Saving Behavior under Upward Looking Comparisons in Germany, 1995-2011

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This version: May 2013

Abstract

Using household data from the German Socio-Economic Panel between 1995 and 2011 we examine household saving behavior and its determinants, in particular upward looking comparisons in the light of rising income inequality. We show that changes in the saving rate of households are not only driven by changes in own disposable income but are also influenced by the income and/or the consumption of richer households. As a consequence, both absolute and relative income changes determine the development of household saving rates. Our findings give valuable insights for the analysis of the evolution of the aggregate saving rate and help explain why income inequality has increased considerably stronger than consumption inequality. In addition, our study provides microeconometric support for basic behavioral assumptions within recent research that examines the effects of rising income inequality for aggregate saving and macroeconomic instability.

JEL-Classification: D91, E21, C23

Keywords: household saving rate, income inequality, reference income, relative income hypothesis

We thank Martin Adler, Gerd Ronning and Thomas Theobald for helpful comments.

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I. Introduction

a. Topicality and Relevance of the Subject

Throughout the 20th century, income inequality and its potential consequences for macroeconomic stability were issues that mostly flew under the radar. Duesenberry’s Relative Income Hypothesis, i.e. the insight that private consumption and saving decisions strongly depend on how one’s own level of income compares to that of a reference group (see Duesenberry 1949), experienced the same fate.2

Although, since the 1990s, there has already been a strand of research showing that households do compare themselves to their social environment and that these interpersonal comparisons affect self-reported happiness and well-being3, it was the financial and economic downfall in 2008 that finally led to two closely connected developments: (i) The reemergence of the Relative Income Hypothesis as a prominent subject in economics, accompanied by (ii) a stronger focus on the role of income inequality as a potential cause of macroeconomic instability.4

Among others, Rajan (2010) regards rising income inequality as the core problem leading up to the financial crisis in the U.S. Following his logic, the expansion of loans to households in the lower part of the income distribution has stimulated aggregate demand and caused a deterioration of the current account balance. This mechanism has been taken up by Kumhof et al. (2012) who model its basic transmission channels and conduct a macroeconometric analysis for sixteen developed countries. One fundamental microeconomic assumption is that households in the lower and middle parts of the income distribution reduce their saving rate and take on credits in order to keep up with the level of consumption of the rich.

This idea has been addressed by Alvarez-Cuadrado and Long (2011) who propose a theoretical model that connects relative income changes to household saving rates. The authors show that interpersonal comparisons can explain why saving rates increase with permanent income and why income inequality exceeds consumption inequality.5

The latter phenomenon has been subject to several empirical studies using household data for different countries. It has been documented that over the past decades consumption inequality

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2 This is mainly because the majority of economists have been focusing on the Permanent Income Hypothesis, i.e. on the question whether saving rates are positively related to lifetime income (see Friedman 1957). This view was qualified by empirical research such as Dynan et al. (2004) who show that saving rates do indeed vary not only with current but also with permanent income using U.S. household data.

3 Relevant contributions in this field are, for example, Dyman and Ravina (2007), Ferrer-i Carbonell (2005) and Luttmer (2005). For a summary of this literature see Alvarez-Cuadrado and El-Attar Vilalta (2012) as well as van Treeck (2012).

4 See van Treeck (2012) for a detailed discussion of the literature on the macroeconomic impact of inequality and the reemergence of the Relative Income Hypothesis.

5 The relevance of the distinction between current and permanent income is addressed in section II.
grew at a much slower pace than income inequality - for the U.S. by Kopczuk et al. (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-Schündeln et al. (2010). This divergence of income and consumption inequality might be explained by the fact that income shocks are only perceived as transitory and households consequently keep their levels of consumption comparably stable. However, Kopczuk et al. (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 goes back to the Relative Income Hypothesis, i.e. the effect of interpersonal comparisons.

There is already some empirical evidence for the existence of interpersonal comparisons. Luttmer (2005), for example, finds that people’s self-reported level of happiness is responsive to the level of earnings of their neighbors when controlling for the effects of changes in own income. Besides this, Dynan and Ravina (2007) and Ferrer-i Carbonell (2005) obtain similar results. The latter also finds evidence for upward looking comparisons using German household panel data.

\[ b. \text{Contribution} \]

Our research builds on these insights and reveals that positional concerns do not only affect happiness or well-being, but also the economic decision making of households. We argue that upward looking interpersonal comparisons lead households to adjust their saving rates in reaction to relative income shocks.

In other words, changes in the saving rate of households are not only driven by changes in own disposable household income but are also influenced by the income of a reference group as predicted by Duesenberry’s Relative Income Hypothesis. While an increase in own income is associated with a rise of the saving rate, an increase of the reference income leads to an increase of consumption, i.e. to a reduction of the saving rate. These two effects imply that changes in the income distribution might exhibit aggregate effects, i.e. affect the development of aggregate consumption.

The most closely related previous contributions on this issue include Frank et al. (2010), Bertrand and Morse (2012) and Alvarez-Cuadrado and El-Attar Vilalta (2012). Frank et al. (2010) analyze

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\[ ^{6} \text{For a more detailed discussion of this literature see Kumhof et al. (2012).} \]

\[ ^{7} \text{In fact, Ferrer-i Carbonell use the German Socio-Economic Panel (SOEP) which is the same dataset that is used in our analysis.} \]
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. Bertrand and Morse (2012) present evidence for expenditure cascades using U.S. micro data from the Consumer Expenditure Survey: Households of the middle class react to higher consumption of the upper 20 percent by reducing their saving rate in order to keep up with the expenditures of the rich. 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 saving.8 Besides this, they find that changes in upward looking reference income, i.e. the mean income of all quintiles above the household’s own income class, exhibit explanatory power for the decline in U.S. household saving.

We contribute to this branch of research by analyzing the role of interpersonal comparisons as a determinant for household saving rates in Germany. Thereby, we provide further microeconometric evidence for the effects of income inequality on household saving behavior and identify upward looking comparisons as one key mechanism of transmission of this effect. Our study is based on household data from the German Socio-Economic Panel (SOEP) which provides annual information on household saving and disposable income from 1995 to 2011. We obtain three main findings:

(i) First, we are able to replicate the results of Dynan et al. (2004)9 and Alvarez-Cuadrado and El-Attar Vilalta (2012), that have been obtained for U.S. household data, for Germany: Household saving rates increase with permanent income.10 This result is contrary to one of the basic implications of the permanent income hypothesis. (ii) Second, we illustrate that this positive relationship between income and saving rates is still valid when estimating the causal effect of a change in a given household’s income on the change in its saving rate. The effect is highly significant and economically far from negligible. (iii) Third, we use different definitions of reference group and thus different measures of reference income and reference consumption in order to capture the effect of upward looking comparisons on the saving decision of households. We show that the effect of changes in reference income and reference consumption is statistically and economically significant and robust across different specifications of reference group. We find that changes in reference income have a significant negative effect on household saving rates for the bottom 80 percent of the income distribution. The effect is stronger for poorer households.

For example, our results suggest that an increase in own income by 10 percent raises the saving

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8 The different measures of inequality such as the coefficient of variation or the Gini-coefficient are constructed for each U.S. state. The estimated negative coefficient thus suggests that household saving rates are lower in states with higher income inequality.

9 Dynan et al. (2004) also use the Panel Study of Income Dynamics.

10 We follow the approximation of permanent income suggested in the literature. This is explained in detail in section II.
rate of a household on average by about 0.33 percentage points and an increase in reference income by 10 percent lowers the saving rate by about 0.14 percentage points for a household with income around the median. When using reference consumption instead of reference income, the estimates remain almost unchanged.

Our results provide strong microeconometric evidence for the existence of upward looking comparisons and their economic implications. Moreover, our findings serve as support for studies that link rising income inequality to macroeconomic instability via the aforementioned microeconomic transmission mechanism. In particular, our study suggests a clear impact of income inequality on the development of aggregate saving and consumption. With regard to economic theory, our analysis bears implications on the consumption-versus-income-tax debate and sheds further doubt on the appropriateness of the use of a single representative agent in macroeconomic models as the saving and consumption behavior of households varies with income and is sensitive to asymmetric income shocks, i.e. changes in the distribution of income.

The remainder of the paper is structured as follows: Section II discusses the data. Section III presents our conceptual framework and empirical analysis of the role of upward looking comparisons for the saving behavior of households. Based on our microeconometric findings, section IV elaborates on the striking interdependence between rising income inequality and the development of household saving rates which offers a deeper understanding of the development of the aggregate household saving rate in Germany. Section V addresses further implications such as the evolution of consumption inequality and links of household savings and macroeconomic stability. Section VI concludes.

II. Data

This section describes our dataset as well as the construction of the key variables used in our analysis and summarizes the set of control variables included in our regressions. In the appendix, table A1 provides basic summary statistics for our main variables.

a. The Socio-Economic Panel (SOEP)

Our analysis is based on household survey data from the German Socio-Economic Panel (SOEP). As the information on household saving is available only since 1995 and the latest available information of net household income and saving is 2011, the sample covers the years from 1995 to 2011. For a detailed description of the panel see Wagner et al. (2007).

When preparing our sample for the analysis we tried to apply a minimum of restrictions: (i) First, we drop households with net income below or equal to zero. (ii) In the questionnaire, the cardinal
question for 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 176,477 observations and at least 6,692 households in any given year.

b. Measure of Disposable Income

Our measure of disposable income is real monthly household net income provided by the SOEP.\textsuperscript{11} The respective question in the SOEP questionnaire reads:

\textit{If you take a look at the total income from all members of the household: how high is the monthly household income today? Please state the net monthly income, which means after deductions for taxes and social security. Please include regular income such as pensions, housing allowance, child allowance, grants for higher education support payments, etc.}

Our goal is to analyze the saving behavior of households and, more precisely, to explain the role of absolute changes in own income as well as the role of asymmetric income shocks, i.e. changes in the income of a reference group, for the adjustment of households' saving rates.

A potential problem with current income may arise as households adjust their saving rates in response to transitory income shocks for a smooth consumption path. Hence, changes of the saving rate may be driven by consumption smoothing behavior: Households that suffer a transitory income cut reduce their saving rate in order to keep consumption stable while in the medium to long run their saving rate returns to the previous level as income recovers. Thus, one distinguishes between current and permanent income. While current income is subject to short-term income volatility, permanent income is average income over lifetime. It is the evolution of permanent income rather than transitory income changes that is relevant for the saving behavior of households.

In the SOEP, income measures capture current income, i.e. most likely include transitory income shocks. To control for transitory volatility in the saving rate of households that result from transitory income changes we follow Kopczuk et al. (2010) and apply a 5-year moving average of

\textsuperscript{11} The SOEP also contains information on households' yearly income, which provides more comprehensive information on income as it includes further income components such as Christmas bonus. As the saving information is only collected on a monthly basis, we use monthly income for consistency reasons.
current income.\textsuperscript{12} In addition, we use average labor income, current consumption and years of education of the household head as instruments for permanent income and employ two-stage-least-squares estimation techniques.\textsuperscript{13} This means that we approximate the information on variations in permanent income by extracting permanent household income from these instruments in a first regression. Subsequently, we estimate the relevance of these proxies for permanent income for household saving rates in a second regression. This approach was first proposed by Dynan et al. (2004).\textsuperscript{14}

c. Measure of Saving and Construction of Saving Rate

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 rather than passive saving:\textsuperscript{15}

\textit{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?}

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. Thus, there is no alternative to using the information captured by this question.\textsuperscript{16} For consistency reasons, we construct two different versions of the household saving rate, i.e. a current saving rate and a permanent saving rate. The current saving rate is constructed by dividing current saving by current income and the permanent saving rate is calculated by using the 5-year moving averages of saving and income.\textsuperscript{17}

d. Control Variables

We use a set of control variables that is regarded as standard within this field of research. The individual variables are the age, years of education and dummy variables for the employment status of the household head. Besides these, we consider the number of adults as well as the

\textsuperscript{12} Another possibility is the use of average income within a period of several years, as applied by Dynan et al. (2004) as well as Alvarez-Cuadrado and El-Attar Vilalta (2012).
\textsuperscript{13} Average labor income is constructed excluding the current period. Current consumption is current income net current saving as the SOEP does not provide detailed consumption measures.
\textsuperscript{14} Remarkably, within their IV technique (approaching several measures of “permanent” income) these authors show that the results for the explanation of household saving rates do not change compared to their measure of current income.
\textsuperscript{15} Passive saving is defined as the change of wealth whereas active saving is the change of wealth net of capital gains. Alvarez-Cuadrado and El-Attar Vilalta (2012) as well as Dynan et al. (2004) use active and passive saving measures in their respective analysis. However, their results do not differ substantially with regard to the measure of saving used.
\textsuperscript{16} However, one does not know whether respondents include payments to private pension or life insurance schemes in their answer warranting further research.
\textsuperscript{17} As will be shown in section III, the use of current saving and current income does not yield qualitatively different results.
number of children living in the household. Moreover, we control for year and region specific effects. For our estimations in first difference we principally apply the same set of control variables but replace the employment status of the household head by dummy variables for changes of the employment status, the household size by the change of the household size and the number of children by the change of the number of children.

e. Measures of Reference Income and Reference Consumption

The core of this paper is the analysis of the effects of interpersonal comparisons on households’ saving and consumption decisions. More specifically, we examine whether the level of income and consumption of richer households lead households to adjust their saving rate when controlling for own income. We consider both income and consumption as reference variables and test alternative definitions of reference group. The level of consumption of a household is calculated as household net income minus household saving. The concepts of reference group and the derivation of reference consumption and reference income are discussed in more detail in section IIIc.

III. Conceptual Framework and Empirical Analysis

This section describes our regression setup and presents estimation results. Our econometric analysis comprises three main steps: (a) the relationship between the level of real household disposable income and the household saving rate, (b) the relationship between changes in real household net income and changes in household saving rates over time and (c) the role of reference income and reference consumption for the saving behavior of households.

a. Household Saving Rate and own Income: Do the Rich Save More?

In a first step, we regress the household saving rate on real disposable household income and several measures of permanent income in order to reproduce the U.S. results of Alvarez-Cuadrado and El-Attar Vilalta (2012) for Germany. These authors find that the saving rate is not independent of permanent income, but rather positively associated with the latter. Thus, before focusing on the effect of interpersonal comparisons, it is interesting to see whether the income

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18 When using education as an instrument, it is excluded from the list of control variables.
19 For this purpose, we construct a new variable that explicitly captures changes in the employment status as this is relevant for income changes and thus for the adjustment of household saving rates.
20 We regard this methodological replication and the comparison of the results for Germany to these obtained for the U.S. as an important first step and quality check of the data underlying our analysis. For the same reason we subsequently apply the IV estimation.
21 This was first shown by Dynan et al. (2004), but the empirical approach by Alvarez-Cuadrado and El-Attar Vilalta (2012) is more similar to ours.
saving relationship is qualitatively identical and quantitatively similar to their U.S. findings. The effect of own income on household saving rates is the first of two channels through which asymmetric income shocks can have effects on overall household saving and consumption.

In line with their approach, we apply median regressions to the following equations.\(^{22}\)

\[
SRATE = \alpha + \beta \ln(INC) + \delta \text{CONTR}_{\text{level}} + \varepsilon \tag{1}
\]

\[
SRATE = \alpha + \beta_1 \ln(INC) + \beta_2 \ln(INC)^2 + \delta \text{CONTR}_{\text{level}} + \varepsilon \tag{2}
\]

Here, \(SRATE\) is the household’s saving rate, \(INC\) is real household disposable own income and \(\text{CONTR}_{\text{level}}\) is a set of control variables described above.

Table 1 summarizes the results of specifications (1) and (2). We estimate this relationship for current income (1a, 2a) as well as for a measure of permanent income approximated by a 5 year moving average of current income (1b, 2b). Median regression techniques are applied to the pooled sample. We do not report the coefficients for the considered control variables. They are mostly significant and show up with the expected sign.

In columns (1a) and (1b) we see that household saving rates are positively associated with real household disposable income. This holds for current income as well as for our measure of permanent income. Columns (2a) and (2b) consider squared income as an additional regressor and reveal a convex relationship between the saving rate and income. This means that for higher levels of income the impact of an additional percent of income on the saving rate is higher than for low levels of income.

<table>
<thead>
<tr>
<th>Table 1: Household Saving Rate on Log Real Household Disposable Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>(SRATE)</td>
</tr>
<tr>
<td>ln(INC)</td>
</tr>
<tr>
<td>ln(INC)^2</td>
</tr>
<tr>
<td>Observations</td>
</tr>
<tr>
<td>Pseudo-R^2</td>
</tr>
</tbody>
</table>

Note: This table illustrates estimation results from pooled median regressions of the household saving rate \(SRATE\) on log real household disposable income ln (INC). We apply bootstrapped standard errors using 500 replications. */**/*** denote significance on the 10/5/1 percent level.

\(^{22}\) Due to the skewness of the distribution of household saving rates, median regression rather than ordinary least squares regression is appropriate to measure the effects of income on household saving rates. This technique has also been used by Dynan et al. (2004) as well as by Alvarez-Cuadrado and El-Attar Vilalta (2012).
To further highlight the robustness of these findings with regard to the sensitivity of saving rate adjustments to transitory income shocks we follow Dynan et al. (2004) and Alvarez-Cuadrado and El-Attar Vilalta (2012) and estimate the saving rate income relationship by applying a two stage least squares IV-approach. This means that we run a first regression of current income on an instrument for permanent income and the other covariates and extract predicted values for household income. The latter are supposed to approximate permanent income. In a second estimation we regress household saving rates on the predicted values obtained from the first regression. We instrument permanent household income by average labor income of the household, by the education of the household head as well as by household consumption. The corresponding estimation results are reported in table 2. Within all specifications but one the relationship of saving rates and income is still highly significant. Solely in specification (2e) squared income is not significant.

Our results are qualitatively identical to the U.S. findings of Dynan et al. (2004) and Alvarez-Cuadrado and El-Attar Vilalta (2012). For example, Alvarez-Cuadrado and El-Attar Vilalta (2012) report a marginal effect of about 0.052 for average labor income of the median household, which is very close to our estimate of 0.056.

Table 2: Household Saving Rate on Instrumented Permanent Household Income

<table>
<thead>
<tr>
<th>SRATE</th>
<th>Average Labor Income</th>
<th>Education</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1c)</td>
<td>(2c)</td>
<td>(1d)</td>
</tr>
<tr>
<td>ln(INC)</td>
<td>0.0564***</td>
<td>-0.2217***</td>
<td>0.0056***</td>
</tr>
<tr>
<td></td>
<td>(0.0011)</td>
<td>(0.0085)</td>
<td>(0.0009)</td>
</tr>
<tr>
<td>ln(INC)^2</td>
<td>0.0195***</td>
<td>0.0209***</td>
<td>0.0003</td>
</tr>
<tr>
<td>Observations</td>
<td>150,949</td>
<td>150,949</td>
<td>154,642</td>
</tr>
<tr>
<td>Pseudo-R^2</td>
<td>0.0702</td>
<td>0.0775</td>
<td>0.0585</td>
</tr>
</tbody>
</table>

Note: This table illustrates estimation results from pooled median regressions of the household saving rate \( S RATE \) on different measures for log permanent income. According to Dynan et al. (2004) average labor income is calculated as the mean of all available periods but excluding the current period. Education is measured as the number of years of education of the household head. Consumption is income net savings. We apply bootstrapped standard errors using 500 replications. */**/*** denote significance on the 10/5/1 percent level.

Within this section we illustrated that estimations for German household data from the SOEP yield qualitatively identical results to the findings within U.S. surveys. Higher permanent income of households is positively associated with higher levels of household saving rates.

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23 As mentioned above, when using education as an instrument, it is excluded from the list of control variables.
24 For technical details of the two-stage-least-squares IV estimation see Wooldridge (2002).
b. Changes of Household Saving Rates and Changes of own Income over Time

Next we examine to what extent changes of own income explain the variation of households' saving rates over time. To this end we measure how households adjust their saving rate in reaction to a change in own disposable income. We thus estimate the income saving relationship in first difference as indicated in specification (3) using Pooled OLS.\(^25\) By eliminating the effects of time-invariant omitted variables, we aim at capturing a causal effect of income changes on saving behavior.

\[
\Delta SRATE = \alpha + \beta \Delta \ln(INC) + \delta \text{CONTR}_\Delta + \epsilon \tag{3}
\]

Here, \(\Delta\) denotes the first difference operator and \(\text{CONTR}_\Delta\) denotes the modified set of control variables as described above. The estimated effect of income changes on the household saving rate is presented in table 3.

\begin{table}[h]
\centering
\begin{tabular}{lcc}
\hline
\textbf{\(\Delta SRATE\)} & \textbf{Current Income} & \textbf{Permanent Income} \\
& \hspace{1cm} (3a) & \hspace{1cm} (3b) \\
\hline
\textbf{\(\Delta \ln(INC)\)} & 0.0142*** & 0.0331*** \\
& (0.0027) & (0.0035) \\
\hline
Observations & 135,895 & 73,351 \\
\textbf{R\(^2\)} & 0.0093 & 0.0202 \\
\hline
\end{tabular}
\caption{\(\Delta\) Household Saving Rate on \(\Delta\) Log Real Household Disposable Income}
\end{table}

Note: This table illustrates estimation results from POLS regression of the first difference of the household saving rate \(\Delta SRATE\) on the first difference of log real household disposable income \(\Delta \ln(INC)\). \(*/**/***\) denote significance on the 10/5/1 percent level.

Column (3a) illustrates that changes in current real household disposable income are positively related to changes of the household saving rate. Column (3b) reports the results for changes in our measure of permanent income.\(^{26}\) We see that specification (3b) which captures less transitory information of saving rates and income yields a better model fit and a higher coefficient for the change in own income. This indicates that more persistent income changes affect households’ saving decisions more substantially than merely short-term income fluctuations.

As intuitively anticipated, the effect of income changes over time turns out to be considerably smaller than the estimates of levels presented in table 1. This is because within the above presented estimation of levels (section IIIa) time invariant household characteristics that increase both the saving rate and the level of income are not controlled for. In contrast, in our first

\(^{25}\) In contrast to the estimation in levels, here the estimation by ordinary least squares is appropriate as the dependent variable is approximately normally distributed.

\(^{26}\) The effect of squared income, as shown in specification (2), is no longer significant for the estimation in first difference. Squared income is therefore omitted from specification (3).
difference approach these unobserved factors cancel out which allows for a more causal interpretation of the estimated coefficient. However and more importantly, the effect is still significant and economically far from negligible. Household income not only plays an important role when comparing relatively poor households to relatively rich ones, but also as a causal effect within observations: An increase in a household’s income over time induces the household to raise its saving rate.\textsuperscript{27}

The magnitude of the coefficient for household disposable income from specification (3b) suggests the following interpretation: In the year 2005 a household with a disposable income of 1950 Euros, which is around the median income, and an initial saving rate of 6.0 percent, which is around the median saving rate, that experiences an income gain of 10 percent (195 Euros) raises its saving rate to about 6.33 percent.\textsuperscript{28}

The results from table 3 document that a change in own income is associated with a change in the household's saving rate over time: While households that move up in the income distribution in absolute terms increase their saving rate, households that suffer absolute income losses decrease their saving rate.

c. The Role of Upward Looking Comparisons

In the following third step of our econometric analysis we implement a measure of upward looking reference income or reference consumption as an additional explanatory variable to our model in order to capture the effect of interpersonal comparisons on household saving.

The basic assumption is that people compare themselves to the level of income or consumption of other people which we refer to as reference groups.\textsuperscript{29} Upward looking comparisons imply that a household’s reference group is made up by households with a higher level of income or consumption. To capture this, we use two concepts for the definition of reference group.

First, we define the reference group of a given household as all households that are part of income classes above the household’s own income class. For example, given a quintile classification of the income distribution, the reference group of the median household, who itself is located in the

\textsuperscript{27} Note that one has to be careful and may not take this result as a general law that might be applicable to aggregate movements of income and saving. Particularly, decades of robust economic growth after the Second World War associated with rising average household income were not accompanied by a steadily rising aggregate saving rate. However, within the observed time span there was no rising tide to lift all boats as average household net income in Germany has virtually stagnated. Therefore, absolute income changes imply switching relative income positions of households.

\textsuperscript{28} This increase of the saving rate by 0.33 percentage points results from the hypothetical increase in own income by 10 percent given the coefficient of 0.0331 reported in specification (3b) in table 3.

\textsuperscript{29} As mentioned above, basic empirical work on the relevance of relative concerns has been done by Dynan and Ravina (2007), Luttmer (2005) and Ferrer-i-Carbonell (2005).
third quintile, equals the aggregate of all households in the fourth and fifth income quintiles. This approach has also been suggested by Alvarez-Cuadrado and El-Attar Vilalta (2012) who apply a quintile categorization to assess reference income. In our analysis we refer to this concept as the class concept.

The second specification of reference group is more specific as it is defined as the respective income class above the household’s own income class. For example, given a quintile categorization of the income distribution, the reference group of the median household is the fourth income quintile. This concept is motivated by the work of Bertrand and Morse (2012) and Frank et al. (2010), who assess expenditure cascades. In our analysis we refer to this concept as the trickle concept.

For each concept we divide the income distribution into five income classes of equal size (quintiles), and in an additional specification into ten income classes of equal size (deciles), for each year. Reference income or reference consumption is defined as the mean income or consumption within the households’ respective reference group. Every household of a given income class thus has the same reference income or reference consumption. For example, given a decile classification for the first concept of reference groups (class concept), for all households in the fourth decile, the reference income is the mean income of all households within the upper 60 percent of the income distribution. Moreover, all of our concepts of reference income or reference consumption are constructed as current variables and as 5 year moving averages.

To examine the effect of upward looking comparisons and thus reference income upon household saving rates, we estimate the econometric equations

$$\Delta \text{SRATE} = \alpha + \beta_1 \Delta \ln(\text{INC}) + \beta_2 \Delta \ln(\text{REFINC}) + \beta_3 \Delta \ln(\text{REFINC}) \times \ln(\text{INC}) + \delta \text{CONTR}_A + \epsilon$$  (4)

$$\Delta \text{SRATE} = \alpha + \beta_1 \Delta \ln(\text{INC}) + \beta_2 \Delta \ln(\text{REFCON}) + \beta_3 \Delta \ln(\text{REFCON}) \times \ln(\text{INC}) + \delta \text{CONTR}_A + \epsilon$$  (5)

where \text{REFINC} denotes reference income and \text{REFCON} denotes reference consumption of the household as described above. Note that we consider an interaction of reference income and reference consumption with the household’s own income. This is because we are interested in differences of the effect of reference income and consumption across the income distribution. All the other variables are identical to those in specification (3). As has been suggested by Bertrand and Morse (2012), we focus on upward looking behavior of non-rich households, i.e. we estimate
specifications (4) and (5) for all households except the highest income class in the respective income categorization of each reference concept.\textsuperscript{30}

The above described distinctions with regard to reference concepts, income classes and time averaging of income and consumption lead us to examine $2 \times 2 \times 2 = 16$ specifications. The respective results are illustrated in tables 4-7, A2 and A3.

Table 4 illustrates the regression results for reference income of the \textit{class concept}. Here, we observe that the coefficient of household income is comparable to specification (3).\textsuperscript{31} Most importantly, we see that a change in the household’s reference income exhibits a negative effect on the household saving rate. Besides this, the coefficient of the interaction with own income is positive. This suggests that the negative effect of changing reference income is less pronounced in the upper parts of the income distribution.\textsuperscript{32} This holds across all specifications.

\textit{Table 4: \Delta Household Saving Rate on \Delta Income and \Delta Reference Income - Class Concept}

<table>
<thead>
<tr>
<th>$\Delta \text{SRATE}$</th>
<th>\textbf{Current Income}</th>
<th>\textbf{Permanent Income}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>\textit{Quintiles} (4a)</td>
<td>\textit{Deciles} (4a')</td>
</tr>
<tr>
<td>$\Delta \ln (\text{INC})$</td>
<td>0.0127*** (0.0040)</td>
<td>0.0109** (0.0046)</td>
</tr>
<tr>
<td>$\Delta \ln (\text{REFINC})$</td>
<td>-0.3786** (0.1794)</td>
<td>-0.3014*** (0.1077)</td>
</tr>
<tr>
<td>$\Delta \ln (\text{REFINC}) \times \ln (\text{INC})$</td>
<td>0.0521** (0.0239)</td>
<td>0.0419*** (0.0140)</td>
</tr>
<tr>
<td>\textbf{Observations}</td>
<td>129,185</td>
<td>129,185</td>
</tr>
<tr>
<td>\textbf{R}^2</td>
<td>0.0099</td>
<td>0.0101</td>
</tr>
</tbody>
</table>

Note: This table illustrates estimation results from POLS regression of the first difference of the household saving rate $\Delta \text{SRATE}$ on the first difference of log real household disposable income $\Delta \ln (\text{INC})$ and the first difference of reference income $\Delta \ln (\text{REFINC})$. Reference income is calculated according to the class concept. */**/*** denote significance on the 10/5/1 percent level.

The economic relevance of the coefficients presented in table 4 may be illustrated in the following way. As in the example corresponding to the effect of own income reported in table 3, we relate to the results for permanent income. Further, we chose the decile categorization of reference income, i.e. we refer to the specification summarized in column (4b'). The impact of reference income results from the combination of the coefficient on the change in reference income and the

\textsuperscript{30} This means that we do not consider the top 10 percent of the income distribution in the case of a decile categorization and the top 20 percent of the income distribution in case of a quintile categorization in the sample for our estimations.

\textsuperscript{31} Furthermore, the coefficients of the control variables also yield similar estimates as for specification (3).

\textsuperscript{32} We will elaborate on this in more detail in the contribution analysis in section IV.
coefficient of the interaction of the change in reference income with own income.\textsuperscript{33} Again we relate to the year 2005 and focus on a household with a disposable income of 1950 Euros, which is around the median income, and an initial saving rate of 6.0 percent, which is also around the median saving rate. If reference income (which is about 3230 Euros for the median income household) rises by 10 percent, the median household will reduce its saving rate on average from 6.0 percent to 5.86 percent.\textsuperscript{34}

Table 5 provides a more specific picture by showing the corresponding marginal effects of reference income at the first three income quartiles.\textsuperscript{35} We report marginal effects by income quartiles to illustrate to what extent the impact of changes in reference income upon the saving rate varies across the income distribution.

\textbf{Table 5: Marginal Effects of $\Delta$ Reference Income on $\Delta$ Household Saving Rate by Income Quartiles - Class Concept}

<table>
<thead>
<tr>
<th>Household Net Income</th>
<th>Marginal effect</th>
<th>Quintiles</th>
<th>Deciles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income Quartile</td>
<td>Income Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (p25)</td>
<td>1350</td>
<td>-0.0155***</td>
<td>-0.0235***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0047)</td>
<td>(0.0077)</td>
</tr>
<tr>
<td>2 (p50)</td>
<td>1937</td>
<td>-0.0060**</td>
<td>-0.0148***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0031)</td>
<td>(0.0045)</td>
</tr>
<tr>
<td>3 (p75)</td>
<td>2671</td>
<td>0.0024</td>
<td>-0.0070**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0046)</td>
<td>(0.0033)</td>
</tr>
</tbody>
</table>

Note: This table reports marginal effects of reference income for different levels of own household income. The effects are based on the estimation of permanent income corresponding specifications (4b) and (4b') in table 4. */**/*** denote significance on the 10/5/1 percent level. The quartile classification is based on the distribution of real monthly MA(5) household income in the year 2005.

These effects are derived from the estimations underlying table 4. We observe that the negative effect of reference income on the adjustment of the saving rate is strongest for the first income quartile, i.e. within the lower part of the income distribution. Moreover, it depends on the categorization applied to the reference group definition (quintile or decile categorization) whether the negative effect of reference income is significant for the third income quartile, i.e.

\textsuperscript{33} This effect is calculated using the formula for the total marginal effect of reference income on the saving rate which reads

$$\frac{\Delta \text{rate}}{\Delta \ln(\text{REFINC})} = \beta_2 + \beta_3 \ln(INC).$$

The corresponding marginal effects are reported in table 5 by quartiles of the income distribution.

\textsuperscript{34} This decrease of the saving rate by 0.14 percentage points results from the hypothetical increase in reference income by 10 percent given the marginal effect of -0.0149 reported in table 5.

\textsuperscript{35} The specific income values correspond to income quartiles of the total population and not to quartiles of the restricted sample used for the regression, which does not include the respective top income classes as described above.
within the upper part of the distribution. We will address the income class specific nature of this mechanism again below.

Table 6 summarizes the regression results for reference income based on the trickle concept of reference groups.

*Table 6: ΔHousehold Saving Rate on ΔIncome and ΔReference Income - Trickles Concept*

<table>
<thead>
<tr>
<th>ΔSRATE</th>
<th>Current Income</th>
<th>Permanent Income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quintiles (4c)</td>
<td>Deciles (4c')</td>
</tr>
<tr>
<td>Δln(INC)</td>
<td>0.0131***</td>
<td>0.0092*</td>
</tr>
<tr>
<td></td>
<td>(0.0040)</td>
<td>(0.0048)</td>
</tr>
<tr>
<td>Δln(REFINC)</td>
<td>-0.1868**</td>
<td>-0.1286***</td>
</tr>
<tr>
<td></td>
<td>(0.0887)</td>
<td>(0.0494)</td>
</tr>
<tr>
<td>Δln(REFINC) × ln(INC)</td>
<td>0.0257***</td>
<td>0.0184***</td>
</tr>
<tr>
<td></td>
<td>(0.0118)</td>
<td>(0.0065)</td>
</tr>
</tbody>
</table>

Observations | 96,462 | 110,629 | 53,408 | 61,816
R²            | 0.0109 | 0.0113  | 0.0220 | 0.0213

Note: This table illustrates estimation results from POLS regression of the first difference of the household saving rate ΔSRATE on the first difference of log real household disposable income Δ ln(INC) and the first difference of reference income Δ ln(REFINC). Reference income is calculated according to the trickle concept. */**/*** denote significance on the 10/5/1 percent level.

The results in table 6 confirm the findings for the class concept. As expected, again, the coefficient for changes in own income is comparable to table 3 and the estimated coefficients for reference income show up with a negative sign. Compared to the class concept we observe that the impact of reference income upon the development of the saving rate is weaker. Depending on the specification, the respective coefficients are only half as large or even smaller.

Table 7 reports marginal effects of reference income by income quartiles for the trickle concept. Compared to the class concept marginal effects are weaker but comparably significant. Again, the effect is stronger within the lower part of the income distribution.

For both reference concepts the estimates for reference consumption are reported in tables A2 and A3 in the appendix. Although the coefficients for reference consumption are slightly less significant, the economic implications are qualitatively comparable to the discussed findings for reference income. While within both reference concepts, reference consumption yields a negative

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36 The marginal effect of reference income around the third income quartile for the quintile categorization (third column in tables 5 and 7) is most probably not significant because there is only little variation in the reference income for this income group.
and at most statistically highly significant coefficient, the effects of reference consumption are stronger for the class concept.\textsuperscript{37}

\textit{Table 7: Marginal Effects of Δ Reference Income on Δ Household Saving Rate by Income Quartiles - Trickle Concept}

<table>
<thead>
<tr>
<th>Household Net Income</th>
<th>Marginal effect</th>
<th>Quintiles</th>
<th>Deciles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income Quartile</td>
<td>Income Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (p25)</td>
<td>1350</td>
<td>-0.0082***</td>
<td>-0.0086***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0027)</td>
<td>(0.0031)</td>
</tr>
<tr>
<td>2 (p50)</td>
<td>1937</td>
<td>-0.0027**</td>
<td>-0.0059***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0014)</td>
<td>(0.0017)</td>
</tr>
<tr>
<td>3 (p75)</td>
<td>2671</td>
<td>0.0022</td>
<td>-0.0034**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.0026)</td>
<td>(0.0017)</td>
</tr>
</tbody>
</table>

Note: This table reports marginal effects of reference income for different levels of own household income. The effects are based on the estimation of permanent income corresponding specifications (4d) and (4d') in table 6. */**/*** denote significance on the 10/5/1 percent level. The quartile classification is based on the distribution of real monthly MA(5) household income in the year 2005.

To sum up, the adjustment of the saving rate of households is positively associated with a change of the household’s own income. Moreover, and most importantly, the adjustment of the household saving rate is negatively affected by the development of the income and/or the consumption of reference groups, i.e. by households that earn higher income. The magnitude of these effects varies with the household’s position in the income distribution. The negative effect of reference income and consumption is particularly evident for the lower two thirds and is strongest in the lower part of the income distribution.

\textbf{IV. Making a Case for the Role of Changing Income Inequality}

\textit{a. Income Concentration, Reference Income and Household Saving Rates}

Next we address the relevance of upward looking comparisons for the development of household saving rates against the background of changing income inequality in Germany. Within the observed time span from 1995-2011 the concentration of monthly net household income in Germany measured by the Gini-coefficient fell during the second half of the 1990s. Within the last decade, however, the concentration of monthly net household income has steadily increased (see

\textsuperscript{37}The result that the effect of reference consumption seems to be less pronounced than that of reference income is somewhat surprising as consumption tends to be more visible than income. This might be explained by the fact that reference consumption is constructed based on income classes rather than consumption classes.
Figure 1 illustrates the development of saving rates, median income, income shares and reference income by income classes (deciles) in Germany from 1995-2011. In the following we refer to reference income as being calculated based on the class concept using a decile classification.

We observe that during the last decade income shares of the lower 70 percent of the income distribution have clearly fallen in trend. In contrast, in particular for the upper 20 percent of the income distribution income shares have increased. Whereas, this rising income concentration was associated with decreasing median real income within income deciles 1 to 6, within deciles 9 and 10 median real income has risen. Moreover, we observe that for the lower half of the income distribution saving rates have decreased and that income group-specific saving rates are by no means clearly tied to the development of average own income. Rather we observe a comparably strong positive association of the saving rate and the income share of a respective income group suggesting that relative income changes play a role with regard to changes of household saving rates. Increasing income inequality is associated with rising reference income for the majority of households as reference income reflects the development of income shares. Thus, on average, reference income and household saving rates are negatively associated.

While this is in line with the above reported microeconometric findings for the impact of changing reference incomes for the adjustment of saving rates (section III c), our analysis also highlights the positive impact of the development of own income on the saving rate of households (section III b). Consequently, changing income inequality will affect the saving rate of households via two major channels: first, via the development of own income, i.e. absolute income changes and second, via relative income changes, i.e. the evolution of reference incomes. In order to find out more about the economic significance of these two channels for the adjustment of household saving rates the following subsection visualizes the contributions of own income and reference income based on the estimation results from section III.

Note that our calculations are based on monthly net household income. Based on yearly equivalized income the income concentration has not risen further since 2006. For a detailed discussion of the development of income inequality in Germany since the 1990s see for example Biewen and Juashz (2012) as well as Grabka et al. (2012).
Figure 1: Income Class-specific Development of Income Shares in Germany, 1995-2011.
Note: This figure illustrates median real net household income, aggregate household saving rates and reference incomes by income decile groups. These series refer to the left scale and are indexed to 1995 = 100. Decile group-specific total income shares are reported on the right scale in percent.

Source: SOEP (v28), own calculations.

b. Contribution of Own Income and Reference Income to Changes in Saving Rates

Next we want to assess the actual impact of changes in own income as well as reference income on changes of household saving rates from 1997 to 2009.\textsuperscript{39} Therefore, we calculate the absolute effects of income and reference income by multiplying their actual percentage change with the corresponding marginal effects from tables 4 and 5.\textsuperscript{40} To obtain the relative contributions of own income and reference income we divide their absolute effects by the actual change of the saving rate. This is done for different parts of the income distribution in order to understand the

\textsuperscript{39} We cover the years 1997-2009 as we use the saving and income information of the 5 year moving averages.

\textsuperscript{40} As the differences of the marginal effects of own income are negligible between income quartiles, these effects are not reported in a separate table. For the following calculations we therefore refer to the marginal effects reported in table 4.
explanatory power of absolute and relative income shocks for the adjustment of the saving rate across the income distribution. As conducted above, we contrast the effects for the first income quartile with the median income and the third income quartile. Figure 2 shows the absolute changes of household saving rates between 1997 and 2009 as well as the relative contributions of own income and reference income to these changes in household saving rates.

**Figure 2: Contribution of Own Income and Reference Income to Change in the Household Saving Rate by Income Quartiles, 1997/2009.**

We see that, depending on the income quartile, the saving rate declined by 1.6 to 2.8 percentage points. For a household with an income around the first income quartile, the fall in own income accounts for about 7.2 percent of the overall decline of the saving rate. The increase of its reference income accounts for 3.5 percent. For the median income household, decreasing own income accounts for 2.9 percent and increasing reference income for 2.7 percent of the decrease of the saving rate. With regard to households around the third income quartile, things look

---

41 For example, at the first income quartile the household’s real own income decreased by about 3.6 percent while its reference income increased by 2.4 percent. The marginal effect of own income of 0.0394 (see table 4) and the marginal effect of reference income of -0.0237 (see table 5) imply an absolute contribution of -0.12 percentage points for own income and -0.06 percentage points for reference income to the decline of the saving rate of -1.6 percentage points.

42 For the sake of illustration we chose this quartile classification of the income distribution. It suffices to illustrate the basic relationships and corresponds to the reporting of the marginal effects of reference income in tables 5 and 7.
different. Here, the decline of the saving rate can be attributed to roughly 1.7 percent to the effect of rising reference income. However, for this income group, own income has increased. Therefore, absolute and relative income changes affect the saving rate in opposite directions and the fall of the saving rate was damped by about 2.7 percent by the impact of own income.

Two things are worth summing up. First, the explanatory power of absolute and relative income changes for the adjustment of household saving rates is economically relevant. Second, these effects differ considerably across the income distribution. For the lower half of the income distribution declining own income and rising reference income coincide, and therefore, both effects contribute to the fall of the saving rate. For households around the third income quartile this is not the case. Here, we see that both effects neutralize each other to a certain extend as increasing own income tends to raise the household saving rate while rising reference income reduces the saving rate.

c. How would Saving Rates have evolved without the Impact of Own Income and Reference Income?

In this section, we simulate the counterfactual evolution of income group specific saving rates by subtracting those proportions of the changes in the saving rate that are ascribed to changes in own income and/or reference income. The deviation between the artificial and the actual development of the saving rate is supposed to approximate the impact of changing income inequality upon household saving rates.

Figure 3 compares the development of the actual saving rate and different counterfactual saving rates that result from the exclusion of income and/or reference income effects. Again, we contrast the development for households around the first income quartile, the median income and the third income quartile.

The black line illustrates the development of the actual saving rate. The blue dotted line represents the saving rate adjusted for the effect of own income. The saving rate adjusted for the effect of reference income is approximated by the blue solid line. The dark red line highlights the counterfactual where both income effects are excluded. The left column shows the time span from 1997-2009.43 Due to the sharp fall within the first few years, it is hard to visually identify the effects of own income changes and interpersonal comparisons. The right column thus depicts the period from 2003 to 2009. As mentioned above, within this period inequality of household net

43 For consistency reasons we end up with this period because our estimations and thus the counterfactual exercise are based on 5 year moving averages of incomes and saving rates (see section II and III).
income has risen significantly in Germany (see figure A1 in the appendix) which is associated with larger changes in the key explanatory variables.\textsuperscript{44}

Within the years 2003-2009 for the first income quartile and around the median income (right column, rows 1 and 2) we see that the saving rates adjusted for the impact of own income and for the impact of reference income lie above the actual saving rate.\textsuperscript{45} Thus, increasing income inequality has contributed to the decrease of saving rates in the lower half of the income distribution via the two effects of declining own income and rising reference income. However, as mentioned above, for households around the third income quartile this is not the case. Here, without the effect of upward looking comparisons, i.e. the impact of reference income, the saving rate would have been higher.\textsuperscript{46} In contrast, without the increase of own income, the saving rate would have been lower.

Moreover, the effects of these two channels of absolute and relative income changes help understanding the development of the aggregate household saving rate during the period of rising income inequality in Germany (see figure A1 in the appendix). On the one hand, taking the whole income distribution into account, rising top income shares and the associated increase of saving rates of high income households caused a slight rise of the overall saving rate. Thereby, falling saving rates within the lower half of the income distribution were compensated by the increase of saving rates of high income households. This is even more so the case because these households yield considerably higher income shares (see figure 1). However, on the other hand, the effect of rising reference incomes mitigated this increase. Thus, without the effect of positional concerns, i.e. if households had not been influenced by relative income losses, the aggregate household saving rate would have risen even stronger.

In general, we see that the effect of microeconomic adjustments of household saving rates on aggregate consumption varies with the characteristics of the asymmetric income shock. The effect of changes in the distribution of income on the aggregate saving rate depends on which parts of the income distribution are affected by the shock. The higher the income of an affected household group the larger is the pro-cyclical effect on the aggregate household saving rate via the adjustment to changes in households’ own income. Besides this, we have shown that households do care about their relative income position and, therefore, compare themselves to the development of the income of richer households. This implies that their adjustment of savings

\textsuperscript{44} In this period the Gini-coefficient of household disposable income increased by about 10 percent.

\textsuperscript{45} Although not plotted in the figure, we also constructed significance bands for the counterfactuals on the basis of the confidence intervals of the respective marginal effects for own income and reference income. The actual saving rate is not within these bands.

\textsuperscript{46} The impact of reference income around the third income quartile has lowered the saving rate within this income group by approximately 0.1 percentage points.
rates also depends on how the income of reference groups evolves in periods of changing income inequality.

Figure 3: Impact of Own Income and Reference Income upon Saving Rates, by Income Quartiles.

Note: This figure illustrates the impact of changes in own income and reference income upon household saving rates by income quartiles.

Source: SOEP (v28), own calculations.
V. Further Implications

Our findings allow connecting microeconometric evidence on household saving behavior and its determinants to macroeconomic developments but also bear extensive implications for economic theory as well as economic policy.

In particular, our results complement the contributions of Kopczuk et al. (2010) as well as Blundell and Etheridge (2010) who show that the comparably small increase of consumption inequality given rising income inequality in several industrialized countries cannot be explained by consumption smoothing behavior in reaction to transitory income shocks. Instead of consumption smoothing our results support the argument that the moderate growth of consumption inequality is substantially driven by the adjustment of household saving rates due to positional concerns: In the face of persistent shocks to their relative income, low and middle class households are reluctant to reducing consumption in an attempt to "keep up with the Joneses".

Moreover, our findings provide microeconometric evidence for the Rajan Hypothesis. Following the Great Recession, more and more economists have taken on the issue of income inequality as a core problem leading up to the financial downfall in 2008. The key mechanism of transmission is seen in expenditure cascades that are caused by the fact that low and middle class households care about their level of consumption or income relative to the rich. We show that these upward looking comparisons can be identified as a statistically and economically significant attribute of household consumption and saving behavior. We thus provide important micro level evidence for the basic assumptions of macroeconomic contributions such as Kumhof and Rancière (2010) or Kumhof et al. (2012).

VI. Conclusion

Using German household data from the SOEP between 1995 and 2011 we examine the role of upward looking comparisons for the saving behavior of households.

We find that changes in household income are positively associated with an adjustment of household saving rates over time. Moreover and most importantly, changes in the income and/or the consumption of higher income reference groups negatively affect household saving rates because households compare themselves to their social environment and especially the living standard of richer households. Our results offer a better understanding of the link between changes in income inequality and the development of aggregate saving as asymmetric income shocks, i.e. relative income changes, affect aggregate consumption.
We compare several measures of reference income and reference consumption. Our results prove robust to different types of categorization of the income distribution and different degrees of smoothing income and saving.

Our findings give valuable insights for the analysis of the evolution of the aggregate saving rate and why consumption inequality is considerably smaller than income inequality in Germany. In addition, our study provides microeconometric support for the basic assumptions of the Rajan Hypothesis. Furthermore, these insights bear various implications for economic theory and policy as, for example, modeling choices of heterogeneous agents in macroeconomic simulations or the projections of the aggregate effects of different types of taxation, e.g. consumption versus income taxes as for example highlighted by Dynan et al. (2004), may be improved.
References


Appendix

Table A1: Descriptive Statistics of Dependent Variables and our main Explanatory Variables

<table>
<thead>
<tr>
<th>Key Variables</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saving Rate</td>
<td>Current MA(5)</td>
<td>0.089</td>
<td>0.114</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Current MA(5)</td>
<td>0.091</td>
<td>0.094</td>
<td>0</td>
<td>0.948</td>
</tr>
<tr>
<td>Own Income</td>
<td>Current MA(5)</td>
<td>2.095</td>
<td>2.821</td>
<td>0.091</td>
<td>4.529</td>
</tr>
<tr>
<td>Reference Consumption (class, deciles)</td>
<td>Current MA(5)</td>
<td>2.923</td>
<td>765</td>
<td>1919</td>
<td>4.529</td>
</tr>
<tr>
<td>Reference Consumption (class, quintiles)</td>
<td>Current MA(5)</td>
<td>2.885</td>
<td>560</td>
<td>2.071</td>
<td>3.712</td>
</tr>
<tr>
<td>Reference Consumption (trickle, deciles)</td>
<td>Current MA(5)</td>
<td>2.217</td>
<td>1.107</td>
<td>879</td>
<td>4.529</td>
</tr>
<tr>
<td>Reference Consumption (trickle, quintiles)</td>
<td>Current MA(5)</td>
<td>2.416</td>
<td>936</td>
<td>1.180</td>
<td>3.712</td>
</tr>
<tr>
<td>Reference Income (class, deciles)</td>
<td>Current MA(5)</td>
<td>3.376</td>
<td>944</td>
<td>2.182</td>
<td>5.383</td>
</tr>
<tr>
<td>Reference Income (class, quintiles)</td>
<td>Current MA(5)</td>
<td>3.269</td>
<td>809</td>
<td>2.213</td>
<td>4.314</td>
</tr>
<tr>
<td>Reference Income (trickle, deciles)</td>
<td>Current MA(5)</td>
<td>3.217</td>
<td>682</td>
<td>2.363</td>
<td>4.066</td>
</tr>
<tr>
<td>Reference Income (trickle, quintiles)</td>
<td>Current MA(5)</td>
<td>2.526</td>
<td>1.348</td>
<td>1.030</td>
<td>5.383</td>
</tr>
</tbody>
</table>

Note: This table reports weighted summary statistics for our main explanatory variables and the dependent variables. The means as well as the minimum and maximum values are reported in 2010 Euros. The standard deviation is in percentage points for the saving rates and in 2010 Euros for the explanatory variables.

Table A2: Δ Household Saving Rate on Δ Income and Δ Reference Consumption - Class Concept

<table>
<thead>
<tr>
<th>Δ SRATE</th>
<th>Current Consumption</th>
<th>Permanent Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quintiles (5a)</td>
<td>Deciles (5a')</td>
</tr>
<tr>
<td>Δln (INC)</td>
<td>0.0124***</td>
<td>0.0106**</td>
</tr>
<tr>
<td></td>
<td>(0.0040)</td>
<td>(0.0047)</td>
</tr>
<tr>
<td>Δln (REFCON)</td>
<td>-0.3906**</td>
<td>-0.3063***</td>
</tr>
<tr>
<td></td>
<td>(0.1877)</td>
<td>(0.1132)</td>
</tr>
<tr>
<td>Δln (REFCON) × ln (INC)</td>
<td>0.0540**</td>
<td>0.0420***</td>
</tr>
<tr>
<td></td>
<td>(0.0251)</td>
<td>(0.0147)</td>
</tr>
<tr>
<td>Observations</td>
<td>96,462</td>
<td>110,629</td>
</tr>
</tbody>
</table>

Note: This table illustrates estimation results from POLS regression of the first difference of the household saving rate Δ SRATE on the first difference of log real household disposable income Δ ln (INC) and the first difference of reference income Δ ln (REFCON). Reference consumption is calculated according to the class concept. */**/*** denote significance on the 10/5/1 percent level.

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### Table A3: Δ Household Saving Rate on Δ Income and Δ Reference Consumption - Trickle Concept

<table>
<thead>
<tr>
<th>Δ SRATE</th>
<th>Current Consumption</th>
<th>Permanent Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quintiles (5c)</td>
<td>Deciles (5c')</td>
</tr>
<tr>
<td>Δln (INC)</td>
<td>0.0128***</td>
<td>0.0090*</td>
</tr>
<tr>
<td></td>
<td>(0.0040)</td>
<td>(0.0049)</td>
</tr>
<tr>
<td>Δln (REFCON)</td>
<td>-0.1966**</td>
<td>-0.1363**</td>
</tr>
<tr>
<td></td>
<td>(0.0937)</td>
<td>(0.0529)</td>
</tr>
<tr>
<td>Δln (REFCON) × ln (INC)</td>
<td>0.0271**</td>
<td>0.0195***</td>
</tr>
<tr>
<td></td>
<td>(0.0125)</td>
<td>(0.0069)</td>
</tr>
</tbody>
</table>

| Observations | 96,462 | 110,629 | 53,408 | 61,816 |
| R²           | 0.0109 | 0.0112  | 0.0219 | 0.0212 |

Note: This table illustrates estimation results from POLS regression of the first difference of the household saving rate Δ SRATE on the first difference of log real household disposable income Δ ln (INC) and the first difference of reference income Δ ln (REFCON). Reference consumption is calculated according to the trickle concept. */**/*** denote significance on the 10/5/1 percent level.

### Figure A1: Income Inequality and Aggregate Household Saving Rate, 1995-2011.

Note: This figure shows the development of inequality of household net income from measured by the Gini-Coefficient (left scale) and the aggregate household saving rate (right scale).

Source: SOEP (v28), own calculations.