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Wealth, Assets and Life Satisfaction: A Metadata Instrumental-Variable Approach *

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Abstract

We analyse the relationship between wealth/assets and life satisfaction. Using the Household Finance and Consumption Survey microdata from Slovakia in 2017, we first show that real assets (being the major component of household wealth) and life satisfaction are positively correlated. We address endogeneity concerns thanks to the metadata of the survey: we use the interviewers' ratings of the respondents' quality of dwellings to instrument the value of real assets. We show that the 2SLS estimate is positive and higher than the baseline OLS estimate, confirming that real assets are measured with error in survey data. Finally, we use the paradata to show that living next to a neighbour with better house quality significantly decreases one's happiness. Our results suggest that around half of the total effect of real assets on life satisfaction is relative.

Keywords: life satisfaction, wealth, real assets, housing, endogeneity, instrumental variable, survey data, paradata, Slovakia.

JEL-Codes: I30, D60, G51, C26.

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"A house may be large or small; as long as the neighbouring houses are likewise small, it satisfies all social requirement for a residence. But let there arise next to the little house a palace, and the little house shrinks to a hut."

Karl Marx (1847)

1. Introduction

Standard microeconomic models assume that decisions are based on constrained optimisation of utility. One of the constraints being the budget, it is not surprising to see that the most-studied determinant of well-being is income (Clark, 2018). However, income is not the only monetary dimension that is likely to influence well-being: it is important to take into account wealth as well (D'Ambrosio et al., 2020). Income measures an individual's ability to consume within a given time period. Wealth, on the other hand, has a variety of functions. It generates income, confers economic security and enables individuals to smooth consumption over the life cycle for themselves and their relatives via intergenerational transmission of wealth (Boserup et al., 2016).

Very little is known about the wealth-happiness gradient, mostly because of the scarcity of wealth data of good quality. Unsurprisingly, life satisfaction and household net wealth are positively associated (Headey and Wooden, 2004). Wealth is the sum of different dimensions that may relate differently to well-being. Literature on the link between homeownership and life satisfaction finds that homeowners have higher life satisfaction than those who do not own homes (see, e.g., Hu, 2013; Zumbro, 2014; Cheng et al., 2020; Zheng et al., 2020). It has been also shown that not only the ownership but also the dwelling size have an impact on perceived satisfaction. For example, Bellet (2017) demonstrates that the house size is positively linked to housing satisfaction. Regarding financial assets, Brown and Gray (2016) and D'Ambrosio et al. (2009) find positive correlations between financial assets and life satisfaction.[1] D'Ambrosio et al. (2020) also show that net real estate wealth, financial, and business assets are all positively correlated with life satisfaction while credit debt has a negative effect. Brown et al. (2005) report that unsecured, as opposed to secured, debt reduces psychological well-being. Keese and Schmitz (2014) find that household debt is negatively linked to mental

[1] Prior studies analysed the happiness-financial assets relation and found that it depends on the riskiness of the asset (Guven, 2009; Rao et al., 2016; Chen et al., 2020). Chen et al. (2020) reveal positive effect of investment into risk-free assets on happiness and negative effect of risky assets. Similarly, Rao et al. (2016) support positive effect of risk-free assets (savings) on happiness, however they also find positive effect of ownership of risky assets (stocks) on happiness.

well-being. This effect is stronger if debt is mentally labelled as such (Greenberg and Mogilner, 2021).

Beyond the above-mentioned correlational studies, extremely little is known about causal pathways from wealth to life satisfaction production. Only a handful of studies have managed to address the possible endogeneity of wealth and its components with respect to perceived happiness. For example, Lindqvist et al. (2020) estimate the long-run causal effect of financial wealth on individual life satisfaction using combination of unique Swedish register data and a random survey. They show that those surveyed people who won a lottery prize 20 years ago report significantly higher happiness scores. A similar result has been demonstrated also in the case of Singapore (Kim and Oswald, 2021) and Ethiopia (Andersen et al., 2021). Zheng et al. (2020) estimate a causal relationship between homeownership and subjective well-being by a difference-in-differences approach in China. However, most of the aforementioned papers use phenomena such as lottery wins to isolate an exogenous change in wealth. Although lottery wins offer plausible random variations, they are not the usual tool individuals use to build their wealth. As with any experiment, the results of the extant literature are affected by the problem of a limited external validity.

An extensive literature demonstrates that subjective well-being also depends on peer comparisons. The comparison effect describes situations where the higher the outcome of the reference group the lower the individual's well-being is. This phenomenon is observed in survey data (Clark and Oswald, 1996; Luttmer, 2005), large-scale register data (Clark et al., 2009; Ifcher et al., 2018; Brodeur and Flèche, 2019) and experimental settings (Card et al., 2012). The information effect corresponds to the opposite situation: the presence of peers with a better outcome is seen as a signal for future improvement and increases an individual's well-being immediately.[2] What about the relative effect of wealth? Brown and Gray (2016) show that relative wealth matters in Australian data: the information effects generally dominate comparison effects, indicating that an individual's level of subjective well-being is positively influenced by the wealth of others. This suggests that individuals interpret the increase in wealth of the comparison group as a signal of future prospects and not as a source of relative deprivation. D'Ambrosio et al. (2020) come to similar conclusions using German data. However, Bellet (2017) finds that the comparison effect dominates in the US: an individual's housing satisfaction decreases with the size of the houses of the neighbours.

We here focus on the impact of real assets in Slovakia on a measure of cognitive subjective well-being, namely life satisfaction. This country is an interesting case study in the

[2] See Senik (2004) for an empirical illustration with Russian survey data.

light of our research question. In Slovakia, real assets are mostly made of housing and they represent more than 95% of the total household wealth on average. Around 90% of Slovak households own a dwelling and the share of renters in Slovakia is significantly lower than in Western EU countries such as Germany (Bover et al., 2016). The importance of homeownership in Slovakia has strong historical roots: in the era of socialism, the government of the former Czecho-Slovakia widely supported the population to become homeowners. This culture of homeownership survived the end of socialism since Slovaks keep investing more today in dwelling and real assets than financial assets such as shares or bonds. Beyond the fact that real assets likely have a strong and direct impact on life satisfaction in Slovakia, the nature of real assets itself might also exacerbate comparison effects. Real assets, such as real estate, can be seen and evaluated with accuracy by peers and, hence, be a source of comparison effects.

Using the 2017 wave of the Household Finance and Consumption Survey (HFCS) microdata, we show that there is a positive association between the value of real assets and life satisfaction. To address the various endogeneity concerns, we rely on instrumental variables from the survey paradata.[3] The paradata (or metadata) refers to the data describing the process of data collection (such as interviewers' questionnaires). We use here the interviewers' assessments of the dwelling quality to instrument the value of the real assets. Knowing that vast majority of the value of real assets in Slovakia is made of real estate, the instrumental variables are shown to be strong and relevant. We discuss at length the assumptions under which our instruments produce plausible exogenous variations in the values of real assets. Our results show that the effect of real assets on life satisfaction is positive. It is 2.5 times larger than in OLS, which suggests that errors in the measurement of wealth in survey data produce strong attenuation biases.[4] Our conclusions survive a battery of robustness checks and the effect of real assets is not heterogeneous. We also extend the relative income model of Card et al. (2012) and outline a conceptual framework that decomposes the effect of real assets on subjective well-being into two components: the direct effect and the relative effect. We appeal again to the paradata in our empirical analysis and show that (i) having a dwelling that is worse than the average house in the neighbourhood reduces significantly subjective

[3]The use of interviewer paradata to build an IV strategy is supported by a previous empirical research, though in a different context. For example, Cupák et al. (2019) have used the interviewer ratings along with interviewer characteristics to address the endogeneity of financial literacy in analysing the literacy-savings relationship. A similar approach has also been used by Crossley et al. (2021). Albacete et al. (2021) show that generally the survey data quality depends on the interviewer characteristics, including experience.

[4]There is a close parallel between our research and the one by Hamermesh and Abrevaya (2013). The authors studied the effect of beauty on perceived happiness/satisfaction. Just like in our case of real assets and housing, Hamermesh and Abrevaya (2013) show that beauty is measured with errors in the survey data marring the causal estimates.

well-being and (ii) around half of the total effect of real assets is relative.

We contribute to the literature in several ways. First, we provide a new evidence to the research on the wealth-happiness gradient and make use of paradata to design an empirical strategy that plausibly produces causal estimates. Second, our paradata identification strategy also allows distinguishing and quantifying the importance of the direct and relative effect of the value of real assets on life satisfaction, unlike the previous empirical research on peer effects that heavily relies on an ad-hoc imputation of wealth of a reference group (based on proxy-characteristics such as age, education, region, etc.). Third, we generalise the relative income model of Card et al. (2012) to the broader case of assets and wealth. Last, Slovakia belongs to a group of countries - Central and Eastern Europe - that is commonly underrepresented in international academic research on well-being[5], while it is nonetheless of a great interest when it comes to questions related to household wealth accumulation and portfolio allocation.

The remainder of the paper is organised as follows. Section 2 presents the conceptual framework. The data are described in Section 3 while Section 4 explains the identification strategy and the estimation sample. Section 5 reports the main results, the robustness checks, and the heterogeneity analysis. The analysis of the relative effect of real assets on life satisfaction follows in Section 6. Section 7 concludes.

2. Conceptual Framework

2.1. Relative Wealth Model

To provide a structure to our analysis, we adapt the *relative income model* of Card et al. (2012) to account for both direct and relative effects of real assets. Consider an individual whose own asset value is A and who compares her asset value to a reference level, denoted M, which depends on the asset values of her reference group (e.g., neighbours in the case of housing). We simplify the model of Card et al. (2012) by assuming that M is known; this is plausible assumption considering the greater observability of real assets. Assume that the individual's utility can be written as

$$U(A) = C(A) + V(A - M) + e, \tag{1}$$

where $C(.)$ represents the utility derived from the owned real assets, $V(.)$ are the feelings arising from relative values after asset comparisons, and e represents individual-

[5]There is only a handful of studies analysing general determinants of life satisfaction in Central and Eastern Europe concerned with direct and relative income effects; no study, however, addresses the asset-happiness relationship (see, e.g., Hayo and Seifert, 2003; Želinský, 2021).

specific random variations in preferences.

We expect $C(.)$ to increase with A. Being both consumption and investment good, real assets convey an array of economic and social benefits. Although current consumption has to be reduced to accumulate assets, they have the potential to raise long-term incomes, provide economic security, and improve well-being (Sherraden, 1991; Rossi and Weber, 1996; DiPasquale and Glaeser, 1999; Edin, 2005).

In line with the evidence on comparison effects (Clark and Oswald, 1996, among others), $V(.)$ may be an increasing function of $A - M$. In other words, it would mean that individuals care about the distance between the value of their own real assets and the value of the real assets of their reference group: their utility increases when the value of their own assets exceeds that of the reference group average and reduces when it does not. On the contrary, the literature on the *information effect* (Senik, 2004) would suggest that $V(.)$ decreases with $A-M$: the larger is the average value of the real assets of the reference group as compared to the value of the own real assets, the better the prospects for future wealth gains. Determining the direction of the effect of the real asset comparisons is an empirical question that we will resolve in this article.

2.2. Bringing the Model to the Empirical Analysis

Although utility is a theoretical concept, we follow Clark et al. (2008) and assume here that it can be empirically measured using cognitive measures of subjective well-being (SWB). Equation (1) becomes consequently

$$SWB\,(A) = C\,(A) + V\,(A - M) + e. \tag{2}$$

Keeping everything else constant, the effect of A in a SWB-regression that does include M is equal to $C'(.) + V'(.)$. Because it adds up the direct effect of real assets $C'(.)$ to the relative effects $V'(.)$, we call this sum the *total effect* of real assets.

Our objectives in the remainder of the paper are twofold. First, we aim at estimating the causal total effect of real assets using an instrumental-variable approach. Second, we ambition to disentangle and evaluate the relative importance of the direct and relative effects of real assets. If most of the total effect turns out to be direct, real assets would have the features of a traditional private good (rivalrous, excludable but its consumption does not affect other's utility). On the contrary, if most of the total effect turns out to be relative, real assets could be considered as positional goods.

3. Data and variables

Our data come from the Household Finance and Consumption Survey (HFCS) conducted in the spring of 2017 by the National Bank of Slovakia in cooperation with the Slovak Statistical Office.[6] The HFCS is a nationally representative survey of households and individuals that collects information about household assets, liabilities, incomes, consumption, as well as a rich set of demographic characteristics. The survey was fielded in 2010, 2014, and 2017 but only the latest 2017 wave contains information about the self-assessed life satisfaction of respondents.

Our outcome variable, life satisfaction (LS), is a standard measure of self-assessed SWB (Clark, 2016). Each household represented by the most knowledgeable reference person was asked a question: *"On a scale from 0 to 10, how satisfied are you overall with your life? where 'zero' means totally dissatisfied and '10' means entirely satisfied."* Similar life-satisfaction questions are used in many surveys (e.g., British Household Panel Survey, German Socio-Economic Panel, World Values Survey, Latinobarometer, etc.).

Our main explanatory variable of interest is the value of own real assets. As we already discussed earlier, real assets dominate the household portfolios in Slovakia. On average they comprise around 95% of household wealth, dwelling value being the largest share of real assets. Real assets are tangible assets comprising of real estate, vehicles, valuables, and self-employment business. In our case, it is natural to keep them in one aggregated bundle, as our conceptual framework relies on the observability of wealth, a property which real assets satisfy.

HFCS respondents report standard sociodemographic characteristics (e.g., age, gender, education). In addition to the real asset value, they are also asked to provide the value of financial assets, mortgage and non-mortgage debt which we use as additional control variables in our empirical estimations. Last, dwelling characteristics including the type of dwelling (detached house, semi-detached house or flat/apartment), the degree of the urbanisation of the dwelling location (big city, town or suburban municipality, and rural village) and the region of residence (Bratislava, Trnava, Trenčín, Nitra, Žilina, Banská Bystrica, Prešov, and Košice) are also controlled for.

Importantly, the National Bank of Slovakia together with the Slovak Statistical Office granted us an access to the paradata (or metadata) for the Slovak HFCS. The term "paradata" generally refers to auxiliary data about the process by which a dataset was collected. In our case, the paradata corresponds to the questionnaire HFCS inter-

[6] The data is part of a broader European project coordinated by the European Central Bank (https://www.ecb.europa.eu/stats/ecb_surveys/hfcs/html/index.en.html).

viewers were required to fill after each interview. Data contains essential information about the respondent and survey process including the evaluation of respondent's confidence/interest in answering the questions, additional documents used during the survey as well as visual evaluation of the respondent's wealth (household living conditions). We make use of the following question to build our instrumental variable: *"Could you describe the conditions in the interior of the house/apartment? 1: Poor. Complete reconstruction of some walls and ceiling is required; 2: Sufficient. Requires rather large interior work. Holes or cracks need repair. Painting is required, etc.; 3: Good. It needs minor repainting or interior repairs; 4: Excellent. The walls and ceilings have no cracks, the paint and the tiles are in excellent condition."* We also make use of the question *"What is the dwelling quality of the respondent household compared to the dwellings of neighbours? 1: Worse; 2: About the same; 3: Better."* to estimate the magnitude of the relative effect of real assets on life satisfaction. Furthermore, the paradata also includes characteristics of the interviewers regarding their age, education and experiences. We can see in Table 6 in Appendix that an average interviewer has 18.39 years of experience. The interviewers have been given an intensive training on the HFCS survey data collection (with strict instructions following the ECB guidelines). In combination with their robust experience in collecting survey microdata, we assume that the ratings interviewers provide should be viewed as professional unbiased judgements produced in a uniform way. Nevertheless, in our robustness checks we control for interviewer-level characteristics and interviewer fixed-effects to show that our main results are not spuriously driven by observed differences between interviewers.

4. Identification Strategy and Estimation Sample

4.1. Identification Strategy

We first estimate the following wealth-life satisfaction relationship:

$$LS_i = \alpha RA_i + \beta W_i' + \gamma X_i' + \varepsilon_i, \tag{3}$$

where LS_i is self-rated life satisfaction of the respondent i, RA_i is the household real assets and W_i' is a vector of other wealth components (financial assets, mortgage and non-mortgage debts). The impacts of assets, especially how people use their assets, may depend on how people built their assets—whether the resources came from savings, from gifts or inheritances, or from an unanticipated jump in asset values. Thus,

the effects of assets will depend on the level of debt and the term composition of debt undertaken to accumulate the assets (Stillman and Liang, 2010). This is why we control for the mortgage and non-mortgage debts. We apply the inverse hyperbolic sine (IHS) transformation to all wealth variables. X_i' is a vector of standard control variables aiming at reducing the possibility for omitted variables to bias the estimate of interest α, the effect of real assets. There are two types of controls: socio-demographics variables (i.e., age, age-squared, gender, education, household income, marital status, household size, presence of children in the household) and dwelling characteristics (i.e., dummies for the region, the city size, and the type of dwelling, i.e., a detached house, a semi-detached house, or a flat). The first set of controls is standard and contains variables that arguably influence both real assets and life satisfaction. Although we do not know the exact address of the respondents, we believe that the combination of the dwelling characteristics is sufficient to keep constant most of the unobserved influences of the quality of their neighbourhood that simultaneously affect real assets and life satisfaction.

Our theoretical model states that real assets have positive returns on utility. In our empirical model, this means that RA_i, after an IHS transformation, should attract a positive α. While we built our vector of control variables to keep the influence of confounders of the relationship between real assets and life satisfaction constant, α might still be biased due to remaining endogeneity issues. More specifically, real assets are prone to measurement errors (Lepinteur and Waltl, 2021). If the measurement error in real assets is uncorrelated to the true value of real assets (classical errors-in-variables model), α should be attenuated. In case of non-classical measurement error, α could even be reverted. Whatever the type of measurement error, instrumental variables can be used to obtain a consistent estimate of α as long as the instrument only correlates with the true values of real assets and not with any of the measurement errors.

We use the interviewers' ratings as an instrumental variable in a two-stages least squares (2SLS) procedure as follows:

$$RA_i = \pi Rating_{ji} + \delta W_i' + \lambda X_i' + \mu_i, \tag{4}$$

$$LS_i = \alpha \widehat{RA}_i + \beta W_i' + \gamma X_i' + \varepsilon_i, \tag{5}$$

where $Rating_{ji}$ is the interviewers' ratings going from one to four (from 'Weak' to 'Excellent'). We also consider the ratings as discrete variables in the robustness checks. The rest of the notation remains the same as in Equation (3), except $\widehat{RA}_i$ that is not the actual but the predicted values of real assets. As in any 2SLS procedure, Equations (4) and (5) are respectively the first- and second-stage regressions.

Assuming that our set of controls X_i' is sufficient to satisfy the hypothesis of conditional independence, the interviewers' ratings are valid instruments if they also satisfy the relevance assumption and the exclusion restriction. The relevance assumption means that the interviewers' ratings have to predict significantly the value of real assets. This assumption is easily testable: π has to be significantly different from zero. The exclusion restriction states that the instrumental variable affects the outcome variable only through the influence of the endogenous variable. While this assumption is untestable, it arguably holds in our context: the life satisfaction question is asked at the very beginning of the HFCS questionnaire (even before the respondents report the value of their assets, incomes, and liabilities) and interviewers assess the interior quality in the survey paradata, once the data collection is over. As life satisfaction of the HFCS respondents is reported first, it seems implausible for the interviewers' ratings to have any direct influence. In a similar vein, the possibility for the life satisfaction response to directly influence the interviewers' ratings (and hence to provoke a reverse causation) seems implausible for several reasons. First, around 140 Slovak interviewers received detailed training prior the fieldwork to guarantee the quality of the data collection. Within three months, they interviewed on average from 15 to 20 households applying identical procedures. Last, but not least, the HFCS questionnaire contains more than 140 questions with multiple loops, 16 paradata questions and the median length of interview in the Slovak panel of HFCS was around 50 minutes. Considering the quality of interviewer training, the number of household interviewed, the number of questions in the HFCS questionnaire and the time between the moment the life satisfaction of the HFCS respondent and the paradata are recorded, it is difficult to believe that the interviewers' ratings were influenced by the life satisfaction of the HFCS respondents. Hence, we believe that the interviewers' ratings satisfy the identification assumptions an instrumental variable requires to correct for endogeneity issues and identify a causal effect of real assets on life satisfaction.

Note that we only use linear models. This means that we treat life satisfaction as cardinal (despite its ordinal nature). As shown by Ferrer-i Carbonell and Frijters (2004), this is not a source of worry in our case since linear and non-linear life satisfaction-regressions often yield similar results.

Because the OLS and 2SLS models do not keep constant the potential relative effect of real assets, α is arguably what we call in our conceptual framework the total effect of real assets. We make use of the richness of the paradata of HFCS in Section 6 below to disentangle the direct and relative effects of real assets.

4.2. Estimation Sample

Our empirical analysis is based on an estimation sample coming from the Slovak version of HFCS 2017. We only keep individuals with non-missing dependent, independent and instrumental variables. We also restrict our sample to non-retired respondents between the age of 20 and 70. We exclude the respondents above age 70 to attenuate the share of individuals that would arguably be considered defiers in our 2SLS procedure, i.e. the older respondents are more likely to have houses considered as *vintage* (objectively in poor conditions for the interviewers point of view but with a high value). Our selection produces a sample of 880 individuals (households).

Table 1 shows a set of descriptive statistics. The average net wealth is around 117 thousand euros and the average gross household annual income sums to around 25 thousand euros. Real assets represent more than 90% of the gross total household wealth. This is consistent with the fact that the average amount of secured (mortgage) debt is ten time bigger than the average amount of unsecured debt. The average life satisfaction is 6.95 with a standard deviation of 1.88. The distribution of life satisfaction score is shown in Figure 1. Around 75% of the responses lies between five and eight while roughly 10% of the respondents reported a level of life satisfaction lower than five. This skewness in the distribution of life satisfaction is common. From socio-demographic perspective, our respondents (referenced persons) are on average 45.58 years old and majority is represented by males (71%). 27% finished tertiary education and 92% is employed. The average household size is 3.17 members and 57% has children. The average household gross income is 10.53 (in IHS).

Last, we report in Figure 2 the distribution of the interviewer ratings and the average value of the real assets (in IHS). Around 65% of the respondents' dwelling were rated *"4 - Excellent. The walls and ceilings have no cracks, the paint and tiles are in excellent condition"*, 25% were rated *"3 - Good. It needs minor repainting or interior repairs"*, 10% were rated *"2 - Sufficient. Requires rather large interior work. Holes or cracks need repair"* and the last 5% were rated *"1 - Poor. Complete reconstruction of some walls and ceiling is required"*. Importantly, the average value of the real assets increases with the interviewer ratings. While this graphical evidence cannot be seen as a formal test, it supports the relevance assumption of the instrumental-variable framework. It is important to emphasize that the interviewers are experienced professionals with on average 18.39 years of experiences. They are mostly older with average age 49.33 years and 29% have university education (master level). The descriptive statistics and distribution of interviewers' characteristics are shown in Table 6 and Figure 3.

Table 1: Descriptive statistics

Variable	Mean	SD	Min	Max
Dependent variable:				
Life Satisfaction	6.96	1.88	0	10
Wealth variables:				
Net Wealth	117,935.70	208,640.90	-56,741	3,719,051
Real Assets	122,006.40	199,276.90	0	3,649,848
Financial Assets	11,048.82	28,259.15	0	354,733.60
Mortgage Debt	13,592.0	28,294.18	0	182,019.40
Non-Mortgage Debt	1527.57	5219.16	0	104,175.80
Socio-demographics characteristics:				
Household Income	24,849	36,115.66	0	744,000
Age	45.58	9.55	20	69
Tertiary Education	0.27		0	1
Employed	0.92		0	1
Male	0.71		0	1
Household Size	3.17	1.31	1	8
Children in the Household	0.57		0	1
Married	0.68		0	1
Dwelling characteristics:				
Type of Dwelling:				
Individual House	0.51		0	1
Semi-detached House	0.03		0	1
Flat/Apartment	0.46		0	1
Degree of Urbanisation:				
Big City	0.24		0	1
Other Town or Suburban Municipality	0.38		0	1
Rural Village	0.39		0	1

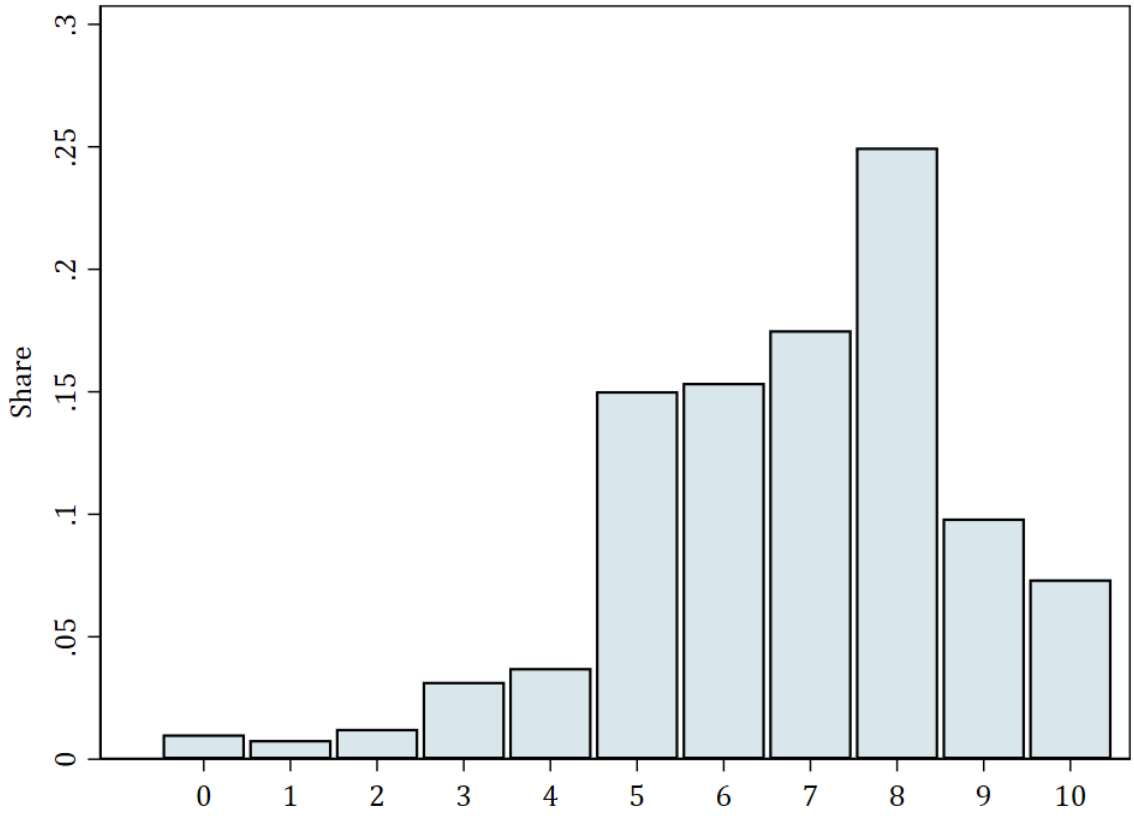
Notes: Based on the sample of non-retired respondents who are aged 20-70. Descriptive statistics computed using survey weights and multiply imputed data. There are eight regions in Slovakia (Bratislava, Trnava, Trenčín, Nitra, Žilina, Banská Bystrica, Prešov, and Košice) which are approximately equally represented in the survey.

Source: HFCS 2017, National Bank of Slovakia.

4.3. Accounting for the Specifics of the HFCS Data

As a final remark, we would like to highlight that missing values in some of the HFCS variables (mostly related to household assets, debts, and incomes) are imputed and replaced 5 times. Multiple-imputed data allow us to consider imputation uncertainty related to item non-response to obtain statistical inference. We follow the standard procedure suggested by Rubin (1987) to obtain unbiased point estimates and variance estimation of the statistics of interest. Empirical applications of multiple imputation technique along with the complexity of survey data are described, in detail, in Christelis et al. (2010) or Cupák et al. (2020).

Figure 1: Distribution of life satisfaction score in Slovakia



Notes: Based on the sample of non-retired respondents who are aged 20-70.
Source: HFCS 2017, National Bank of Slovakia.

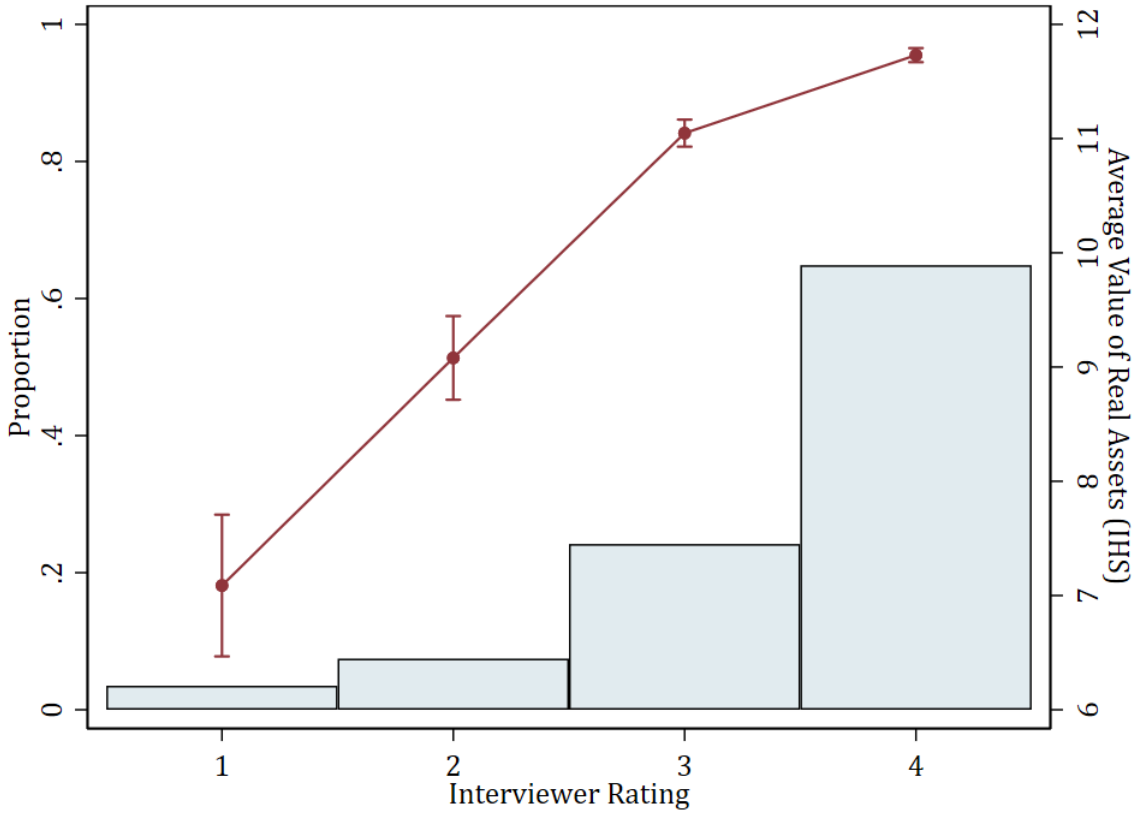
5. Results

5.1. Own Real Assets and Life Satisfaction

Table 2 displays our baseline estimates. In column (1), we estimate the bivariate association between the net wealth after an IHS transformation and life satisfaction. Unsurprisingly, the net wealth attracts a positive and significant estimate at the 1% level. We then ask in column (2) whether the correlations between the different dimensions of net wealth and life satisfaction are also significantly different from zero. Real and financial assets attract positive estimates of the same magnitude while changes in the values of mortgage and non-mortgage debts are not associated with any significant changes in life satisfaction.

However, the aforementioned coefficients are very likely to confound the influence of omitted socio-demographic characteristics (such as age and income). We attempt to reduce this omitted variable bias by reproducing the regression estimated in column (2)

Figure 2: Average value of real assets (IHS) by interviewer rating



Notes: Based on the sample of non-retired respondents who are aged 20-70.
Source: HFCS 2017, National Bank of Slovakia.

while controlling for a large set of observable characteristics. Results are displayed in column (3) of Table 2. Mortgage debts now attract a negative coefficient that is significant at conventional level while non-mortgage debts do not. This result is in contrary to prior research from Western countries. For example, Gray (2014) find that in Germany the effect of secure debt on life satisfaction is positive and insignificant while unsecured debt has more significant impact on life satisfaction compare to secure debt. The introduction of the controls reduced the estimate for financial assets, although it remains positive and significantly different from zero at the 1% level. Last, the correlation between real assets (expressed in IHS) and life satisfaction strikingly remains the same after the introduction of the controls. The estimate for real assets is now significantly larger than the one for financial assets at the 10% level. The estimate attracted by the value of real assets in column (3) likely confounds the effect of the location of the dwelling: a neighbourhood of good quality is likely to affect simultaneously the prices on the housing market and the life satisfaction of its inhabitants. This is why we control for a set of dwelling characteristics aiming at capturing the influence of its location in column (4). In line with our expectations, the estimate attracted by the value of real

Table 2: Life satisfaction and Wealth Components (OLS and 2SLS Results)

	Life Satisfaction [0-10]				
	OLS				2SLS
	(1)	(2)	(3)	(4)	(5)
Net wealth (IHS)	0.097***				
	(0.032)				
Real assets (IHS)		0.168***	0.166***	0.156***	0.400**
		(0.036)	(0.035)	(0.034)	(0.176)
Financial assets (IHS)		0.171***	0.110***	0.112***	0.060
		(0.036)	(0.035)	(0.036)	(0.052)
Mortgage debt (IHS)		0.002	-0.025*	-0.026*	-0.052**
		(0.014)	(0.014)	(0.014)	(0.023)
Non-mortgage debt (IHS)		0.002	-0.006	-0.001	0.008
		(0.019)	(0.018)	(0.018)	(0.020)
First stage estimate for Real Assets (IHS):					
Interviewer Rating [1-4]					0.585***
					(0.174)
Controls:					
Socio-demographic characteristics	No	No	Yes	Yes	Yes
Dwelling characteristics	No	No	No	Yes	Yes
Observations	880	880	880	880	880
Cragg-Donald F-statistic	-	-	-	-	28.120

Notes: Based on the sample of non-retired respondents who are aged 20-70. Estimations carried out using multiple-imputation techniques. Bootstrapped standard errors presented in parentheses are based on 1,000 replicate weights. The socio-demographics characteristics are the gender, the age, the age squared, a dummy for tertiary education, the net monthly household income (in IHS), the household size, a dummy for the presence of children in the household and a dummy for married respondents. The dwelling characteristics are dummies for the type of dwelling, for the degree of urbanisation and for the region of residence.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Source: HFCS 2017, National Bank of Slovakia.

assets is slightly smaller than the one in column (3).

While the stability of the correlation between real assets and life satisfaction across the specifications attenuates the concerns caused by the omitted variable bias, it is not sufficient to address all the endogeneity issues and to conclude that real assets causally increase life satisfaction. This is why we turn now to the instrumental variable approach. As explained in Section 4.1, we use the interviewer rating of the house quality to instrument the value of real assets. Results are shown in the last column of Table 2. According to the 2SLS estimate for real assets, doubling the value of real assets significantly increases life satisfaction by 0.4. Although the OLS estimates for real assets are qualitatively similar to the 2SLS estimate, they are roughly two times smaller in magnitude. Considering that the value of real assets is subject to classical measurement errors, it is not surprising to find a larger 2SLS estimate. Moreover, the gap between OLS and 2SLS estimates is in line with the one found in Powdthavee (2010) where the effect of income is roughly two times bigger after instrumentation. Last, the bottom part

of the Table reports some statistics to discuss the validity of the instrumental variable. The first-stage estimate supports the relevance assumption: a higher rating from the interviewer predicts a large and highly significant increase in the value of the real assets. With the Cragg-Donald F-statistics being roughly equal to 30, we can also discard the problems of weak-instrumentation.

5.2. Robustness Checks

While the 2SLS estimate presented in the section above suggests that real assets have a positive and significant causal effect on life satisfaction, we now present a battery of robustness checks to test the sensitivity of our main specification. A first series of test discusses the adequacy of the measurement of the value of real assets. We then discuss the measurement of the instrumental and dependent variables. All the results are shown in Table 3.

Although there is very little reason to believe that the interviewers' ratings *per se* violate the exclusion restriction, some interviewers' characteristics might directly affect the life satisfaction of the HFCS respondents. Were those characteristics orthogonal to the interviewers' ratings or the assignment of interviewers to survey fields random, our 2SLS would not be influenced. However, to rule out this issue, we do augment our baseline regression with the available interviewers' characteristics in the Slovak panel of HFCS (age, education, and experience in years). Column (2) displays the results: the main 2SLS estimate is similar to the baseline estimate. This suggests that the interviewers' characteristics are unlikely to affect our conclusions. Including interviewer fixed-effects produces similar estimates.

Equivalence scales are used to account for economies of scale in resources within households. While we do control for family size in our man specification, one may argue that it is not sufficient and that we should rescale the value of our real assets (and all the remaining measures of resources) to account for such economies of scale. We do so by dividing the value of the real assets by the square root of the number of household members. As we only observe the number of members in the household (and not separately the number of adults and children), we cannot use the OECD equivalence scale. The 2SLS estimate in column (3) is similar to our baseline estimate although the Cragg-Donald F-statistics is slightly lower.

The IHS formula is a standard transformation that accounts for both the non-linearity and the negative values of the wealth distribution. However, as we mostly focus our attention on the gross value of real assets, we could also use the log transformation. We do so in column (4) and find results that are quantitatively similar to our baseline

Table 3: Life satisfaction and Real Assets – Robustness Checks (2SLS Results)

	Life Satisfaction [0-10]						Life Satisfaction [0-6 vs 7-10]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Real assets (IHS)	0.400**					0.378	0.109**
	(0.176)					(0.262)	(0.047)
Equivalent Real assets (IHS)		0.446**					
		(0.195)					
Real assets (log)			0.415**				
			(0.185)				
Net Real Assets (IHS)				0.316**			
				(0.144)			
Net Wealth (IHS)					0.331***		
					(0.109)		
First stage estimate:							
Interviewer Rating [1-4]	0.585***	0.523***	0.558***	0.712***	0.979***		0.585***
	(0.171)	(0.163)	(0.164)	(0.213)	(0.299)		(0.174)
Interviewer Rating [1-3 vs 4]						0.579**	
						(0.247)	
Cragg-Donald F-statistic	28.120	25.592	28.439	25.026	26.282	12.319	28.120
Observations	880	880	880	880	880	880	880

Notes: Based on the sample of non-retired respondents who are aged 20-70. Estimations carried out using multiple-imputation techniques. Bootstrapped standard errors presented in parentheses are based on 1,000 replicate weights. The controls are the gender, the age, the age squared, a dummy for tertiary education, the net monthly household income (in IHS), the household size, a dummy for the presence of children in the household, a dummy for married respondents, dummies for the type of dwelling, for the degree of urbanisation and for the region of residence. The interviewer characteristics are the age, the experience and the education.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Source: HFCS 2017, National Bank of Slovakia.

specification.

One may also argue that considering the net value of real assets might be more appropriate. The 2SLS estimate for the net value of real assets (in IHS) in column (5) is somewhat lower than the estimate in column (1), although it is still positive and significant at the 5% level. In a similar vein, we could instrument the net wealth rather than only the value of the real assets. Results in column (6) are consistent: net wealth attracts a positive and significant estimate. However, the Cragg-Donald F-statistics is somewhat smaller. This is not surprising: the interviewer rating applying only to the state of the dwelling of the respondents, it unlikely predicts with accuracy the other components of the total net wealth and, as such, is less relevant.

Last, the interviewer ratings and life satisfaction are ordinal variables, but they have been used as if they were continuous throughout the analysis so far. We address this concern by first dichotomising the interviewer rating using the median as a threshold and use the dummy "high interviewer rating" as an instrumental variable in column (7). The instrument is still relevant and the 2SLS estimate for the value of real asset is positive although its p-value is 0.15. The loss of significance might be due to the lower

variability in the instrumental variable, which is in line with the lower Cragg-Donald F-statistics. In a similar vein, we replace the continuous life satisfaction by a dummy "high life satisfaction" in column (8). We use again the median to dichotomise life satisfaction. The effect of the value of real assets is still positive and significant at the 5% level. Note that we also used the dichotomised instrumental and dependent variables in the same specification and various thresholds (not reported) and found similar estimates. Results are available upon request.

5.3. Heterogeneity Analysis

The baseline 2SLS estimate reported in the last column of Table 2 is an average coefficient over the estimation sample. However, we might suspect that the life satisfaction of some sub-groups to be more sensitive to the value of real assets. We check this intuition by introducing interaction terms in Equations (4) and (5) as suggested by Wooldridge (2010).

The determinants of life satisfaction may differ by gender (Fugl-Meyer et al., 2002). Hence, we introduce an interaction term estimating whether the effect of the value of the real assets is different between men and women. Results are displayed in the first column of Table 4. The interaction term does not attract a significant coefficient, which means that there is no difference across gender. Along the same line, we interacted the value of real assets with a dummy for respondents of age 50 and above (50 is the median age of our estimation sample). As revealed by column (2) of Table 4, we do not find difference between the young and old respondents. Different age thresholds yield similar results, available upon request. In the next column, we show that the effect of the value of real assets does not depend upon education.

In column (4) of the same Table, we ask whether the effect of the real assets differ between poor and rich household (using the median value of the household income as a threshold). We find no significant difference again. This supports the idea that real assets and household income are neither complements nor substitutes in a life-satisfaction regression.

Last, parenthood and marriage might exacerbate the positive effect of real assets over life satisfaction because a high value of real assets might bring more financial security to the household. We account for such possibility in columns (5) and (6) where we interact the value of the real assets with a dummy for being a parent and a dummy for being married respectively. Although the interaction terms are positive, none of them is significantly different from zero at conventional levels. Overall, the absence of heterogeneity is in line with Andersen et al. (2021).

Table 4: Life satisfaction and Real Assets – Heterogeneity Analysis (2SLS Results)

	Life Satisfaction [0-10]					
	(1)	(2)	(3)	(4)	(5)	(6)
Real assets (IHS)	0.302	0.398**	0.408**	0.397**	0.317	0.281*
	(0.193)	(0.177)	(0.171)	(0.179)	(0.248)	(0.166)
Interacted with:						
Male	0.121					
	(0.189)					
Age 50 and Above		-0.024				
		(0.025)				
Tertiary Education			-0.160			
			(0.485)			
High Income				0.003		
				(0.018)		
Parenthood					0.130	
					(0.200)	
Married						0.217
						(0.193)
Cragg-Donald F-statistic	14.678	14.036	9.653	13.628	12.130	15.597
Observations	880	880	880	880	880	880

Notes: Based on the sample of non-retired respondents who are aged 20-70. Estimations carried out using multiple-imputation techniques. Bootstrapped standard errors presented in parentheses are based on 1,000 replicate weights. The controls are the gender, the age, the age squared, a dummy for tertiary education, the net monthly household income (in IHS), the household size, a dummy for the presence of children in the household, a dummy for married respondents, dummies for the type of dwelling, for the degree of urbanisation and for the region of residence.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Source: HFCS 2017, National Bank of Slovakia.

6. Assessing the Importance of the Relative Effect of Real Assets

To what extent real assets are positional goods? While our main 2SLS estimate in Table 2 suggests that the net effect of real assets is positive, we still do not know whether the increase in life satisfaction comes from the direct effect of the absolute value of real assets or from the high relative standing it conveys.

Identifying the importance of the relative effect of real assets is empirically challenging. First, it is almost impossible to know with certainty who is the reference group. We here follow the literature (Brodeur and Flèche, 2019) and assume that the neighbours are a valid reference group.[7] The measurement of the difference between the value

[7] Chyn and Katz (2021) discuss at length positive externalities of neighbourghoods and conclude that neighbourhood environments matter for the population well-being and health even more than for their labour market outcomes.

of the own real assets and that of the reference group is the second challenge. Using our conceptual framework, it means that $A - M$ is often unknown. Rather than making normative assumptions about the definition of a neighbourhood and to avoid calculating a noisy empirical measure of M, we decide to appeal again to the paradata. In the Slovak HFCS paradata, the interviewers were asked the following question: *"How does the dwelling of the respondent household compare to the neighbours' dwellings?"*. The potential responses were "Better", "As good as the other surrounding dwellings" and "Worse". Although this measure allows identifying with precision the relative quality of the house of the respondent, it is not a continuous variable. This calls for an adjustment of our conceptual framework. Our Equation (2) becomes

$$SWB\,(A) = C\,(A) + V'\,(A > M) + V''\,(A = M) + V'''\,(A < M) + e, \tag{6}$$

where $V'(.)$, $V''(.)$ and $V'''(.)$ do not depend on the continuous difference $A - M$ but rather on whether A is greater, equal or lower than M respectively. In addition, if $V(.)$ is concave, as is assumed by Fehr and Schmidt (1999), individuals with $A < M$ will experience relatively large reductions in satisfaction, while those with $A \geq M$ will experience only modest increases. From an empirical perspective, we account for the presence of $V'(.)$, $V''(.)$ and $V'''(.)$ by augmenting 2SLS model with the interviewers' assessments of the relative quality of the dwelling as controls. We report the results in Table 5 and the first column replicates the results of the main specification for comparison purposes.

We first control for a dummy "Worse" that is equal to one if the interviewer considered the respondent's dwelling to be worse than the other dwellings from the same neighbourhood. Column (2) shows the results: the dummy "Worse" attracts a negative and significant estimate. In line with the correlations from D'Ambrosio et al. (2020), it confirms that real assets are positional goods. More importantly, the estimate attracted by the real assets is no longer significantly different from zero and equal to 0.2. Using the estimate in the first column of the same Table as a benchmark, it means that the relative effect represents half of the total effect of real assets on life satisfaction. Note that the Cragg-Donald F-statistics is now smaller. This is explained by the fact that the dummy "Worse" is correlated negatively with the value of real assets and positively with our instrumental variable, namely the interviewer's assessment of the state of the dwelling. Yet, the instrumental variable still significantly predicts the value of real assets at the 1% level and the Cragg-Donald F-statistics remains larger than 10.

In the last column of Table 5, we also control for the dummy "Better" that is equal to one if the interviewer considered the respondent's dwelling to be better than the other dwellings from the same neighbourhood. The reference category for the dummies

Table 5: Life satisfaction and Relative Real Assets (2SLS Results)

	Life Satisfaction [0-10]		
	(1)	(2)	(3)
Real assets (IHS)	0.400**	0.200	0.196
	(0.176)	(0.218)	(0.220)
Relative quality of the respondent's dwelling:			
Worse		-0.625*	-0.617*
		(0.372)	(0.372)
Better			0.078
			(0.182)
Cragg-Donald F-statistic	28.120	17.196	17.129
Observations	880	880	880

Notes: Based on the sample of non-retired respondents who are aged 20-70. Estimations carried out using multiple-imputation techniques. Bootstrapped standard errors presented in parentheses are based on 1,000 replicate weights. The controls are the gender, the age, the age squared, a dummy for tertiary education, the net monthly household income (in IHS), the household size, a dummy for the presence of children in the household, a dummy for married respondents, dummies for the type of dwelling, for the degree of urbanisation and for the region of residence.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: HFCS 2017, National Bank of Slovakia.

"Worse" and "Better" is now "As good as the other surrounding dwellings". Having a better dwelling does not increase life satisfaction at conventional levels of significance. We replicated the empirical models in Table 5 using baseline OLS and found estimates that are similar in magnitude and statistical significance.

7. Conclusion

Using the 2017 Slovak panel of the Household Finance and Consumption Survey and an instrumental-variable approach based on the survey paradata, we show that the total effect of the value of real assets on life satisfaction is positive, sizable and significant. The 2SLS estimate is 2.5 larger than the OLS estimate: this is not surprising because wealth dimensions are measured with imprecision in survey data. We run a battery of robustness checks and conclude that our results are not driven by the interviewers' characteristics, by the way we measured real assets or by the way we treat the dependent and instrumental variables. No heterogeneity in the real asset effect is found. Last, we use the paradata of the HFCS survey to disentangle the direct and relative effect of real assets. We conclude that around half of the total effect of real assets is relative and that comparisons are asymmetric: having a better house than the neighbour does not increase life satisfaction while having a worse one does decrease it.

Our findings could be of interest to policymakers designing public and fiscal policies.

For example, recently there is an ongoing global debate about taxing the individual wealth of the ultra-rich to mitigate societal inequalities (e.g., Saez and Zucman, 2019). However, taxing the wealth will likely reach the general population as well. For example, Slovakia and other Central and Eastern European countries are known for very low or non-existent property/wealth taxes (Hansjörg et al., 2016). At the same time, real assets predominantly comprising dwellings represent the greatest share of household wealth in these countries. Given our results about the importance of real assets for individual utility – subjective well-being, policymakers will need to carefully design property tax reforms, as not only the absolute effect of wealth matters for individual well-being, but also comparisons through ranks, which seem to be highly asymmetric.

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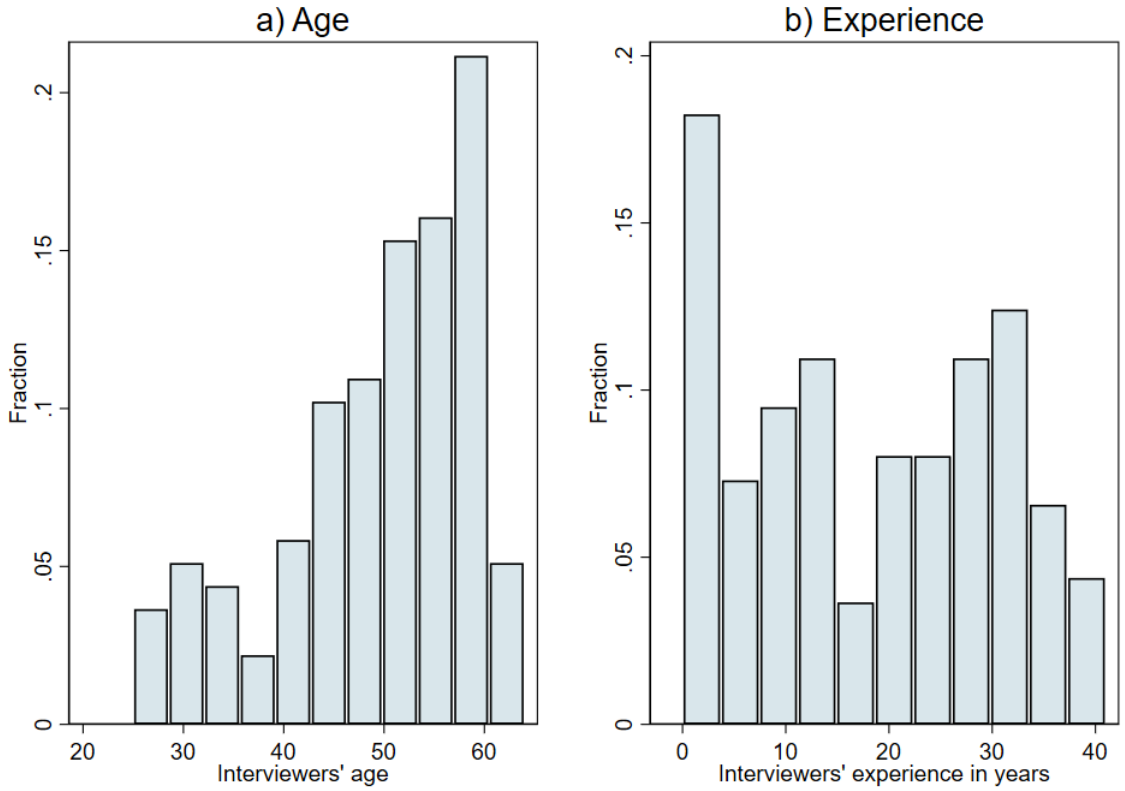
APPENDIX

Figure 3: Distribution of interviewers' characteristics



Source: Statistical Office of the Slovak Republic.

Table 6: Descriptive statistics of interviewers' characteristics

Variable	Mean	SD	Min	Max
Interviewers' age	49.33	9.46	25	64
Interviewers' education				
Secondary specialised vocational education (with diploma)	0.09		0	1
General secondary education (grammar school)	0.11		0	1
Secondary vocational education (with diploma)	0.49		0	1
University education (bachelor level)	0.01		0	1
University education (master level)	0.29		0	1
Interviewers' experience in years	18.39	12.32	0	41

Notes: There are 137 interviewers who interviewed households in the HFCS 2017. They are approximately equally distributed across the 8 regions of Slovakia.

Source: Statistical Office of the Slovak Republic.