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Keeping up with the Kardashians: Evidence from a choice experiment with a nationally representative sample

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ABSTRACT

This study aims at investigating preferences regarding nominal income, standing in income distribution, and income change over time. We use a nationally representative sample and employ the Discrete Choice Experiment methodology in the random utility framework. We estimate trade-offs between the absolute income, income change over time, and relative standing in income distribution. The general finding is that the importance of relative income is greater for wealthier respondents; moreover, respondents are willing to sacrifice a large amount of their overall well-being for a constant upward trend in their earnings during their life cycle. Males are particularly sensitive to relative income: they are willing to "burn" nominal money to reach a higher status, also controlling for wealth. Our study provides evidence for the driving force behind the pursuit of wealth in more affluent countries. Despite high aggregate consumption levels, there is a concern for status as measured by relative standing in society and own income change over time.

1. Introduction

Mainstream economic theory typically assumes that consumers only care about their own income. Indeed, if utility depends on one's consumption, others' incomes are irrelevant. With Easterlin's (1974) influential study, economists learned that self-reported happiness increases with income in a given country and a given year, but average happiness in a given country seems to be broadly constant over time, even though average income increases. This paradox could be explained in terms of income being evaluated in relative terms: either depending on others' current income (social comparison) or on one's own past income (habituation); see Clark et al. (2008). Research inspired by Easterlin's study usually concluded that utility depends on both absolute and relative income but that the absolute component is rather small for richer countries, such as the US (Frank, 1985; Oswald, 1997). In other words, empirical evidence tends to indicate that changes in relative income contribute significantly more to subjective well-being than changes in absolute income.

In contrast to economics, comparisons with others (rather than with an absolute scale) are routinely modeled by psychologists interested in status and related phenomena (Anderson et al., 2015). It is assumed that individuals achieve higher status (respect, admiration, voluntary deference, etc.) not when they possess valued characteristics on an absolute level but rather when they possess more of these characteristics than relevant others (i.e., are richer than those around them, more intelligent, etc.). Never-ending apprehension that one might fall behind, dubbed status anxiety (De Botton, 2008), has been proposed to be the hallmark of modern times.

Accordingly, it appears that the lure of higher status leads people to prefer outcome distributions in which they are at least as rich as others, even if it means everyone—including themselves—is worse off on an absolute level. This hypothesis has been confirmed in hypothetical survey experiments such as Alpizar et al. (2005) and Johansson-Stenman et al. (2002). Refusal to have less than others (as proposed in inequity aversion models by Fehr & Schmidt (1999) and Bolton & Ockenfels (2000) has also been extensively studied in incentivized laboratory experiments. For example, responders in ultimatum games (see Oosterbeek et al., 2004), routinely reject low offers, sacrificing their own share to avoid falling behind. Likewise, if others' income enters utility function negatively, no matter if they are behind or ahead of us (as in Levine's (1998) spitefulness model), workers will tend to supply more labor than would have been socially optimal.

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Then again, some authors have noticed a positive relationship between well-being and income variance (Engelhardt & Wagener, 2014; Rözer & Kraaykamp, 2013) and possibly biased perceptions of income distribution resulting from biased individuals' evaluations of their own relative position in the distribution (Cruces at el., 2013). According to Hirschman's tunnel effect (Hirschman & Rothschild, 1973), information about income distribution and relative income provides details about prospects (high earning achievability); this shows that people take into account not only their current but also their future situation. Interestingly, holding the undiscounted sum of all payments, a preference for sequences that improve over time is often reported (Prelec & Loewenstein, 1991; Schmitt & Kemper, 1996), which, paradoxically, implies negative temporal discounting. This has been proposed as the reason for the often-found pattern of wages increasing with seniority at a pace that is very difficult to explain in terms of a rise in productivity or otherwise within the standard economic model (Frank & Hutchens, 1993). Moreover, if income growth expectations are not met, people start to feel disappointment and anger, and therefore the tunnel effect is only temporary. In the long run, this leads to the opposite effect (Schneider, 2016).

Our main contribution is testing the importance of relative income, decomposed as proposed by Clark et al. (2008), compared to their absolute counterparts and income trend. However, contrary to Clark et al. (2008), which was carried out in the happiness framework, our study is conducted in the random utility framework. This framework allows direct testing of economic theory tackling expected utility, not reported happiness. To the best of our knowledge, this is the first study to estimate trade-offs between absolute income and relative income components decomposed into status (measured by relative standing in society) and own income change over time. As preferences towards relative consumption may depend on income level (Larney et al., 2019; Brañas-Garza et al., 2021), our experiment was carried out in two treatments: high and low income treatment. In both treatments, we identified systematic factors that shape preferences regarding relative consumption. Moreover, contrary to extant studies with student participants, our study was conducted on a representative sample of Polish citizens.

In our work, we use a choice experiment methodology and test the Clark et al. (2008) hypothesis, which states that individual utility, in addition to absolute income, depends on relative income. Following the work of Clark et al. (2008), we assume that relative income comprises two components, namely (*i*) changes in one's own income where the internal reference point is own past income (or expected future income) and (*ii*) relative standing of an individual at the country level.

2. Methodological issues in measuring preferences towards absolute and relative income in the context of well-being

The literature in the field is broad but not univocal in its conclusions. This may partly be related to three groups of challenges the authors faced: (1) data and measures, (2) reference groups, and (3) the misperception of statistical measures.

First, most of the works in the field are based on some kind of social survey (e.g., the British Household Panel Study used by Clark & Oswald, 1996; German Socio-Economic Panel Study used by Mayraz et al., 2009; Behavioral Risk Factor Surveillance System used by Cheung & Lucas, 2016), where well-being assessment relies on the declared level of satisfaction/happiness measured on a Likert scale. For example, Clark and Senik (2010) used data from the European Social Survey, including happiness self-ranked on a 0–10 scale, household income, the extent to which one compares own income to others', and who these others typically are (family, friends, work colleagues, yet others, none). They found that the rich tend to compare less than the poor, although it makes them relatively happy if they do; work colleagues are the most common reference group and the one that tends to boost happiness the most.

The use of Likert scales which is, not surprisingly, typical for studies using self-reported happiness as the dependent variable, may lead to scale and reference point problems as indicated by, for example, Heine et al. (2002), Jamieson (2004), and Norman (2010). Likert levels are not anchored in objective measures, and intervals between levels may be perceived differently. Similarly, a broader question of the link between declared happiness and preferences arises, which we will address in the next subsection.

The second challenge is that the perceived level of inequality strongly depends on the defined reference group (to which the income is compared), which is often somewhat arbitrarily imposed by the researcher (e.g., people of the same age, level of education, place of residence, friends, etc.). In fact, different people can compare their income differently with the income of certain reference groups rather than society as a whole. For the sake of robustness checks, in some studies, authors have conducted their analyses with different definitions of reference groups (relatives, neighbors, etc.) (e.g., Boyce et al., 2010). In general, an individual's choice of reference is relevant to their subjective well-being. As a result, people may actively seek to locate in a poorer neighborhood (Bottan & Perez-Truglia, 2022). Relative income has been identified as having the greatest influence on well-being if the reference group was made up of people around the same age.

Last but not least, this is not adequate to use typical statistical central measures of other people's incomes (average, median, standard deviation). These measures are precisely defined and thus convenient for modeling. However, they may be difficult to process for participants with a limited understanding of statistics; when used in an empirical survey targeting a diverse audience, they should thus be carefully explained and visualized.

The approach adopted in this paper addresses these key challenges identified by the existing literature. First, we use the stated preference methodology (Benjamin et al., 2014) to ensure we do not encounter Likert scale problems. Secondly, the definition of the reference group is strictly controlled. Finally, we pay special attention to providing respondents with comprehensive explanations of the statistical measures used.

3. Happiness and utility

An influential model solving the Easterlin paradox was illustrated by Clark et al. (2008), who proposed a modified utility function with a relative income term added:

$$U_t = U\left(u_1(Y_t),\ u_2\left(Y_t \middle| Y_t^*\right), u_3(T - l_t, Z_{1t})\right).$$

According to their model, the aggregate utility is composed of three sub-utilities, in which the first component is a function of income (Y), which can be thought of as the standard function showing utility from consumption. The last component identifies the influence of leisure (with l being the time devoted to work) and Z_{1t} being a vector of socioeconomic and demographic variables. The new component in the proposed function is $(Y_t|Y_t^*)$, which can be considered the relative income term where Y_t* denotes the 'reference group' income.

In their paper, Clark et al. (2008) distinguished two types of reference points: internal and external. The internal reference point is one's own past income (or expected future income), whereas, in the case of external reference points, comparisons refer to distinct demographic groups such as one's own family, other workers at the individual's place of employment, people in the same neighborhood, country, or even people across a whole set of countries. With external reference points, the component $u_2(Y_t|Y_t^*)$ can be interpreted as the 'status return' from income or the positional or conspicuous consumption aspect of income (Clark et al., 2008).

The question arises concerning whether equating treating happiness and utility as Clark et al. (2008) do is justified. A number of papers should make us cautious regarding this issue. One reason is that happiness is an evaluation of what has occurred, whereas utility is

concerned with the expectation of what is to happen. Individuals may make systematic mistakes in predicting their happiness (Kahneman & Thaler, 2006).). In particular, adaptation (Kahneman et al., 1999) tends to make the hedonic experience of changes in our circumstances shorter and less intense than anticipated. By the same token, we are likely to underappreciate that with higher income, we will also often start comparing it to others' higher incomes. For example, a promotion to a managerial position will make us pay more attention to other managers' incomes. This consideration suggests that the effect of higher relative income may be stronger in anticipation than in experience. While some studies (Clark et al., 2017) elicit subjective well-being and (hypothetical) choices from the same individuals, more evidence on the comparability of these two approaches is needed.

In a happiness survey, respondents are typically asked questions such as "*All things considered, how satisfied are you with your life as a whole these days?*" (World Values Survey, Inglehart et al., 2020) or "*Taken all together, how would you say things are these days? Would you say that you are very happy, pretty happy, or not too happy?*" (General Social Survey, Smith, 2015). Some researchers argue that happiness as a measure of utility cannot be trusted due to the malleability of answers to such questions (Bertrand & Mullainathan, 2001). In particular, they are strongly dependent on subtle manipulations of mood (Schwarz et al., 1987).

Another difficulty of using data on subjective well-being is that individuals may interpret and use the response categories differently (Kahneman et al., 2004). For example, if Person 1 says that they are "very satisfied" and Person 2 says that they are only "satisfied," is Person 1 really more satisfied than Person 2? Person 2 could simply be someone who rarely uses superlatives to describe themselves, be they jubilant or depressed. Person 1, by contrast, could readily use extremes in their self-descriptions. While researchers are developing approaches to measuring happiness associated with different levels of absolute and relative income, and which are based on brain imaging rather than self-reports (Dohmen et al., 2011), this literature remains scarce.

These difficulties partly make economists somewhat skeptical about measuring well-being, preferring instead to infer preference for absolute vs. relative payoffs from choices. The most convenient and versatile way to accomplish this is to run laboratory experiments; see Cappelen et al. (2020) for a recent review. A vital general finding in this area of study is that the preferences are highly heterogeneous. Some participants tend to be selfish, while some have concerns for others. These tend to target those behind (with a lower payoff) rather than those ahead (with a higher payoff). Some participants are even willing to pay to reduce the payoffs of those ahead (disadvantageous inequality aversion). Notably, marginal utility from relative income is rarely positive for all levels (as expected in the Clark et al. 2008 model). Again, the distinction between decision utility revealed in choices and experienced utility declared in surveys may be responsible for this discrepancy. Clearly, the artificial setting and small stakes involved in laboratory experiments could also contribute to the divergence of findings. An interesting strand of literature has recently emerged trying to measure sensitivity to inequality *and* link it to self-reported life satisfaction. For example, Espín et al. (2018) find life satisfaction to be negatively related to disadvantageous inequality aversion ("envy") but, perhaps surprisingly, positively associated with advantageous inequality aversion ("guilt" or "compassion"). In our work, we chose the middle road, as it were, between the surveys and the experiments. In this way, we were able to benefit from a large representative sample, at the same time keeping the experimental setting in hypothetical scenarios. It is most closely related to the studies conducted by Johansson-Stenman et al. (2002), Alpizar et al. (2005), and, very recently, Bergolo et al. (2022). Like these authors, we instructed our responders to consider the well-being of their imagined grandchild and make choices between alternative societies, systematically differing in terms of the grandchild's and others' incomes. The working assumption here is that lacking any other relevant insight, the responder projects their own preference while choosing on their grandchild's behalf. However, unlike in happiness studies, absolute and relative income can be exogenously manipulated, regardless of the respondents' actual situation.

Our approach deviates from this tradition of research in two major ways. First, on top of own and others' income, we also compare decreasing vs. stable vs. increasing income *trends* (over much longer time horizons that could ever be investigated using incentivized laboratory choices). This allows jointly considering two natural points of reference for income comparisons: others' current income and own past income. Second, instead of using a convenience sample of students, we administer the survey to a nationally representative one; as it turns out, demographic variables, notably age, play an important role here.

4. Survey design

Our survey aimed to investigate preferences regarding absolute income vs. relative income decomposed into the following attributes: nominal income, standing in income distribution, and own income change over time. The core of the survey was a choice experiment. The respondents were presented with two societies where their hypothetical grandchild could live and asked to choose the one where they believed they would be happier.

The attributes that were used to describe the alternatives were selected based on the literature review of related research (i.e. Johansson-Stenman et al. 2002, Alpizar et al. 2005, Bergolo et al. 2022, Clark et al. 2008) and qualitative research, wherein respondents were asked about the absolute and relative income attributes that impact their satisfaction level.

After qualitative testing in the process of five Focus Group Interviews (FGI), where respondents discussed understanding of definition and wording of attributes related to absolute and relative income, we defined three attributes:

- **absolute income,** understood as average monthly income after tax;
- **relative income** expressed by individuals' relative standing measured by income percentile in society;
- **the trend in income** throughout their working life.

To test whether the perception of relative income depends on absolute income level, two different treatments varying in income levels were defined, i.e., **Low Income** (after-tax income range: 3500–5000 PLN), and **High Income** (after-tax income range: 8000–14,000 PLN), as indicated in Table 1. Respondents were only assigned to one of the treatments.

For these two treatments, two different sets of levels of relative positions in society were defined. Respondents were informed about the share of the population (income percentile) below the indicated absolute income. This attribute was described as the percentage of people with a lower income than respondents' relative income. The following levels of this attribute were defined: the **10th, 20th, 30th,** and **40th percentiles** in the low income treatment and the **60th, 70th, 80th,** and **90th** percentiles in the high income treatment. Detailed attribute descriptions are presented in the script in the Annex 2.

In addition to absolute and relative income attributes, we defined three levels of **Income Trend** over the working period: **Decreasing, Stable, and Increasing**. This attribute relates to the idea discussed in Clark et al. (2008) that people, in addition to comparing to different reference groups, may also compare to their own past income (or expected future income). The trend was defined as the change in earnings (stable, increase, or decrease) with age. We assumed that earnings might be doubled, stable, or decreased by 50% during the period between the 26th and 65th years of age. Respondents noted that with the trend, the share of people with lower incomes will change, but the trend has no impact on average income level over their professional careers. See Annex 2 for details of the script.

To increase the study's authenticity, the respondents in our exercises

Table 1
The attributes and corresponding levels used in the stated choice.

Attributes	Attribute levels	
	Low income treatment	High income treatment
After tax monthly income (in PLN)	• 3500 • 4000 • 4500 • 5000	• 8000 • 10,000 • 12,000 • 14,000
*Relative standing in society (Income percentile)	• 10th • 20th • 30th • 40th	• 60th • 70th • 80th • 90th
** Trend in income	• Decreasing • Stable • Increasing	

were informed about Poland's mean, median, and 10th and 90th percentiles of income levels. In-depth interviews confirmed that the relative standing measured by Income Percentile and Trend in income were difficult to grasp for some respondents. Since the survey was targeted at the general public, significant attention was thus devoted to the proper communication of the attributes used in order to ascertain that these attributes were understood in the same manner by all respondents.

In the final step of the preparation phase, five focus groups were conducted with respondents of various characteristics to refine the final wording of the attributes used and corresponding levels. The final version of the script can be found in Annex 2. The attributes used and the corresponding levels are presented in Table 1.

An example of a choice card is presented in Table 2.

During the survey, the respondents were reminded that they should not select what they considered the overall best society but the society that would be the best for their relative. The respondents were also told that the societies were identical in all respects except the issues being analyzed. It was also stressed that all the prices, interest rates, and available goods were the same in all societies.

The survey was conducted on a representative sample of 1000 Polish citizens using an online panel (CAWI, Computer Assisted Web Interviewing mode). The sample was representative with respect to gender, age, region, and settlement size. Respondents were randomly assigned to two treatments: Low or High income. In total, 799 completed questionnaires were collected. In our sample: 51% were men; the average age equaled 42 years; 30% of our sample declared higher education; 32% live in large cities (>100 000), and 33% in rural areas. We have not found any statistically significant pattern in dropouts in relation to gender, age, education, and income treatment; thus, we conclude no selection to attrition bias. The detailed attrition analysis we provided in Annex 1.

In our experiment, each respondent was presented with 12 choice situations consisting of two alternatives. In each choice situation, respondents were asked to select their preferred alternative or the opt-out option to avoid forced choice. The combinations of the attribute levels presented in each of the choice tasks (i.e., the experimental design) were selected in a Bayesian-efficient manner (Ferrini & Scarpa, 2007; Scarpa & Rose, 2008). Specifically, the determinant of the expected asymptotic variance-covariance (AVC) matrix of the estimates (D-error) was minimized, given the priors on the parameters of a representative respondent's utility function derived from a pilot survey. The order of choice situations, alternatives, and attributes was randomized to avoid potential order effects.

5. Econometric model

The modeling of preferences using discrete choice data draws on theories of economic value (Lancaster, 1966) and random utility theory (McFadden, 1974, 2001). This modeling assumes that the utility an individual receives from the chosen alternative depends both on observed characteristics (attributes) and unobserved idiosyncrasies, which are represented by a stochastic component. The utility of an individual, i, resulting from choosing an alternative, j, in the situation t can be expressed as:

$$U_{ijt} = X_{ijt}\beta + e_{ijt} \quad (1)$$

The utility expression is composed of the observed choice attributes $\mathbf{X}_{ijt}$, with the corresponding vector of parameters $\boldsymbol{\beta}$ (constant across respondents), and the stochastic component e_{ijt}, which accounts for other factors that are not captured by the analysis. Assuming that the stochastic component (e_{ijt}) follows an independent and identical extreme value (type I) distribution, this will lead to a familiar logit probability specification, as used in simple conditional logistic regressions:

Table 2
Example of the choice card.

$$P(j \mid J) = \frac{exp(X_{ijt}\beta)}{\sum_{k=1}^{J} exp(X_{ikt}\beta)} \quad (2)$$

where J is the value of the predictors corresponding to j. Eq. (2) can be used for deriving the maximum likelihood estimator of the utility function parameters, conditional on individuals' observed choices and attribute levels associated with choice alternatives. The formula in (2) is known as the multinomial logit model (MNL). Discrete choice models are usually derived under the decision-maker's assumption of utility-maximizing behavior.

As noted by Train and Weeks (2005), despite their power to represent choice behavior, logit models have several limitations. First, MNL can only represent taste variation related to the decision-maker's observed characteristics. In other words, MNL can only account for the so-called systematic taste variation but not random taste variation, which can be considered differences in tastes that cannot be linked to observed characteristics.

The second limitation of MNL is that these models cannot handle situations where unobserved factors are correlated over time. One way of relaxing these restrictions and overcoming the limitations – that is, allowing for (unobserved) preference heterogeneity and potential correlations between the alternatives and choices across time – is to include individual-specific parameters, $\boldsymbol{\beta}_i$, which leads to more general models. Both continuous and discrete mixing distributions are commonly assumed. If individual parameters are assumed to be continuously distributed following a parametric distribution specified a priori by the modeler, $\boldsymbol{\beta}_i \sim f(\boldsymbol{b}, \boldsymbol{\Sigma})$, with means, $\mathbf{b}$, and variance-covariance matrix, Σ, then the random parameters mixed logit model is formed (McFadden & Train, 2000).

To further account for these limitations, in addition to the MNL, the data were analyzed with a mixed logit model (MIXL). Mixed logit probabilities can be expressed as the integrals of standard logit probabilities over a density of parameters.

$$P_{ijt} = \int \frac{e^{\beta_{ijt}' x_{ijt}}}{\sum_{jt} e^{\beta_{ijt}' x_{ijt}}} \phi(\beta_{it} | b, \Omega) d\beta_{it} \quad (3)$$

For the MIXL, we used the panel specification put forward by Revelt and Train (1998). This specification assumes that parameters (β_{ijt}) vary across respondents but stay constant across choices for the same respondent.[1] In our work, we assumed φ to be a normal and lognormal density mixture, with mean b and unrestricted covariance Ω.

All the non-price coefficients were assumed to follow a normal distribution, while the price coefficient was assumed to follow a lognormal distribution. Assuming a lognormal distribution for the price coefficient is plausible from a behavioral perspective, given that it restricts all respondents to negative price sensitivity. In addition, this assumption guarantees that the resulting distributions of Willingness to Pay (WTP) are useful and meaningful, namely that they have finite moments (Daly et al., 2012).

Given that we are interested in marginal rates of substitution with respect to income, it is convenient to introduce the following modification of (1), which is equivalent to using a money-metric utility function (also called estimation in WTP space) (Train & Weeks, 2005):

$$U_{ijt} = \alpha\left(p_{ijt} + Y_{ijt}\frac{b}{\alpha}\right) + e_{ijt} = \alpha(p_{ijt} + Y_{ijt}\beta) + e_{ijt} \quad (4)$$

In this specification (with the rescaling of the utility function), the vector of parameters, $\boldsymbol{\beta} = \frac{b}{a}$ can be directly interpreted as a vector of implicit prices (p_{ijt}, or marginal WTPs) which refer to the non-monetary attributes, Y_{ijt}, facilitating an interpretation of the results.

[1] Further details on this specification can be found in Train, 2009.

Table 3
MIXL Results in WTP-space – High income treatment.

		Means		Standard Deviations	
var.	dist.	coef.	st.err.	coef.	st.err.
Opt out	n	0.2753***	0.0687	0.6423***	0.0944
Percentile_70	n	0.5981***	0.1104	2.8628***	0.158
Percentile_80	n	0.8496***	0.1421	4.2971***	0.131
Percentile_90	n	1.0519***	0.1856	5.7977***	0.1869
Trend_Stable	n	3.0060***	0.2322	3.3942***	0.1552
Trend_Increasing	n	4.4420***	0.2973	5.3053***	0.178
Model diagnostics:					
LL at convergence:				−2531.7405	
LL at constant(s) only:				−3340.056	
McFadden's pseudo-R^2:				0.242	
Ben-Akiva-Lerman's pseudo-R^2:				0.5787	
AIC/n:				1.185	
BIC/n:				1.2365	
N				438	

Table 4
MIXL results in WTP-space – low income treatment.

		Means		Standard Deviations	
var.	dist.	coef.	st.err.	coef.	st.err.
Opt out	n	0.0171	0.0173	0.0779***	0.0182
Percentile_20	n	0.038	0.0306	0.5035***	0.0313
Percentile_30	n	0.1062***	0.034	0.9131***	0.0475
Percentile_40	n	0.2365***	0.0538	1.3692***	0.0657
Trend_Stable	n	1.2496***	0.0669	1.1544***	0.0496
Trend_Increasing	n	1.2141***	0.0738	1.5256***	0.0559
Model diagnostics:					
LL at convergence:		−3405.2823			
LL at constant(s) only:		−4339.1186			
McFadden's pseudo-R^2:		0.2152			
Ben-Akiva-Lerman's pseudo-R^2:		0.548			
AIC/n:		1.3091			
BIC/n:		1.3528			
N		361			

6. Results and discussion

Data on respondents' choices provide information about their preferences for choice attributes. These preferences are represented by the estimated utility function coefficients (utility specification for the high income treatment):

$$U_j = \beta_1 Income_j + \beta_2 Percentile_j^{70} + \beta_3 Percentile_j^{80} + \beta_4 Percentile_j^{90} + \beta_5 Trend_{Stable\,j} + \ldots + \beta_6 Trend_{Increase\,j}^{medium} + \beta_7 Opt_{out} \quad (5)$$

where U_j represents utility associated with choosing a program j, variable names correspond to attributes used to characterize the societies (see Table 1 for details) and βs are the parameters to be estimated. *Income* was coded as a continuous variable, whereas *Percentile* and *Trend in Income* were dummy-coded. $Percentile^{10}$ in the low income treatment and $Percentile^{60}$ in the high income treatment have been set as the reference levels, whereas for *Trend in Income,* the reference level was *Decreasing*.

The utility function is, by definition, used to describe ordinal dependence (preference relation); hence, the estimated coefficients do not have an absolute interpretation. However, their signs represent whether a given attribute is perceived as good (positive coefficient) or bad (negative coefficient). An increase of a desired attribute in an alternative would increase the utility associated with this alternative and hence the probability that it would be selected by respondents. In addition, the relative values of coefficients indicate whether one attribute is more important than another.

Note that the increase in one attribute could be offset by a decrease in another, leaving the utility level unchanged. This trade-off is measured by the ratio of coefficients. The ratio of the coefficient of an attribute to

Table 5
MIXL WTP for income percentile across the low and high income treatments.

	mean	95 CI_low	95_CI_high		mean	95 CI_low	95_CI_high
P_10	0.00	0.00	0.00	P_60	0.00	0.00	0.00
P_20	0.04	−0.02	0.10	P_70	0.60	0.38	0.81
P_30	0.11	0.04	0.17	P_80	0.85	0.57	1.13
P_40	0.24	0.13	0.34	P_90	1.05	0.69	1.42

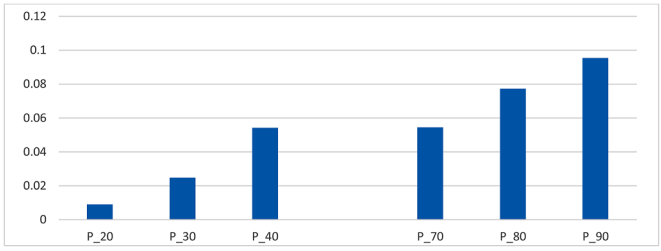

Fig. 1. Relative (divided by the mean income in low and high income treatments) WTP for Income percentiles across the Low and High income treatment WTPs.

the coefficient of the monetary attribute represents the trade-off respondents would be willing to make with respect to money. Following the procedure described by Eq. (4), we rescale the utility function with respect to income (i.e., divide each coefficient by β_1) so that the resulting ratios of coefficients represent the marginal rates of substitution. For example, β_6/β_1 represents the trade-off respondents are willing to make in terms of exchanging their mean lifetime labor income for an increasing income trend (with the decreasing trend being the reference level).

We start by presenting the results of the MIXL. In Table 3, we present the results of the high income treatment, and in Table 4, the results of the low income treatment. As both models were estimated in the WTP space, the presented results can be directly interpreted as trade-offs between *Absolute Income* and an attribute of interest. In other words, we use the money-metric utility function (Scarpa et al., 2008) wherein the marginal utility of *income* (in 1000 PLN) is set to 1 (and hence not reported), providing a reference for other coefficients.

In the case of the MMNL model, the parameters are assumed to be random, and therefore in the results, we present the estimated means and standard deviations of their distributions, representing the heterogeneity of individual preferences in the studied sample. All individual parameter distributions are assumed to be normal, except for *income*, for which lognormal distribution provided a better fit. Assuming the income parameter to be lognormally distributed is also consistent with economic theory as it restricts the marginal utility of money to be strictly positive.

First, all results are consistent and rational, indicating a good understanding of attributes. The results for both treatments indicate that utility depends not only on absolute income but also on relative income as measured by *Percentile of Income* and *Trend*. The impact of relative standing in society measured by *Income Percentile* is much stronger in the high income treatment, where we observe a clear increasing trend in utility for being in a higher income percentile. The respondents in this treatment are willing to pay 598 PLN from their monthly earnings for being in *Percentile_70,* 850 *PLN* for being in *Percentile_80,* and 1052 PLN for being in *Percentile_90*. All these trade-offs are estimated with respect to the reference level *Percentile_60* and are significant at the 0.01 level.

In the case of the low income treatment, the impact of *Income Percentile* on the respondents' choices is weaker. The respondents are willing to forgo income for being in *Percentile_30* and *Percentile_40*, with *Percentile_10* being the reference level, but the estimate for *Percentile_20* is not statistically different from zero. For example, WTP for *Percentile_90* is 1052 PLN, and for *Percentile_40* is 237 PLN, so we observe 4.5 times higher WTP in the high income treatment compared to the low treatment in which the mean income level is 2.6 times higher (Table 5). This indicates that relative standing measured by income percentiles is more important in the high income treatment. When we relate the estimates of WTP for *Income percentile* to the corresponding treatment-specific mean income level (4425 PLN in the low and 11,000 PLN in the high treatment, respectively), we still see that the WTP expressed in relative terms is substantially higher in the high income treatment (Fig. 1).

Table 6
MIXL results in WTP-space – high income treatment. Model with interactions.

		Means		Standard Deviations	
var.	dist.	coef.	st.err.	coef.	st.err.
Status quo	n	−0.0035	0.2836	0.3616***	0.1215
Percentile_70	n	1.2469**	0.5583	2.9537***	0.2365
Percentile_80	n	2.7803***	0.6461	3.7979***	0.244
Percentile_90	n	4.1896***	0.8993	5.0020***	0.2931
Trend_Stable	n	3.3336***	0.5424	3.6169***	0.188
Trend_Increasing	n	5.0246***	0.6256	5.7733***	0.2588
Interactions of means		Men		Age*	
var.	dist.	coef.	st.err.	coef.	st.err.
Status quo	n	−0.6006***	0.1562	1.2211**	0.5586
Percentile_70	n	0.7546**	0.3311	−2.5530**	1.1804
Percentile_80	n	1.1481***	0.3231	−5.0890***	1.2997
Percentile_90	n	0.5665	0.3796	−6.8090***	1.7975
Trend_Stable	n	0.8424***	0.3066	−1.3974	0.9013
Trend_Increasing	N	0.8761*	0.4806	−1.4389	1.2271
LL at convergence:		−2512.7791			
LL at constant(s) only:		−3340.0560			
McFadden's pseudo-R^2:		0.2477			
Ben-Akiva-Lerman's pseudo-R^2:		0.5817			
AIC/n:		1.1827			
BIC/n:		1.2548			
N		361			

* Age has been scaled by 100.

Systematically, in both treatments, *Decreasing trend* is associated with the lowest utility. In other words, in both treatments, respondents have positive WTP for *Stable* and *Increasing* trend, with *Decreasing* being the base. In the high income treatment, the respondents are willing to pay 3,006PLN and 4,442PLN for *Stable* and *Increasing* trends, respectively, whereas, in the low income treatment, the corresponding WTP estimates are 1,249PLN and 1,214PLN. These estimates in both treatments are highly significant (i.e., p values below 0.01).

The respondents in our exercise were told to assume that the price levels and interest rates correspond to the current levels in Poland and that these parameters would be constant over the relative's 40 years of working time. In such conditions, behavior consistent with economic theory (i.e., maximizing the present value of earned income[2]) would be to prefer *Decreasing Trend* over *Stable Trend*, with *Increasing Trend* being the least preferred level. However, in our data, we observe the opposite pattern. Interestingly, in our exercise, the difference in preferences for

[2] The study was carried out in Jan 2019. The inflation rate based upon the consumer price index (CPI) in Jan 2019 (year to year) was 0.63. https://www.inflation.eu/inflation-rates/poland/historic-inflation/cpi-inflation-poland-2019.aspx. Long term deposit interest rates at this time were 3% p.a., or 2.43% when the so-called Belka's tax on capital gains is deducted.

Table 7
MIXL results in WTP-space – low income treatment. Model with interactions.

		Means		Standard Deviations	
var.	dist.	coef.	st.err.	coef.	st.err.
Status quo	N	−0.0259	0.0395	0.0783***	0.0148
Percentile_20	N	0.2055***	0.0753	0.5611***	0.027
Percentile_30	N	0.6600***	0.0829	0.8680***	0.0278
Percentile_40	N	0.8425***	0.0996	1.2915***	0.0441
Trend_Stable	N	0.4017***	0.0797	1.1553***	0.0461
Trend_Increasing	N	−0.1731*	0.0965	1.4574***	0.0568
Interactions of means		Men		Age*	
var.	dist.	coef.	st.err.	coef.	st.err.
Status quo	N	−0.0706***	0.0266	0.1932**	0.0815
Percentile_20	N	0.1368***	0.0528	−0.3488***	0.1459
Percentile_30	N	0.1085**	0.0538	−1.1145***	0.1504
Percentile_40	N	0.3539***	0.0627	−1.6587***	0.1950
Trend_Stable	N	−0.0117	0.0506	1.8331***	0.1516
Trend_Increasing	N	0.2170***	0.0664	2.5716***	0.1788
LL at convergence:		−3365.3030			
LL at constant(s) only:		−4339.1186			
McFadden's pseudo-R^2:		0.2244			
Ben-Akiva-Lerman's pseudo-R^2:		0.5525			
AIC/n:		1.2992			
BIC/n:		1.3604			
N		361			

Age* has been scaled by 100.

Table 8
WTP for income percentile for men and women **high income treatment**.

	Women		Men	
	Mean	st.err.	mean	st.err.
Percentile_70	0.23	0.55	0.98	0.60
Percentile_80	0.74	0.62	1.89***	0.67
Percentile_90	1.47	0.86	2.03**	0.91
Low income treatment				
	Women		Men	
	mean	st.err.	mean	st.err.
Percentile_20	0.07	0.10	0.20	0.11
Percentile_30	0.21**	0.10	0.32***	0.12
Percentile_40	0.18	0.13	0.53***	0.14

income trends depends strongly on the treatment: in the high income treatment *Increasing* trend is strongly preferred over *Stable*, while in the case of the low income treatment, the difference between *Increasing* and *Stable* trends is not statistically significant ($p = 0.62$).

In the next step, we explored systematic factors that impact the observed preference heterogeneity. To do so, we interacted the means of random parameters with socio-demographic variables, i.e., *gender, age, education,* and *municipality size*. Out of these variables, *gender* and *Age* turned out to be significant factors explaining preference heterogeneity. In order to ensure the model results in the high and low treatments were comparable, precisely the same utility function (6) in both treatments was estimated, with a dummy for *men* and continuous *age* interacted with the means of all random parameters:

$$U_j = \beta_1 Income + \beta_2 Percentile_j^{70} + \beta_3 Percentile_j^{80} + \beta_4 Percentile_j^{90} + \beta_5 Trend_{Stable\,j} + \beta_6 Trend_{Increase\,j}^{medium} + \beta_7 Opt_{out} + \beta_1 Income * Women + \beta_2 Percentile_j^{70} * Women + \beta_3 Percentile_j^{80} * Women + \ldots + \beta_1 Income * Age + \beta_2 Percentile_j^{70} * Age + \beta_3 Percentile_j^{80} * Age + \ldots \quad (6)$$

The results of these models are presented in Table 6 (high income treatment) and Table 7 (low income treatment).

The inclusion of interactions with socio-demographics statistically improved both models' fits, with Likelihood Ratio test statistics of 37.94 (df=14) in the high income treatment and 79.96 (df=14) in the low income treatment; $p < 0.01$ in either case.

In both treatments, the shifts for men with *Income percentile* are systematically positive and significant, indicating that men, on average, have a higher tendency than women to trade-off their absolute income for relative standing in society. The only level for which there is no significant difference between men and women is the highest level in the high income treatment (i.e., *Percentile_90*), for which the estimates for men and women are not statistically different.

To clarify the comparison between men and women, in Table 8, we present WTP for each Income percentile by gender. All WTP values are evaluated at the sample mean level of age, which was 42 years. The obtained results indicate that men are systematically willing to forgo absolute income to be in a higher income percentile. The only levels for which WTP is not significantly different from the reference level (i.e., *Percentile_10* and *Percentile_60*) are *Percentile_20* and *Percentile_70*.

Interestingly, age turned out to be a very strong predictor of preferences toward relative standing in society. Systematically, for both treatments, the older the respondent, the lower the WTP for the Income percentile. This effect is considerable. For example, ceteris paribus, an increase in age by ten years is associated with a decline in WTP for *Percentile_90* by 680 PLN in the high income treatment and by 166 PLN for *Percentile_40* in the low income treatment.

Gender and age also turned out to be crucial factors in explaining preference heterogeneity in preferences for trend in income. However, in the case of this variable, the pattern is less evident than in the case of Income percentile. In both treatments, there is a significant positive shift in WTP for Increasing trend for Men; specifically, the WTP for the Increasing trend is 876 PLN higher for men compared to women in the high income treatment and 217 PLN higher in the low income treatment. The shift for the Stable trend is significant for Men only for the low income treatment. Regarding age, the only significant shifts with both trend levels (Increasing and Stable) are in the low income treatment, where we observe that older respondents have significantly higher WTP for Increasing and Stable trends, with the Decreasing trend being the reference level.

7. Conclusions

This study investigated preferences concerning relative and absolute income. One major contribution is related to the heterogeneity and non-linearity of observed tastes.

The general finding is that the importance of relative income is greater in the high income treatment. This sheds new light on Easterlin's alleged paradox. As the growth of mean income proceeds, it contributes less and less to social welfare because citizens tend to increasingly focus on their relative position instead. As a result, happiness levels stabilize.

Respondents' demographic characteristics moderate their preferences. For example, respondents' age is an important factor affecting their preference. This implies that earlier experimental studies, chiefly relying on student samples, give an incomplete picture. Another clear demographic effect is that males in our sample are willing to trade-off a significantly larger amount of money to increase their relative standing in society. They are willing "to burn" money in order to reach a higher status, a pattern holding true for both treatments. Although this is to be expected from the evolutionary viewpoint and is confirmed by the

literature on gender differences in competitiveness, interestingly, this prediction is typically not borne out in lab experiments on social preferences. One reason for this difference could be that patterns of selection into laboratory subjects and/or lab experience dilute gender differences observable in the general population.

We also identified that respondents strongly prefer an *Increasing Trend* over the *Stable* and *Decreasing* in income over the working period. They are willing to sacrifice significant amounts of their money not to experience the *Decreasing Trend* of income over their life cycle. This result is in line with Loewenstein and Sicherman (1991) discussion about the negative discounting parameter and is in contrary to economic theory as the decreasing trend (assuming the constant sum of income in their lifetime) is an option that maximizes the net present value of their income stream over their working period. We also discovered that there is an asymmetry in both treatments – disutility from *Decreasing Trend* is much larger than the utility gain from *Increasing Trend* (compared to *Stable Trend),* which links our results to prospect theory and Hirschman's tunnel effect. Respondents are willing to sacrifice a large amount of their overall well-being to avoid a drop in their earnings during their life cycle.

Our results have significant policy-relevant consequences for environmental economics. They provide strong evidence for the driving force behind the pursuit of wealth in richer countries. Despite high aggregate consumption levels, there is a concern for status as measured by relative standing in society and own income change over time. This finding contrasts standard lab experiments where some willingness to reduce own relative income is often observed when it is "too high" (advantageous inequality aversion).

Sustainable development of the world economy requires limiting consumption aspirations in societies. Unfortunately, with the rapid increase in life quality, consumption aspirations are not converging at a certain stable level. Moreover, the richest people are willing to devote more and more money to gain better social status and increase their earnings over time.

Declaration of Competing Interest

Declare no conflict of interest.

Data availability

Data will be made available on request.

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Annex 1. Attrition analysis

In this annex, we provide an analysis of attrition patterns among the two treatment groups in the sample. After elucidating the process of survey deployment, we present the composition of the sample based on treatments and fundamental socio-demographic variables (such as the classification of settlement unit, education level, gender, and age). This information is presented for: (1) the initial sample, (2) the subset of observations included after instrument calibration, and (3) the subset after accounting for dropout cases.

Following that, a sequence of statistical examinations was carried out to assess the potential presence of selection bias associated with dropout. Logistic regression models were utilized to explain the factors contributing to dropout in the full sample, as well as individually for the High and Low treatment groups. Subsequently, a Log-likelihood ratio test was executed to determine if the factors influencing dropout exhibited consistency across both treatment groups.

The survey implementation commenced with a soft launch involving 100 randomly assigned respondents, distributed equally between two treatments (50–50). During the optimization of the DCE design for the remaining sample, an instrument coding failure was detected in one of the treatments. Consequently, the 50 respondents assigned to the Low treatment in the initial phase could not be included. Consequently, while the study initially encompassed 1000 respondents, the DCE results could only be incorporated for 950 respondents (500 for Treatment High and 450 for Treatment Low). It is important to note that this exclusion does not undermine the overall representativeness of the study, as respondents were randomly assigned to the defected version of the tool. In Table A1, we present the socio-demographic characteristics of the sample based on the initial treatment assignment, while Table A2 showcases the structural composition of the sample within both treatments after the removal of the 50 defective observations, but prior to any survey dropout.

In the next step, logistic regression analyses were conducted independently for each treatment group, with dropout serving as the dependent variable (1- if dropout) and socio-demographic characteristics as predictors. The results, displayed in Table A3, indicate that none of the respondent characteristics exhibited a statistically significant association with dropout within the sample. Likewise, no statistically significant predictors of dropout were identified within the full sample, as demonstrated in Table A4.

Lastly, a Log-likelihood ratio test (LR test) was conducted to assess whether the parameters influencing dropout differed between the treatments. The test results did not provide sufficient evidence to reject the null hypothesis (H0), which posits that the parameters influencing dropout are the same across both treatments (LR = 10.91, p-value = 0.0532).

In summary, the findings indicate that there is no statistically significant evidence to suggest that attrition significantly differed between the two treatments, and therefore, it is unlikely to introduce potential bias into the results.

Table A1
Initial assignment to high- and low- treatment.

	Treatment High			Treatment Low	
Variable	Obs	Mean	Std. dev.	Mean	Std. dev.
Rural	500	0.35	0.48	0.32	0.47
City	500	0.31	0.46	0.33	0.47
High Edu	500	0.30	0.46	0.30	0.46
Men	500	0.53	0.50	0.52	0.50
Age	500	42.74	16.50	42.33	16.44

Table A2
Final sample statistics: high- and low- treatment.

		Final sample: All		Final sample: High		Final sample: Low	
Variable	Obs	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Rural	799	0.34	0.47	0.35	0. 48	0.32	0.47
City	799	0.32	0.47	0.31	0.46	0.33	0.47
High Edu	799	0.30	0.46	0.30	0.46	0.30	0.46
Men	799	0.52	0.50	0.53	0.50	0.51	0.50
Age	799	42.87	15.85	43.06	16.20	42.65	15.45
OBS		799		438		361	

Table A3
Logistic regression: Determinants of drop out in treatment High and Low. Final sample after exclusion on 50 observations.

Drop -out	High Treatment			Treatment Low		
	Coefficient	Std. err.	$P>\|z\|$	Coefficient	Std. err.	$P>\|z\|$
Rural	−0.11	0.33	0.75	−0.066	0.279	0.81
City	0.187	0.33	0.57	−0.22	0.295	0.46
High Edu	−0.14	0.31	0.65	0.05	0.28	0.84
Men	0.13	0.28	0.63	0.16	0.24	0.51
Age	−0.01	0.01	0.21	−0.01	0.01	0.55
cons	−1.56	0.471	0.001	−1.22	0.40	0.00
LL	−186.19			−223.10		

Table A4
Logistic regression: Determinants of dropout in full final sample after exclusion of 50 observations.

Drop_out	Coefficient	Std. err.	$P>\|z\|$
Rural	−0.11	0.21	0.62
City	−0.03	0.22	0.89
High Edu	−0.05	0.20	0.82
Men	0.14	0.18	0.43
Age	−0.01	0.01	0.16
cons	−1.36	0.301	0.00
Log likelihood = −414.75			
Number of obs = 950			
LR chi2(5) = 2.55			
Prob > chi2 = 0.77			
Pseudo R2 = 0.00			

Annex 2. SCRIPT

To begin with please answer the following questions:
Age: below 25 ……..above 50
Sex:

- Woman
- Man

Marital Status:

- Married
- Divorced or separated
- Widowed
- Single

Do you have children:

- Yes
- No

Education:

- Elementary

- Middle school
- Higher- bachelor
- Higher- Master or higher

Hypothetical choice situation description

In this part of the study, please select the society in which you think life would be better. You can imagine that this is, for example, about the future of a close relative – your grandchild, later in this survey referred to as "your relative". In this section, you will be asked to choose the society in which you think your relative would live a more satisfying life.

The scenarios will be described by the following characteristics:

1 **an absolute income of your relative**
2 **share of population below your income (your income percentile)**
3 **income trend**

***Relative standing in society**

Societies differ in their level of income and the degree of their differentiation. For example, if we rank the working people in Poland from the lowest to the highest earners and divide them into 10 equal groups, we will find that:

- *10% of the lowest earners receive a gross salary of less than PLN 2 460*
- *10% of the highest earners receive a gross salary of more than PLN 9 360*
- *the **median**,* i.e.*, the gross salary level **above which exactly half of society is situated** (the other half earns less than the median), is 4 560 PLN*
- *the **average** income is 5 400 PLN*

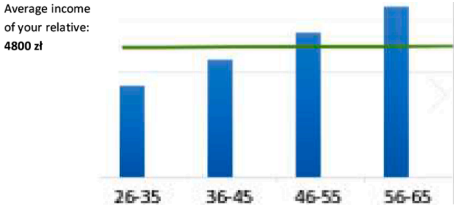
For a better understanding of the differences between these measures, please imagine that we are analyzing income in a group of 100 people. The first step is to rank these people from the lowest to the highest earners. The earnings of the 10th person will correspond to the limit amount for the 10% of those earning the least. The earnings of the 90th person will correspond to the limit for the 10% of the top earners. The earnings of the 50th person will correspond to the median, while the average income in this group will be equal to the total income of all persons divided by 100.

***In this study, you will be informed about the absolute income of your relative and the share of population below your income (your income percentile).** You will be told the percentage of people with a lower income than your relative. Naturally, you will also know the percentage of people who earn more. For example, if 5% of people have a lower income then 95% earn income above this level.*

** **trend in income**

*Another attribute is **the changes in income over time.** We have divided your relative's professional career into four 10-year periods. In this section, you will receive information about your relative's salary in each period and the average level of salary in their life. The blue bar shows the average income level in each of these periods. **The green horizontal line represents the average income during the entire period of their professional career.** In this study, the following changes are possible in the subsequent ten years of your relative's professional career:*

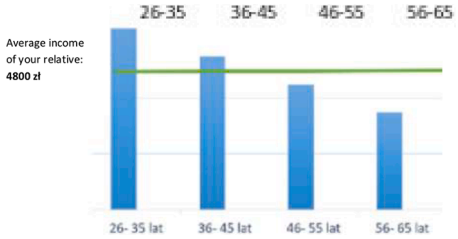
1 ***Your relative earns more and more as their seniority increases.** It is assumed that in the last 10 years of their professional career, your relative will earn twice as much as at the beginning of their career (*e.g.*, their income will increase from PLN 2500 in the first 10 years to PLN 5 000 in the last decade of their professional activity). The way the income changes with seniority (increases, decreases, or remains constant) does not affect the average level of income during the whole period of their working life.*



2 ***Your relative earns a similar level of income throughout their professional career.** Throughout the whole period of their professional career, the same percentage of people earn less.*

3 ***Your relative earns less and less with age.** We assume that in the last 10 years your relative will earn half of what they earned in the first 10 years (*e.g.*, their income will drop from PLN 5 000 PLN to PLN 2 500). If your relative earns less and less, it means that with time more and more people will earn more*

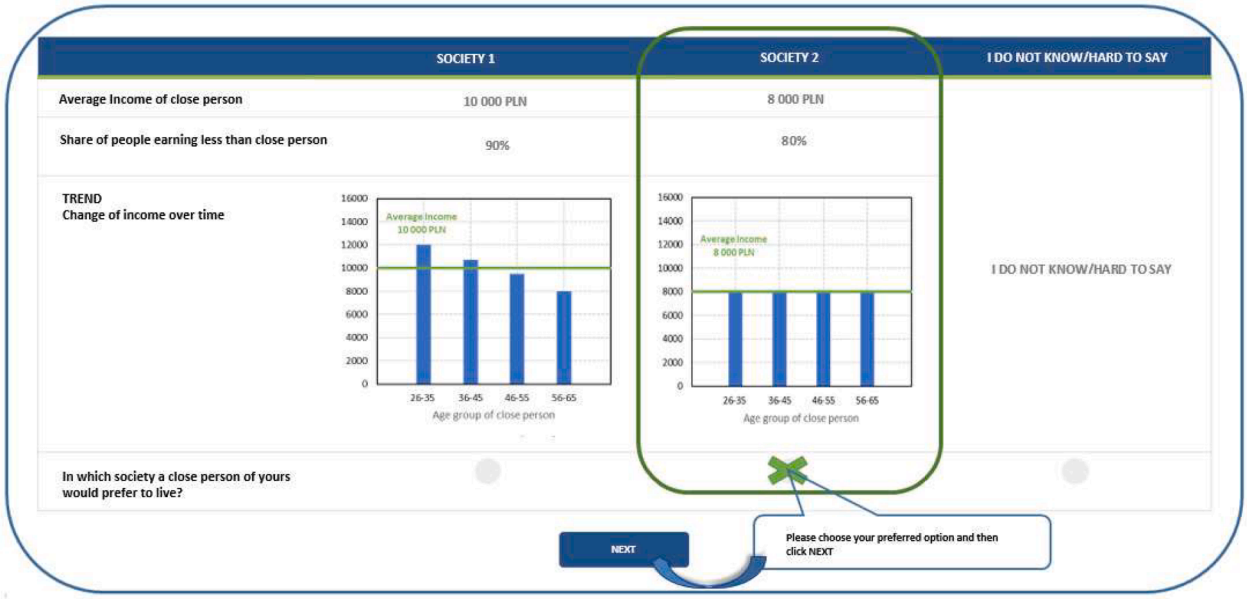
than they do. ***The given% of people earning less than your relative corresponds to the average level for the whole period of their professional career. The way their income changes with the length of their working life (whether it increases, decreases, or is constant) has no impact on the average income level over the whole length of their professional career.***



While you're making your choices, please assume that:

- all other characteristics of work except average income and how income changes over time are identical in both societies.
- the level of the old-age pension is only dependent on the average level of earnings during the entire professional career.
- for each of the pairs of societies, the price level is identical and corresponds to current prices. Please assume that prices do not change over time (no inflation).

When making your choice, focus on the welfare of the person you care about and not the society as a whole.
In this section, you will also see 12 selection cards.
An example of a selection card: **Your relative's position in society. Please select your preferred scenario:**



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