dummy variable equals 1 if monthly gross income is in the 7001–10,000 NIS range; 0 otherwise	0.18	0.39	0	1
<i>Income3</i>	Dummy variable equals 1 if monthly gross income is in the 10,001–14,000 NIS range; 0 otherwise	0.20	0.40	0	1
<i>Income4</i>	Dummy variable equals 1 if monthly gross income is greater than 14,000 NIS; 0 otherwise	0.24	0.43	0	1
<i>Occupation1</i>	Dummy variable equals 1 if student; 0 otherwise	0.27	0.44	0	1
<i>Occupation2</i>	Dummy variable equals 1 if employee; 0 otherwise	0.46	0.50	0	1
<i>Occupation3</i>	Dummy variable equals 1 if self-employed; 0 otherwise	0.21	0.41	0	1
<i>Occupation4</i>	Dummy variable equals 1 if unemployed; 0 otherwise	0.01	0.12	0	1
<i>Occupation5</i>	Dummy variable equals 1 if retired; 0 otherwise	0.02	0.13	0	1
<i>Religious1</i>	Dummy variable equals 1 if observant; 0 otherwise	0.12	0.36	0	1
<i>Religious2</i>	Dummy variable equals 1 if religious; 0 otherwise	0.08	0.29	0	1
<i>Status1</i>	Dummy variable equals 1 if single; 0 otherwise	0.42	0.49	0	1
<i>Status2</i>	Dummy variable equals 1 if married; 0 otherwise	0.53	0.50	0	1
<i>Status3</i>	Dummy variable equals 1 if divorced; 0 otherwise	0.04	0.20	0	1

the cross-sectional dataset; *PersonalityTraits1* is a matrix of individual scores on the traits agreeableness (*A*), conscientiousness (*C*), extraversion (*E*), neuroticism (*N*), and openness (*O*); and *Controls1* is a matrix of personal background and socio-economic and demographic characteristics (a series of control variables including *Age1*–*Age3*, *ChildTenure*, *Children1*–*Children4*, *EconKnowledgeH* and *EconKnowledgeL*, *Education1*–*Education4*, *Female*, *Homeowner1* and *Homeowner2*, *Income1*–*Income4*, *Occupation1*–*Occupation5*, *Religious1* and *Religious2*, and *Status1*–*Status3* (once again, see Table 2 for variable definitions). Finally, for each *i*,  $\beta_0$  is an estimated parameter,  $\beta_1$  and  $\beta_2$  are vectors of estimated parameters, and  $u_1$  is a random disturbance term. Altogether the model in (1) thus

includes five independent equations differentiated by the specific left-hand-side preference variable. We estimate the set of five equations in (1) using a step-wise ordered-probit procedure.<sup>8</sup>

Table 3 presents the results on the correlation between the Big Five personality traits and preferences on housing tenure and

<sup>8</sup> We examine the use of factorial analysis on our set of dependent variables in an attempt to provide additional insight on the preferences over real estate issues. It turns out, however, that the factorability of our set of dependent variables is below the adequate threshold with Kaiser–Meyer–Olkin measure of sampling adequacy value of 0.45 (see, for example, Kaiser, 1970; Dziuban and Shirkey, 1974, and, more recently, Williams, Brown, and Onsmann, 2012).

**Table 3**

Outcomes obtained from the estimation of preferences over housing tenure and mortgage and investment attributes.

Variable	<i>Long_Dur</i>	<i>AdjRate</i>	<i>LTV</i>	<i>RE_Invest</i>	<i>Rent_Tenure</i>
<i>N</i>			−0.075* (0.042)		−0.093* (0.047)
<i>E</i>				−0.162*** (0.053)	
<i>O</i>			−0.138** (0.058)	−0.117** (0.059)	
<i>C</i>	−0.136*** (0.053)	−0.138*** (0.053)		−0.167*** (0.055)	−0.117** (0.057)
<i>A</i>				−0.145** (0.058)	−0.115* (0.060)
<i>Female</i>		0.154** (0.074)	−0.150* (0.077)	−0.214*** (0.080)	−0.151* (0.078)
<i>Age3</i>		−0.198* (0.107)	−0.676*** (0.097)		
<i>Religious2</i>	−0.244** (0.113)		−0.235** (0.113)	0.214* (0.123)	
<i>Education1</i>	0.299*** (0.111)				
<i>Education3</i>	−0.156** (0.079)			0.337*** (0.078)	
<i>Education4</i>	−0.272** (0.118)	−0.200* (0.116)		0.267** (0.118)	
<i>Income1</i>				−0.161* (0.096)	
<i>Income2</i>			0.202** (0.096)		
<i>Income3</i>		−0.251*** (0.088)	0.186* (0.098)		
<i>Income4</i>	−0.242*** (0.080)	−0.200** (0.085)	−0.305*** (0.099)	0.272*** (0.085)	
<i>Homeowner1</i>	0.245*** (0.071)			−0.528*** (0.077)	−0.502*** (0.070)
<i>Homeowner2</i>				−0.317** (0.158)	
<i>Status2</i>			0.245*** (0.073)		
<i>Status3</i>		0.435** (0.174)			0.380** (0.181)
<i>Occupation3</i>	0.263*** (0.084)		0.334*** (0.086)		
<i>Occupation5</i>	0.542** (0.267)	0.981*** (0.282)			
<i>Children2</i>				0.244** (0.096)	0.183** (0.092)
<i>Children4</i>				−0.289* (0.162)	
<i>EconKnowledgeH</i>	−0.136* (0.076)		0.222** (0.092)	0.249*** (0.082)	0.291*** (0.080)
<i>EconKnowledgeL</i>			−0.260** (0.120)		
# of Observations	1084	1085	1089	1088	1083
Pseudo-R <sup>2</sup>	0.022	0.016	0.046	0.047	0.023
LR-Stat	74.6	50.7	161.5	150.7	78.8

Notes: Table 3 presents probit estimates of Eq. (1). The coefficients represent the marginal probabilities of the explanatory variables on the preference of housing tenure, mortgage loan, and investment attributes. The dependent and independent variables are defined in Tables 1 and 2, respectively. Numbers in parentheses are standard deviations. Significant values at 10%, 5%, and 1% are marked with one, two, and three asterisks, respectively.

mortgage loan and investment attributes. Outcomes provide strong support for the correlation between personality traits and preferences in the real estate market. Specifically, it follows from Table 3 that, as anticipated, conscientiousness negatively correlates with the tendency to prefer adjustable- over fixed-rate mortgage loan ( $p=0.010$ ), stock over real estate investment ( $p=0.003$ ), rental over homeownership ( $p=0.042$ ), and a longer mortgage loan duration ( $p=0.010$ ). These findings are consistent with the hypotheses discussed above, as past studies show an indirect association between conscientiousness and both risk avoidance and the ability to postpone gratification. Also, neuroticism negatively correlates with the willingness to assume high loan-to-value ratio ( $p=0.075$ ) and the tendency to prefer rental over homeownership ( $p=0.052$ ), whereas

agreeableness negatively correlates with the tendency to prefer stock over real estate investments ( $p=0.012$ ) and the tendency to prefer a rental over homeownership ( $p=0.056$ ). Again, these findings are consistent with our hypotheses and previous studies that show an association between risk aversion and both neuroticism and agreeableness. Our results further indicate a negative correlation between openness and the tendency to prefer stock over real estate investments. This outcome is consistent with Mayfield, Perdue, and Wooten (2008), who show that openness associates with long-term investment choice.

We further find that the tendency to prefer stock over real estate investments negatively correlates with extraversion ( $p=0.002$ ) and openness ( $p=0.049$ ), and that the willingness to assume a high

**Table 4**  
List of dependent and independent state-level variables, definitions, and summary statistics.

Variable	Description	Avg.	Std.	Min.	Max.
<i>Dependent variables</i>					
<i>LTV_Alt</i>	State-level average loan-to-value for Alt-A mortgage category	83.72	3.46	76.69	88.89
<i>LTV_Sub</i>	State-level average loan-to-value for sub-prime mortgage category	85.55	2.98	76.69	89.2
<i>Ownership</i>	Homeownership rate by state (in percent)	69.83	5.78	44.1	77.8
<i>ARM</i>	Share of ARM loans for sub-prime mortgage category (in percent)	63.7	8.4	47.4	78.1
<i>Independent variables</i>					
<i>A</i>	Personality trait (state average)–Agreeableness	50	10	21.4	69.4
<i>C</i>	Personality trait (state average)–Conscientiousness	50	10	24	69.6
<i>E</i>	Personality trait (state average)–Extraversion	50	10	26.5	69.8
<i>N</i>	Personality trait (state average)–Neuroticism	50	10	30.4	79.2
<i>O</i>	Personality trait (state average)–Openness	50	10	21.8	77.5
<i>Population</i>	State population	6,165,005	6,784,384	532,668	$3.68 \times 10^7$
<i>Value</i>	State median home value (in dollars)	204,706	92,299	95,900	474,100
<i>Income</i>	State mean household income (in dollars)	68,572	11,268	50,166	95,881
<i>White</i>	The share of white population in the state (in percent)	79.55	11.74	37.50	95.90
<i>Unemp</i>	State unemployment rate (in percent)	5.93	1.34	3.2	9.5
<i>Urban</i>	Share of urban inhabitants by states (in percent)	73.90	14.92	38.7	100

Notes: Personality traits A, C, E, N, and O are reported in Rentfrow et al. (2013), where they are normalized to mean value of 50 and standard deviation equal to 10. The demographic characteristics (including *Population*, *White*, *Unemp*, *Ownership*, and *Value*) are obtained from U.S. Census Bureau for the year 2008. The variable *Urban* is obtained from U.S. Census Bureau for the year 2010 (not available for 2008). The figures for *LTV\_Alt*, *LTV\_Sub*, and *ARM* are available from the Federal Reserve Bank of New York and refer to 2008.

loan-to-value ratio negatively correlates with openness ( $p = 0.017$ ). While these outcomes do not contradict our hypotheses, we cannot find past empirical evidence that is consistent with these results. Nevertheless, as we show in Section 4, some of these results gain further support from the macro-level analysis.<sup>9</sup>

#### 4. Personality and real estate market outcomes

In this section we test whether the micro-level evidence presented in the previous section conveys consequences on macro-level outcomes. Specifically, we test for the correlation between personality traits and real estate market macro-indicators.

##### 4.1. Sample

Rentfrow et al. (2013) use state-level aggregate personality scores on the Big Five personality test to characterize regional differences in personality patterns (also see Rentfrow, Gosling, and Potter, 2008). They subsequently offer evidence showing that regional-level personality characterization correlates with political, economic, social, and health variables. Similarly, we use Rentfrow et al.'s (2013) state-level aggregate personality scores to estimate the correlation between personality and state-level macro housing and mortgage variables.

Data for the analysis is thus comprised of 48 states of the U.S. and Washington, D.C. (Hawaii and Alaska are excluded from Rentfrow et al., 2013), where state-level real estate indicators represent the year 2008.<sup>10</sup> Table 4 provides variable description and summary statistics on the cross-section of state-level variables. Among the dependent variables, the mean homeownership share (*Ownership*) is 69%. With respect to mortgage choice, the average loan-to-value ratio (*LTV\_Alt* and *LTV\_Sub*) is 83% and 85% for the Alt-A and sub-prime mortgage categories, respectively, while the

share of adjustable-rate mortgages (*ARM*) is 63% for the sub-prime category.<sup>11</sup> Among the control variables, the average state population size (*Population*) is about 6.2 million inhabitants, of which 79% on average are whites (*White*). Also, average household income (*Income*) is about \$68,000, and average state median home value (*Value*) is about \$205,000. The mean share of urban (versus rural) inhabitants (*Urban*) is 74% and, finally, the average unemployment rate (*Unemp*) is 5.93%.<sup>12</sup>

##### 4.2. Method and results

Consider the following specification:

$$\text{Market}_{ij} = \gamma_{0i} + \gamma_{1i} \text{Personality Traits } 2_{ij} + \gamma_{2i} \text{Controls } 2_{ij} + u_{2ij}, \quad (2)$$

where  $\text{Market}_i$  represents a series of dependent variables  $i$  characterizing the state-level macro real estate market, including average market share of adjustable-rate housing mortgage loans (ARMs) out of loans outstanding, average loan-to-value ratio (LTV) at origination of loans outstanding, and average rate of homeownership. Also, the index  $j$  represents the cross-section of states, and  $\text{Controls}_2$  is a matrix of control variables that include state-level median housing value, mean income, unemployment rate, population size, the share of white population, and the share of urban (versus rural) inhabitants;  $\text{PersonalityTraits}_2$  is a matrix of state-level aggregate personality scores on the traits agreeableness, conscientiousness, extraversion, neuroticism, and openness. Finally, for each  $i$ ,  $\gamma_0$  is an estimated parameter,  $\gamma_1$  and  $\gamma_2$  are vectors of estimated parameters, and  $u_2$  is a random disturbance term. Altogether the model in (2) includes four independent equations differentiated by the specific left-hand side real estate market variable. We estimate the set of four equations in (2) using a step-wise OLS estimation procedure.

<sup>11</sup> Unfortunately, we were unable to acquire state-level data on average mortgage duration or on average LTV and adjustable-rate mortgage share among prime mortgage loans.

<sup>12</sup> The variables *Population*, *White*, *Unemp*, *Urban*, *Ownership*, *Value*, and *Income* are obtained from the U.S. Census Bureau reports for 2008 (with the exception of *Urban*, which is not available for 2008 and thus reflects 2010 data). The figures for *LTV\_Alt*, *LTV\_Sub*, and *ARM* are provided by the Federal Reserve Bank of New York and refer to the year 2008.

<sup>9</sup> The correlations between preferences and the control socio-economic and demographic characteristics are presented in Table 3. However, for ease of presentation, we omit their report from the text.

<sup>10</sup> The state-level aggregate personality scores on the Big Five personality test are based on a survey of almost 1.6 million individuals conducted over the period 1999–2010 (see further description in Rentfrow et al., 2013).

**Table 5**

Outcomes obtained from the estimations of state-level housing and mortgages attributes and state-average personality traits.

Variable	<i>LTV_Alt</i>	<i>LTV_sub</i>	<i>Ownership</i>	<i>ARM</i>
<i>N</i>	−0.075*** (0.026)	−0.119*** (0.022)		−0.466*** (0.076)
<i>E</i>				
<i>O</i>	−0.170*** (0.039)	−0.114*** (0.031)		−0.448*** (0.116)
<i>C</i>			−0.153** (0.073)	
<i>A</i>			0.230*** (0.072)	
<i>Population</i>			1.49 × 10 <sup>−7</sup> * (8.6 × 10 <sup>−8</sup> )	−2.7 × 10 <sup>−7</sup> ** (1.1 × 10 <sup>−7</sup> )
<i>Value</i>	−2.8 × 10 <sup>−5</sup> *** (4.4 × 10 <sup>−6</sup> )	−2.2 × 10 <sup>−5</sup> *** (3.7 × 10 <sup>−6</sup> )	−5.5 × 10 <sup>−5</sup> *** (1.2 × 10 <sup>−5</sup> )	6.8 × 10 <sup>−5</sup> *** (1.3 × 10 <sup>−5</sup> )
<i>White</i>	−0.089*** (0.026)		0.161** (0.063)	0.303*** (0.078)
<i>Unemp</i>			1.275** (0.503)	1.938*** (0.672)
<i>Income</i>			2.6 × 10 <sup>−4</sup> ** (1.0 × 10 <sup>−4</sup> )	
<i>Urban</i>	0.079*** (0.024)	0.055*** (0.020)		0.155** (0.069)
<i>Constant</i>	103.09*** (3.995)	97.603*** (2.112)	40.105*** (11.621)	50.024*** (11.374)
Number of obs.	49	49	49	49
<i>R</i> <sup>2</sup>	0.78	0.77	0.67	0.74
<i>P</i> ( <i>F</i> )	0.000	0.000	0.000	0.000

Notes: Table 5 presents OLS estimates of Eq. (2). The independent and dependent variables are defined in Table 4. Numbers in parentheses are standard deviations. Significant values at 10%, 5%, and 1% are marked with one, two, and three asterisks, respectively. The variables *Income* and *Value* are highly correlated ( $p = 0.80$ ), yet the outcomes on the personality traits are robust to the omission of the *Income* variable.

Table 5 presents the parameter estimates obtained from the regression estimation of equation (2). The empirical results provide solid evidence for the correlation between real estate market equilibrium outcomes and state-level personality traits and, moreover, reinforce our micro-level evidence. Specifically, and consistent with micro-level outcomes on the negative correlation between the tendency to assume high LTV and both openness and neuroticism, we find that average state-level LTV negatively correlates with openness and neuroticism in both the Alt-A ( $p = 0.000$  and  $p = 0.006$ , respectively) and the subprime mortgage categories ( $p = 0.001$  and  $p = 0.000$ , respectively).<sup>13</sup> Further, in line with micro-level evidence on the association between agreeableness and the personal tendency to prefer homeownership over rental, the state-level homeownership rate positively correlates with agreeableness ( $p = 0.003$ ). Finally, we find that the state-level share of adjustable-rate (compared to fixed-rate) mortgage loans negatively correlates with neuroticism and openness ( $p = 0.000$  in both cases). While micro-level evidence on these correlations was statistically insignificant, state-level results are consistent with past studies showing an association between neuroticism and risk avoidance.<sup>14</sup>

<sup>13</sup> Recall that, consistent with our outcome, past studies indicate an association between neuroticism and risk aversion.

<sup>14</sup> Also, whereas micro-level estimation discussed earlier indicates a positive correlation between the tendency to prefer homeownership (over rental) and conscientiousness, the state-level test shows that homeownership rate negatively correlates with conscientiousness ( $p = 0.043$ ). This seeming inconsistency might be an outcome of the complexity of economic and non-economic considerations involved in the housing tenure decision (e.g., [Raya and Garcia, 2012](#)). Further, while the micro-level variable *Rent.Tenure* represents the tendency to prefer homeownership conditional on rental being economically superior (see [Table 1](#)), the macro-level variable *Ownership* represents the unconditional rate of homeownership. Hence the

## 5. Summary and conclusions

In recent decades, numerous researchers have documented a correlation between personality traits and individual behavior, preferences, and affects in various areas and frameworks of the social sciences. Yet no previous study has examined the correlation between personality traits and preferences and choices on real estate market-related issues. In this study, we developed micro-data on personality traits, personal background, socio-economic and demographic characteristics, and preferences on housing, mortgage, and real estate investment attributes to study the correlation between the Big Five personality traits and preferences with respect to real estate-related issues. Further, we examined the effect of the personality-preference association on real estate market outcomes based on macro data on state-level aggregate personality scores and real estate market variables.

Overall, our research findings indicate substantial correlation between personality traits and real estate market-related preferences. Moreover, we find evidence that the association between individual personality and preferences conveys significant macro consequences on real estate market equilibrium outcomes. The intuition underlying the results is generally consistent with findings that emerge from previous applied personality studies.

Our approach thus proposes a new perspective for exploring individual and household motivations, preferences, and choices in the real estate market. Future research may attempt to identify other individual psychological aspects (such as locus of control, self-esteem, and anxiety) that correlate with real estate market-related preferences and outcomes.

apparent inconsistency may simply be an outcome of the different meanings that are attributed to the homeownership variable on the micro- and macro-levels.

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