How Behavioral Habits Mediate the Relationship between Personality Traits and Savings – Evidence from the UK

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ABSTRACT
The household saving ratio in the UK dramatically decreased and traditional economic theory fails to explain this decline. Therefore, researchers and policy makers turn to behavioral economics theory to better understand saving behavior and to take corrective action. This paper combines three bodies of literature into a single framework in order to contribute to this understanding. For this, survey data from the UK is used in a multi-level dichotomous mediation analysis. It is revealed that substantial fractions of the effects that personality traits have on saving outcomes arise due to the influence that these personality traits have on specific saving behaviors.

Keywords
Behavioral economics, household saving behavior, nudging, personality traits, saving policies, mediation analysis.

INTRODUCTION
The household saving ratio in the UK has fallen from 11.5% in 2010 to a historically low level of 3.8% in the last quarter of 2015 ([17]). This rapid decline is part of a downward trend starting in 2000 which was only interrupted by a sharp increase in response to the financial crisis. In fact, a recent study by Which? (2014) has found that 41% of the households do not hold the savings buffer recommended by the Money Advice Service and the UK government.

In order for policy makers to successfully take action, however, it is necessary to understand the determinants of saving behavior first ([4], [22]). In doing so, two complementary approaches can be identified in the existing literature. Traditional theory takes a purely economic perspective and describes saving behavior as an expected utility maximizing, optimal decision making process ([11], [15]). However, despite its substantial predictive power ([4]), it fails to provide guidance for policy design ([2]), to account for the complexities of saving behavior ([21]) and to fully explain the decline in the saving ratio ([6]). Further, it is in direct conflict with the strong field evidence that underlines the importance of behavioral concepts for the successful design of saving stimulating policies ([1], [18], [20]).

To fill the shortcomings of traditional theory, researchers and policy makers increasingly turn to behavioral economics theory ([4]). In this field, three related bodies of research help to understand saving behavior by establishing direct links between individual personality traits and saving outcomes ([2], [16]), by relating individual personality traits to specific saving habits ([3]) and by analyzing the effects of these saving habits on saving outcomes ([5], [13], [23]).

Thus, a considerable amount of evidence suggests that there is a significant influence of personality traits on individuals' and households' savings. However, the findings of these three bodies of literature exist in isolation and no significant efforts are made in order to combine them into a single framework. Therefore, the existing research primarily focuses on the question if personality traits have an effect on individual or household savings, while falling short on describing in what way they do so. At the same time, the huge successes of the aforementioned policy initiatives that appeal directly to behavioral and psychological incentives rather than economic ones ([1], [18], [20]) demand that the underlying dynamics of these policy initiatives are understood.

Taking these two arguments together, it can be concluded that there is currently both a lack of and a need for understanding in what way personality traits affect saving outcomes. To address this gap, the three related bodies of literature are combined into a single framework. In doing so, it can be assessed in what way personality traits, saving habits and saving outcomes are related. This assessment contributes to the field of behavioral economics in two ways. Firstly, it contributes to the academic research as it can help to better understand the link between personality traits and household saving by illuminating the driving forces of this relationship. Secondly, discerning underlying behavioral habits that lead to overall household saving success and their relation to individuals' personality traits can support the design of new governmental initiatives aimed at influencing household saving behavior, while helping to explain the success of existing ones. More specifically, if the personality traits of people who are likely to commit to a certain behavioral habit can be identified, new policy initiatives can be set up which appeal directly to the personality trait underlying this saving habit. This conceptualization is especially needed in order to design these policies at a larger scale and in a more systematic way than it has been done for far.

Thus, the aim of this paper is to analyze whether and to what extent particular saving habits mediate the relationship between personality traits and saving outcomes.

METHODOLOGY

For this paper, a multi-level dichotomous mediation analysis is conducted. The analysis process is divided into three consecutive stages.

First Stage: Preconditions for Mediation Analysis
In the first stage, the three precondition for mediation analysis are carefully checked and only those mediation triangles for which all conditions are fulfilled are further analyzed in the subsequent stages. Here, mediation triangles

refer to sets of three variables in which one is viewed as the independent variable (X), one is the mediating variable (M) and one the dependent variable (Y). The three preconditions are that the independent variables have a significant effect on the dependent variables, that the mediation variables have a significant relationship with the dependent variables and that this relationship exists even when the independent variables are controlled for. As all mediating and dependent variables in this paper are measured on a dichotomous scale, logistic regression models have to be applied. This causes differences in scale which have to be accounted for in the statistical analysis by using the following adjusted models ([10], [14]):

Precondition 1: $Y' = i1 + c\ X + e1$
Precondition 2: $M' = i2 + a\ X + e2$
Precondition 3: $Y'' = i3 + c'\ X + b\ M + e3$

Second Stage: Significance and Strength of Mediation

Since they are measured on arbitrary scales, it is not possible to arrive at meaningful interpretations for the magnitude of the logit coefficients a, b, c and c' ([12]). Therefore, the second stage of this paper focuses on the significance and strength of the potential mediation triangles instead. This is in line with the aim of this paper to analyze the direction and the extent to which behavioral habits function as a mediator for the relationship between personality traits and savings rather than to analyze the total magnitude of these relationships. In order to test for significance, however, comparability of the coefficients – which was distorted by the logistic regressions - needs to be ensured. To do so, Herr (2016) derives equations from MacKinnon & Dwyer (1993) that suggest the multiplication of each of the coefficients a, b, c and c' with the standard deviation of the predictor variable as well as division with the standard deviation of the outcome variable (e.g. variance $(Y'') = c'^2V(X) + b^2\ V(M) + 2\ b\ c'\ Cov\ (X,M) + \pi^2/3$). The rescaled coefficients can then be tested for statistical significance. To do so, a bootstrapping approach is used with a total of 300 replications for each significance test. As this analysis will only show whether the coefficients found in stage 1 are significantly different from zero, a test of strength will subsequently be performed which indicates how large the mediation effect is ([8]). More specifically, it will be measured how much of the total effect of the independent variable Y on the dependent variable X is mediated by the mediating variable M. For this, the mediation effect of M is divided by the total effect of the independent variable X on the variable Y ([12]).

Third Stage: Multiple Mediators, Controls, Adjustments

At this point in the analysis, multiple mediation triangles are detected and the strength of each indirect effect is assessed. To gain further insights from the data, however, two additional analyses are conducted in the third stage. Both of these analyses will help to merge all individually derived mediation triangles into combined models in order to discern unique effects of each mediating variable when controlling for all other mediating and independent variables.

Again, the logistic regression causes scale identification issues that prohibit the simple decomposition of effects ([12]). Thus, the KHB model is used to first discern the effect of each individual mediating variable while controlling for all other mediating variables. Building on this, multiple adjustments will be made to the model with regard to suppression or inconsistent mediation effects ([9]). As soon as these adjustments are made, in a last step the models will be further improved by not only controlling for all mediating variables, but by also explicitly controlling for all other independent variables in the analysis. This will help to discern the unique effect that a combination of one of the independent variables together with one of the mediation variables suggests.

DATA AND VARIABLES

A representative survey of 1000 respondents in the United Kingdom will be used. It includes information about the respondents' personality traits, saving methods, saving goals, saving regularity and saving motives. Importantly, the survey data provides information at the household level and includes data only from those household members who are solely or jointly responsible for their households' finances. The survey was conducted by Which? (2014) which is the largest consumer body in the United Kingdom. It will be tested whether individuals' personality traits determine their saving outcomes and whether particular saving habits mediate this relationship.

Independent Variables (5 Personality Traits)

The independent variables for the research concern the measure of responds' personality traits. As has been done in previous research in this field ([19]), this paper will use the Big Five personality dimensions to this end. Namely, these are openness, neuroticism, extraversion, conscientiousness and agreeableness. The Big Five personality dimension framework suggests that most differences in the personality of humans can be categorized into these five broad, empirically derived domains. While not being without criticism, there is consensus in the field of personality psychology, suggesting the Big Five personality dimensions as being the general taxonomy of personality traits.

Mediating Variables (4 Saving Habits)

The selection of potential saving habits which function as mediators is based on findings by Which? (2014) and is supported by various other sources of existing, empirical evidence. In total, four saving habits are identified. Firstly, the variable Saving Regularity takes on the value 1 when a respondent has indicated to have saved at least 5 out of the past 12 months and 0 otherwise. Secondly, the variable Saving Motive takes on the value 1 if "saving for a rainy day" (precautionary saving) is one of the respondent's saving motives and 0 if not. Thirdly, the variable Saving Method assesses whether a household's main saving method is to keep savings in a current account (1) or to keep savings in a dedicated savings product (0). Lastly, saving target discriminates between responds who indicate to have set a specific savings target (1) and those who do not (0).

Dependent Variable (2 Saving Outcomes)

The dummy variable "Cover 3 Months" refers to the achievement of a savings buffer that is sufficiently high to meet the recommendations of the Money advice Service and the UK government. Specifically, this means having three months' or more of essential expenditure put aside in liquid savings (1) or not (0). While this variable focuses on savings only, the second dependent variable ("More Debt"), takes on the value 1 when it can be inferred from the survey data that a respondent holds more debt than savings and 0 otherwise.

RESULTS

Results - Preconditions for Mediation Analysis

For the detailed assessment of the preconditions 70 logistic regression tests are required. When taking together the analyses of these tests, a total of 20 mediation triangles can be identified which meet all three preconditions. For example, the statistical analyses suggest that an individual's Saving Method and Saving Target are expected to have a significant mediation effect between the personality trait conscientiousness and the likelihood that the individuals holds the recommended savings buffer.

Results - Significance and Strength of Mediation tests

The bootstrapping analysis reveals that only 14 of the 20 potential mediation triangles show a significant mediation effect. Interestingly, the mediating variable Saving Target is not found to have a significant mediation effect in any of the triangles and is thus discarded from further analysis. In a next step, the strength of the identified mediation triangles is analyzed by calculating confounding percentages. It is found that the mediation effects are not only significantly different from zero but that they account for a large part of the total effect. For example, the percentage of the total effect that the personality traits conscientiousness, extraversion, agreeableness, neuroticism and openness have on the saving indicator Cover 3 Months is mediated by the behavioral habit Saving Method by 28.6%, 41.7%, 28.4%, 20.0% and 26.8%, respectively.

Results - Multiple Mediators, Controls and Adjustments

At this point in the analysis, the individual mediation effects discerned in the previous steps will be disentangled. To do so, the mediation triangles which include the same personality traits and the same saving indicator are combined into a single model. It becomes apparent that controlling for all other mediating variables changes the individual mediating effects, indicating that there is some overlap in the effects. Also, in some of the models the confounding percentage is found to be negative. This suggests that the inconsistent mediation phenomenon occurred, meaning that the inclusion of a mediation variable into the regression equation has increased the predictive validity of the independent variable rather than reducing it as in regular mediation. This finding demands that several adjustments are made to the models and that previously discarded mediation triangles are reintegrated. This has the reason that inconsistent mediation can cause an independent variable to have an insignificant effect on a dependent variable only because a third variable mediates this relationship positively and a fourth variable negatively, so that both effects cancel out.

After these adjustments are made, a set of 9 final models is reached, which all include the mediating variables Saving method, Saving Regularity and Saving Motive. In these final models the unique, disentangled mediation effect of each mediating variable can be identified since all other independent and mediating variables used in this paper are controlled for. For example, the statistical outcome for Model 1 reveals that the total effect of the personality trait conscientiousness on the saving outcome Cover 3 Months is mediated by the saving habits Saving Method, Saving Regularity and Saving Motive with a total strength of 62.71%, 25.11% and 8.32%, respectively. In sum, 96.14% of the total effect is mediated by the saving habits.

DISCUSSION

In line with the existing literature in this field, the findings will first be evaluated in isolation. This enables initial interpretations and contributes to each body of literature separately. Subsequently, the findings of the mediation analysis and the combined models are interpreted.

Discussion of Separate Relationships

Firstly, it is striking that all five personality traits have a significant effect on the likelihood that a household has accumulated the savings buffer recommended by the UK government. Since the existing empirical evidence concerned with this relationship is characterized by significant contradictions, it is not possible to generalize whether the findings of this paper are in line with previous findings. The importance of personality traits on saving outcomes, however, is underscored. Further, the analysis has shown that all personality traits have a significant relationship with almost all saving habits, emphasizing that it is not only necessary to analyze the outcomes but also the underlying dynamics of the relationship. Additionally, it is found that for all saving habits the effects on the saving outcome Cover 3 Months are always the reverse as compared to the saving outcome More Debt, emphasizing the consistency of the findings.

Discussion of Mediation Effects and Combined Model

When assessing the mediation effects in the final models it can be seen that striking evidence is found suggesting that the relationship between personality traits and saving outcomes is mediated by the saving habits Saving Method, Saving Regularity and Saving Motive. In fact, up to 96.14% of the relationships are mediated by these three habits. It is important to note that these figures are calculated when controlling for all other saving habits and personality traits simultaneously. Thus, the confounding percentages mentioned here are discerning the unique effect that the personality traits at hand have on saving outcomes. Further, it is striking that the behavioral habit Saving Method has the strongest mediation effect for most of the relationships between personality traits and saving outcomes. In other words, it can be concluded that a substantial portion of the effects that personality traits have on saving outcomes arise due to the effect which these personality traits have on saving habits.

These insights into saving behavior enable us to understand why previously executed policy initiatives were so impactful. For example, the introduction of automatic enrollment into 401 (k) saving accounts in the US has increased the participation in this saving scheme dramatically ([1]). This policy initiative shows how very small changes can have dramatic impacts on the saving behavior of individuals. Equipped with the models derived in this paper, the dynamics underlying the success of this policy initiative can be illuminated. In fact, it can be seen that the setup of the automatic enrollment savings plan simultaneously appeals to all three analyzed saving habits.

The findings do not only help to understand the success of initiatives like the 401 (k) savings plan better but they also enable policy makers to design them in an even more effective way. More specifically, they can be set up to more specifically appeal to people which score high on certain

personality traits by targeting the positive saving habits that they are already executing and by nudging them to engage in those that they are lacking.

CONCLUSION

The aim of this paper is to analyze whether and to what extent particular saving habits mediate the relationship between personality traits and saving outcomes. This aim was derived from four realizations. Firstly, the sharp decline in the household savings ratio in the UK requires government action. Secondly, researchers and policy makers increasingly turn to behavioral economics theory to understand the decline and to derive saving policy initiatives. Thirdly, several existing saving policies which are specifically based on psychological and behavioral incentives are found to be highly successful, revealing that slight changes in saving schemes can have dramatic effects on their effectiveness. Fourthly, the existing literature in the field of behavioral economics related to saving is scattered into explaining the separate parts of the relationship between personality traits, saving habits and saving outcomes in isolation. Not only does this impede that holistic theoretical frameworks can be derived but also does it hinder the use of the findings for the assessment of existing saving policies and the design of new saving schemes in a more structured as well as scalable way.

In order to overcome this gap, three related bodies of literature are combined into a single framework. By conducting a three stage dichotomous mediation analysis, it is found that the links between personality traits and saving outcomes are highly significant and that they are substantially mediated by three behavioral habits, namely whether or not households keep their savings separate from their other money, whether or not they save regularly and whether or not they save out of precautionary motives. These findings can be used to design saving schemes which not only address the saving habits that were found to be highly effective but at the same time connect them with an appeal to selected personality traits of individuals.

ROLE OF THE STUDENT

The research was conducted by Ufuk Altunbüken who graduates from his university with the highest distinction. The student has defined the research topic himself, took it upon himself to learn the advanced application of Stata and taught himself to perform a dichotomous mediation analysis. The paper is entirely written by the student.

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