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**Working Paper**

## Consumption-savings decisions under upward looking comparisons: Evidence from Germany, 2002-2011

SOEPPapers on Multidisciplinary Panel Data Research, No. 594

**Provided in Cooperation with:**

German Institute for Economic Research (DIW Berlin)

Suggested Citation: Drechsel-Grau, Moritz; Schmid, Kai D. (2013) : Consumption-savings decisions under upward looking comparisons: Evidence from Germany, 2002-2011, SOEPPapers on Multidisciplinary Panel Data Research, No. 594, Deutsches Institut für Wirtschaftsforschung (DIW), Berlin

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ISSN: 1864-6689 (online)

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

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September 2013

## Abstract

We demonstrate that interpersonal comparisons lead to "keeping up with the Joneses"-behavior. Using annual household data from the German Socio-Economic Panel, 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 household savings and consumption. When controlling for own income, an increase in reference consumption of 100 euros leads to an increase in consumption of 10 to 25 euros. Upper middle class households are most strongly affected. Our findings provide valuable input for macroeconomic models that consider the economic consequences of interdependent preferences.

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

*JEL classification:* D11, D12, E21

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\*We thank Daniel Kienzler, Johannes Pfeifer, Thomas Theobald and Till van Treeck for helpful comments and suggestions. We also thank Martin Adler and Gerd Ronning for helpful comments on an earlier draft of this paper.

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# 1 Introduction

Throughout the 20th century, income inequality and its potential consequences for macroeconomic stability were issues that mostly flew under the radar. This changed in the aftermath of the present financial and economic crisis which led many economists to conclude that rising income inequality might have been a central root-cause for the financial crisis in 2008. 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 in order to "keep up with the Joneses".<sup>1</sup> In combination with the growing availability of easy credit, rising consumption needs of low and middle class households were eventually financed through the expansion of loans rather than incomes. This credit-driven consumption was later revealed as unsustainable and brought about drastic economic consequences.<sup>2</sup> A central behavioral assumption underlying this line of argument is the relevance of positional concerns, i.e. interpersonal comparisons. Accordingly, low and middle class households compare their level of consumption to that of other households in society (reference consumption). Additionally, this comparison has to result in higher consumption needs.

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.<sup>3</sup> Using German micro data, Ferrer-i-Carbonell (2005) obtains similar results.<sup>4</sup> However, little is known as to whether these con-

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<sup>1</sup>Increasing income inequality has been characterized by rapid income growth at the top of the income distribution which in turn is mostly driven by rising wage inequality, especially at the top.

<sup>2</sup>Other prominent contributions that stress the macroeconomic risks of inequality were made by e.g. Stiglitz (2009), Galbraith (2012), Kumhof et al. (2012) and Al-Hussami and Remesal (2012).

<sup>3</sup>This negative effect of neighbors' earnings seems not to be driven by omitted variables. The author is able to exploit the panel dimension of his data set in order to test for biases resulting from individual or state fixed effects and local housing prices. He also uses a predicted measure for local earnings to control for local earnings shocks that are caused by unobserved factors which also influence well-being.

<sup>4</sup>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) and Dynan and Ravina (2007). See Frey and Stutzer (2002) or Luttmer (2005) for a more detailed discussion of the literature on self-reported well-being and happiness.

sumption externalities actually alter the economic choices of households. If the consumption of others only affects the level of utility but leaves marginal utility unchanged, optimizing households will chose the same consumption path as in a scenario without consumption externalities.<sup>5</sup> Duesenberry (1949) first introduced the idea that a household’s consumption-savings decision is determined by its position in the income distribution (Relative Income Hypothesis (RIH)). The saving rate is thus an increasing function of the household’s position in the income distribution. Low and middle class households save a smaller fraction of their income as their consumption aspirations are framed by the consumption of the rich. Alvarez-Cuadrado and Van Long (2011) present a permanent income version of the RIH where an individual’s consumption is determined by both his lifetime income and the lifetime income of his reference group which leads him to over-consume.<sup>6</sup>

This paper presents evidence that the implications of interpersonal comparisons are by no means confined to well-being or happiness but rather substantially affect households’ consumption-savings decisions. We use household panel data from the German Socio-Economic Panel (SOEP) for the years 2002 through 2011.<sup>7</sup> The SOEP data set is highly appropriate for carrying out such an investigation, as it provides yearly information on household disposable income and household savings. Assuming upward looking comparisons, we define a household’s reference group as all households that belong to a consumption class above the household’s own consumption class.<sup>8</sup> Thereby, we use the consumption distribution as an approximation of the perceived income distribution.<sup>9</sup> We find that reference consumption, defined as the mean consumption of all households in the reference group, negatively affects household savings. The panel structure of the SOEP allows us to take first time differences and thereby eliminate time-invariant unobserved factors. A one euro increase in the consumption of richer households reduces savings on average by 14 cents. Furthermore, we find evidence that it is especially the (upper) middle class that responds to con-

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<sup>5</sup>Dupor and Liu (2003) make clear that consumption externalities may raise the marginal utility of consumption relative to leisure and/or reduce the household’s level of utility. The authors refer to the former as ”keeping up with the Joneses” and to the latter as ”jealousy”.

<sup>6</sup>See Van Treeck (2013) for a detailed discussion of the literature on the macroeconomic impact of inequality and the reemergence of the Relative Income Hypothesis.

<sup>7</sup>Ferrer-i-Carbonell (2005) uses the same data set for her analysis of self-reported well-being.

<sup>8</sup>For that purpose, the consumption distribution is divided into deciles.

<sup>9</sup>This is because households cannot directly observe other households’ incomes but may indeed recognize changes in the consumption level of others. As the SOEP does not provide information on the budget share of different types of consumption, we are not able to further differentiate between observable and unobservable consumption.

sumption increases at the top. These findings prove to be robust with regard to specification.

This paper builds on previous studies that have empirically analyzed the economic consequences of positional concerns. Despite the insights from well-being research, there have been relatively few studies examining the extent to which comparison-effects impact the actual economic behavior of agents.<sup>10</sup> This changed following the financial downfall and economic crisis as both income inequality and the RIH have resurfaced as prominent topics in economics.<sup>11</sup> Valuable recent contributions that are most closely related to our analysis include Frank et al. (2010), Alvarez-Cuadrado and El-Attar Vilalta (2012) as well as Bertrand and Morse (2013). Frank et al. (2010) analyze U.S. census data to show that changes in a given group's expenditure affect the frame of reference which in turn impacts the level of consumption of those people right below them in the income distribution. 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. outward looking reference income. 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 class, induce lower levels of household savings when controlling for changes in own income. Bertrand and Morse (2013) present evidence for expenditure cascades using U.S. micro data from the Consumer Expenditure Survey: Households in the middle class react to rising consumption of the top income quintile by increasing their own expenditures in order to keep up with the expenditures of the rich.

Our analysis contributes to the literature in three ways: First, the panel structure of our data with yearly information on household savings and income enables us to estimate the causal effect of reference consumption on households' consumption-savings decisions. We apply the insights from the literature on self-reported well-being (e.g. Luttmer (2005)) to the recent research on expenditure cascades (e.g. Frank et al. (2010), Bertrand and Morse (2013)<sup>12</sup>).

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<sup>10</sup>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).

<sup>11</sup>See Van Treeck (2013) for a detailed discussion of these issues.

<sup>12</sup>Bertrand and Morse (2013) also find evidence that permanent income considerations, upwardly-biased expectations of future income or differences in housing prices cannot fully account for the correlation between consumption of the rich and consumption of the non-rich. However, they have to base their conclusions on state-year variation as the CEX is not structured as a panel.

That is, we construct household reference groups according to the insights of well-being research and investigate whether changes in consumption of richer households drive households' consumption-savings decisions. Our results thus confirm the hypothesis that the correlation between top-income consumption and middle class consumption levels to a large extent caused by interpersonal comparisons, i.e. "keeping up with the Joneses"-behavior (KUJ-behavior). We believe that our microeconomic findings may serve as a valuable input for macroeconomic models incorporating multiple agents and interdependent preferences. Second, by constructing class-specific reference groups, we are able to examine whether positional concerns vary across the income distribution. This seems to be the case: Households in the (upper) middle class are most strongly affected by the consumption level of their respective reference groups. Third, we link our microeconomic evidence to the evolution of income inequality.

The remainder of this paper is structured as follows: Section 2 presents a more formal version of our conceptual approach and section 3 outlines the empirical strategy. Section 4 discusses the data and section 5 presents estimation results of the role of upward looking comparisons for the consumption-savings decision of households. Based on our micro-economic findings, section 6 elaborates on the link between rising income inequality and the development of household savings which offers a deeper understanding of the evolution of aggregate household savings and consumption in Germany from 2002 to 2011. Subsequently, section 7 addresses further implications of our findings, namely the evolution of consumption inequality and the links between income inequality, household savings and macroeconomic stability. Section 8 concludes.

## 2 Conceptual Approach

In order to formalize the intuition behind our conceptual approach outlined in section 1, imagine a household whose utility depends on own consumption and leisure as well as 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 income or the level of consumption of the household's reference group.<sup>13</sup> The analysis of whether interpersonal comparisons affect households' consumption-savings decisions requires one to address two questions: (i) Which variable drives interpersonal comparisons? (ii) Who forms the reference group of a household?

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<sup>13</sup>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).



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.<sup>14</sup> 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 others people’s income levels. People usually observe what people consume and use this information to make inferences with respect to their income levels. 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. We use the distribution of consumption to approximate the perceived income distribution.<sup>15</sup> 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 in interpersonal comparisons.<sup>16</sup> We therefore define  $REF_i$  as the average consumption level of the household’s reference group,  $\bar{C}_i$ .<sup>17</sup>

The answer to the question as to who belongs to a household’s reference group is not as straight forward. In order to attach a causal interpretation to the estimated effect of reference consumption, however, the reference group has to be correctly defined. To determine the household’s reference group, we turn to two findings of the literature on self-reported well-being and theoretical contributions. Most importantly, interpersonal comparisons tend to be directed upwards as is found by Ferrer-i-Carbonell (2005) who shows that comparisons are

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<sup>14</sup>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.

<sup>15</sup>As the SOEP does not provide detailed information on individual or household expenditures, we have to compute household consumption as household disposable income less household savings. A description of our key variables is provided in section 4.

<sup>16</sup>We are unable to further differentiate between different kinds of consumption goods with regard to their degree of visibility. Heffetz (2011) ranks different expenditures based on their visibility. Bertrand and Morse (2013) use this visibility score but find only weak evidence for varying positionality with regard to the degree of visibility.

<sup>17</sup>This approach is similar to Bertrand and Morse (2013) who use the expenditures of the rich to explain the expenditures of the non-rich.

asymmetric. In her micro-econometric 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 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. The reference group of a household thus consists of all households with a higher relative position in the perceived income distribution. This is in line with the theoretical predictions of the Relative Income Hypothesis by Duesenberry (1949).

Moreover, it is often assumed that the reference group is defined along categories such as region of residence, age or education.<sup>18</sup> However, there is no consensus as to which of these categories matters most. Easterlin (1995), for example, uses none of these categories assuming that people compare themselves to all citizens of their country.

We attempt to combine these findings as follows: 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 simply includes 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. According to these assumptions, the household's utility results in  $U_i = U(C_i, \bar{C}_{c,j(c)})$ , where the subscript  $c$  is the concept of reference group and  $j(c)$  denotes the household's consumption class in the relevant (sub-)population according to the concept used.

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.

In our baseline specification, we divide the consumption distribution of the relevant (sub-)population(s) into ten classes of equal size. The reference group of a household is then defined as all households who belong to consumption classes above the household's own consumption class and are part of the same

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<sup>18</sup> Among others, Luttmer (2005), Dynan and Ravina (2007), Kapteyn et al. (1997), Ferreri-Carbonell (2005), McBride (2001) use one or more of these categories to construct reference groups.

(sub-)population. Hence, the reference group of a household in the fifth decile includes all households of deciles six through ten.<sup>19</sup> Our decile classification results in the top ten percent of the consumption distribution not having an upward looking reference group which does not seem plausible. We thus split the upper ten percent and define the top five percent as the reference group of households in the nineteenth vingtile.<sup>20</sup>

## 2.1 The consumption-savings decision under interpersonal comparisons

As afore-mentioned, interdependent preferences do not directly imply KUJ-behavior. If reference consumption,  $\bar{C}_{c,j(c)}$ , 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:

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

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  $h$ . The aim of this paper is to test the main prediction of the RIH, i.e. whether a household's consumption-savings decision is also a function of reference consumption,  $\bar{C}_{c,j(c)}$ . The expected sign of the effect of reference consumption is positive. Hence, under KUJ-behavior, the household's consumption function evolves into:

$$C_{i,t} = f(\bar{C}_{c,j(c),t}, INC_{i,t}, \dots, INC_{i,t+h}, W_{i,t}, AGE_{i,t}, MACRO_t) \quad (2)$$

The assumption of linearity in our econometric model 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

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<sup>19</sup>This allows the top of the distribution to impact the middle and lower classes. This approach has also been suggested by Alvarez-Cuadrado and El-Attar Vilalta (2012) who apply a quintile categorization.

<sup>20</sup>As will be explained below, the top five percent of the consumption distribution are excluded from our regression analysis.

consumption leading to a consumption function that is linear in own lifetime income and lifetime income of the reference group.<sup>21,22</sup>

### 3 Empirical Strategy

In this section, we discuss the identification of the stylized consumption function derived in equation (2). Since we define 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*.<sup>23</sup>

#### 3.1 Baseline Model

Due to the fact that the SOEP questionnaire asks saving information rather than consumption information, we use household savings as our dependent variable. As the savings variable captures information on active savings, this does not make a difference. 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. We thus estimate the following baseline equation using pooled OLS:

$$\begin{aligned} \Delta S_{i,t} = & \alpha + \beta_1 \Delta INC_{i,t} + \beta_{2,S} \Delta REF_{i,t} \times STAY_{i,t} + \beta_{2,H} \Delta REF_{i,t} \times HOP_{i,t} \\ & + \delta \mathbf{X}_{i,t} + \gamma \mathbf{STATE}_{i,t} + \theta \mathbf{TIME}_t + \epsilon_i. \end{aligned} \quad (3)$$

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<sup>21</sup>Ljungqvist and Uhlig (2000) also model relative consumption additively.

<sup>22</sup>Although empirical studies dealing with the importance and effects of interdependent preferences is scarce, there are quite a few other theoretical contributions exploring the effects of interpersonal comparisons. See for example Abel (1990), Galí (1994), Carroll et al. (1997), Liu and Turnovsky (2005) or Al-Hussami and Remesal (2012).

<sup>23</sup>About one third (34.2 percent) of the households in our sample are class-hoppers.

Thereby,  $STAY_{i,t}$  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.

Our estimation strategy has a number of advantages that stem from the fact that the panel structure of the SOEP enables us to eliminate many unobserved factors that might otherwise challenge the causal interpretation of the coefficient on reference consumption. In particular, we are able to take first time differences of household savings, own income and reference consumption eliminating time-invariant unobserved individual factors.<sup>24</sup> This eliminates the potential problem that households with identical disposable income self-select themselves into different consumption classes according to, for example, different types of friends and free-time activities that require varying consumption expenditures. In addition, time-invariant regional heterogeneity such as differences in regional housing prices will not drive our results. We believe that the ability to estimate in first differences is one of the major advantages of our analysis as it allows us to focus on the variation within household behavior over time rather than variation across households for a given point in time. The estimated parameter tells us how strong households react to a one unit increase in the consumption level of richer households. All national macroeconomic variables, e.g. the interest rate or national business cycles, are absorbed by the time dummies. We do not expect regional business cycles that potentially affect the consumption level of all households in the respective region to drive our results as our concepts of reference group are not defined along regional dimensions such as state of residence. Except for the *EAST-concept*, households' reference groups include households from the entire country, i.e. reference consumption is defined as the national mean consumption level of households in higher consumption classes. Regional business cycles thus either off-set or are absorbed by the time-dummies.<sup>25</sup> By taking three-year moving averages of household consumption and income, we control for transitory fluctuations. The Permanent Income Hypothesis predicts that households smooth transitory fluctuations in current income and only ad-

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<sup>24</sup>Most previous studies such as Bertrand and Morse (2013) as well as Alvarez-Cuadrado and El-Attar Vilalta (2012) exploit state-year variation in reference consumption and do not estimate in first difference. Even though their results prove to be robust to, for example, the inclusion of regional housing prices, unobserved heterogeneity may still be present.

<sup>25</sup>Including a full set of interactions between state and year dummies does not change the results. We do not report these estimation results here.

just consumption in response to permanent income changes. This argument can easily be extended to the household’s relative position.<sup>26</sup> Since the upper five percent of the consumption distribution cannot be assigned an upward looking reference group, we exclude these households from the estimations.<sup>27</sup> We cluster robust standard errors at the household level.

### 3.2 Interaction Analysis

We further ask whether interpersonal comparisons impact certain parts of the income distribution more than others. As we are interested in the income distribution of the entire population, we only use the *ALL-concept* for this analysis. Moreover, we examine whether the effect of reference consumption differs systematically between social subgroups. 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. In equation (4) this is captured in the interactions with the vector of dummy variables  $INT_{i,t}$ .

$$\begin{aligned} \Delta S_{i,t} = & \alpha + \beta_1 \Delta INC_{i,t} + \beta_{2,S} \Delta REF_{i,t} \times STAY_{i,t} \times \mathbf{INT}_{i,t} \\ & + \beta_{2,H} \Delta REF_{i,t} \times HOP_{i,t} + \delta \mathbf{X}_{i,t} + \gamma \mathbf{STATE}_{i,t} \\ & + \theta \mathbf{TIME}_t + \epsilon_i. \end{aligned} \tag{4}$$

Moreover, to compare the impact of reference consumption on household savings, we multiply the income-class specific coefficients with the income class specific standard deviation of the change in reference consumption. Using Wald-tests, we then test whether the impact of reference consumption differs across the income distribution.

### 3.3 Robustness Analysis

In addition to the baseline estimations introduced so far we carry out a number of robustness checks. Accordingly, we compare alternative definitions of reference group. We reduce the reference group of a household to the consumption class that is directly above the household’s own class. This eliminates the impact of the (very) rich for low and middle class households. We also examine whether the results hold up if this neighboring consumption class is excluded

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<sup>26</sup>Our approach follows Kopczuk and Song (2010) who take five-year-moving averages to approximate permanent earnings.

<sup>27</sup>This procedure has also been applied by Bertrand and Morse (2013).

from the reference group as the effects might be solely driven by what happens to the consumption level of the households that have only a slightly better relative position. Moreover, we test whether our results are driven by the exact classification of the consumption distribution. Instead of using deciles, we construct our concepts of reference group using 8 and 12 classes. We also investigate whether the results change significantly when taking five-year moving averages of income and savings or when not smoothing at all. Finally, we examine whether our estimates are affected by outliers in our sample.

## 4 Data

### 4.1 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 data set 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. In this period, each year features over 10,000 households. 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 observations and at least 10,708 households in any given year.<sup>28</sup> Table 3 provides basic summary statistics for our main variables.

[ Table 3: Summary Statistics of Main Variables. ]

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<sup>28</sup>In total, our restrictions lead to the loss of 5165 observations

## 4.2 Measure of Disposable Household Income, Savings and Consumption

Our measure of disposable income is real monthly household net income. The SOEP also contains information on households' yearly income, which provides more comprehensive information on income as it includes further income components such as the Christmas bonus. Since the saving information is only collected on a monthly basis, we use monthly income for consistency reasons.

The saving information used in our analysis is based on the one-shot question in the SOEP questionnaire which is supposed to measure active saving<sup>29</sup>:

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 phrasing of the question implies that payments to private pension or life insurance schemes as well as building loan contracts are most likely to be included in this measure of saving. We assume that information on savings is documented less accurately than income measures 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 a different interpretation of the term savings across households do not necessarily bias the level of savings in a systematic way. Second, and more importantly, in our regressions we apply first differences of household savings rather than levels. Hence, even systematic time-invariant over- or underestimation within households does not affect our estimation of the causal effect of changes in reference consumption on changes in household savings.

For consistency reasons, we understand household consumption as the difference between monthly income and saving. Unlike other micro data sets such as

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<sup>29</sup>Alvarez-Cuadrado and El-Attar Vilalta (2012) as well as Dynan and Zeldes (2004) use active and passive saving measures in their respective analysis. Here, passive saving is defined as the change of wealth whereas active saving is the change of wealth net of capital gains. Their results do not differ substantially with regard to the measure of saving used. For our analysis, however, households' active consumption-savings decision are best captured by an active savings measure that does not include price effects. 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.



the U.S. Consumer Expenditure Survey (CEX), the SOEP does not contain detailed information on expenditures. We thus cannot further distinguish between very visible and positional consumption goods and other less positional goods.<sup>30</sup>

## 5 Results

This section presents empirical evidence for the relevance of upward looking comparisons for households' consumption-savings decisions. Subsections 5.1 and 5.2 present the estimation results of our empirical model. Subsections 5.3.1 through 5.3.5 address selected robustness aspects.

### 5.1 Baseline

*Yes, they do.* Table 1 shows the estimation results for our baseline specifications, i.e. all four concepts of reference group. That is, column (1) reports the estimated effect of reference consumption when the upward looking reference group includes the entire population. 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 affects households' consumption-savings decisions for all specifications of reference group. However, one has to mention that the *ALL-concept* delivers slightly higher coefficients in absolute value. Nowadays, households are closely connected via modern communication technologies. Hence, it is intuitive that households living in East Germany compete with households 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 is also very restrictive. Even though the coefficients do not differ significantly with varying definitions of reference group, there is little reason to restrict the reference group to a certain social group.<sup>31</sup>

The core result of table 1 is that reference consumption does have a significant negative effect on household savings when controlling for changes in own disposable income. This effect is statistically significant on the one percent level.

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<sup>30</sup>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).

<sup>31</sup>Keep in mind that all concepts feature upward looking comparisons. If this assumption is dropped so that reference groups are only defined along certain social characteristics such as age, education or state of reference, the reference group does no longer exhibit significant effects on households' consumption-savings decisions.

**Table 1:** Savings and Reference Consumption.

	(1)	(2)	(3)	(4)
VARIABLES	ALL-Concept	AGE-Concept	EDU-Concept	EAST-Concept
$\Delta$ INC	0.3067*** [0.0275]	0.2975*** [0.0257]	0.3386*** [0.0621]	0.3074*** [0.0269]
$\Delta$ REF $\times$ STAY	-0.1254*** [0.0250]	-0.0760*** [0.0136]	-0.0986*** [0.0322]	-0.0987*** [0.0165]
$\Delta$ REF $\times$ HOP	-0.1738*** [0.0133]	-0.1685*** [0.0120]	-0.2113*** [0.0379]	-0.1732*** [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.

The coefficient on reference consumption is largest for the *ALL-concept*. This indicates that households compete with all richer citizens. Accordingly, a one euro increase in the average consumption level of a household's reference group leads the household to reduce its savings ceteris paribus by about 13 cents. As the savings information in the SOEP clearly captures active saving, 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 KUJ-behavior.<sup>32</sup>

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 their consumption classes. One might argue that the mechanism of changing consumption levels that may be 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

<sup>32</sup>The coefficient for own income may well be endogenous, i.e. biased upwards. Even though own income is only a control variable in our analysis, this endogeneity could affect the regression outcomes for the variables of prior interest. This is not the case. In fact, a GMM estimation that instruments own income with all available and eligible lags yields a smaller coefficient for own income (slightly above 0.2) while the coefficients of reference consumption remain virtually unchanged. These results are available on request from the authors.

this somewhat conservative approach and accept the potential underestimation of the 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 also focus on the *ALL-concept*.

## 5.2 Interaction Analysis

We are further interested in whether the effects of interpersonal comparisons differ between socio-economic subgroups. We thus 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 2 shows the estimation results of our 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, this difference is not statistically significant on any conventional level of significance. 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 and are likely to be positively correlated with the importance of relative consumption. Yet again, the coefficients do not differ significantly on the 5 percent significance level. The results reported in columns (1) and (2) suggest that the effects of interpersonal comparisons are by no means 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.<sup>33</sup> 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.<sup>34</sup> The only exception

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<sup>33</sup>We will return to this issue in section 6 that discusses the implications of positional concerns for linking changing income inequality to the development of aggregate household savings.

<sup>34</sup>Most of the point estimates are actually larger than the overall average effect reported in column (1) of table 1.

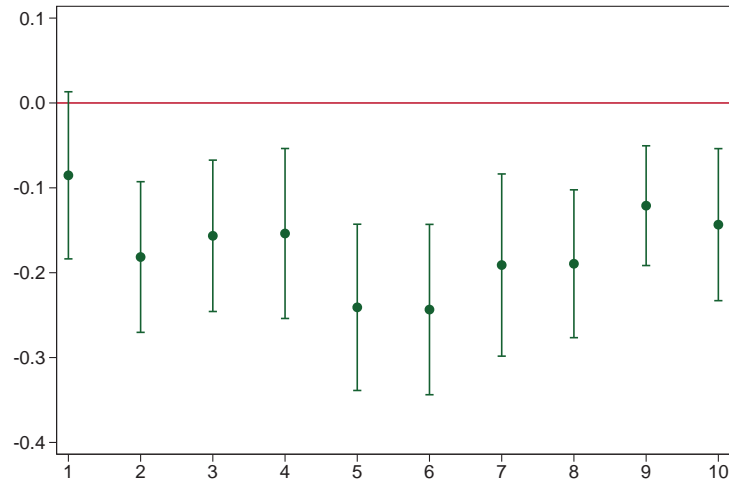
is at the lowest end of the income distribution, namely the first decile group. Here, the estimated coefficient is only significant at the 10 percent level. Income classes five and six have the largest coefficients. The entire income distribution is affected by the consumption level of the respective reference group due to interpersonal comparisons. A graphical illustration of the class specific marginal effects of reference consumption is provided in figure 1. From figure 1 we conclude that the estimated effects do not vary systematically across income deciles two to ten. We see that all the 95 percent 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.<sup>35</sup>

However, we argue that comparing the coefficients is not sufficient in order to determine whether certain parts of the income distribution are more prone to KUJ-behavior. 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 two to four and five to nine 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.

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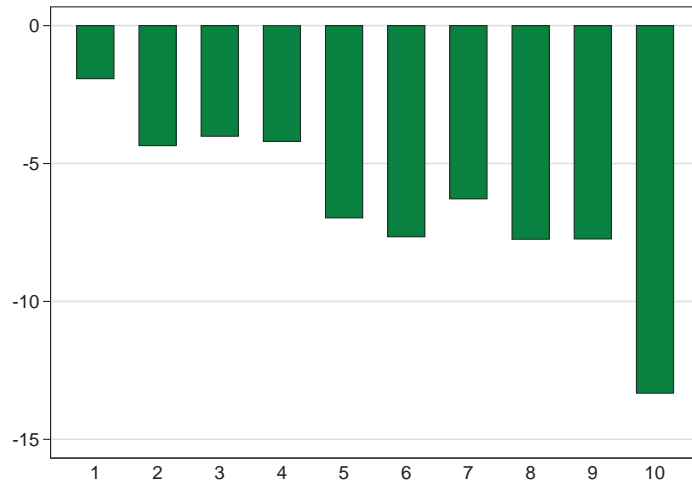
<sup>35</sup>This graphical impression is confirmed by Wald-tests for homogeneity of the class specific effects.

**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 2. Confidence intervals correspond to the 95 percent 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 2 with the standard deviation of the change in reference consumption.

**Table 2:** Savings and Reference Consumption - Interaction Analysis.

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

### 5.3 Robustness

In this subsection, we test whether the strong evidence for the existence and economic relevance of upward looking comparisons for household consumption-savings decisions is driven by certain assumptions that were made with regard to the construction of reference groups or other specification details. In the following we take the *ALL-concept* with income-class specific effects as the baseline. This allows us to examine whether our two major findings are robust to variations in specification: First, positional concerns drive the consumption-savings decision of all households significantly. Second, the (upper) middle class is especially affected by the consumption of the reference group. Hence, all robustness estimations include an interaction with income-class dummy variables.

#### 5.3.1 Alternative Concepts of Reference Group

In our baseline concepts, reference consumption is defined as the mean consumption of households above one's own consumption decile. We examine whether the results are driven by either the consumption class directly above the household's own one (A) or by the consumption of those households having a significantly higher position in the perceived income distribution (B). This former, concept A means that, for example, the reference group of a household in the fifth consumption class only includes the households of the sixth consumption class.<sup>36</sup> 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 (concept 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 tests whether the results are driven by the households who appear to be just slightly richer.

Table 4 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 concept A and B respectively.

[ Table 4: *Savings, Ref. Consumption - Alternative Concepts of Reference Group.* ]

We see that for both robustness specifications the results are very similar to the baseline case, though statistically slightly less significant. The point estimates are also somewhat smaller in absolute value. Deviations from the baseline are as follows: For both alternatives the coefficient for the first income decile is

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<sup>36</sup>Again, we use a decile classification.

no longer significant and coefficient estimates are generally smaller. This suggests that both the top of the distribution as well as the close vicinity matter to the household. Table 4 thus supports the idea that the reference group should include all households that are perceived to be richer.

### **5.3.2 Are the Effects Driven by Uncertainty Following the Financial Crisis?**

The second concern we have is the fact that our sample includes the period of the financial and economic crisis. The wealth losses of 2008 and the tremendous uncertainty associated with the risk of a global financial collapse might have affected households' expectations with regard to future income. Even though the time dummies should pick up global shocks to expected future income, there might be a unusually high degree of variability in our data. To this end, we compare the baseline results to an estimation covering only the years 2002-2007. As this subsample does not include the crisis years from 2008 onwards, the measured effects are not influenced by potential behavioral shifts or random fluctuations associated with the financial crisis. The results of this robustness check are reported in table 5. Column (2) reveals that the post-Lehman years do not drive the results. On the contrary, the estimates even increase when these years are excluded from the estimation. The observed behavioral pattern is active in both times of stability and in times of turmoil and crisis.

*[ Table 5: Savings, Ref. Consumption - Influence of Financial Crisis. ]*

### **5.3.3 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 and 12 consumption classes. The respective estimation results are summarized in table 6. 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 6: Savings, Ref. Consumption - Varying Number of Consumption Classes. ]*



### 5.3.4 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 behavioral change but rather short-term outcomes of consumption smoothing behavior. 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 7 illustrates the regression outcomes. Again, we see that the degree of smoothing income information does not substantially affect our results.

[ Table 7: Savings, Ref. Consumption - Varying Degree of Income Smoothing. ]

### 5.3.5 Are the Effects Driven by Outliers?

We also need to check if 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 8 summarizes the results. We see that the effects of changes in reference consumption are not affected by outliers.

[ Table 8: Savings, Ref. Consumption - Controlling for Outliers. ]

We thus conclude that reference consumption causally affects households' consumption-savings decisions. The effect is most pronounced for households in the (upper) middle class, i.e. income deciles five through nine. Interpersonal comparisons not only influence people's level of utility but also lead to KUJ-behavior as reference consumption does indeed affect the way households split their income between consumption and savings. These results are not sensitive with regard to changes in specification and constitute a central aspect of household behavior.

## 6 Making a Case for Changing Income Inequality

In this section we demonstrate that upward looking comparisons exhibit economically relevant effects and discuss the implications for interpreting the economic development in Germany over the last decade. To this end we analyze the explanatory power of absolute and relative income shocks vis-a-vis changes

in household savings across the income distribution. This allows us to assess the implications of changes in income inequality for the evolution of aggregate household savings and consumption.

One basic idea underlying this part of the analysis is that, in periods of changing income inequality, households are subject to both absolute and relative income shocks. Absolute income shocks correspond to changes in own household income. Under upward looking comparisons relative income shocks correspond to perceived income changes of households above the respective household's own position in the income distribution. In the following we approximate the effect of perceived relative income shocks on household savings by modelling the impact of variations of reference consumption. We adopt this approach because the variations of reference consumption are more visible and therefore more relevant for behavioral patterns of households than variations of the income of reference groups. Moreover, the pronounced income increases in the upper part of the income distribution came along with a corresponding rise in consumption of rich households. Based on this conceptual approach, we exploit the behavioral insights suggested by our estimation results presented in section 5. 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.

## 6.1 Asymmetric Income Shocks and Household Savings Across the Income Distribution

In the last decade Germany experienced a steady increase in inequality of net household income.<sup>37</sup> According to the Gini-coefficient, the concentration of household net income has risen by approximately 11.5 percent from 0.296 in 2002 to 0.330 in 2011. The rise in income inequality is also reflected in the movement of the basic regressors in our empirical model. This is illustrated in figure 3 which contrasts the mean changes of income and reference consumption across income deciles. The representation shows the extent to which the impact of absolute and relative income shocks varied across the income distribution. Additionally, 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.<sup>38</sup> Within income decile groups 9 and 10 mean real

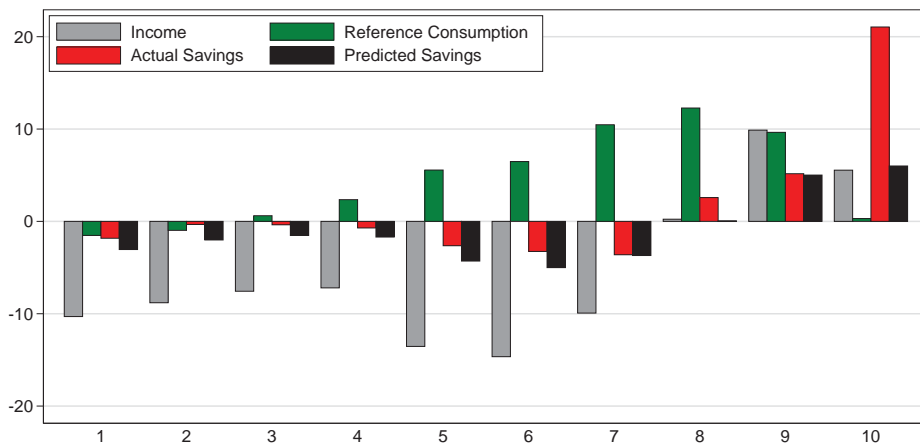
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<sup>37</sup>For a discussion of the major explanatory factors for this development see Biewen and Juhasz (2012) or Schmid and Stein (2013).

<sup>38</sup>All variables are deflated to 2005 prices using the Consumer Price Index.

income rose between about 6 and 10 euros per year. A very similar pattern can be discerned for the changes in mean household savings, which only increased for households in decile classes 8 to 10. In contrast, mean reference consumption rose in all income groups above the second income decile and in particular within decile groups 5 to 9.<sup>39</sup> Average predicted savings move more or less in parallel with actual savings.

**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 percent of the consumption distribution are excluded from this representation. These households belong to the 9th and the 10th income decile.

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

<sup>39</sup>It is important to keep in mind, that the top five percent of the consumption distribution, and through this about 83 percent 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.

into the distribution of consumption.<sup>40</sup> 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.

## 6.2 Relative Contributions of Income and Reference Consumption

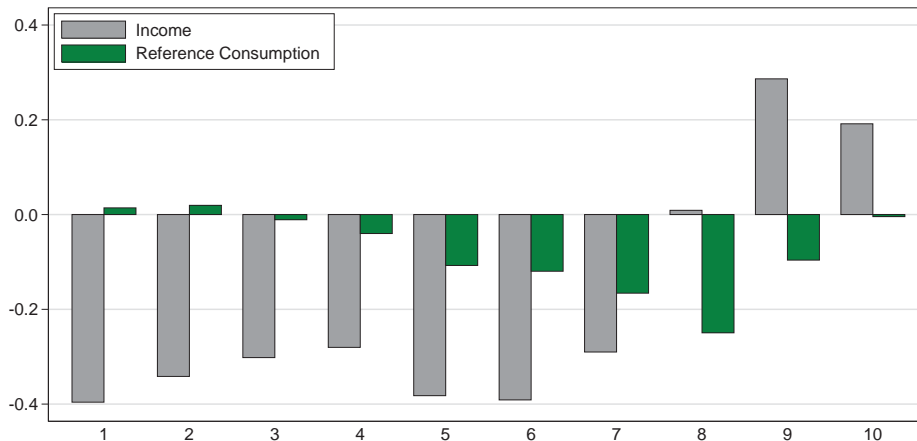
Finally, we examine how inequality changes affect aggregate household savings if households' consumption-savings decisions are subject to upward looking comparisons. This issue involves a number of questions: *Are changes in the income distribution actually relevant for developments in household savings? How much of the measured variation in savings can be explained by absolute and relative income shocks? To what extent may this vary across the income distribution?* To answer these questions, we combine our regression results for households' adjustments of savings to income shocks with the actual shifts in the income distribution experienced in Germany from 2002 to 2011. To this end, we analyze the explanatory power of income and reference consumption in our model. Therefore, we calculate the relative contributions of these two regressors to the predicted variation of household savings. This is done for each income class. The resulting income group specific contributions of income and reference consumption to variations in household savings are presented in figure 4.

This illustration offers three insights that relate to the above raised questions: First, changing income inequality does indeed exhibit substantial effects upon the development of household savings and consumption. According to our model, absolute and relative income shocks account for approximately 30 to 40 percent of the variation in household savings. Second, we recognize that 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, we see that, 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 deciles 5 to 7 with deciles 8 and 9. Within income decile groups 5 to 7, the negative effect of rising reference consumption amplified the reduction of household savings triggered by absolute

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<sup>40</sup>As mentioned above, 83.1 percent of the top vingtile class within the consumption distribution also belong to the highest income vingtile.

**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 percent. After determining the regressors' contributions, we multiplied each with the respective signs of the coefficients and of the regressors.

income losses. In contrast, within decile groups 8 and 9, relative income losses partly counteracted the rise of savings stemming from absolute income gains.

With regard to the macroeconomic implications of these results it is worth pointing out that, despite the negative impact of upward looking comparisons on the development of household savings and the experienced income losses for the majority of households in the examined time-span, aggregate household savings increased. The most important reason for this is the absolute income increase that has taken place within the upper part of the income distribution. The highest income decile experienced by far the strongest income gains.<sup>41</sup> Nevertheless, as predicted by our model, taking into account that people are influenced by positional concerns implies a substantial drop in household savings compared to an evolution of savings in a hypothetical world in which households would not have reacted to relative income shocks.

<sup>41</sup>Note that this is not directly visible from the illustration presented in figure 3 as the 10th income group of our sample is only partly incorporated due to the exclusion of the top five percent consumption households from our regressions and the illustration in figure 3.

## 7 Discussion

This section addresses further implications of our findings. First, subsection 7.1 relates our results to studies that examine the relative development of consumption inequality in contrast to income inequality. Second, subsection 7.2 discusses the implications of upward looking behavior in the context of the recently stressed argument that income inequality might have contributed to the macroeconomic fragility in the run up to the financial crisis in the U.S.

### 7.1 Consumption versus Income Inequality

The evolution of income and consumption inequality has been subject to several empirical studies on household data for different countries. The tenor of this research is that over the past decades consumption inequality grew at a much slower pace than income inequality. This 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).<sup>42</sup>

This divergence of income and consumption inequality is usually explained by the fact that income shocks are only perceived as transitory and households consequently keep their levels of consumption comparably stable. However, Kopczuk and Song (2010) as well as Blundell and Etheridge (2010) 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. In contrast to the rather conventional interpretation that households smooth transitory income shocks, the combination of these two findings - incomplete adjustment of consumption to income shocks and the persistent nature of income shocks - suggest that there is presumably an alternative explanation that traces back to the Relative Income Hypothesis, i.e. the effect of interpersonal comparisons.

Our results suggest that the under-proportionate growth of consumption inequality is also driven by KUJ-behavior: In the face of relative income losses and increasing reference consumption, low and middle class households increase consumption and reduce savings in an attempt to "keep up with the Joneses". Consequently, as income and consumption diverge, household saving rates decrease.<sup>43</sup>

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<sup>42</sup>For a more detailed discussion of this literature see Kumhof et al. (2012).

<sup>43</sup>It should be clear that consumption cannot be infinitely increased without growth of own income or eventually violating the intertemporal budget constraints. It is beyond the scope of this paper to examine this issue.

## 7.2 Income Inequality and Macroeconomic Stability

The estimated effects of reference consumption on household savings and the connection of this behavioral mechanism to changes in the distribution of income observed from 2002 to 2011 suggest that changing income inequality does exhibit effects on aggregate household saving and thus on aggregate household consumption. More specifically, we see that along with the impact of absolute income shifts, relative income shocks are relevant for the consumption-savings decisions of households. While within income decile groups 4 to 7 the reduction of savings caused by losses in own income was amplified by the negative impact of relative income losses, within decile groups 8 and 9 the rise of savings initiated by increasing income was mitigated by relative income losses. Here, the impacts of absolute income gains and negative relative income shocks neutralized each other to a certain extent.

Thus, the net effect of changing income inequality on aggregate household savings is difficult to determine. In periods of rising income concentration, particularly the very top of the income distribution increase savings in accordance with increases in their own income. This counteracts falling savings in lower parts of the income distribution. More clear, however, is the impact of upward looking comparisons when income inequality rises. For most of the income distribution, positional concerns and the induced reaction of own consumption to a rising consumption level of reference groups affect savings negatively.

More generally, our results show that positional concerns and upward looking comparisons can explain the presence of 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.<sup>44</sup> This mechanism can be seen as a potential source of macroeconomic instability in the face of pronounced increases of income inequality that trigger expenditure cascades, as argued by Rajan (2010) or Stiglitz (2009). Absolute income losses and the perceived relative decline stimulate consumption and may provoke the building up of excessive indebtedness in the lower and middle part of the income distribution. In Germany, however, such a risk is not evident. There are two primary reasons: First, the rise of income concentration was not as strong as in the U.S. Thus, although the basic behavioral pattern seems to be inherently existent, the magnitude of

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<sup>44</sup>Frank et al. (2010), Bertrand and Morse (2013) and Alvarez-Cuadrado and El-Attar Vilalta (2012) present evidence for expenditure cascades in the U.S.

absolute and relative income shocks was comparably weak. Second, in Germany the institutional framework of the credit market is much less prone to the danger of financial bubbles and the building up of unsustainable indebtedness.

### 7.3 Modelling Household Behavior

Moreover, our results provide strong evidence for the presence and relevance of interdependent preferences. The fact that reference consumption leads households to substantially increase their own consumption, interpersonal comparisons affect households' marginal utility of consumption relative to leisure. This implies that private consumption-savings decisions cannot be accurately modelled using just one representative agent. Our results indicate that the presence of interdependent preferences is not only of theoretical but also of practical importance. The effects of reference consumption are likely to be too large to be abstracted from. Even though further research needs to be done in order to better understand household consumption-savings behavior in different contexts, we believe that our estimates can help in modelling the importance of positional concerns and reference consumption.

## 8 Conclusion

In this paper we demonstrate that interpersonal comparisons do not only influence people's level of utility but also lead to KUJ-behavior as reference consumption does indeed affect 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, i.e. the consumption level of those households that are perceived to be richer, on households' consumption-savings decisions. We find that when controlling for changes in own income, increases in reference consumption lead households to lower their savings and increase consumption. This outcome is in line with the main prediction of the Relative Income Hypothesis. Our results are robust to changes in specification. We also find evidence that households compete with both (very) rich households and those households who are just slightly richer. As predicted by the RIH, interpersonal comparisons constitute a central aspect of household behavior. Our interaction analysis reveals that the effects of reference consumption are not confined to certain social subgroups such as highly educated households. As predicted by the RIH, interpersonal comparisons constitute a central aspect of household behavior. 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 10 to 20 euros depending on the households position in the income distribution.

The economic consequences of such behavior 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 between 30 and 40 percent of the variation in changes of household savings can be attributed to inequality changes, i.e. to the repercussions of absolute and relative income shocks. More precisely, upward looking positional concerns reinforced the reduction of household savings triggered by absolute income losses within the lower middle class of the income distribution. In contrast, within the upper middle class the positive effect of absolute income gains upon household savings was counteracted by relative income losses which induced rising consumption. Furthermore, our results bear extensive implications with respect to the effects of inequality on macroeconomic and financial stability. Overproportional growth of top incomes can trigger consumption cascades that may lead to inefficiently low household saving rates. In combination with easy access to credit, KUJ-behavior may not only lead to consumption cascades but also to financial instability as suggested by Rajan (2010). Finally, the effects of reference consumption appear to be too large to be abstracted from. Modelling household behavior using a single representative agent thus cannot capture a central aspect of household behavior.

## References

- Abel, A. B., 1990. Asset Prices under Habit Formation and Catching Up with the Joneses. *American Economic Review* 80 (2), 38–42.
- Al-Hussami, F., Remesal, Á. 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., Van Long, N., 2011. The Relative Income Hypothesis. *Journal of Economic Dynamics and Control* 35 (9), 1489–1501.
- Bertrand, M., Morse, A., 2013. Trickle-Down Consumption. *NBER Working Papers* 18883, National Bureau of Economic Research, Inc.
- Biewen, M., Juhasz, A., 2012. Understanding Rising Inequality in Germany, 1999/2000 - 2005/06. *Review of Income and Wealth* 58, 622–647.

- Blundell, R., Etheridge, B., January 2010. Consumption, Income and Earnings Inequality in Britain. *Review of Economic Dynamics* 13 (1), 76–102.
- Carroll, C. D., Overland, J., Weil, D. N., 1997. Comparison Utility in a Growth Model. *Journal of Economic Growth* 2 (4), 339–367.
- Clark, A.E., O. A., 1996. Satisfaction and Comparison Income. *Journal of Economic Literature* XLI, 112–158.
- Diener, E., Sandvik, E., Seidlitz, L., Diener, M., 1993. The Relationship between Income and Subjective Well-Being: Relative or Absolute? *Social Indicators Research* XXVIII, 195–223.
- Domeij, D., Floden, M., January 2010. Inequality Trends in Sweden 1978-2004. *Review of Economic Dynamics* 13 (1), 179–208.
- Duesenberry, J., 1949. *Income, Saving and the Theory of Consumer Behavior*. Harvard University Press.
- Dupor, B., Liu, W.-F., 2003. Jealousy and Equilibrium Overconsumption. *American Economic Review* 93 (1), 423–428.
- Dynan, K., Ravina, E., 2007. Increasing Income Inequality, External Habits, and Self-Reported Happiness. *American Economic Review* 97(2), 226–231.
- Dynan, K.E., S. J., Zeldes, S., 2004. Do the Rich Save More? *Journal of Political Economy* 112 (2), 397–444.
- Easterlin, R. A., 1995. Will raising the incomes of all increase the happiness of all? *Journal of Economic Behavior & Organization* 27 (1), 35–47.
- Ferrer-i-Carbonell, A., 2005. Income and Well-being: An Empirical Analysis of the Comparison Income Effect. *Journal of Public Economics* 89 (5-6), 997–1019.
- Frank, R., Levine, A., Dijk, O., 2010. Expenditure Cascades.  
URL <http://ssrn.com/abstract=1690612>
- Frank, R. H., 1984. Are Workers Paid Their Marginal Products? *American Economic Review* 74 (4), 549–71.
- Frank, R. H., 1985. *Choosing the Right Pond: Human Behavior and the Quest for Status*. Oxford University Press, New York, NY.
- Frank, R. H., 1999. *Luxury Fever*. Free Press, New York, NY.
- Frank, R. H., 2007. *Falling Behind: How Income Inequality Harms the Middle Class*. University of California Press, Berkeley.
- Frey, B., Stutzer, A., 2002. What Can Economists Learn from Happiness Research? *Journal of Economic Literature* XL, 402–435.

- Fuchs-Schuendeln, N., Krueger, D., Sommer, M., January 2010. Inequality Trends for Germany in the Last Two Decades: A Tale of Two Countries. *Review of Economic Dynamics* 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.
- Galí, J., 1994. Keeping Up with the Joneses: Consumption Externalities, Portfolio Choice, and Asset Prices. *Journal of Money, Credit and Banking* 26 (1), 1–8.
- Heffetz, O., 2011. A Test of Conspicuous Consumption: Visibility and Income Elasticities. *The Review of Economics and Statistics* 93 (4), 110–1117.
- Jappelli, T., Pistaferri, L., January 2010. Does Consumption Inequality Track Income Inequality in Italy? *Review of Economic Dynamics* 13 (1), 133–153.
- Kapteyn, A., van de Geer, S., van de Stadt, H., Wansbeek, T., 1997. Interdependent Preferences: An Econometric Analysis. *Journal of Applied Econometrics* 12, 665–686.
- Kopczuk, W., S. E., Song, J., 2010. Earnings Inequality and Mobility in the United States: Evidence from Social Security Data since 1937. *Quarterly Journal of Economics* 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.
- Liu, W.-F., Turnovsky, S. J., 2005. Consumption externalities, production externalities, and long-run macroeconomic efficiency. *Journal of Public Economics* 89 (5-6), 1097–1129.
- Ljungqvist, L., Uhlig, H., 2000. Tax Policy and Aggregate Demand Management under Catching Up with the Joneses. *American Economic Review* 90 (3), 356–366.
- Luttmer, E. F. P., 2005. Neighbors as Negatives: Relative Earnings and Well-Being. *Quarterly Journal of Economics* 120 (3), 963–1002.
- McBride, M., 2001. Relative-Income Effects on Subjective Well-Being in the Cross-Section. *Journal of Economic Behavior & Organization* 45 (3), 251–278.
- Rajan, R., 2010. *Fault Lines: How Hidden Fractures Still Threaten the World Economy*. Princeton University Press.
- Schmid, K. D., Stein, U., 2013. *Explaining Rising Income Inequality in Germany, 1991–2010*. IMK Study, Macroeconomic Policy Institute at the Hans-Boeckler Foundation.
- Solnick, S., Hemenway, D., November 1998. Is More Always Better?: A Survey on Positional Concerns. *Journal of Economic Behavior & Organization* 37 (3), 373–383.

- Solnick, S. J., Hemenway, D., May 2005. Are Positional Concerns Stronger in Some Domains than in Others? *American Economic Review* 95 (2), 147–151.
- Stiglitz, J., 2009. The Global Crisis, Social Protection and Jobs. *International Labour Review* 148 (1-2), 1–13.
- Van de Stadt, H., Kapteyn, A., van de Geer, S., 1985. The Relativity of Utility: Evidence from Panel Data. *Review of Economics and Statistics* LXVII, 179–187.
- Van Treeck, T., 2013. Did Inequality Cause the U.S. Financial Crisis? *Journal of Economic Surveys*, forthcoming.
- Veenhoven, R., 1991. Is Happiness Relative? *Social Indicators Research* XXIV, 1–24.
- Wagner, G., Frick, J., Schupp, J., 2007. The German Socio-Economic Panel Study (SOEP) - Scope, Evolution and Enhancements. *Journal of Applied Social Science Studies* 127 (1), 139–169.

## Appendix

**Table 3:** Summary Statistics of Main Variables.

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

**Table 4:** Savings, Reference Consumption - Alternative Concepts of Reference Group.

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

Robust standard errors in brackets

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;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. Column (1) is the baseline estimation from table 2 (*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 5:** Savings, Reference Consumption - Influence of Financial Crisis.

VARIABLES	(1)	(2)
	Baseline 2002-2011	Robustness 2002-2007
$\Delta$ INC	0.3518*** [0.0236]	0.3505*** [0.0176]
$\Delta$ REF $\times$ STAY $\times$ CL 1	-0.0853* [0.0502]	-0.1733*** [0.0646]
$\Delta$ REF $\times$ STAY $\times$ CL 2	-0.1815*** [0.0453]	-0.3210*** [0.0572]
$\Delta$ REF $\times$ STAY $\times$ CL 3	-0.1565*** [0.0455]	-0.2479*** [0.0616]
$\Delta$ REF $\times$ STAY $\times$ CL 4	-0.1538*** [0.0511]	-0.2478*** [0.0748]
$\Delta$ REF $\times$ STAY $\times$ CL 5	-0.2408*** [0.0500]	-0.3314*** [0.0745]
$\Delta$ REF $\times$ STAY $\times$ CL 6	-0.2434*** [0.0512]	-0.3603*** [0.0755]
$\Delta$ REF $\times$ STAY $\times$ CL 7	-0.1910*** [0.0548]	-0.1871** [0.0766]
$\Delta$ REF $\times$ STAY $\times$ CL 8	-0.1895*** [0.0444]	-0.2212*** [0.0597]
$\Delta$ REF $\times$ STAY $\times$ CL 9	-0.1210*** [0.0360]	-0.1288*** [0.0445]
$\Delta$ REF $\times$ STAY $\times$ CL 10	-0.1434*** [0.0457]	-0.2423*** [0.0485]
Observations	51,633	29,935
$R^2$	0.3561	0.3561

Robust standard errors in brackets

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;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. Column (1) is the baseline estimation from table 2 (*ALL-concept*) which is based on a sample that contains the years 2002 through 2011. In column (2) we drop the years following the financial crisis. As the annual survey is conducted in May, we drop all observation after 2007.

**Table 6:** Savings, Reference Consumption - Varying Number of Consumption Classes.

VARIABLES	(1)	(2)	(3)
	Baseline 10 Con. Classes	Robustness 8 Con. Classes	Robustness 12 Con. Classes
$\Delta$ INC	0.3518*** [0.0236]	0.3083*** [0.0221]	0.3937*** [0.0247]
$\Delta$ REF $\times$ STAY $\times$ CL 1	-0.0853* [0.0502]	0.0091 [0.0527]	-0.1432*** [0.0482]
$\Delta$ REF $\times$ STAY $\times$ CL 2	-0.1815*** [0.0453]	-0.0961** [0.0483]	-0.2316*** [0.0440]
$\Delta$ REF $\times$ STAY $\times$ CL 3	-0.1565*** [0.0455]	-0.0656 [0.0496]	-0.2034*** [0.0446]
$\Delta$ REF $\times$ STAY $\times$ CL 4	-0.1538*** [0.0511]	-0.0817* [0.0464]	-0.2580*** [0.0466]
$\Delta$ REF $\times$ STAY $\times$ CL 5	-0.2408*** [0.0500]	-0.1320*** [0.0496]	-0.2982*** [0.0477]
$\Delta$ REF $\times$ STAY $\times$ CL 6	-0.2434*** [0.0512]	-0.1608*** [0.0504]	-0.2072*** [0.0498]
$\Delta$ REF $\times$ STAY $\times$ CL 7	-0.1910*** [0.0548]	-0.1206** [0.0496]	-0.2941*** [0.0505]
$\Delta$ REF $\times$ STAY $\times$ CL 8	-0.1895*** [0.0444]	-0.0432 [0.0445]	-0.2762*** [0.0469]
$\Delta$ REF $\times$ STAY $\times$ CL 9	-0.1210*** [0.0360]	-0.0766** [0.0313]	-0.1784*** [0.0413]
$\Delta$ REF $\times$ STAY $\times$ CL 10	-0.1434*** [0.0457]	-0.0534 [0.0428]	-0.1499*** [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. Column (1) is the baseline estimation from table 2 (*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 7:** Savings, Reference Consumption - Varying Degree of Income Smoothing.

VARIABLES	(1) Baseline MA(3)	(2) Robustness Current	(3) Robustness MA(5)
$\Delta$ INC	0.3518*** [0.0236]	0.3418*** [0.0436]	0.2299*** [0.0218]
$\Delta$ REF $\times$ STAY $\times$ CL 1	-0.0853* [0.0502]	-0.0909* [0.0502]	-0.0791 [0.0529]
$\Delta$ REF $\times$ STAY $\times$ CL 2	-0.1815*** [0.0453]	-0.1351*** [0.0480]	-0.0475 [0.0488]
$\Delta$ REF $\times$ STAY $\times$ CL 3	-0.1565*** [0.0455]	-0.2060*** [0.0467]	-0.0438 [0.0539]
$\Delta$ REF $\times$ STAY $\times$ CL 4	-0.1538*** [0.0511]	-0.1485*** [0.0464]	-0.1254** [0.0530]
$\Delta$ REF $\times$ STAY $\times$ CL 5	-0.2408*** [0.0500]	-0.1668*** [0.0448]	-0.1669*** [0.0602]
$\Delta$ REF $\times$ STAY $\times$ CL 6	-0.2434*** [0.0512]	-0.2489*** [0.0448]	-0.0363 [0.0647]
$\Delta$ REF $\times$ STAY $\times$ CL 7	-0.1910*** [0.0548]	-0.2546*** [0.0395]	-0.1255** [0.0562]
$\Delta$ REF $\times$ STAY $\times$ CL 8	-0.1895*** [0.0444]	-0.1592*** [0.0500]	-0.0618 [0.0418]
$\Delta$ REF $\times$ STAY $\times$ CL 9	-0.1210*** [0.0360]	-0.1015*** [0.0300]	-0.0909*** [0.0267]
$\Delta$ REF $\times$ STAY $\times$ CL 10	-0.1434*** [0.0457]	-0.0501 [0.0475]	-0.0286 [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. Column (1) is the baseline estimation from table 2 (*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 8:** Savings, Reference Consumption - Controlling for Outliers.

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

Robust standard errors in brackets

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;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. Column (1) is the baseline estimation from table 2 (*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.