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Consumption-Savings Decisions under Upward Looking Comparisons: Evidence from Germany, 2002-2011

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Working Paper

Moritz Drechsel-Grau and Kai D. Schmid[1]

Consumption-Savings Decisions under Upward Looking Comparisons: Evidence from Germany, 2002-2011*

September, 2013

Abstract

In this paper we demonstrate that interpersonal comparisons do not only influence people's level of utility but also lead to „keeping up with the Joneses"-behavior as reference consumption substantially affects households' consumption-savings decisions. By applying the insights from the literature on self-reported well-being to the analysis households' economic decisions, we estimate the causal effect of changes in reference consumption, defined as the consumption level of all households who are perceived to be richer, on households' savings and consumption. Using annual household data from the German Socio-Economic Panel (SOEP) for the years 2002 through 2011 allows us to control for various sources of unobserved heterogeneity. We find that when controlling for changes in own income, increases in reference consumption lead to lower savings and increased consumption as predicted by the Relative Income Hypothesis. Furthermore, households in the (upper) middle class of the income distribution are most strongly affected. An increase in reference consumption of 100 euros induces an average reduction of household savings of 10 to 25 euros depending on the household's position in the income distribution. The economic implications of such behavior are particularly helpful for understanding the link between changes in income inequality and developments in aggregate household savings and consumption. Our model attributes between 30 and 40 percent of the variation in changes of household savings to inequality changes.

Keywords: Household Savings, Household Consumption,Interdependent Preferences, Reference Consumption, Relative Income Hypothesis, Income Inequality

JEL classification: D12, D11, E21, C23

[1] *Moritz Drechsel-Grau*: University of Tübingen. E-Mail: moritz.drechselgrau@googlemail.com; *Kaid D. Schmid*: Macroeconomic Policy Institute. E-Mail: kdschmid@googlemail.com; *Corresponding Author*: Kai D. Schmid, Macroeconomic Policy Institute, Hans-Böckler-Str. 39, 40476 Düsseldorf

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Consumption-Savings Decisions under Upward Looking Comparisons: Evidence from Germany, 2002-2011*

Moritz Drechsel-Grau and Kai D. Schmid†

This Version: November 2013

Abstract

We demonstrate that upwardly-looking comparisons induce "keeping up with the *richer* Joneses"-behaviour. Using data from the German Socio-Economic Panel, we estimate the causal effect of reference consumption, defined as the consumption level of all households who are perceived to be richer, on household savings and consumption. When controlling for own income as well as unobserved individual and local area heterogeneity, an increase in reference consumption of 100 euros leads to an increase in consumption of up to 25 euros depending on the households position in the income distribution. Our findings suggest that changing income inequality can have significant macroeconomic effects.

Keywords: Household Savings, Household Consumption, Interdependent Preferences, Reference Consumption, Relative Income Hypothesis, Income Inequality.

JEL classification: D12, D11, D91, E21, C23

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†*Moritz Drechsel-Grau:* University of Tübingen. E-mail: moritz.drechselgrau@googlemail.com; *Kai D. Schmid:* Macroeconomic Policy Institute. E-mail: kdschmid@googlemail.com; *Corresponding Author:* Kai D. Schmid, Macroeconomic Policy Institute, Hans-Böckler-Str. 39, 40476 Düsseldorf.

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, $U_i = U(C_i, \bar{C})$ where $\bar{C}$ denotes the consumption level of the household's reference group. Most prominently, Luttmer (2005) shows that, after controlling for own income, higher local average earnings lead to lower levels of self-reported happiness for U.S. households.[1] However, little is known as to what extent 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. Meanwhile many economists assume 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 can thus trigger expenditure cascades.[3] A central behavioural assumption underlying this line of argument is the presence of *upward-looking* interpersonal comparisons, i.e. that 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 reduce active savings in favour of consump-

[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 (2013) 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 stressing the macroeconomic risks of inequality comprise Stiglitz (2009), Galbraith (2012), Kumhof et al. (2012) and Al-Hussami and Remesal (2012).

tion 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 indeed 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, negatively affects household savings. A one euro increase in the consumption of richer households reduces savings on average by up to 25 cents depending on the household's position in the income distribution. An interaction analysis reveals that KURJ-behaviour can be observed for various social subgroups. Furthermore, we find evidence that it is especially the (upper) middle class that responds to consumption increases at the top.

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 relatively little evidence for the impact of status comparisons 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

[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).

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 causal effect of reference consumption on households' consumption-savings decisions. Our model reliably identifies the coefficient on reference consumption for several reasons. As our empirical strategy does not rely on regional variation in reference consumption, we are able to eliminate unobserved local area characteristics. In addition, the panel structure of the SOEP allows us to control for unobserved individual fixed effects. Finally, we do not define reference groups along demographic characteristics. This prevents our results from being driven by unobserved peer effects. 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 positional concerns 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 negligible. (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 upward-looking reference consumption is not solely driven by the expenditures of those households who are just slightly richer.

Third, the paper links the microeconometric evidence to the evolution of income inequality in Germany from 2002 to 2011 showing that, depending on the household's position in the income distribution, our model attributes up to 25 per cent of the change in household savings to the effects of changing reference consumption.

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 contribution analysis. Section 5 addresses further implications of our findings and concludes.

2 Conceptual Approach and Empirical Strategy

2.1 The Consumption-savings Decision Under Interpersonal Comparisons

In order to formalize the intuition behind our conceptual approach, imagine a household whose utility depends on own consumption and leisure as well as on some measure of reference that drives interpersonal comparisons, $U_i = U(C_i, REF_i)$, where C_i denotes own consumption and REF_i denotes the reference measure which is either the level of income or consumption of the household's reference group.[5]

Note that interdependent preferences do not directly imply KUJ-behavior.[6] If a change in the reference measure only reduces the level of utility but leaves the marginal utility of consumption relative to leisure unchanged, an optimizing household will not alter its consumption-savings decision despite the presence of consumption externalities. In such a case, one obtains the same consumption function as in a scenario without interpersonal comparisons. For forward-looking households, this would yield a consumption function of the form:

$$C_{i,t} = f(INC_{i,t}, \ldots, INC_{i,t+h}, W_{i,t}, AGE_{i,t}, MACRO_t). \tag{1}$$

Thereby, $INC_{i,t}$ denotes household disposable income, $W_{i,t}$ is wealth including human capital, $AGE_{i,t}$ is the age of the household head and $MACRO_t$ includes macroeconomic factors such as the interest rate. The household's planning horizon is captured by h. Under KUJ-behavior, the household's consumption function evolves into:

$$C_{i,t} = f(REF_{i,t}, INC_{i,t}, \ldots, INC_{i,t+h}, W_{i,t}, AGE_{i,t}, MACRO_t). \tag{2}$$

The assumption of linearity is in line with theoretical research. The permanent-income version of the RIH suggested by Alvarez-Cuadrado and Van Long (2011) involves an additive specification of relative consumption leading to a consumption function that is linear in own lifetime income and lifetime income of the reference group.[7][8]

[5] We abstract from the second standard argument of utility, leisure, as leisure is far less positional than consumption. See for example Solnick and Hemenway (1998) and Solnick and Hemenway (2005).

[6] Note that KURJ-behaviour is just a special case of KUJ-behaviour.

[7] Ljungqvist and Uhlig (2000) also model relative consumption additively.

[8] Although empirical studies dealing with the importance and effects of interdependent preferences are rare, there are quite a few other theoretical contributions exploring the effects

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, consumption is more positional than income. Among others, Solnick and Hemenway (1998) and Solnick and Hemenway (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] The latter result suggests that it is mostly the visible part of one's income that initiates external effects with regard to the well-being of others. This seems intuitive as people are not able to directly observe other people's income levels. People usually observe what other people consume and use this information to make inferences with respect to the income levels of those people. Consequently, the relative position of a household in the actual income distribution is not necessarily identical to the household's position in the perceived income distribution. Hence, we use the distribution of consumption to approximate the perceived income distribution as this is relevant for positional concerns. Even though this measure of consumption still includes forms of non-visible consumption such as health expenditures, it is still clearly more visible than income and therefore likely to be a driving factor of interpersonal comparisons. We therefore define REF_i as the average consumption level of the household's reference group.

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. Similarly, Alvarez-Cuadrado and El-Attar Vilalta (2012) demonstrate

of interpersonal comparisons. See for example Abel (1990), Galí (1994), Carroll et al. (1997), Liu and Turnovsky (2005) or Al-Hussami and Remesal (2012).

[9] Solnick and Hemenway base their conclusions on a survey in which they confront the respondents with a choice between two hypothetical scenarios of the type: A: Your home has seven rooms; other people's homes ten rooms. B: Your home has five rooms; other people's homes have three rooms. The percentage of respondents who gave positional answers, i.e. who, in this example, prefer B to A, differs between different goods which suggests that different goods are not equally positional.

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. We thus assume that the reference group of a household consists of all households with a higher relative position in the perceived income distribution.

Moreover, it is often assumed that the reference group is defined along categories such as region of residence, age or education assuming that people compare themselves within certain subpopulations.[10] However, there is no consensus as to which of these categories really matters. 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, that is they do not include households with a lower relative position in the respective subpopulation.

To model reference consumption in our baseline specifications, 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 through 10.[11] This decile classification would result in the top ten per cent of the consumption distribution not having an upward-looking reference group which does not seem plausible. We thus split the upper ten per cent and define the top five per cent as the reference group of households in the 19th vingtile.

In order to demonstrate that the assumption of upward-looking comparisons is appropriate, i.e. that households' consumption-savings decisions are not affected by poorer households, we additionally construct three versions of outward-looking reference groups. This allows us to examine whether the effect of reference consumption is still present when poorer households are part of the reference group.

[10] 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. Easterlin (1995), for example, uses none of these categories assuming that people compare themselves to all citizens of their country.

[11] This approach has also been suggested by Alvarez-Cuadrado and El-Attar Vilalta (2012) who apply a quintile categorization.

2.3 Baseline Econometric Model

As our conceptual approach defines reference consumption as average consumption of all households who belong to consumption classes above the household's own consumption class (j) and who are part of the household's (sub-)population (c), $REF_i = \bar{C}_{c,j(c)}$, reference consumption is by construction endogenous. 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 consumption and reference consumption. We control for this problem by interacting reference consumption with two dummy variables that distinguish between households who do not change consumption classes and those who hop into a different class over time. In the following we refer to the latter as *class-hoppers*.[12]

Due to the fact that the SOEP questionnaire captures active savings rather than consumption information, we use household savings as our dependent variable. Household active savings S_i is defined as household disposable income minus consumption. Hence, reducing savings by a certain amount, while holding own disposable income constant, implies an increase of consumption by that exact amount.[13] We thus estimate the following baseline equation using pooled OLS:

$$\begin{aligned} \Delta S_{i,t} &= \alpha + \beta_1 \Delta INC_{i,t} + \beta_{2,S} \Delta REF_{i,t} \times STAY_{i,t} + \beta_{2,H} \Delta REF_{i,t} \times HOP_{i,t} \\ &\quad + \boldsymbol{\delta} \mathbf{X_{i,t}} + \boldsymbol{\gamma} \mathbf{STATE_{i,t}} + \boldsymbol{\theta} \mathbf{TIME_t} + \epsilon_i. \end{aligned} \tag{3}$$

Thereby, $\Delta S_{i,t}$, $\Delta INC_{i,t}$ and $\Delta REF_{i,t}$ are first differences of a household's real savings, real disposable income and real reference consumption. $STAY_{i,t}$ equals one if the household does not change its consumption class j from period $t-1$ to t and $HOP_{i,t}$ equals one if the household does change its consumption class. $X_{i,t}$ 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 head. $STATE_{i,t}$ is a vector of state dummies and $TIME_t$ is a vector of year dummies.

By taking three-year moving averages of household consumption and income, we control for transitory fluctuations. The Permanent Income Hypothesis pre-

[12] About one third (34.2 per cent) of the households in our sample are class-hoppers.

[13] We will further discuss the question whether we can deduce consumption information from the savings information given in the SOEP in section 3.

dicts that households smooth transitory fluctuations in current income and only adjust consumption in response to permanent income changes. This argument can easily be extended to the household's relative position.[14] 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 by interacting reference consumption with dummy variables for income deciles. As we are interested in the income distribution of the entire population, we use the *ALL-concept* for this analysis. In equation (4) these variables are captured in the interactions with the vector of dummy variables $INT_{i,t}$.

$$\begin{aligned} \Delta S_{i,t} &= \alpha + \beta_1 \Delta INC_{i,t} + \boldsymbol{\beta_{2,S}} \Delta REF_{i,t} \times STAY_{i,t} \times \mathbf{INT_{i,t}} \\ &\quad + \beta_{2,H} \Delta REF_{i,t} \times HOP_{i,t} + \boldsymbol{\delta} \mathbf{X_{i,t}} + \boldsymbol{\gamma} \mathbf{STATE_{i,t}} \\ &\quad + \boldsymbol{\theta} \mathbf{TIME_t} + \epsilon_i \end{aligned} \tag{4}$$

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. For the latter, we have already taken care in our baseline model by taking first differences and thereby removing time-invariant individual heterogeneity. The former methodological 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

[14] Our approach follows Kopczuk and Song (2010) who take five-year-moving averages to approximate permanent earnings. In our robustness section we compare three-year-moving averages to current information and five-year-moving averages and show that the results are not driven by the degree of smoothing.

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.

Besides this, we carry out several additional robustness checks that address different definitions of reference group, the degree of smoothing income information and sample outliers.

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 that is 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 yearly saving information and high quality income measures.

In the SOEP saving information is available since 1995. 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 distribution of income and consumption is central to the analysis, the inclusion of the HIS marks a fundamental improvement in the quality of the data in terms of representativeness. 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 111,512 observa-

tions and at least 10,708 households in any given year.[15] Table 1 provides basic summary statistics for our main variables.[16]

[Table 1: Summary Statistics of Main Variables.]

3.2 Measures of Disposable Income, Savings and Consumption

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. The phrasing of the question implies that payments to private pension or life insurance schemes as well as building loan contracts are included in this measure of saving. Moreover, the purchase of very durable goods such as housing or vehicles is taken as part of active saving. By definition, active saving does not include revaluations of wealth but rather captures the amount of money that is not spent for consumption.[17] To the extent that the above posed question successfully captures active saving information, one can deduce consumption information by subtracting active saving from disposable income. One might assume that information on savings is documented less accurately than income 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 two 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

[15] In total, our restrictions lead to the loss of 5,165 observations

[16] All variables are deflated to 2005 prices using the Consumer Price Index.

[17] 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, 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.

in first differences. We thus deduct household consumption as the difference between monthly disposable income and active saving.[18]

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 equation (3). 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 negative effect on household savings when controlling for changes in own disposable income. This holds across all specifications and the effects are statistically significant on the one per cent 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 group, there seems to be little reason to restrict the reference group to a certain social group. According to the *ALL-concept*, a one euro increase in reference consumption leads the household

[18] 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 effects 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).

to reduce its savings ceteris paribus by about 13 cents. As the savings information in the SOEP captures active savings, i.e. the difference between household disposable income and consumption, the reduction of savings translates one to one into an increase in consumption as income is held constant. The results are strong evidence for KURJ-behaviour.

[Table 2: Savings and Ref. Consumption - Baseline.]

As expected, we also see that the negative effect of reference consumption is considerably stronger for class-hoppers than 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 also change and a change of reference group can even account for such adjustments. Thus, the estimated coefficient for $STAY$ers 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. Due to the lack of space, we do not report the coefficients for class-hoppers in the remaining estimations of this paper. In the following interaction and robustness analysis, we will focus on the *ALL-concept*.

4.2 Are Comparisons Directed Upwards?

Yes, they are. 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 3 reports the corresponding effects of reference consumption. In column (1) the household's reference group includes all households with a similar level of education, in column (2) the reference group consists of all households living in the same of Germany's 16 states and in column (3) these dimensions are combined such that all households with a similar level of education and the same state of residence form the reference group.[19] One immediately recognizes that outward-looking reference consumption exhibits substantially smaller and by far less significant effects on household savings. In columns (1) and (2), the effect is

[19] 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 a degree or with a non-standard degree are excluded from this analysis (8,894 observations).

not significant. Although the effect of reference consumption is significantly different from zero in column (3), it is substantially smaller compared the results of our baseline estimation which assumes upward-looking comparisons. The point estimate for the effect of reference consumption drops from about -0.13 (table 2, column (1)) to at most -0.04 (table 3, column (2)). We take this result as further evidence for the fact that comparisons are directed upwards. In addition, we find this result confirming one of our main assumptions regarding the construction of reference consumption.

[Table 3: Savings, Ref. Consumption - Including Poorer Households in Ref. Group.]

4.3 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 4 shows the corresponding estimation results according to equation (4).

[Table 4: Savings and Ref. Consumption - Interaction Analysis.]

Column (1) reveals that the point estimates for households whose head attended school for a maximum of nine years (LOW-EDU) as well as for households whose head received thirteen years of schooling or attended college or university (HIGH-EDU) are slightly higher compared to that of households whose head has attended school for at least ten and at most twelve years (MID-EDU). However, these differences are not statistically significant. Column (2) paints a similar picture with regard to differences between different types of employment. Households with a self-employed household head appear to be more prone to changes in reference consumption. 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 consumption. The coefficients do not differ significantly on the 5 per cent significance level. 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 saving and consumption.[20] Column (3) thus reports income class specific point estimates. We see that for all income deciles the effect of reference consumption upon household savings is negative and statistically highly significant. The only exception is at the lowest end of the income distribution, namely the first decile group. Here, the estimated coefficient is only significant at the 10 per cent level. Income classes 5 and 6 show the largest coefficients. The entire income distribution is affected by the consumption level of the respective reference group due to interpersonal comparisons. A graphical illustration of the class specific marginal effects of reference consumption is provided in figure 1. We see that the estimated effects do not vary systematically across income deciles 2 to 10 as all the 95 per cent confidence bands cover a spectrum ranging approximately from the point estimates of the second and the fourth income decile, i.e. values between -0.18 and -0.15.

[Figure 1: Marginal Effects of Ref. Consumption - Income Class Specific Effects.]

However, comparing the coefficients is not sufficient to determine whether certain parts of the income distribution are more prone to KURJ-behaviour than others. One has to take into account that the standard deviation of changes in reference consumption increases with the household's position in the income distribution. We thus multiply the estimated income-class specific effects with the standard deviation of reference consumption within the respective income classes. The resulting income-class specific impacts are contrasted in figure 2. This representation reveals that the actual impact of changes in reference consumption rises across income deciles. Income classes 2 to 4 and 5 to 9 differ considerably. The impact is most pronounced for households within the 10th income decile. While the coefficients do not differ significantly between income classes, the impacts in classes 5 through 9 are significantly different from the impacts in classes 2 through 4.

[Figure 2: Impact of Ref. Consumption - Income Class Specific Measures.]

[20] We will return to this issue in section 4.5 that discusses the implications of positional concerns for linking changing income inequality to the development of aggregate household savings.

4.4 Robustness

4.4.1 Exogeneity of Reference Consumption

One central challenge the literature on interpersonal comparisons faces regards 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 specific heterogeneity can still lead to spurious correlation between own and reference consumption. Income or consumption shocks that operate below the national level might be absorbed neither by the time nor state fixed effects. We address this crucial 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 an 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 living in the same state of residence from the 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 might affect our results. Column (3) shows the effects of reference consumption when this modified concept is used. The effects are somewhat smaller but still very relevant and significantly different from zero across the entire income distribution.

[Table 5: Savings, Ref. Consumption - Exogeneity of Ref. Consumption.]

4.4.2 Alternative Concepts of Reference Group

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

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

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 6 compares the results for these alternative concepts to the baseline specification. The baseline results are presented in column (1). Columns (2) and (3) summarize the regression outcomes for the two alternative measures of reference consumption of concepts (A) and (B) respectively. We see that for both robustness specifications the results are very similar to the baseline case suggesting that both the top of the distribution as well as the close vicinity matter to the household.

[Table 6: Savings, Ref. Consumption - Alternative Concepts of Ref. Group.]

4.4.3 Are the Effects Driven by a Certain Classification of the Consumption Distribution?

Further, we examine the robustness of our results across different categorizations of reference group. The baseline specification considered a decile classification of the distribution of consumption. Now we compare this to measures of reference consumption derived from categorizations that are based on 8 or 12 consumption classes. The respective estimation results are summarized in table 7. These modifications do not qualitatively alter our results. However, the significance of reference consumption and the overall model fit decrease with the reduction of the number of consumption classes. This is probably due to the associated loss of variation of reference consumption.

[Table 7: Savings, Ref. Consumption - Varying Number of Consumption Classes.]

4.4.4 Are the Effects Driven by the Degree of Smoothing Income and Savings Information?

Our baseline results were derived on the basis of income and savings measures that were slightly smoothed by applying a three-year moving average to mitigate the influence of erratic transitory income changes. This procedure is quite

common when assessing income-savings-relationships in household data as adjustments of savings to transitory income changes might not reflect a behavioural change but rather short-term outcomes of consumption smoothing behaviour. To examine to what extent our results are influenced by the degree of smoothing, we re-estimate our specification for current income and a five-year moving average of income. Table 8 illustrates the regression outcomes. Again, we see that the degree of smoothing income information does not substantially affect our results.

[Table 8: Savings, Ref. Consumption - Varying Degree of Income Smoothing.]

4.4.5 Are the Effects Driven by Outliers?

Finally, we examine whether our results are driven by extreme values in the distributions of the first differences of savings and income. We thus drop the top 0.1% on both sides of the distribution of the changes in own income, savings and reference consumption. Table 9 summarizes the results. We see that the effects of changes in reference consumption are not affected by outliers.

[Table 9: Savings, Ref. Consumption - Controlling for Outliers.]

4.5 Contribution Analysis

Next we demonstrate that upward-looking comparisons exhibit economically relevant effects. To this end we analyse the explanatory power of absolute and relative income shocks vis-a-vis changes in household savings across the income distribution. This analysis reveals to what extent household savings are not only driven by changes in own income but also influenced by relative positional shifts in the income distribution.

Figure 3 summarizes decile-specific mean changes in household savings and average changes in predicted savings, i.e. those elements of changes in savings that are explained by our model. From 2002 to 2011 within decile groups 1 to 7 mean real income fell between 7 and 15 euros per year. Within income decile groups 9 and 10 mean real income rose between about 6 and 10 euros per year. Changes in mean household savings, which only increased for households in decile classes 8 to 10, reveal similar pattern. In contrast, mean reference consumption rose in all income groups above the second income decile and in

particular within decile groups 5 to 9.[22] Average predicted savings move more or less in parallel with actual savings.

[Figure 3: Mean Changes of Income, Ref. Consumption, Savings and Predicted Savings by Income Deciles.]

The illustrated mean changes in real net household income mimic the rise in inequality in household net income as follows: While in the 9th and 10th income decile groups real net income rose, income deciles 1 to 7 were subject to income losses. The steady increase of reference consumption from the 3rd up to the 8th income decile reflects how these absolute income changes manifest themselves in terms of variations in relative income positions. This is because the income increases of rich households led to a rise in consumption in the top percentiles of the consumption distribution. As high consumption households are part of the upper range of the income distribution income gains transmit into the distribution of consumption.[23] Consequently, reference consumption for the majority of households in the upper half of the income distribution increased substantially. More precisely, these changes resulted in the specific hierarchy of relative income shocks as portrayed in figure 3. Here we observe that income decile groups 5 to 9 were affected most heavily by the consumption expansion of the highest consumption percentiles.

Figure 4 shows the relative contributions of own income and reference consumption to the predicted variation of household savings by income deciles.

[Figure 4: Explanatory Power of Income and Ref. Consumption for Savings by Income Deciles.]

This illustration offers three insights: First, according to our model, absolute and relative income shocks account for approximately 30 to 40 per cent of the variation in household savings. Second, the negative effect of perceived relative income losses on household savings is substantial. The reactions to rising reference consumption particularly affected household savings within income deciles 5 to 9. Third, the implications of changes in income inequality are even more specific, as the effects of absolute and relative income shocks on household savings may run in opposite directions. This is also visible, when comparing income

[22] It is important to keep in mind, that the top five per cent of the consumption distribution, and through this about 83 per cent of the top income vingtile, were excluded from our regressions. This restriction also holds for the representation in figure 3. Hence, the mean changes of own income in income reported for decile 10 is far too low. Without this restriction the mean increase of own income in the top decile group is approximately 39.5 euros.

[23] As mentioned above, 83.1 per cent of the top vingtile class within the consumption distribution also belong to the highest income vingtile.

deciles 5 to 7 with deciles 8 and 9. Within income deciles 5 to 7, the negative effect of rising reference consumption amplified the reduction of household savings triggered by absolute income losses. In contrast, within deciles 8 and 9, relative income losses partly counteracted the rise of savings stemming from absolute income gains.

5 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 through 2011 in order to estimate the causal 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 of 100 euros leads households to lower their savings and increase consumption by up to 23 euros depending on the household's position in the income distribution. 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 are included in 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 top income and consumption levels.

The economic consequences of such behaviour are substantial and particularly help in understanding the link between changes in income inequality and the development of aggregate household savings and consumption. For the German economy from 2002 to 2011 our model shows that up to 25 per cent of the variation in changes of household savings can be attributed to the repercussions of relative shocks, i.e. rising reference consumption.

With regard to the study of macroeconomic stability, our findings suggest that upward-looking comparisons can cause expenditure cascades triggered by increasing income inequality at the top of the distribution. When (increasingly) richer households raise their consumption level, middle class households try to keep up and raise their own levels of consumption despite stagnating disposable

income. Households at the bottom of the income distribution react to consumption increases at the very top and in the middle.[24] Our results can thus be taken as microeconometric evidence supporting analyses that connect rising inequality to macroeconomic developments or even economic instability in the spirit of Rajan (2010).

Our results further help to understand the reason for 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.[25] 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".[26]

[24]Frank et al. (2010) and Bertrand and Morse (2013) present evidence for expenditure cascades in the U.S.

[25]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).

[26]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.

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Appendix

Table 1: Summary Statistics of Main Variables.

	N	mean	p50	p25	p75	stdev	min	max
Δ SAVING	57656	1.1	0.0	-17.8	22.2	148	-12237	10874
Δ INC	63978	-2.8	-8.6	-90.7	86.0	345	-27731	9628
Δ REF (ALL)	57656	2.3	4.0	-43.8	53.1	299	-3258	3333
Δ REF (AGE)	57656	2.4	0.4	-64.0	65.3	301	-3498	3454
Δ REF (EDU)	57656	-3.6	-2.5	-54.6	51.9	287	-3939	4075
Δ REF (EAST)	57656	2.3	2.3	-45.4	68.4	302	-3391	3056

Table 2: Savings and Reference Consumption - Baseline.

VARIABLES	(1) ALL-Concept	(2) AGE-Concept	(3) EDU-Concept	(4) EAST-Concept
Δ INC	0.3067***	0.2975***	0.3386***	0.3074***
	[0.0275]	[0.0257]	[0.0621]	[0.0269]
Δ REF $\times$ STAY	-0.1254***	-0.0760***	-0.0986***	-0.0987***
	[0.0250]	[0.0136]	[0.0322]	[0.0165]
Δ REF $\times$ HOP	-0.1738***	-0.1685***	-0.2113***	-0.1732***
	[0.0133]	[0.0120]	[0.0379]	[0.0130]
Observations	51,633	51,750	52,364	51,571
R^2	0.3131	0.3087	0.3350	0.3118

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports results of the first difference estimation of the impact of reference consumption upon household savings. Δ INC denotes the first difference of the household's real disposable income. Δ REF is the first difference reference consumption. STAY equals one if the household does not change its consumption class j from period $t-1$ to t and HOP equals one if the household does change its consumption class. 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. 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.

Table 3: Savings, Reference Consumption - Including Poorer Households in Reference Group.

VARIABLES	(1) Education	(2) State	(3) State and Education
Δ INC	0.2168***	0.2124***	0.2174***
	[0.0383]	[0.0363]	[0.0383]
Δ REFOUT	-0.0104	-0.0275	-0.0355**
	[0.0332]	[0.0188]	[0.0155]
Observations	52,528	57,656	52,528
R^2	0.2252	0.2199	0.2256

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports results of the first difference estimation of the impact of reference consumption upon household savings. We control for reverse causality resulting from class-hoppers. Δ INC denotes the first difference of the household's real disposable income. Δ REFOUT is the first difference 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 4 (*ALL-concept*). 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 (3), 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.

Table 4: Savings and Reference Consumption - Interaction Analysis.

VARIABLES	(1) Education	(2) Employment Status	(3) Income Class
Δ INC	0.3067***	0.3067***	0.3518***
	[0.0275]	[0.0275]	[0.0236]
Δ REF × STAY × CL 1			-0.0853*
			[0.0502]
Δ REF × STAY × CL 2			-0.1815***
			[0.0453]
Δ REF × STAY × CL 3			-0.1565***
			[0.0455]
Δ REF × STAY × CL 4			-0.1538***
			[0.0511]
Δ REF × STAY × CL 5			-0.2408***
			[0.0500]
Δ REF × STAY × CL 6			-0.2434***
			[0.0512]
Δ REF × STAY × CL 7			-0.1910***
			[0.0548]
Δ REF × STAY × CL 8			-0.1895***
			[0.0444]
Δ REF × STAY × CL 9			-0.1210***
			[0.0360]
Δ REF × STAY × CL 10			-0.1434***
			[0.0457]
Δ REF × STAY × SELFEMPL.		-0.1897**	
		[0.0902]	
Δ REF × STAY × CIV.SERV.		-0.1153	
		[0.0780]	
Δ REF × STAY × WHITECOLLAR		-0.1228***	
		[0.0356]	
Δ REF × STAY × BLUECOLLAR		-0.1149***	
		[0.0328]	
Δ REF × STAY × UNEMPL.		-0.0704	
		[0.0530]	
Δ REF × STAY × OTHER	-0.0736	-0.1087***	
	[0.0612]	[0.0332]	
Δ REF × STAY × LOW-EDU	-0.1351***		
	[0.0304]		
Δ REF × STAY × MID-EDU	-0.1056***		
	[0.0347]		
Δ REF × STAY × HIGH-EDU	-0.1424***		
	[0.0403]		
Observations	51,633	51,633	51,633
R^2	0.3131	0.3131	0.3561

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports results of the analysis as to whether the effects of reference consumption are stronger for certain social subgroups. Δ INC denotes the first difference of the household's real disposable income. Δ REF is the first difference reference consumption. STAY equals one if the household does not change its consumption class j from period $t-1$. CL 1 to CL 10 denote income deciles. 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 nine 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-class specific effects.

Table 5: Savings, Reference Consumption - Exogeneity of Reference Consumption.

	(1) Baseline	(2) Robustness all states State-Year Interactions	(3) Robustness excl. own state
VARIABLES			
Δ INC	0.3518***	0.3521***	0.3514***
	[0.0236]	[0.0236]	[0.0236]
Δ REF × STAY × CL 1	-0.0853*	-0.0925*	-0.0621
	[0.0502]	[0.0498]	[0.0492]
Δ REF × STAY × CL 2	-0.1815***	-0.1867***	-0.1575***
	[0.0453]	[0.0453]	[0.0444]
Δ REF × STAY × CL 3	-0.1565***	-0.1596***	-0.1339***
	[0.0455]	[0.0462]	[0.0445]
Δ REF × STAY × CL 4	-0.1538***	-0.1535***	-0.1255**
	[0.0511]	[0.0510]	[0.0504]
Δ REF × STAY × CL 5	-0.2408***	-0.2453***	-0.2164***
	[0.0500]	[0.0502]	[0.0468]
Δ REF × STAY × CL 6	-0.2434***	-0.2435***	-0.2255***
	[0.0512]	[0.0510]	[0.0496]
Δ REF × STAY × CL 7	-0.1910***	-0.1899***	-0.1494***
	[0.0548]	[0.0547]	[0.0545]
Δ REF × STAY × CL 8	-0.1895***	-0.1844***	-0.1480***
	[0.0444]	[0.0450]	[0.0436]
Δ REF × STAY × CL 9	-0.1210***	-0.1211***	-0.0911***
	[0.0360]	[0.0358]	[0.0319]
Δ REF × STAY × CL 10	-0.1434***	-0.1418***	-0.0940**
	[0.0457]	[0.0455]	[0.0470]
Observations	51,633	51,633	51,633
R^2	0.3561	0.3573	0.3556

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports results of the first difference estimation of the impact of reference consumption upon household savings by income decile classes. We control for reverse causality resulting from class-hoppers. Δ INC denotes the first difference of the household's real disposable income. Δ REF is the first difference reference consumption. STAY equals one if the household does not change its consumption class j from period $t-1$. CL 1 to CL 10 denote income deciles. 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 4 (*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 absorbed by 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.

Table 6: Savings, Reference Consumption - Alternative Concepts of Reference Group.

VARIABLES	(1) Baseline	(2) Robustness A	(3) Robustness B
Δ INC	0.3518***	0.3339***	0.3964***
	[0.0236]	[0.0230]	[0.0254]
Δ REF × STAY × CL 1	-0.0853*	-0.0079	0.0055
	[0.0502]	[0.0676]	[0.0473]
Δ REF × STAY × CL 2	-0.1815***	-0.1208**	-0.0884**
	[0.0453]	[0.0524]	[0.0412]
Δ REF × STAY × CL 3	-0.1565***	-0.1281**	-0.0681
	[0.0455]	[0.0534]	[0.0415]
Δ REF × STAY × CL 4	-0.1538***	-0.1002*	-0.0652
	[0.0511]	[0.0563]	[0.0459]
Δ REF × STAY × CL 5	-0.2408***	-0.1779***	-0.1423***
	[0.0500]	[0.0555]	[0.0449]
Δ REF × STAY × CL 6	-0.2434***	-0.1652***	-0.1604***
	[0.0512]	[0.0510]	[0.0462]
Δ REF × STAY × CL 7	-0.1910***	-0.1012	-0.1004**
	[0.0548]	[0.0629]	[0.0408]
Δ REF × STAY × CL 8	-0.1895***	-0.1350***	-0.1014***
	[0.0444]	[0.0466]	[0.0253]
Δ REF × STAY × CL 9	-0.1210***	-0.0676*	-0.0399**
	[0.0360]	[0.0345]	[0.0162]
Δ REF × STAY × CL 10	-0.1434***	-0.1068**	-0.0568**
	[0.0457]	[0.0450]	[0.0240]
Observations	51,633	51,633	50,758
R^2	0.3561	0.3370	0.3868

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports results of the first difference estimation of the impact of reference consumption upon household savings by income decile classes. We control for reverse causality resulting from class-hoppers. Δ INC denotes the first difference of the household's real disposable income. Δ REF is the first difference reference consumption. STAY equals one if the household does not change its consumption class j from period $t-1$. CL 1 to CL 10 denote income deciles. 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 4 (*ALL-concept*). Columns (2) through (4) 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.

Table 7: Savings, Reference Consumption - Varying Number of Consumption Classes.

VARIABLES	(1) Baseline 10 Con. Classes	(2) Robustness 8 Con. Classes	(3) Robustness 12 Con. Classes
Δ INC	0.3518***	0.3083***	0.3937***
	[0.0236]	[0.0221]	[0.0247]
Δ REF × STAY × CL 1	-0.0853*	0.0091	-0.1432***
	[0.0502]	[0.0527]	[0.0482]
Δ REF × STAY × CL 2	-0.1815***	-0.0961**	-0.2316***
	[0.0453]	[0.0483]	[0.0440]
Δ REF × STAY × CL 3	-0.1565***	-0.0656	-0.2034***
	[0.0455]	[0.0496]	[0.0446]
Δ REF × STAY × CL 4	-0.1538***	-0.0817*	-0.2580***
	[0.0511]	[0.0464]	[0.0466]
Δ REF × STAY × CL 5	-0.2408***	-0.1320***	-0.2982***
	[0.0500]	[0.0496]	[0.0477]
Δ REF × STAY × CL 6	-0.2434***	-0.1608***	-0.2072***
	[0.0512]	[0.0504]	[0.0498]
Δ REF × STAY × CL 7	-0.1910***	-0.1206**	-0.2941***
	[0.0548]	[0.0496]	[0.0505]
Δ REF × STAY × CL 8	-0.1895***	-0.0432	-0.2762***
	[0.0444]	[0.0445]	[0.0469]
Δ REF × STAY × CL 9	-0.1210***	-0.0766**	-0.1784***
	[0.0360]	[0.0313]	[0.0413]
Δ REF × STAY × CL 10	-0.1434***	-0.0534	-0.1499***
	[0.0457]	[0.0428]	[0.0461]
Observations	51,633	51,633	51,633
R^2	0.3561	0.3146	0.3987

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports results of the first difference estimation of the impact of reference consumption upon household savings by income decile classes. We control for reverse causality resulting from class-hoppers. Δ INC denotes the first difference of the household's real disposable income. Δ REF is the first difference reference consumption. STAY equals one if the household does not change its consumption class j from period $t-1$. CL 1 to CL 10 denote income deciles. 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 4 (*ALL-concept*) where a decile classification is used to construct reference consumption. In column (2) the consumption distribution is divided into 8 classes. In column (3) we use 12 classes for the construction of reference consumption.

Table 8: Savings, Reference Consumption - Varying Degree of Income Smoothing.

VARIABLES	(1) Baseline MA(3)	(2) Robustness Current	(3) Robustness MA(5)
Δ INC	0.3518***	0.3418***	0.2299***
	[0.0236]	[0.0436]	[0.0218]
Δ REF × STAY × CL 1	-0.0853*	-0.0909*	-0.0791
	[0.0502]	[0.0502]	[0.0529]
Δ REF × STAY × CL 2	-0.1815***	-0.1351***	-0.0475
	[0.0453]	[0.0480]	[0.0488]
Δ REF × STAY × CL 3	-0.1565***	-0.2060***	-0.0438
	[0.0455]	[0.0467]	[0.0539]
Δ REF × STAY × CL 4	-0.1538***	-0.1485***	-0.1254**
	[0.0511]	[0.0464]	[0.0530]
Δ REF × STAY × CL 5	-0.2408***	-0.1668***	-0.1669***
	[0.0500]	[0.0448]	[0.0602]
Δ REF × STAY × CL 6	-0.2434***	-0.2489***	-0.0363
	[0.0512]	[0.0448]	[0.0647]
Δ REF × STAY × CL 7	-0.1910***	-0.2546***	-0.1255**
	[0.0548]	[0.0395]	[0.0562]
Δ REF × STAY × CL 8	-0.1895***	-0.1592***	-0.0618
	[0.0444]	[0.0500]	[0.0418]
Δ REF × STAY × CL 9	-0.1210***	-0.1015***	-0.0909***
	[0.0360]	[0.0300]	[0.0267]
Δ REF × STAY × CL 10	-0.1434***	-0.0501	-0.0286
	[0.0457]	[0.0475]	[0.0649]
Observations	51,633	76,395	31,469
R^2	0.3561	0.3245	0.2527

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note: This table reports results of the first difference estimation of the impact of reference consumption upon household savings by income decile classes. We control for reverse causality resulting from class-hoppers. Δ INC denotes the first difference of the household's real disposable income. Δ REF is the first difference reference consumption. STAY equals one if the household does not change its consumption class j from period $t-1$. CL 1 to CL 10 denote income deciles. 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 4 (*ALL-concept*) where three-year moving averages of savings, income and consumption are used. In column (2), we use current information, i.e. we do not apply smoothing. In column (3) we apply five-year moving averages.

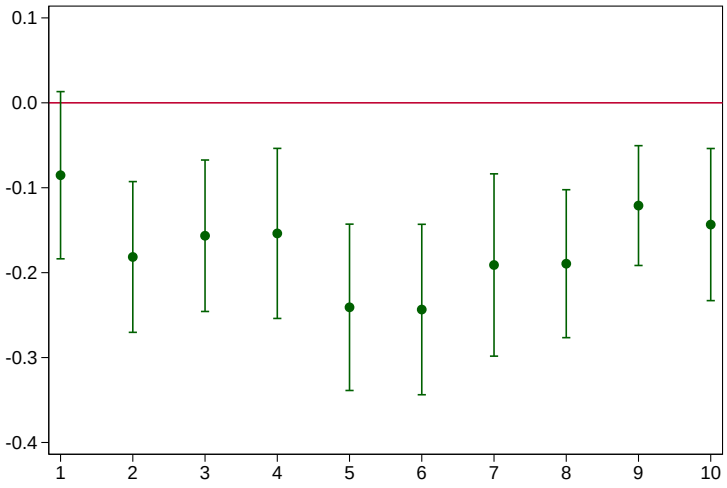
Table 9: Savings, Reference Consumption - Controlling for Outliers.

VARIABLES	(1) Baseline incl. outliers	(2) Robustness excl. outliers
Δ INC	0.3518***	0.3174***
	[0.0236]	[0.0089]
Δ REF $\times$ STAY $\times$ CL 1	-0.0853*	-0.0757
	[0.0502]	[0.0484]
Δ REF $\times$ STAY $\times$ CL 2	-0.1815***	-0.1710***
	[0.0453]	[0.0440]
Δ REF $\times$ STAY $\times$ CL 3	-0.1565***	-0.1435***
	[0.0455]	[0.0445]
Δ REF $\times$ STAY $\times$ CL 4	-0.1538***	-0.1444***
	[0.0511]	[0.0504]
Δ REF $\times$ STAY $\times$ CL 5	-0.2408***	-0.2292***
	[0.0500]	[0.0495]
Δ REF $\times$ STAY $\times$ CL 6	-0.2434***	-0.2299***
	[0.0512]	[0.0510]
Δ REF $\times$ STAY $\times$ CL 7	-0.1910***	-0.1799***
	[0.0548]	[0.0544]
Δ REF $\times$ STAY $\times$ CL 8	-0.1895***	-0.1759***
	[0.0444]	[0.0433]
Δ REF $\times$ STAY $\times$ CL 9	-0.1210***	-0.1162***
	[0.0360]	[0.0332]
Δ REF $\times$ STAY $\times$ CL 10	-0.1434***	-0.1267***
	[0.0457]	[0.0430]
Observations	51,633	51,397
R^2	0.3561	0.3167

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

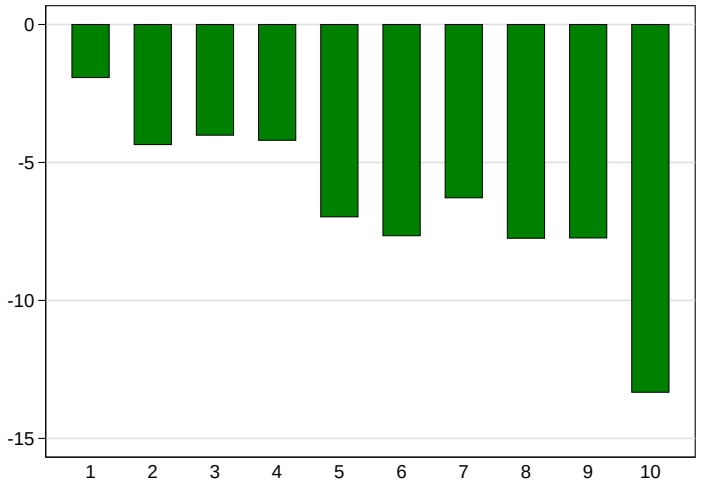
Note: This table reports results of the first difference estimation of the impact of reference consumption upon household savings by income decile classes. We control for reverse causality resulting from class-hoppers. Δ INC denotes the first difference of the household's real disposable income. Δ REF is the first difference reference consumption. STAY equals one if the household does not change its consumption class j from period $t-1$. CL 1 to CL 10 denote income deciles. 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 4 (*ALL-concept*) where outliers are not excluded. In column (2), we present the results based on a sample excluding extreme values of first differences in savings and income. Therefore, we dropped 0.1% on both sides of the distributions of the first difference of own income, savings and reference consumption.

Figure 1: Marginal Effects of Reference Consumption - Income Class Specific Effects.



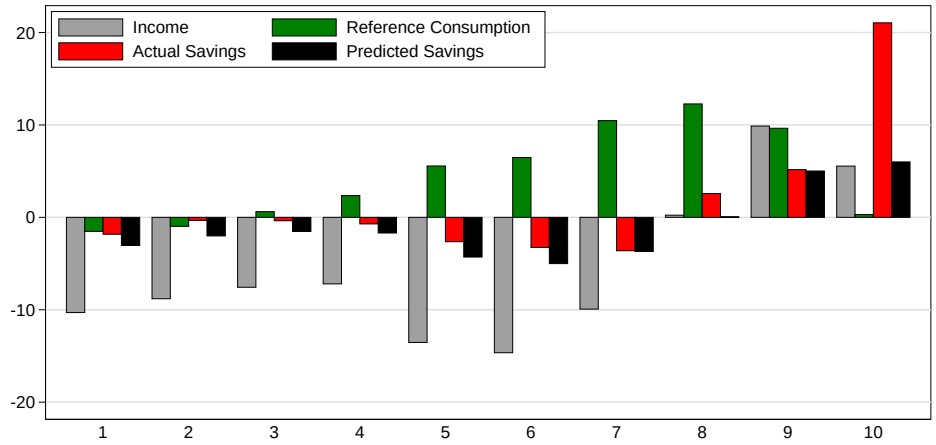
Note: This figure illustrates marginal effects of reference consumption by income decile classes. We control for changes in consumption classes. The illustration is based on the estimation results reported in column (3) of table 4. Confidence intervals correspond to the 95 per cent level of significance. The red horizontal line indicates the zero threshold for the coefficient.

Figure 2: Impact of Reference Consumption - Income Class Specific Measures.



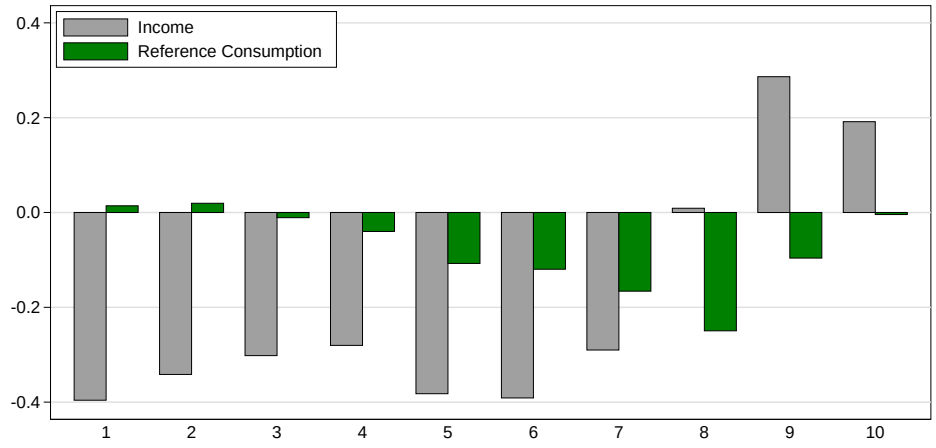
Note: This figure illustrates the impact of reference consumption by income decile classes. We control for changes in consumption classes. The impact measure is obtained by multiplying the coefficients from table 4 with the standard deviation of the change in reference consumption.

Figure 3: Mean Changes of Income, Reference Consumption, Savings and Predicted Savings by Income Deciles.



Note: This figure illustrates mean changes of income, reference consumption, and actual and predicted savings by income deciles from 2002-2011. For consistency reasons we apply the same restrictions with regard to consumption distribution as in our estimations. I.e., the top five per cent of the consumption distribution are excluded from this representation. These households belong to the 9th and the 10th income decile.

Figure 4: Explanatory Power of Income and Reference Consumption for Savings by Income Deciles.



Note: This figure illustrates relative contributions of changes in household income and reference consumption to variations in household savings. The bars correspond to the explanatory power of both regressors and are reported in per cent. After determining the regressors' contributions, we multiplied each with the respective signs of the coefficients and of the regressors.

Publisher: Hans-Böckler-Stiftung, Hans-Böckler-Str. 39, 40476 Düsseldorf, Germany
Phone: +49-211-7778-331, IMK@boeckler.de, http://www.imk-boeckler.de

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Fakten für eine faire Arbeitswelt.