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Consumption–savings decisions under upward-looking comparisons☆

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ABSTRACT

We demonstrate that upward-looking comparisons induce "keeping up with the *richer* Joneses"-behaviour. Using data from the German Socio-Economic Panel, we estimate the effect of reference consumption, defined as the consumption level of all households who are perceived to be richer, on household consumption. When controlling for own income as well as unobserved individual and local area heterogeneity, a 1% increase in reference consumption leads households to raise own consumption by about 0.3%. At the mean values of own and reference consumption this implies that a 100 euro increase in reference consumption leads to an increase in own consumption of approximately 18 euros. Our findings establish an important microeconomic link between changing income inequality and aggregate consumption.

1. Introduction

This paper addresses the question as to whether interpersonal comparisons affect households' consumption–savings decisions. The literature on self-reported well-being and happiness leaves little doubt that positional concerns do affect people's utility. That is, people's utility functions not only depend on absolute consumption but also on relative consumption. Most prominently, Luttmer (2005) shows that, after controlling for own income, higher local average earnings lead to lower

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levels of self-reported happiness for U.S. households.[1] However, little is known about the extent to which these consumption externalities actually influence the consumption–savings decisions of households.[2]

Such behaviour would bear important implications for research on the relationship between income inequality and macroeconomic stability, which has attracted attention in the aftermath of the recent financial and economic crisis. This has led many economists to assert that rising income inequality might have been a central root-cause for the crisis. Among others, Rajan (2010) argues that, as consumption of rich households increases with rising income inequality, low and middle class households reduce their savings despite of the rather poor evolution of their own income. Rising income inequality at the top of the distribution could thus trigger expenditure cascades.[3] A central behavioural assumption underlying this line of argument is the presence of *upward-looking* interpersonal comparisons, i.e. households compare their levels of consumption to those of *richer* households and develop higher consumption needs. Throughout this analysis we refer to this behaviour as "keeping up with the *richer* Joneses" (KURJ-behaviour).

Using household panel data from the German Socio-Economic Panel (SOEP), we present evidence that households raise consumption expenditures if the consumption level of households that are perceived to be richer increases.

Assuming upward-looking comparisons, we define a household's reference group to include all households that belong to a consumption decile above the household's own consumption decile. Thereby, we use the consumption distribution as an approximation of the perceived income distribution since households cannot directly observe other households' incomes but may recognize changes in the consumption level of others. We find that reference consumption, defined as the mean consumption of all households in the reference group, positively affects household consumption. A 1% increase in reference consumption induces an increase in own consumption by about 0.3%. A 100 euro increase in reference consumption increases own consumption at the mean by approximately 18 euros. Depending on the household's position in the income distribution, the effect amounts to up to 35 euros.

This paper builds on previous studies that have empirically analysed the economic consequences of positional concerns. Despite the insights from well-being research, there has been little evidence for the impact of relative concerns on the actual economic behaviour of agents.[4] Valuable recent contributions that are most closely related to our analysis include Ravina (2011), Alvarez-Cuadrado et al. (2012), Alvarez-Cuadrado and El-Attar Vilalta (2012) as well as Bertrand and Morse (2013).

Alvarez-Cuadrado and El-Attar Vilalta (2012) use the U.S. Panel Study of Income Dynamics and explain household saving rates with different measures of inequality and average state income, i.e. they assume outward-looking comparisons. They find a robust negative effect of inequality on aggregate household savings. Besides this, they find that increases in upward-looking reference income, i.e. the mean income of all quintiles above the household's own income quintile, induce lower levels of household savings when controlling for changes in own income. Ravina (2011) and Alvarez-Cuadrado et al. (2012) estimate Euler-equations derived from a utility function that features both internal and external habits. Both show that regional average expenditures influence the growth rate of consumption. Bertrand and Morse (2013) present evidence for expenditure cascades using U.S. micro data from the Consumer Expenditure Survey: Based on state–year variation, the authors find a positive correlation between the expenditures of middle class households and households in the top income quintile.

Our analysis contributes to the literature in three ways. First, we estimate the effect of reference consumption on households' consumption–savings decisions using German household data from the German Socio-Economic Panel (SOEP). Our model reliably identifies the coefficient on reference consumption for several reasons: The panel structure of the SOEP allows us to control for unobserved individual fixed effects. In addition, we do not define reference groups solely along demographic characteristics. This prevents our results from being driven by unobserved peer effects. Finally, as our empirical strategy does not rely on regional variation in reference consumption, we are able to eliminate unobserved local area characteristics. Our results prove to be robust to changes in specification.

Second, we take into account the fact that comparisons are directed upwards which allows us to assess whether inequality changes can cause expenditure cascades. By examining multiple alternative definitions of a household's reference group, we are able to test this important assumption and draw a number of other conclusions with regard to the appropriate definition of reference group: (i) Comparisons are indeed directed upwards. When including households who are perceived to be poorer in the reference group, the effect of reference consumption becomes insignificant. (ii) The effect of reference consumption is strongest when the reference group is not restricted to a certain area or social peer-group. (iii) The effect of

[1] Other studies that examine interpersonal comparisons and the relationship between relative standing and well-being include for example Veenhoven (1991), Diener et al. (1993), Van de Stadt et al. (1985), Kapteyn et al. (1997), Clark (1996), McBride (2001), Ferrer-i-Carbonell (2005) and Dynan and Ravina (2007). See Frey and Stutzer (2002) or Luttmer (2005) for a more detailed discussion of this literature.

[2] The idea that a household's consumption–savings decision is determined by changes in its position in the income distribution was first introduced by Duesenberry (1949) as the Relative Income Hypothesis (RIH). See Van Treeck (2014) for a detailed discussion of the literature on the macroeconomic impact of inequality and the reemergence of the RIH.

[3] Rajan (2010) concludes that rising consumption needs of low and middle class U.S. households were eventually financed through the expansion of loans rather than incomes. This unsustainable credit-driven consumption brought about drastic economic consequences. Other prominent contributions that stress the macroeconomic risks of inequality comprise Stiglitz (2009), Galbraith (2012), Kumhof et al. (2012) and Al-Hussami et al. (2012).

[4] The research by Robert Frank is the most prominent exception. He has been arguing for economic effects of interdependent preferences for decades. See for example Frank (1984), Frank (1985), Frank (1999) or Frank (2007).

upward-looking reference consumption is not solely driven by the expenditures of those households who are just slightly richer.

Third, the microeconometric findings support the Relative Income Hypothesis as they create a connection between changes in income inequality and the development of aggregate consumption. That is, under upward-looking comparisons, households' consumption–savings decisions are affected by both absolute and relative income shocks. This is due to the fact that, in contrast to outward-looking comparison behaviour, a mean-preserving spread in the income distribution moves reference consumption. Hence, aggregate consumption may change while average income remains constant.

The remainder of this paper is structured as follows: Section 2 presents our conceptual approach and outlines the empirical strategy. Section 3 discusses the data and Section 4 presents our estimation results and robustness analyses. Section 5 addresses further implications of our findings and Section 6 concludes.

2. Conceptual approach and empirical strategy

2.1. The consumption–savings decision under interpersonal comparisons

As our theoretical starting point we consider a model where the household's utility depends on interpersonal comparisons.[5] In this setting the household chooses own consumption according to the following optimization problem:

$$\max_{\{c_{it},a_{it}\}_{s=0}^{T}} E_t\left[\sum_{s=0}^{T}\beta^s u(\tilde{c}_{it+s},\boldsymbol{x}_{it+s})\right] \quad \text{s.t.} \quad c_{it}+a_{it}=(1+r)a_{it-1}+y_{it}\ \forall s. \tag{1}$$

Here, $\boldsymbol{x}_{it}$ is a set of household-specific taste-shifters, c_{it} denotes own consumption, a_{it} is the household's stock of assets at the end of period t, y_t is disposable non-interest income, r is the time-constant interest rate and β denotes the household's discount factor. The consumption services that determine utility are denoted by $\tilde{c}_{it}$ which, under interpersonal comparisons, are a function of own consumption, c_{it}, as well as the consumption of the household's reference group, $\bar{c}_{it}$. Thereby, we assume $\tilde{c}_{it}$ to be a linear combination of c_{it} and $\bar{c}_{it}$[6]

$$\tilde{c}_{it}=c_{it}-\alpha\bar{c}_{it}. \tag{2}$$

This results in the following Euler equation expressed in expectational error form:

$$\beta(1+r)\frac{u'(\tilde{c}_{it})}{u'(\tilde{c}_{it-1})}=1+e_{it} \tag{3}$$

where e_{it} denotes the expectational error. Choosing a standard isoelastic utility function of the form

$$u(\tilde{c}_{it},\boldsymbol{x}_{it}'\boldsymbol{\gamma})=\exp(\boldsymbol{x}_{it}'\boldsymbol{\gamma})\frac{(\tilde{c}_{it})^{1-\sigma}}{1-\sigma}, \tag{4}$$

taking the natural logarithm, using the first difference operator and collecting terms yields:[7]

$$\Delta\ln(\underbrace{c_{it}-\alpha\bar{c}_{it}}_{\tilde{c}_{it}})=\mu+\Delta\boldsymbol{x}_{it}'\boldsymbol{\delta}+\underbrace{\ln(1+e_{it})}_{\epsilon_{it}}. \tag{5}$$

Following Dynan (2000), Eq. (5) can be approximated by

$$\Delta\ln(c_{it})=\mu+\alpha\Delta\ln(\bar{c}_{it})+\Delta\boldsymbol{x}_{it}'\boldsymbol{\delta}+\epsilon_{it}. \tag{6}$$

This linearized Euler equation captures the basic dynamics of interpersonal comparisons and serves as a theoretical underpinning of our empirical model (see Section 2.3).

2.2. The nature of interpersonal comparisons

The empirical assessment of interpersonal comparisons requires one to address two crucial questions: (i) Which variable drives interpersonal comparisons? (ii) Who forms the reference group of a household?

First, we choose consumption as the source of relative concerns as consumption expenditures constitute the visible part of a household's income or wealth. This is not only in line with our theoretical model and the bulk of the theoretical

[5] Our theoretical framework is similar to the models used by Alvarez-Cuadrado et al. (2012) or Dynan (2000). A more detailed description of this type of model is provided in these papers and the references therein.

[6] Such a linear specification is also used by Ljungqvist and Uhlig (2000).

[7] We set $\mu=(1/\sigma)[\ln(\beta)+\ln(1+r)]$ and $\boldsymbol{\delta}=(1/\sigma)\boldsymbol{\gamma}$. The assumption that the interest rate is time-invariant and hence is part of the constant μ can be relaxed in the empirical analysis. If the interest rate is constant across households, it will be captured by the time dummies included in the regressions.

literature on interpersonal comparisons but also with empirical research on the degree of positionality of certain goods.[8] People usually observe what other people consume and use this information to make inferences with respect to the income levels of those people. Consequently, a household's position in the actual income distribution is not necessarily identical to that in the perceived income distribution. We approximate the latter with the distribution of household consumption.

Second, in order to answer the question as to who belongs to a household's reference group, we turn to two findings of the literature on self-reported well-being. Most importantly, interpersonal comparisons tend to be directed upwards as is found by Ferrer-i-Carbonell (2005). In her microeconometric analysis of self-reported well-being, she shows that when reference income is defined as the mean income of the reference group, the negative effect of reference income is significantly higher for those whose own income is below the reference income.[9] We thus assume that the reference group of a household consists of all households with a higher relative position in the perceived income distribution.[10]

Moreover, the reference group is often defined along categories such as region of residence, age or education assuming that people compare themselves within certain subpopulations.[11] However, there is no consensus as to which of these categories really matter. To address this issue we construct four different concepts of a household's reference group. Using the categories region of residence (*EAST-concept*), age (*AGE-concept*) or education (*EDU-concept*), we create three separate sets of subpopulations. The fourth concept comprises the entire population (*ALL-concept*). All four concepts assume upward-looking reference groups, i.e. they do not include households with a lower relative position in the respective subpopulation.

To model reference consumption we divide the consumption distribution of the relevant (sub-)population(s) into 10 classes of equal size. The reference group of a household is then defined as all households that belong to consumption classes above the household's own consumption class and that are part of the same (sub-)population. Hence, the reference group of a household in the 5th decile includes all households of deciles 6–10. This decile classification would result in the top 10% of the consumption distribution not having an upward-looking reference group which does not seem plausible. We thus split the upper 10% and define the top 5% as the reference group of households in the 19th vingtile.

2.3. Baseline econometric model

Our approach defines reference consumption as average consumption of all households who belong to consumption classes above the household's own consumption class. As reference consumption is a function of the household's consumption class, the levels of reference consumption and own consumption are by construction positively related, creating an obvious endogeneity problem. To illustrate this, think of a household that raises its consumption expenditures independently of envy or positional concerns. If this consumption increase induces a jump to a higher consumption class, upward-looking reference consumption will increase by construction which leads to a spurious positive correlation between the levels of consumption and reference consumption. Estimation in first differences solves this problem if and only if households do not change consumption classes over time. In this case, the household's consumption class is time-invariant and hence variation across households is eliminated. If, however, households change their consumption class due to changes in their consumption level for reasons other than interpersonal comparisons, a change in consumption would also change the level of reference consumption creating a positive relationship that results from the specific construction of upward-looking reference groups. As we cannot rule out that households do change consumption classes from time to time, we need to control for this source of correlation between reference consumption and own consumption in our estimations. To this end, we interact our measure of reference consumption with the dummy variable HOP_{it} that filters out households who hop into a different consumption class over time. In the following we refer to the latter as *class-hoppers*.

We thus estimate the following baseline equation using pooled OLS:

$$\Delta \ln(c_{it}) = \mu + \pi \Delta \ln(y_{it}) + \alpha_1 \Delta \ln(\bar{c}_{it}) + \alpha_2 \Delta \ln(\bar{c}_{it}) \times HOP_{it} + \mathrm{x_{it}}'\boldsymbol{\delta} + \mathrm{STATE_{it}}'\boldsymbol{\xi} + \mathrm{TIME_t}'\boldsymbol{\theta} + \epsilon_i. \quad (7)$$

Thereby, $\Delta \ln(c_{it})$, $\Delta \ln(y_{it})$ and $\Delta \ln(\bar{c}_{it})$ are the first differences of household consumption, disposable income and reference consumption.[12] The parameter α_1 corresponds to the parameter α in the theoretical model. HOP_{it} equals one if the household does change its consumption class and zero otherwise. x_{it} is a vector of control variables including changes in the number of adults and children living in the household, the number of years of education, employment status and age of the household

[8] Among others, Solnick and Hemenway (1998, 2005) find that certain goods have a higher degree of positionality than others, i.e. they exhibit a greater impact on one's perceived relative status in society. For example, income is more positional than leisure, the consumption of private goods is more positional than that of public goods and, most importantly to our study, expenditures on visible consumption goods are more positional than expenses for safety and insurance.

[9] Similarly, Alvarez-Cuadrado and El-Attar Vilalta (2012) demonstrate that households in the upper half of the income distribution only react to changes in the income of their reference group if the latter does not include households from the bottom half of the distribution.

[10] In the following we refer to this as "upward-looking" in contrast to "outward-looking" comparison behaviour. The latter implies that the household's reference group does also comprise poorer households.

[11] Among others, Luttmer (2005), Dynan and Ravina (2007), Kapteyn et al. (1997), Ferrer-i-Carbonell (2005), McBride (2001) use one or more of these categories to construct reference groups. In contrast, Easterlin (1995) uses none of these categories assuming that people compare themselves to all citizens of their country.

[12] Although the theoretical Euler equation does not feature own income we consider this information in our regressions. This takes into account that households cannot smooth consumption perfectly due to liquidity constraints and imperfect credit markets. Moreover, controlling for changes in own income helps to identify the actual effects of reference consumption. Our estimation results confirm the empirical relevance of this variable (see Section 4).

head. $STATE_{it}$ is a vector of state dummies and $TIME_t$ is a vector of year dummies. Since the upper five per cent of the consumption distribution cannot be assigned an upward-looking reference group, we exclude these households from the estimations. We cluster robust standard errors at the household level.

2.4. Interaction analysis

We further ask whether the effects of reference consumption differ systematically between social subgroups and whether interpersonal comparisons impact certain parts of the income distribution more than others. To this end, we interact reference consumption with dummy variables for different levels of education and different types of employment status of the household head. We also estimate income class-specific effects of reference consumption. Note that the *ALL-concept* is used for this analysis.

2.5. Robustness analysis

Apart from the problem of *class-hoppers*, our conceptual approach faces two other potential challenges to a causal interpretation of the coefficient on reference consumption: Omitted regional shocks and unobserved individual characteristics. The latter we have already addressed in our baseline model by taking first differences and thereby removing time-invariant individual heterogeneity. The former problem arises from the potential correlation between consumption and reference consumption due to region-specific shocks that are not absorbed by the time and state fixed effects that capture the influences of national business cycles and time-invariant heterogeneity at the state level. Hence, we need to ensure that unobserved local area characteristics do not lead to spurious correlation between own and reference consumption. In the robustness section, we thus include a full set of state–year interactions to control for time-varying state-specific shocks, i.e. state business cycles. Beyond this, however, there is still scope for the potential impact of regional shocks that operate below the state level. We address this issue by comparing our baseline results to an adjusted measure of reference consumption which assumes that the reference group only comprises households not living in the same state. Even though this strategy effectively eliminates an important part of the household's reference group, it ensures that the effect of reference consumption is not the result of unobserved local characteristics such as variation in the local job or housing market.

We further test whether permanent income considerations drive the results. To this end, we instrument for own income using lagged information on household labour income and apply 3-year moving averages to the consumption and income variables.[13]

Moreover, we examine whether status comparisons are directed upwards and additionally construct three versions of outward-looking reference groups. These include both richer and poorer households and are defined along certain social characteristics such as education or state of residence. Besides this, we examine whether the financial crisis influences our estimations.

Finally, we construct a number of alternative definitions of upward-looking reference group and contrast our baseline specification with these alternative concepts: First, we compare our baseline results to reference measures that consider the number of household members and whether there are kids living in the household or not as relevant features of the reference group. Second, we test whether comparison effects are driven by either the consumption decile directly above the household's own decile or by the consumption of those households having a significantly higher position in the perceived income distribution.

3. Data

3.1. The sample

Our analysis is based on household survey data from the German Socio-Economic Panel (SOEP). The SOEP is one of the oldest and most established micro panel datasets available to economists and other social scientists. Starting in 1984, it contains yearly information on an individual and household level. For a detailed description of the panel see Wagner et al. (2007). Among other subjects, the SOEP provides monthly active saving information and high quality income measures. Therefore, we deduct household consumption from household active savings and disposable income (see Section 3.2).

Due to the addition of the High Income Sample (HIS) in 2002, we confine our analysis to the period from 2002 until 2011. Especially in a context in which the distributions of income and consumption are central to the analysis, the inclusion of the HIS marks a fundamental improvement in the quality of the data in terms of representativeness. It is a well-known problem that household surveys fail to perfectly capture the entire distribution up to the very rich in society as very rich households are underrepresented (Bach et al., 2009). A lack of observations with very high income leads to a high degree of uncertainty and thus low statistical power with regard to the description of the upper part of the distribution. Before 2002, few observations with yearly income above a threshold of about 41.500 euros were present in the SOEP. In 2002, the issue

[13] The former strategy has been proposed by Dynan et al. (2004) while the latter follows the approach taken by Kopczuk and Song (2010).

Table 1
Summary statistics of main variables.

	N	Mean	Median	SD	Min	Max
Economics variables						
Income	109,921	2102	1827	1429	0	87,719
Consumption	105,292	1875	1626	1189	0	86,894
Upward-looking measures of reference consumption						
ALL-concept	95,559	2988	2714	898	1975	5708
AGE-concept	95,920	2988	2722	916	1914	6120
EDU-concept	96,742	2934	2706	1015	1772	7766
EAST-concept	95,681	2962	2742	917	1578	5998
Excl. own state from ref. group	95,559	2982	2700	899	1951	5844
PHM-concept	99,594	1613	1452	499	1079	3197
KIDS-concept	95,681	2950	2707	947	1812	6372
Modification A only adjacent class	95,559	2199	1811	1239	858	5708
Modification B excl. adjacent class	95,559	3398	2983	1218	2118	7047
Outward-looking measures of reference consumption						
EDU-concept	99,356	1904	1880	326	1532	2496
STATE-concept	109,921	1876	1940	185	1397	2144
EDUSTATE-concept	99,356	1905	1759	406	1073	3210
Sociodemographic variables						
Age	109,921	53.71	53.0	17.27	17	100
Adults	109,921	1.71	2.0	0.73	0	10
Children	109,921	0.35	0.0	0.76	0	9
Years of education	107,430	12.08	11.5	2.66	7	18
Self-employed	109,921	0.06	0.0	0.24	0	1
Civil servant	109,921	0.04	0.0	0.19	0	1
White collar	109,921	0.27	0.0	0.44	0	1
Blue collar	109,921	0.15	0.0	0.36	0	1
Retired	109,921	0.34	0.0	0.47	0	1
Unemployed	109,921	0.06	0.0	0.24	0	1

Note: All variables are deflated to 2005 prices using the Consumer Price Index.

of low statistical power in the upper part of the distribution was addressed by adding the HIS (Frick et al., 2007). Its addition greatly improves the statistical power with which statements about the top of the distribution can be made. In our analysis of upward-looking interpersonal comparisons, reliable information at the top of the income and consumption distribution is especially important for a consistent estimation of the average consumption level of the reference group.[14] Moreover, when constructing reference consumption for different social subgroups, rich information in the sense of a large number of observations is even more important as the number of observations decreases with the number of social subgroups.

When further preparing our sample for the analysis we apply a minimum of restrictions: (i) We drop households with net income below or equal to zero. (ii) The question regarding the amount of monthly saving is preceded by a filter question that captures whether or not the household saves at all. This setup allows for a contradiction: Households may first indicate that their saving is positive but then not answer the follow-up question regarding the amount of their monthly saving. Those observations are not included in our analysis. (iii) In addition to that, we drop households for which monthly saving exceeds net monthly income. We end up with a sample consisting of 109,921 observations and at least 10,000 households in any given year.[15] Table 1 provides basic summary statistics for our main variables.[16]

3.2. Measures of disposable income, savings and consumption

As stated above, we calculate household consumption as being the difference between disposable income and active saving. The saving information used in our analysis is based on the one-shot question in the SOEP questionnaire:

> `Do you usually have an amount of money left over at the end of the month that you can save for larger purchases, emergency expenses or to build up savings? If yes, how much?`

The question is supposed to measure active saving, i.e. the difference between disposable income and expenditures on non-durable consumption.[17] One might assume that information on savings is documented less accurately than income

[14] This is of particular importance for households within the upper middle class whose reference group is defined as the very top of the distribution.
[15] In total, our restrictions lead to the loss of 6,756 observations.
[16] All variables are deflated to 2005 prices using the Consumer Price Index.
[17] By definition, active saving does not include revaluations of wealth but rather captures the amount of money that is not spent for consumption. Dynan et al. (2004) use active and passive saving measures in their analysis. Thereby, passive saving is defined as the change of wealth. For our analysis, however,

Table 2
Consumption and reference consumption – baseline.

Dep. variable: $\Delta \ln(c_{it})$	(1) *ALL-concept*	(2) *AGE-concept*	(3) *EDU-concept*	(4) *EAST-concept*
$\Delta \ln(y_{it})$	0.7288***	0.7396***	0.7202***	0.7364***
	[0.0112]	[0.0101]	[0.0128]	[0.0113]
$\Delta \ln(\bar{c}_{it})$	0.3210***	0.2480***	0.1776***	0.2593***
	[0.0365]	[0.0242]	[0.0429]	[0.0284]
Observations	74,547	74,853	75,456	74,487
R^2	0.8606	0.8597	0.8609	0.8598

Robust standard errors in brackets. *, **, and *** indicate statistical significance at the 10, 5, and 1% level.
Note: This table reports results of the first difference estimation of the impact of reference consumption upon household consumption. We control for reverse causality resulting from class-hoppers. $\Delta \ln(y_{it})$ denotes the first difference of log household real disposable income. $\Delta \ln(\bar{c}_{it})$ is the first difference of log reference consumption. The set of further covariates comprises changes in the number of adults and children living in the household, the number of years of education, employment status and age of the household head, state dummies and year dummies. Column (1) is the baseline estimation from Table 3 (*ALL-concept*). The subpopulations are constructed using three dummy variables leading to two subpopulations in each case. The dummy variable EAST equals one for households living in states that formed the German Democratic Republic, the dummy AGE equals one if the household head is older than 45 and the dummy EDU equals one if the household head has received higher education or has passed the German Abitur.

measures in the SOEP because respondents might differ in their understanding of savings, particularly whether or not one includes contributions to private pension schemes. Thus, the levels of the reported saving amounts are most probably subject to measurement error. However, we do not regard this as a serious problem for our analysis for three reasons: First, specific response patterns that stem from varying interpretations of the term savings across households do not necessarily bias the level of savings in a systematic way. Second, even systematic time-invariant over- or underestimation within households does not affect our estimations as we estimate in first differences. Third, a comparison of our savings measure with dummy and categorical variables on individuals' pension plans, life-insurance and building loan contracts reveals positive correlations between the used savings variable and these specific savings forms.[18] This in general confirms the assumption that the latter may also be captured by the standard savings variable in the SOEP. The positive correlations hold up when running regressions of the savings measure on these categorical variables and controlling for variations in the household's own income. This is consistent with our interpretation of the phrasing of the question implying that payments to private pension or life insurance schemes as well as building loan contracts are included in this measure of saving.[19]

To the extent that the question posed above successfully captures active saving information, one can deduce consumption information by subtracting active saving from disposable income.

Real monthly household disposable income is our most important control variable. It includes both labour and asset income as well as public and private transfers and is thus a very comprehensive measure of own income which enables us to control for a rich set of income sources that might affect households' consumption–savings decisions.

4. Results

4.1. Do upward-looking comparisons affect households' consumption–savings decisions?

Yes, they do. Table 2 shows the estimation results for our baseline specifications according to Eq. (7). Column (1) reports the estimated effect of reference consumption when the upward-looking reference group includes the entire population (*ALL-concept*). In columns (2) through (4), a household's reference group includes only those households who belong to the same age group (*AGE-concept*), who have a similar level of education (*EDU-concept*) or who live in the same region (*EAST-concept*). We see that reference consumption does have a significant positive effect on household consumption when controlling for changes in own disposable income. This holds across all specifications and the effects are statistically significant on the 1% level.

The coefficient on reference consumption is largest for the *ALL-concept*. This indicates that households compete with all richer citizens. Nowadays, people are closely connected via modern communication technologies. Hence, it is intuitive that people living in East Germany compare themselves to people living in both East Germany and West Germany. In addition, excluding all highly educated households from the reference group of a household with a relatively poorly educated head seems also very restrictive. Even though the coefficients do not differ significantly with varying definitions of reference

households' consumption–savings decisions are best captured by an active savings measure that does not include wealth revaluation. Moreover, as there are only two waves including wealth information in the SOEP, constructing a measure of passive saving and especially examining its evolution over time is not feasible.

[18] We thank the editor and an anonymous reviewer for raising this point.

[19] Unlike other micro data sets such as the U.S. Consumer Expenditure Survey (CEX), the SOEP does not contain detailed information on expenditures. We are thus unable to investigate whether the effect of reference consumption differs across consumption categories. Bertrand and Morse (2013) use the CEX in order to differentiate the effect of upward-looking comparisons by certain types of consumption goods. Surprisingly, they do not find convincing evidence for a link between visibility and degree of positionality using the visibility score proposed by Heffetz (2011).

Table 3
Consumption and reference consumption – interaction analysis.

Dep. variable: $\Delta \ln(c_{it})$	(1) Education level	(2) Employment status	(3) Income classes
$\Delta \ln(y_{it})$	0.7288***	0.7291***	0.6871***
	[0.0110]	[0.0109]	[0.0124]
Low educ.	0.3291***		
	[0.0457]		
Mid educ.	0.3530***		
	[0.0477]		
High educ.	0.2878***		
	[0.0522]		
Self-employed		0.3710***	
		[0.1312]	
Civil servant		0.2211***	
		[0.0850]	
White collar		0.2876***	
		[0.0452]	
Blue collar		0.3578***	
		[0.0534]	
Retired		0.3313***	
		[0.0478]	
Unemployed		0.5513***	
		[0.1166]	
Income class 1			0.4652***
			[0.1130]
Income class 2			0.3456***
			[0.0846]
Income class 3			0.5336***
			[0.0773]
Income class 4			0.4486***
			[0.0758]
Income class 5			0.4499***
			[0.0669]
Income class 6			0.5458***
			[0.0634]
Income class 7			0.5400***
			[0.0605]
Income class 8			0.3580***
			[0.0799]
Income class 9			0.2610***
			[0.0454]
Income class 10			0.1243**
			[0.0613]
Observations	74,547	74,547	74,547
R^2	0.8606	0.8623	0.8631

Robust standard errors in brackets. *, **, and *** indicate statistical significance at the 10, 5, and 1% level.
Note: This table reports results of the analysis as to whether the effects of reference consumption are stronger for certain social subgroups. $\Delta \ln(y_{it})$ denotes the first difference of log household real disposable income. $\Delta \ln(\bar{c}_{it})$ is the first difference of log reference consumption. The set of further covariates comprises changes in the number of adults and children living in the household, the number of years of education, employment status and age of the household head, state dummies and year dummies. Column (1) shows education-specific effects where LOW-EDU means that the household head has attended school for a maximum of 9 years, MID-EDU includes household heads who have more than 9 but less than 13 years of schooling and who did not attend college or university. The head of HIGH-EDU households has received the maximum amount of 13 years of schooling or has attended college or university. Column (2) differentiates the effect of reference consumption with respect to the household head's employment status. Column (3) shows income decile specific effects.

group, there seems to be little reason to restrict the reference group to a certain social group. According to the *ALL-concept*, a 1% increase in reference consumption leads the household to raise its consumption ceteris paribus by about 0.32%. As the mean values of reference consumption are by construction larger than average own consumption, the estimated elasticity is difficult to interpret. Table 4 aims at facilitating the interpretation by presenting the mean values of own and reference consumption in colums (1) and (2). In addition, columns (3) and (4) show the absolute value corresponding to a 1% increase in mean reference consumption and a α_1 % change in own consumption. The ratio of these changes is presented in column (5). Hence, at the mean values, a 100 euro increase of reference consumption corresponds to a rise in own consumption of about 18 euros. These results are strong evidence for KURJ-behaviour.

Due to the lack of space, we do not report the coefficients for class-hoppers. However, it is worth noting that for Table 2 these coefficients vary between 0.56 and 0.63, depending on the specification. As expected these values clearly exceed the estimated coefficients for households that do not change consumption classes. One might argue that the mechanism of changing consumption levels associated with an adjustment of the reference group is not necessarily counterintuitive. This is because with new levels of consumption, that are predominantly driven by income changes, consumption aspirations

Table 4
Interpretation of comparison effects across income classes.

	(1) Mean of own consump.	(2) Mean of ref. consump.	(3) 1% change in ref. consump.	(4) α_1 % change in own consump.	(5) Ratio of (4) to (3)
ALL-concept (baseline)	1703	2988	29.88	5.47	0.18
Low educ.	1521	2786	27.86	5.01	0.18
Mid educ.	1790	3074	30.74	6.32	0.21
High educ.	1963	3283	32.83	5.65	0.17
Self-employed	2034	3356	33.56	7.55	0.22
Civil servant	2454	3843	38.43	5.43	0.14
White collar	2012	3316	33.16	5.79	0.17
Blue collar	1803	3072	30.72	6.45	0.21
Retired	1447	2701	27.01	4.79	0.18
Unemployed	1153	2461	24.61	6.36	0.26
Income class 1	608	2040	20.40	2.83	0.14
Income class 2	929	2194	21.94	3.21	0.15
Income class 3	1144	2347	23.47	6.10	0.26
Income class 4	1351	2521	25.21	6.06	0.24
Income class 5	1582	2746	27.46	7.12	0.26
Income class 6	1817	2967	29.67	9.92	0.33
Income class 7	2097	3282	32.82	11.33	0.35
Income class 8	2428	3752	37.52	8.69	0.23
Income class 9	2888	4397	43.97	7.54	0.17
Income class 10	3302	4972	49.72	4.10	0.08

Note: This table aims at facilitating the interpretation of the estimated elasticities in Tables 2 and 3. The mean values of own and reference consumption are presented in colums (1) and (2). Columns (3) and (4) show the absolute value corresponding to a 1% increase in mean reference consumption and an α_1 % change in the mean of own consumption. The ratio of these changes is presented in column (5). This ratio shows, for the mean values, by how much own consumption changes if reference consumption increases by 1 euro.

also change and a change of reference group can even account for such adjustments. Thus, the estimated coefficient for *non-hoppers* actually provides a lower bound of the effects of reference consumption. However, we chose to stick to this somewhat conservative approach and accept the potential underestimation of the average causal effect.

4.2. Interaction analysis

To examine whether the effects of interpersonal comparisons differ between socio-economic subgroups we interact the change in reference consumption with dummy variables that capture different levels of education, different types of employment and the household's position in the income distribution. Table 3 shows the corresponding estimation results.

Column (1) reveals that the point estimates for households whose head attended school for a maximum of 9 years (Low educ.) as well as for households whose head received 13 years of schooling or even attended college or university (High educ.) are slightly lower compared to that of households whose head has attended school for at least ten and at most 12 years (Mid educ.). However, these differences are not statistically significant at the 5% significance level as is graphically illustrated in Fig. 1. Column (2) of Table 3 contrasts different types of employment status. Households with a self-employed household head appear to be more strongly affected by changes in reference consumption. At the mean, a 100 euro change in reference consumption corresponds to a change in own consumption of 22 euros, whereas for civil servants the corresponding effect is only 14 euros (see Table 4). This might be the result of characteristics such as personal motivation and commitment as well as comparably high financial aspirations that are more pronounced among self-employed persons and are likely to be positively correlated with the importance of relative concerns. Although this seems very intuitive, the coefficients again do not differ significantly on the 5% significance level as the confidence band for the self-employed is comparably large (see Fig. 2). The results reported in columns (1) and (2) suggest that the effects of interpersonal comparisons are not confined to certain groups of society.

The question as to whether households in different parts of the income distribution are equally strongly affected by positional concerns is of particular importance with regard to the discussion about expenditure cascades and the effects of increasing inequality on the evolution of aggregate consumption and savings. Column (3) thus reports income class-specific point estimates. We see that for all income deciles the effect of reference consumption upon household consumption is positive and statistically highly significant. Hence, the entire income distribution is affected by the consumption level of the respective reference group due to interpersonal comparisons. Income classes 3, 6 and 7 show the largest coefficients. On the 5% level of significance these are significantly higher than the coefficients for income deciles 9 and 10 (see Fig. 3).

Although the estimated elasticities do not vary systematically across income deciles 1–8, the effects in terms of changes in consumption levels are substantial. Table 4 indicates that while within income deciles 6 and 7 an increase in reference consumption by 100 euros leads the household to raise own consumption by more than 30 euros, the same change in reference consumption only implies an increase of 15 euros within income deciles 1 and 2.

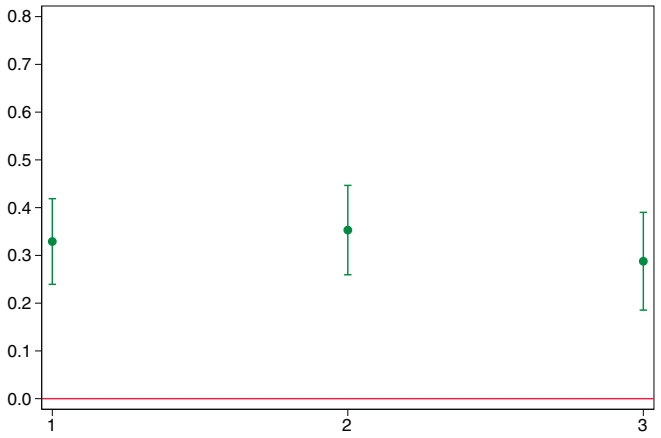

Fig. 1. Marginal effects of reference consumption across different levels of education. *Note*: This figure illustrates marginal effects of reference consumption across different levels of education. (1) denotes households whose head attended school for a maximum of 9 years (Low educ.), (2) are households whose head received 13 years of schooling or attended college or university (High educ.) and (3) denotes households whose head has attended school for at least ten and at most 12 years (Mid educ.). We control for changes in consumption classes. The illustration is based on the estimation results reported in column (1) of Table 3. Confidence intervals correspond to the 5% level of significance. The horizontal line indicates the zero threshold for the coefficient.

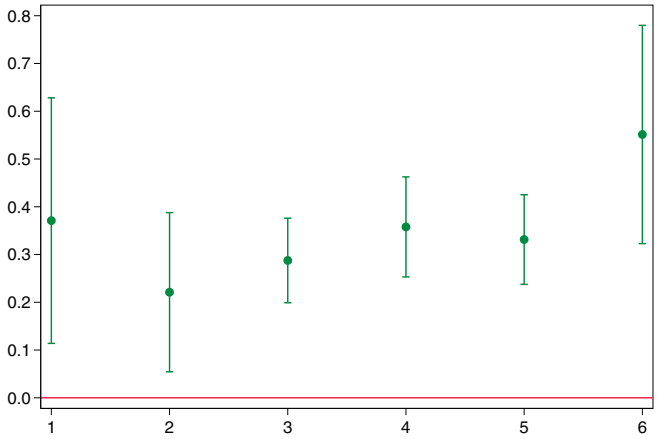

Fig. 2. Marginal effects of reference consumption by different employment types. *Note*: This figure illustrates marginal effects of reference consumption by different typed of employment. (1) denotes households with a self-employed household head, (2) correspond to civil servants, (3) are white collar workers, (4) denotes blue collar workers, (5) are retirees and (6) are households whose head is unemployed. We control for changes in consumption classes. The illustration is based on the estimation results reported in column (2) of Table 3. Confidence intervals correspond to the 5% level of significance. The horizontal line indicates the zero threshold for the coefficient.

4.3. Robustness

The following robustness section addresses a number of important robustness issues that might potentially undermine the quality our results.[20]

4.3.1. Exogeneity of reference consumption

One central challenge the literature on interpersonal comparisons faces is the question as to whether reference consumption can be taken as exogenous.[21] Despite the fact that we do not construct region-specific reference groups, regional heterogeneity can still lead to spurious correlation between own and reference consumption. Income or consumption shocks that operate below the national level might not be reflected in either the time or state fixed effects. We address this crucial

[20] Besides the following issues we ran several additional robustness regressions. We tested alternative numbers of consumption classes for the construction of reference groups. Moreover, we compared the results of our baseline specification to a data set which had been adjusted for extreme values within the economic variables used in our regressions. Here, we dropped 0.1% on both ends of the distributions of the first differences of own income, consumption and reference consumption. These additional robustness specifications do not impact our results either.

[21] For example, Luttmer (2005) carefully constructs reference measures that avoid being subject to endogeneity due to local shocks.

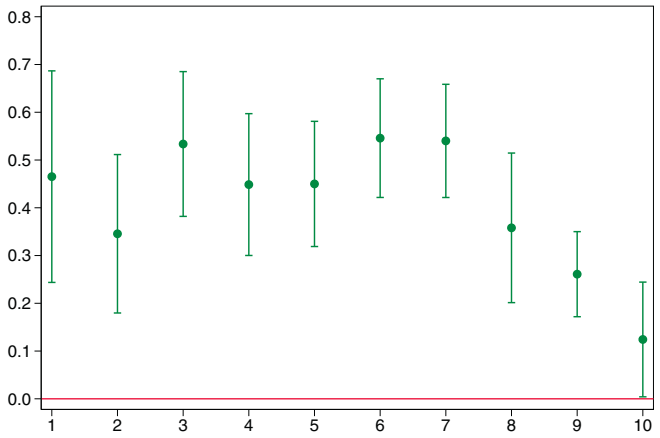

Fig. 3. Marginal effects of reference consumption across income deciles. *Note*: This figure illustrates marginal effects of reference consumption by income deciles. We control for changes in consumption classes. The illustration is based on the estimation results reported in column (3) of Table 3. Confidence intervals correspond to the 5% level of significance. The horizontal line indicates the zero threshold for the coefficient.

Table 5
Consumption, reference consumption – exogeneity of reference consumption.

Dep. variable: $\Delta \ln(c_{it})$	(1) Baseline	(2) State–year interactions	(3) Excl. own state from ref. group
$\Delta \ln(y_{it})$	0.7288***	0.7288***	0.7288***
	[0.0112]	[0.0111]	[0.0112]
$\Delta \ln(\bar{c}_{it})$	0.3210***	0.3183***	0.3025***
	[0.0365]	[0.0371]	[0.0346]
Observations	74,547	74,547	74,547
R^2	0.8606	0.8610	0.8607

Robust standard errors in brackets. *, **, and *** indicate statistical significance at the 10, 5, and 1% level.
Note: This table reports results of the first difference estimation of the impact of reference consumption upon household consumption. We control for reverse causality resulting from class-hoppers. $\Delta \ln(y_{it})$ denotes the first difference of log household real disposable income. $\Delta \ln(\bar{c}_{it})$ is the first difference of log reference consumption. The set of further covariates comprises changes in the number of adults and children living in the household, the number of years of education, employment status and age of the household head, state dummies and year dummies. Column (1) is the baseline estimation from Table 2 (*ALL-concept*). In column (2), we include a full set of state–year interaction terms to capture the potential effects of state-level business cycles that are not reflected in the year and state fixed effects. In column (3), we exclude all households living in the same state of residence from the construction of reference consumption in order to ensure that local unobserved heterogeneity does not drive the results.

question in Table 5. We control for time-variant unobserved heterogeneity at the state level by interacting the set of time dummies with the set of state dummies. Column (2) reports the results from a regression where the set of state–year interactions is added to the vector of control variables. We see that, compared to our baseline results (column 1), the results remain virtually unchanged. However, unobserved local area characteristics, i.e. heterogeneity at a level even less aggregated than the state level, may still drive our estimates. Higher prices in certain municipalities, for example, may increase the consumption expenditures of all households in the respective area. By slightly modifying the definition of the household's reference group, we seek to eliminate this concern. That is, we exclude those households residing in the same state from a household's reference group. Thus, local variations in the housing or labour market can no longer affect both the household's own level of saving or consumption and that of the reference group. While this strategy effectively removes an important part of the household's true reference group, it is the most straight forward and reliable way of checking whether local unobserved heterogeneity drives our results. Column (3) shows the effects of reference consumption when this modified concept is used. The estimated coefficient is only marginally smaller and significantly different from zero.

4.3.2. Permanent income considerations

If households consume according to their expected permanent income the household's own current income may not adequately capture the economic resources of the household. We thus need to test whether the effect of reference consumption prevails when permanent income is accounted for. The first strategy follows Dynan et al. (2004) who use lagged household labour income as a proxy for permanent income. Column (2) of Table 6 shows the results of a two-step GMM estimation where the second and third lags of household labour income are used to instrument for own $\Delta \ln(y_{it})$.[22] Here, the coefficient on own income is slightly smaller compared to our baseline estimation (column 1). Most importantly, however, the effect

[22] Note that the first lag of household labour income is still correlated with the first differenced error term.

Table 6
Consumption, reference consumption – permanent income.

Dep. variable: $\Delta \ln(c_{it})$	(1) Baseline	(2) Lagged labour income as IV	(3) 3-Year moving average
$\Delta \ln(y_{it})$	0.7288***	0.6532***	0.8432***
	[0.0112]	[0.0619]	[0.0069]
$\Delta \ln(\bar{c}_{it})$	0.3210***	0.3044***	0.2135***
	[0.0365]	[0.0595]	[0.0396]
Observations	74,547	52,130	50,655
R^2	0.8606	0.8427	0.9024

Robust standard errors in brackets. *, **, and *** indicate statistical significance at the 10, 5, and 1% level.
Note: This table reports results of the first difference estimation of the impact of reference consumption upon household consumption. We control for reverse causality resulting from class-hoppers. $\Delta \ln(y_{it})$ denotes the first difference of log household real disposable income. $\Delta \ln(\bar{c}_{it})$ is the first difference of log reference consumption. The set of further covariates comprises changes in the number of adults and children living in the household, the number of years of education, employment status and age of the household head, state dummies and year dummies. Column (1) is the baseline estimation (*ALL-concept*). In column (2), we present the results of a two-step GMM estimation where $\Delta \ln(y_{it})$ is instrumented using the second and third lag of household labor income. In column (3), we apply 3-year moving averages to the consumption and income information.

Table 7
Consumption, reference consumption – including poorer households in reference group.

Dep. variable: $\Delta \ln(c_{it})$	(1) Baseline	(2) *EDU-concept*	(3) *STATE-concept*	(4) *EDUSTATE-concept*
$\Delta \ln(y_{it})$	0.7288***	0.9784***	0.9789***	0.9781***
	[0.0112]	[0.0039]	[0.0038]	[0.0040]
$\Delta \ln(\bar{c}_{it})$	0.3210***	-0.0129	-0.0105	0.0166
	[0.0365]	[0.0318]	[0.0500]	[0.0139]
Observations	74,547	77,613	83,935	77,613
R^2	0.8606	0.8250	0.8285	0.8250

Robust standard errors in brackets. *, **, and *** indicate statistical significance at the 10, 5, and 1% level.
Note: This table reports results of the first difference estimation of the impact of reference consumption upon household consumption. We control for reverse causality resulting from class-hoppers. $\Delta \ln(y_{it})$ denotes the first difference of log household real disposable income. $\Delta \ln(\bar{c}_{it})$ is the first difference of log reference consumption. The set of further covariates comprises changes in the number of adults and children living in the household, the number of years of education, employment status and age of the household head, state dummies and year dummies. Column (1) is the baseline estimation from Table 2 (*ALL-concept*) considering upward-looking reference consumption. Columns (2) through (4) use outward-looking definitions of reference group. That is, the reference group includes both poorer and richer households. Reference groups are thus constructed using alternative dimensions. In column (2) the reference group of a household includes all households who have a similar level of education. In column (3) the reference group consists of all households living in the same state. In column (4), both dimensions are combined such that all households living in the same state and having a similar level of education form the household's reference group.

of reference consumption remains almost unchanged at a value 0.3. The second possible way to construct a measure for permanent income is to apply moving averages (Kopczuk and Song, 2010). In column (3), we use 3-year moving averages for both income and consumption information. Here, the estimated elasticity decreases to 0.21 but is still highly significant and economically relevant.

4.3.3. Are comparisons directed upwards?

To examine whether such status comparisons are directed upwards, we additionally construct three versions of outward-looking reference groups that include both richer and poorer households. These concepts are defined along certain social characteristics such as education or state of residence. Table 7 reports the corresponding effects of reference consumption. Column (1) is the above presented upward-looking baseline specification (*ALL-concept*). In column (2) the household's reference group includes all households with a similar level of education, in column (3) the reference group consists of all households living in the same of Germany's 16 states and in column (4) these dimensions are combined such that all households with a similar level of education and the same state of residence form the reference group.[23] One immediately recognizes that outward-looking reference consumption does not exhibit relevant effects on household consumption. We take this result as further evidence for the fact that comparisons are directed upwards. Moreover, we find that this result supports the overall robustness of our estimation results.

4.3.4. Household size and the definition of reference group

In our baseline specification we have neither considered the number of household members nor whether there are kids living in the household as relevant features of the reference group. However, it seems intuitive to compare household consumption levels of households which are of comparable size. To address this issue we run two further regressions. In each

[23] In terms of education level, a household head can either have graduated from *Hauptschule* (9 years), *Realschule* (10 years), *Fachhochschulreife* (12 years) or *Abitur* (13 years). Household heads without graduation or with a non-standard qualification are excluded from this analysis (8,894 observations).

Table 8
Consumption, reference consumption – variations in household size.

Dep. variable: $\Delta \ln(c_{it})$	(1) Baseline	(2) *KIDS-concept*	(3) *PHM-concept*
$\Delta \ln(y_{it})$	0.7288***	0.7335***	0.7160***
	[0.0112]	[0.0114]	[0.0156]
$\Delta \ln(\bar{c}_{it})$	0.3210***	0.3388***	0.3128***
	[0.0365]	[0.0274]	[0.0336]
Observations	74,547	74,618	77,670
R^2	0.8606	0.8614	0.8663

Robust standard errors in brackets. *, **, and *** indicate statistical significance at the 10, 5, and 1% level.
Note: This table reports results of the first difference estimation of the impact of reference consumption upon household consumption. We control for reverse causality resulting from class-hoppers. $\Delta \ln(y_{it})$ denotes the first difference of log household real disposable income. $\Delta \ln(\bar{c}_{it})$ is the first difference of log reference consumption. The set of further covariates comprises changes in the number of adults and children living in the household, the number of years of education, employment status and age of the household head, state dummies and year dummies. Column (1) is the baseline estimation from Table 2 (*ALL-concept*). In column (2) we distinguish between households with children from households without children. In column (3) we consider consumption per household member rather than household consumption.

of the two, the classifications from which the respective reference groups are derived are sensitive to the following deviations from the baseline model: The first alternative, presented in column (2) of Table 8, distinguishes between households with children and households without children. The second alternative specification, presented in column (3), considers consumption per household member rather than household consumption for both the dependent variable as well as reference consumption. For both specifications we find that the results do not vary qualitatively from the baseline specification (column 1).

4.3.5. Do the effects change with the financial crisis?

Next, we examine whether the coefficients are stable across the economic downturn brought about by the financial and economic crisis. To this end we separately estimate the pre-crisis period from 2002 to 2008 and the recession period of 2009 and 2010. The results are presented in Table 9. Column (1) is the baseline specification and columns (2) and (3) summarize the respective subsamples. We see that in the crisis period the coefficients are slightly smaller, though the difference is not different from zero at the 5% level of significance. We take this as a weak indication that the strength of interpersonal comparisons might differ across different phases of the business cycle.

4.3.6. Are the effects driven by the adjacent class?

In our baseline concept, reference consumption is defined as the mean consumption of households above one's own consumption decile. We now examine whether the results are driven by either the consumption decile directly above the household's own decile (A) or by the consumption of those households having a significantly higher position in the perceived income distribution (B). Concept (A) means that, for example, the reference group of a household in the 5th consumption class only includes households of the 6th consumption decile. This concept is supposed to identify whether the estimated effects of upward-looking comparisons are primarily driven by movements of consumption of the very rich. The latter idea (B) is modelled as follows: The household's reference group no longer includes the consumption class that is directly above the household's own consumption class. This specification checks whether the results are driven by households which appear to be just slightly richer.

Table 10 compares the results for these alternative concepts to the baseline specification. Again, the baseline results are presented in column (1). Columns (2) and (3) summarize the regression outcomes for the two alternative measures

Table 9
Consumption, reference consumption – sample split around the financial crisis.

Dep. variable: $\Delta \ln(c_{it})$	(1) Baseline 2002–2011	(2) Pre-crisis 2002–2008	(3) Crisis 2009–2010
$\Delta \ln(y_{it})$	0.7288***	0.7278***	0.7165***
	[0.0112]	[0.0124]	[0.0177]
$\Delta \ln(\bar{c}_{it})$	0.3210***	0.3369***	0.2727***
	[0.0365]	[0.0452]	[0.0700]
Observations	74,547	51,423	15,867
R^2	0.8606	0.8492	0.8837

Robust standard errors in brackets. *, **, and *** indicate statistical significance at the 10, 5, and 1% level.
Note: This table reports results of the first difference estimation of the impact of reference consumption upon household consumption. We control for reverse causality resulting from class-hoppers. $\Delta \ln(y_{it})$ denotes the first difference of log household real disposable income. $\Delta \ln(\bar{c}_{it})$ is the first difference of log reference consumption. The set of further covariates comprises changes in the number of adults and children living in the household, the number of years of education, employment status and age of the household head, state dummies and year dummies. Column (1) is the baseline estimation from Table 2 (*ALL-concept*) covering the years 2002–2011. In column (2) we estimate the period 2002–2008. Column (3) illustrates the results covering the estimation period 2009-2010.

Table 10
Consumption, reference consumption – alternative concepts of reference group.

Dep. variable: $\Delta \ln(c_{it})$	(1) Baseline	(2) Modification A only adjacent class	(3) Modification B excl. adjacent class
$\Delta \ln(y_{it})$	0.7288***	0.6788***	0.7451***
	[0.0112]	[0.0137]	[0.0109]
$\Delta \ln(\bar{c}_{it})$	0.3210***	0.0905***	0.2003***
	[0.0365]	[0.0341]	[0.0295]
Observations	74,547	74,547	72,186
R^2	0.8606	0.8683	0.8511

Robust standard errors in brackets. *, **, and *** indicate statistical significance at the 10, 5, and 1% level.
Note: This table reports results of the first difference estimation of the impact of reference consumption upon household consumption. We control for reverse causality resulting from class-hoppers. $\Delta \ln(y_{it})$ denotes the first difference of log household real disposable income. $\Delta \ln(\bar{c}_{it})$ is the first difference of log reference consumption. The set of further covariates comprises changes in the number of adults and children living in the household, the number of years of education, employment status and age of the household head, state dummies and year dummies. Column (1) is the baseline estimation from Table 2 (*ALL-concept*). Columns (2) and (3) use alternative definitions of reference group. In column (2) the reference group of a household includes only households which belong to the consumption class right above the household's own class. In column (3) the consumption class directly above the household's own class is not part of the reference group.

of reference consumption of concepts (A) and (B) respectively. For both alternative specifications we find a positive and statistically highly significant coefficient. The effects, however, are somewhat weaker compared to the baseline model. This particularly holds for alternative (A) which features only adjacent classes as reference groups. These results indicate that both the top of the distribution as well as the close vicinity matter to the household.

5. Implications

As stated at the beginning, the findings in this paper contribute to the knowledge about the nature of consumption externalities and their role in housholds' consumption–savings decisions. The finding that comparisons are directed upwards, i.e. that the reference group of a household is formed by households who are (perceived to be) richer is a significant result that bears a number of implications:

First, our results further help to understand the divergence of income and consumption inequality which has been found in many countries and which is usually explained by the fact that income shocks are only perceived as transitory and households consequently keep their levels of consumption comparably stable.[24] The findings in this paper suggest that the under-proportionate growth of consumption inequality might have also been driven by KURJ-behaviour: In the face of increasing reference consumption, low and middle class households increase consumption and reduce savings in an attempt to "keep up with the Joneses". This is in line with the findings of Kopczuk and Song (2010) as well as Blundell and Etheridge (2010) who show that the sharp increase in income inequality in the U.S. and the U.K. is mostly due to permanent instead of transitory income shocks.

Second, it creates a microeconomic transmission mechanism linking rising income inequality to changes in aggregate consumption. This is because a mean-preserving spread of the income distribution implies an increase in reference consumption as comparisons are directed upwards. Households in the lower and middle part of the distribution primarily care about the consumption levels of richer households and adjust their own consumption expenditures accordingly in an attempt to keep up with these "*richer* Joneses". Hence, rising consumption levels at the top induce increased consumption levels for low and middle class households. As a result, aggregate consumption expenditures can increase while mean income remains constant.[25] Note that under outward-looking comparisons, this does not hold. Rising inequality can thus trigger significant macroeconomic developments due to the importance of upward-looking comparisons for households' consumption–savings decisions. Our results can be taken as microeconometric evidence supporting analyses that connect rising inequality to macroeconomic developments or even economic instability in the spirit of Rajan (2010).

Finally, it adds knowledge to models who assume interdependent preferences as it shows that comparisons are directed upwards. The fact that comparisons are asymmetric in the sense that the reference group only includes richer households implies that the dynamics of interpersonal comparisons require the use of multiple heterogeneous agents. In addition, the magnitude and robustness of the effect of reference consumption on own consumption suggests that KURJ-behaviour cannot be abstracted from without careful justification.

[24] The fact that income inequality has grown more rapidly than consumption inequality has been documented for the U.S. by Kopczuk and Song (2010), for Italy by Jappelli and Pistaferri (2010), for Sweden by Domeij and Floden (2010), for the United Kingdom by Blundell and Etheridge (2010) and for Germany by Fuchs-Schuendeln et al. (2010).

[25] Frank et al. (2010) and Bertrand and Morse (2013) present evidence for such expenditure cascades in the U.S. Other recent papers such as Alvarez-Cuadrado et al. (2012) or Ravina (2011) find evidence for effects of outward-looking reference consumption with Spanish and U.S. data. However, the authors do not consider the possibility that these results may be driven by the richer households within the reference group.

6. Conclusion

In this paper we demonstrate that interpersonal comparisons lead to KURJ-behaviour as reference consumption, i.e. the consumption level of those households that are perceived to be richer, affects the way households split their income between consumption and savings. We use annual household data from the German Socio-Economic Panel (SOEP) for the years 2002–2011 in order to estimate the effect of changes in reference consumption on households' consumption–savings decisions. We find that when controlling for changes in own income and unobserved regional heterogeneity, an increase in reference consumption by 1% leads to an increase in own consumption by about 0.3%. At the mean values of these variables, this translates into an increase in own consumption of 18 euros caused by a change in reference consumption of 100 euros. For households in the (upper) middle class, this effect can be as large as 35 euros. As predicted by the RIH, interpersonal comparisons constitute a central aspect of household behaviour.

Furthermore, the analysis of multiple definitions of reference group leads us to conclude that a household's reference group mostly includes those households who are perceived to be richer. That is, as soon as poorer households enter the reference group, the effect of reference consumption becomes insignificant and/or economically negligible. Such upward-looking status comparisons allow for consumption cascades as a result of increasing income and consumption levels at the top of the income distribution.

The core result that upward-looking rather than outward-looking comparisons affect people's consumption–savings decisions provides a microeconomic explanation for the observed divergence between consumption and income inequality. Most importantly, however, it establishes a link between rising inequality and aggregate consumption and savings.

References

Al-Hussami, F., Remesal, L.M., 2012. Current Account Imbalances and Income Inequality: Theory and Evidence. Kiel Advanced Studies Working Papers (459).
Alvarez-Cuadrado, F., El-Attar Vilalta, M., 2012. Income Inequality and Saving. Discussion Paper 7083, IZA.
Alvarez-Cuadrado, F., Casado, J.M., Labeaga, J.M., Sutthiphisal, D., 2012. Envy and Habits: Panel Data Estimates of Interdependent Preferences. Banco de Espana Working Papers 1213. Banco de Espana.
Bach, S., Corneo, G., Steiner, V., 2009. From bottom to top: the entire income distribution in Germany, 1992–2003. Rev. Income Wealth 55 (2), 303–330.
Bertrand, M., Morse, A., 2013. Trickle-Down Consumption. NBER Working Papers 18883. National Bureau of Economic Research, Inc.
Blundell, R., Etheridge, B., 2010. Consumption, income and earnings inequality in Britain. Rev. Econ. Dyn. 13 (1), 76–102.
Clark, A.E., 1996. Satisfaction and comparison income. J. Econ. Lit. XLI, 112–158.
Diener, E., Sandvik, E., Seidlitz, L., Diener, M., 1993. The relationship between income and subjective well-being: relative or absolute? Soc. Indic. Res. XXVIII, 195–223.
Domeij, D., Floden, M., 2010. Inequality trends in Sweden 1978–2004. Rev. Econ. Dyn. 13 (1), 179–208.
Duesenberry, J., 1949. Income, Saving and the Theory of Consumer Behavior. Harvard University Press, Cambridge, MA.
Dynan, K.E., 2000. Habit formation in consumer preferences: evidence from panel data. Am. Econ. Rev. 90 (3), 391–406.
Dynan, K., Ravina, E., 2007. Increasing income inequality, external habits, and self-reported happiness. Am. Econ. Rev. 97 (2), 226–231.
Dynan, K., Skinner, J., Zeldes, S.P., 2004. Do the rich save more? J. Polit. Econ. 112 (2), 397–444.
Easterlin, R.A., 1995. Will raising the incomes of all increase the happiness of all? J. Econ. Behav. Organ. 27 (1), 35–47.
Ferrer-i-Carbonell, A., 2005. Income and well-being: an empirical analysis of the comparison income effect. J. Public Econ. 89 (5–6), 997–1019.
Frank, R.H., 1984. Are workers paid their marginal products? Am. Econ. Rev. 74 (4), 549–571.
Frank, R.H., 1985. Choosing the Right Pond: Human Behavior and the Quest for Status. Oxford University Press, Oxford.
Frank, R.H., 1999. Luxury Fever. Free Press, New York.
Frank, R.H., 2007. Falling Behind: How Income Inequality Harms the Middle Class. University of California Press, Berkeley, CA.
Frank, R., Levine, A., Dijk, O., 2010. Expenditure Cascades. http://ssrn.com/abstract=1690612
Frey, B., Stutzer, A., 2002. What can economists learn from happiness research? J. Econ. Lit. XL, 402–435.
Frick, J.R., Goebel, J., Grabka, M.M., Groh-Samberg, O., Wagner, G.G., 2007. Zur Erfassung von Einkommen und Vermögen in Haushaltssurveys: Hocheinkommensstichprobe und Vermögensbilanz im SOEP. Data Documentation 19. Deutsches Institut für Wirtschaftsforschung.
Fuchs-Schuendeln, N., Krueger, D., Sommer, M., 2010. Inequality trends for Germany in the last two decades: a tale of two countries. Rev. Econ. Dyn. 13 (1), 103–132.
Galbraith, J.K., 2012. Inequality and Instability: A Study of the World Economy Just Before the Great Crisis. Oxford University Press, Oxford.
Heffetz, O., 2011. A test of conspicuous consumption: visibility and income elasticities. Rev. Econ. Stat. 93 (4), 110–1117.
Jappelli, T., Pistaferri, L., 2010. Does consumption inequality track income inequality in Italy? Rev. Econ. Dyn. 13 (1), 133–153.
Kapteyn, A., van de Geer, S., van de Stadt, H., Wansbeek, T., 1997. Interdependent preferences: an econometric analysis. J. Appl. Econ. 12, 665–686.
Kopczuk, W., Song, S.E., 2010. Earnings inequality and mobility in the United States: evidence from Social Security Data since 1937. Q. J. Econ. 125 (1), 91–128.
Kumhof, M., Lebarz, C., Rancière, R., Richter, A., Throckmorton, N., 2012. Income Inequality and Current Account Imbalances. Working Paper 12/08. International Monetary Fund.
Ljungqvist, L., Uhlig, H., 2000. Tax policy and aggregate demand management under catching up with the Joneses. Am. Econ. Rev. 90 (3), 356–366.
Luttmer, E.F.P., 2005. Neighbors as negatives: relative earnings and well-being. Q. J. Econ. 120 (3), 963–1002.
McBride, M., 2001. Relative-income effects on subjective well-being in the cross-section. J. Econ. Behav. Organ. 45 (3), 251–278.
Rajan, R., 2010. Fault Lines: How Hidden Fractures Still Threaten the World Economy. Princeton University Press, Princeton, NJ.
Ravina, E., 2011. Habit Formation and Keeping Up With the Joneses: Evidence from Micro Data, mimeo, Available at SSRN: http://ssrn.com/abstract=928248
Solnick, S., Hemenway, D., 1998. Is more always better?: A survey on positional concerns. J. Econ. Behav. Organ. 37 (3), 373–383.
Solnick, S.J., Hemenway, D., 2005. Are positional concerns stronger in some domains than in others? Am. Econ. Rev. 95 (May (2)), 147–151.
Stiglitz, J., 2009. The global crisis, social protection and jobs. Int. Labour Rev. 148 (1-2), 1–13.
Van de Stadt, H., Kapteyn, A., van de Geer, S., 1985. The relativity of utility: evidence from panel data. Rev. Econ. Stat. 67 (2), 179–187.
Van Treeck, T., 2014. Did inequality cause the U.S. financial crisis? J. Econ. Surv. 28 (3), 421–488.
Veenhoven, R., 1991. Is happiness relative? Soc. Indic. Res. XXIV, 1–24.
Wagner, G., Frick, J., Schupp, J., 2007. The German Socio-Economic Panel Study (SOEP) – scope, evolution and enhancements. J. Appl. Soc. Sci. Stud. 127 (1), 139–169.