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## Are Consumers Planning Consumption According to an Euler Equation?

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# Are Consumers Planning Consumption According to an Euler Equation?

## Abstract

Evaluating a new survey dataset of German consumers, we test whether individual consumption plans are formed according to an Euler equation derived from consumption life-cycle models. Estimating several consumption Euler equations, the results are mostly in line with the theory: We find evidence of consumption smoothing, since individual current and planned spending are positively correlated. In addition, current spending is positively correlated with both quantitative and qualitative inflation expectations, and negatively with quantitative nominal interest rate expectations. Overall, this results in a negative link between current spending and implied real interest rate expectations, where the weaker effect of nominal interest rate expectations might be due to the current zero-lower-bound environment. As expected, the effect of perceived real interest rates is most pronounced for consumers who are active on financial markets. Finally, economic news on inflation and financial market developments observed by the consumer strengthen the effects of their interest rate and inflation expectations on current spending.

JEL-Codes: D120, D140, D840, C830.

Keywords: Euler equation, consumers, macroeconomic expectations, consumption plans, survey micro data.

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# 1 Introduction

In recent years, consumers' macroeconomic expectations have become increasingly important for central banks aiming at guiding and anchoring expectations of the general public. These expectations are usually measured in household survey data. While the literature so far has mainly focused on investigating the expectation formation process of consumers' macroeconomic expectations (e.g. [Branch \(2004\)](#), [Coibion and Gorodnichenko \(2015a\)](#) and [Dräger et al. \(2016\)](#)), an important question remains: Do consumers act on these expectations in their economic decision making? This question is crucial, since central banks implicitly assume that consumers' inflation and interest rate expectations will affect their wage negotiations as well as their consumption and saving decisions and thereby impact on actual inflation.

In light of the recent zero lower bound (ZLB) experience in the US and in European economies, several studies have used micro survey data to test for a link between inflation expectations and consumers' current spending, or their reported likelihood to consume ([Burke and Ozdagli, 2013](#); [Bachmann et al., 2015](#); [Ichiue and Nishiguchi, 2015](#); [D'Acunto et al., 2016](#)). The main theoretical hypothesis underlying these studies is that in times of negative shadow interest rates, an increase in expected inflation might help to lower real interest rates, as long as the nominal interest rate stays at zero, and thereby boost consumption and investment.<sup>1</sup> Using the micro data from different consumer survey datasets in the US, both [Burke and Ozdagli \(2013\)](#) and [Bachmann et al. \(2015\)](#) find little evidence of a positive link between consumers' inflation expectations and their consumption expenditure, i.e. their reported "readiness to spend" at the ZLB.<sup>2</sup> More recently, [Crump et al. \(2015\)](#) estimate the link between quantitative expected changes in consumption and quantitative inflation expectations from the new Survey of Consumer Expectations (SCE) in an Euler equation setting, assuming homogeneous nominal interest rate perceptions. The authors report a robust positive effect of inflation expectations, with an implied subjective elasticity of intertemporal substitution around 0.8. Finally, [Ichiue and Nishiguchi \(2015\)](#) and [D'Acunto et al. \(2016\)](#) evaluate Japanese and German micro survey data and report a significantly positive relationship between consumers' actual consumption or their "readiness to spend" and expected inflation.

In this paper, we take the previous analyses one step further and use a new survey micro dataset to evaluate the link between German consumers' decisions on individual current and planned consumption and a range of macroeconomic expectations. In or-

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<sup>1</sup>Note that theoretically also a negative link between inflation expectations and consumption might be possible if the adverse income effect from higher expected inflation dominates over the intertemporal substitution effect or if higher expected inflation is seen as a negative economic indicator, resulting in higher precautionary saving ([Shiller, 1997](#); [Bachmann et al., 2015](#)).

<sup>2</sup>Reported "readiness to spend" is taken as a proxy for actual consumption expenditure and measured in several questions in the University of Michigan Survey of Consumers asking whether consumers generally think now is a good or a bad time to spend on durables, cars etc. We term this measure the "consumption climate" to capture the more general assessment in the question.

der to derive hypotheses from economic theory, we base the analysis on the life-cycle model of consumption resulting in the well-known consumption Euler equation. Specifically, we evaluate whether consumers' current consumption is related to future individual consumption plans as well as the individual nominal interest rate and inflation expectations. In contrast to the previous literature, we can thus control for two different channels via which consumers' perception of real interest rates may affect their current spending decision: The nominal interest rate channel and the inflation channel. The analysis is conducted using two cross-sectional waves from a new household survey conducted at the University of Hamburg. The survey covers a sample representative of the German population and is tailored to obtain detailed information on consumers' current and planned consumption and saving behavior, as well as a large set of individual macroeconomic expectations and socio-demographic details including consumers' financial literacy and financial risk attitude. Given the cross-sectional nature of our dataset and the qualitative survey questions analyzed, we estimate ordered probit models and evaluate the marginal effects of planned consumption as well as inflation and interest rate expectations on the likelihood of stating an increase in current consumption, while controlling for a large set of socio-demographic factors.

Our results give some evidence in favor of the consumption Euler equation. We find that reported qualitative changes in consumption in the previous 12 months are related positively to consumers' reported planned changes in consumption in the next 12 months. Moreover, consumers' current consumption is significantly positively linked with both their qualitative and their quantitative inflation expectations, in line with the results in [Crump et al. \(2015\)](#) and [D'Acunto et al. \(2016\)](#). Nominal interest rate expectations are generally found to affect current consumption with a negative coefficient. Overall, it seems that when asked explicitly about their individual current and planned consumption, German consumers do consider future consumption as well as some measure of the real interest rate. This result is interesting due to the ZLB environment in Germany at the time of the survey and the previous contrasting evidence in other studies.

Evaluating the role of financial market participation on households' consumption patterns, we find again evidence in line with the theory: Consumers who do not save do not react to their interest rate or inflation expectations, while the effect is strongly significant for households who save in assets traded on financial markets. In addition, we test for interaction effects of macroeconomic expectations with economic news on monetary policy, inflation or financial market developments perceived by the consumer. These news might be seen as potential "shocks" to consumers' interest rate or inflation expectations or as indication of new information that influences consumers' expectation formation in line with rational inattention or epidemiology models ([Sims, 2003](#); [Carroll, 2001b](#)). While news on monetary policy have no significant effect, the results suggest that news on higher prices reinforce the impact of consumers' inflation expectations on their current spending

and news on financial market developments strengthen the effect of their nominal interest rate expectations.

The present study is related to the literature dealing with a link between household consumption and consumers' macroeconomic expectations. Most of the earlier literature focuses on the impact of consumers' inflation expectations on their consumption behavior, where, as pointed out by [Ichiue and Nishiguchi \(2015\)](#), the question arises whether the positive link predicted by consumption life-cycle models arises empirically or whether other factors such as wealth effects or precautionary saving motives dominate.

In an early contribution, [Juster and Wachtel \(1972\)](#) use aggregate data from the University of Michigan Survey of Consumers on the index of consumer sentiment, inflation expectations and consumers' evaluation of the consumption climate on durables and cars to explain actual aggregate durables and car purchases in the US. The authors report that higher inflation reduces durables expenditures, but leads to an increase in non-durables and services expenditures, with a slightly negative effect on balance. [Bachmann et al. \(2015\)](#) analyse a longer time span for the US in the University of Michigan Survey of Consumers and report mostly insignificant or even negative links between consumers' inflation expectations and their reported "readiness to spend". Nevertheless, they find a positive link between consumers' assessment of the consumption climate and their inflation expectations for those whose inflation forecasts are relatively accurate. This could suggest that consumers' financial and economic literacy plays a role in this relationship. Similarly, [Burke and Ozdagli \(2013\)](#) evaluate the link of inflation expectations to actual consumer spending on a variety of durable and non-durable goods in a household panel setting covering the ZLB period in the US, and find little robust effects apart from a positive link between short-run inflation expectations and the likelihood of a car purchase. In contrast to the previous US results, [Crump et al. \(2015\)](#) find a positive relation between consumption growth and inflation expectations of US consumers in panel cross-sections from the new Survey of Consumer Expectations (SCE) conducted at the New York Fed. By employing quantitative expectations, the authors are able to estimate the subjective elasticity of intertemporal substitution and report values around 0.8, close to values typically used in the calibration of macroeconomic models. Finally, [Ichiue and Nishiguchi \(2015\)](#) take advantage of a longer ZLB period in Japan and report robust findings that consumers increase actual consumption, and reduce planned consumption, when they report higher inflation expectations.

Evaluating an earlier European survey dataset outside the ZLB, [D'Acunto et al. \(2016\)](#) report a positive relationship between German consumers' "readiness to spend" on durables and their inflation expectations, while a negative relation emerges regarding their likelihood to save. [D'Acunto et al. \(2016\)](#) further evaluate the impact of an unexpected VAT increase in Germany. Comparing the results with matched households in other European countries, the authors attribute a large increase in "readiness to spend" after the shock to increases in the inflation expectations after the VAT shock. Regard-

ing the impact of further economic expectations on household consumption, [Hurd and Rohwedder \(2013\)](#) estimate the effect of the individual assessment of the likelihood of unemployment on household consumption during the recent Great Recession in the US and report that spending on non-durable goods such as clothing is reduced significantly if households perceive a higher likelihood of unemployment. The analysis in this paper adds to the literature by framing the analysis in terms of the consumption Euler equation model, where we simultaneously test for the impact of individual planned consumption, nominal interest rate expectations and inflation expectations on current consumption spending. Thereby, we can test for evidence of consumption smoothing as well as for the nominal interest rate channel and the inflation channel from consumers' perceptions of real interest rates.

Moreover, our analysis relates to the vast literature on consumption life-cycle models and the question whether households smooth their consumption (see [Browning and Crossley \(2001\)](#) for an overview of the empirical literature). In his seminal contribution, the model developed by [Friedman \(1957\)](#) states that rationally forward-looking consumer should consider their "permanent" income over their life-cycle when determining consumption and money demand and choose consumption levels that keep the marginal utility of money constant. This results in predictable patterns of consumption with respect to anticipated changes in income, differences in consumption patterns across socio-demographic groups that differ according to their permanent income and the stage of the life-cycle as well as changes in the opportunity costs of withholding current consumption (or of holding non-interest bearing money) measured by the real interest rate. While in this paper, we do not focus on households' consumption smoothing *per se*, our analysis relates to empirical studies estimating consumption Euler equations. Previous approaches, such as for instance [Carroll \(2001a\)](#) and [Attanasio and Low \(2004\)](#), discuss issues related to the estimation of the structural parameters in the Euler equation with GMM instruments for expectational terms. More recently, the papers by [Smith and Yetman \(2013\)](#) and [Crump et al. \(2015\)](#) use quantitative survey data for expected consumption growth and expected inflation to estimate an Euler equation relationship. While the former discusses the econometric advantages of identifying the relationship with survey expectations, the latter provides estimates of the subjective elasticity of intertemporal substitution with quantitative consumer expectations. The focus of this paper is different, as we are not interested in quantifying structural parameters, but rather test whether an consumption Euler equation estimated with both qualitative and quantitative individual survey expectations on nominal interest rates and inflation and the individual expenditure assessment in a micro data setting shows the expected signs and significance of the parameters.

Additionally, our analysis allows to test for implications of the life-cycle model regarding differences in consumption and saving plans across socio-demographic subgroups. Evaluating individual financial expectations in the British Household Panel Survey, for in-

stance [Brown and Taylor \(2006\)](#) report evidence in favour of life-cycle models, as financial expectations differ significantly across age, employment and income groups.

Finally, our analysis relates to the literature on the consistency of consumers' expectations. Studies such as [Carvalho and Nechio \(2014\)](#) and [Dräger et al. \(2016\)](#) test the consistency of several macroeconomic expectations with theoretical concepts such as the Taylor rule, the Phillips curve or the Fisher equation. Somewhat more closely related to our approach, the study by [Armantier et al. \(2015\)](#) compares consumers' elicited survey inflation expectations to their actions in a financially incentivised investment experiment. The authors find that consumers generally act on their expectations in their choices during the experiment. Moreover, individual changes in expectations between two interviews are related to adjusted behaviour also in the experiment, consistent with payoff maximisation. [Giamboni et al. \(2013\)](#) report that Dutch households consistently adjust their consumption after predictable income shocks resulting from overly optimistic or pessimistic income expectations.

The rest of the paper is structured as follows. The theoretical framework for the analysis is described in section 2. Section 3 describes the new survey data set and section 4 presents the empirical results. Finally, section 5 summarises and concludes.

## 2 Relating Consumers' Consumption and Saving Plans to an Euler Equation

Starting with the seminal contribution in [Friedman \(1957\)](#), theoretical life-cycle models of consumption propose that households aim at smoothing consumption with respect to their permanent income over the life-cycle, thereby choosing consumption so as to keep the marginal utility of money constant over time ([Browning and Crossley, 2001](#)). In this model set-up, the Euler equation describes the optimal intertemporal consumption decision of households that aim at maximizing expected utility from consumption and leisure subject to a period budget-constraint. This relation has become an important building block in modern dynamic macro models ([Clarida et al., 1999](#); [Galí, 2008](#)). Assuming CRRA utility, the problem may be stated as follows:

$$\max E_0 \sum_{t=0}^T \beta^t \left[ \frac{C_{it}^{1-\sigma}}{1-\sigma} - \frac{N_{it}^{1+\varphi}}{1+\varphi} \right] \quad (1)$$

subject to

$$P_t C_{it} + Q_t B_{it} \leq B_{i,t-1} + W_{it} N_{it} - T_{it}, \forall t \geq 0, \quad (2)$$

where  $T$  gives the final period of the consumer  $i$ 's life-cycle horizon,  $C_{it}$  is individual consumption,  $N_{it}$  is hours worked,  $P_t$  is the price of the consumption good,  $W_{it}$  is the nominal wage received by consumer  $i$ ,  $B_{it}$  represents the quantity of one-period, nominal

riskless discount bond holdings, purchased in  $t$ , paying one unit of money at maturity in  $t+1$ ,  $Q_t$  is the bond price, and  $T_{it}$  represents lump-sum transfers. Solving the optimization problem and log-linearizing then yields the standard Euler equation in its recursive form:

$$c_{it} = E_t c_{i,t+1} - \sigma^{-1} (i_t - E_t \pi_{t+1} - \ln \beta), \quad (3)$$

where lower case variables denote deviations from steady-state. Expected inflation is then given by  $E_t \pi_{t+1}$  and  $i_t$  denotes the nominal bond yield, which in equilibrium equals the negative log of the bond price  $Q_t$ . In this framework, the marginal rate of substitution between current and future consumption thus equals the opportunity cost of choosing consumption over saving as measured by the real interest rate, adjusted for the household's time preference rate. From the theoretical Euler equation in (3), we hypothesize that current consumption is positively related to planned consumption and expected inflation, and negatively to (expected) nominal interest rates.

To evaluate whether consumers form their consumption plans in line with the simple Euler equation in (3), we estimate the individual likelihood to report a perceived increase in current spending over the past 12 months relative to an average year from ordered probit estimates of the following regression set-up:

$$c_{it}^p = \beta_0 + \beta_1 c_{it}^e + \beta_2 i_{it}^e + \beta_3 \pi_{it}^e + \Gamma X_{it}^{controls} + u_{it}, \quad (4)$$

where  $c_{it}^p$  measures consumers' individual perceived relative change in current consumption,  $c_{it}^e$  is their reported qualitative planned change in relative expenditures in the next 12 months,  $i_{it}^e$  and  $\pi_{it}^e$  are individually reported nominal interest rate and inflation expectations and the vector  $X_{it}^{controls}$  includes individual socio-demographic controls. The exact wording of the survey questions is given in the appendix. From the theoretical Euler equation in (3), we thus hypothesize that the coefficients  $\beta_1$  and  $\beta_3$  are significantly positive, while  $\beta_2$  is expected to be significantly negative.

Note that three caveats apply: First, our survey measures  $c_{it}$  and  $c_{it}^e$  record changes in consumers' *total expenditure* over the last/next 12 months compared to an average year. Hence, this may include purchases of durable goods and, thus, strictly speaking we estimate a spending, rather than a consumption, Euler equation. Nevertheless, this question wording is frequently used in other consumer surveys, such as the Bundesbank Panel of Household Finances, to capture households' consumption and we also test for an impact of expected expenditures only on durable consumption goods. Second, the questions ask about nominal, rather than real, current and planned spending. This means that the estimated parameters are linear transformations of the underlying structural ones, as discussed in [Crump et al. \(2015\)](#). However, it should not affect their sign or significance, especially since actual inflation was very low at the time of the survey. Third, since the dataset does not include any information about consumers' current interest rate perceptions  $i_t$  or their perception of the current real interest rate, we proxy  $i_t$  by their



expected interest rate  $i_{it}^e$ . We argue that since interest rates are relatively persistent, this is a valid proxy and should not drive our results. Moreover, evaluating the impact of interest rate and inflation expectations separately has the advantage that we can distinguish between two potential channels of real interest rates affecting consumers' consumption.

In order to test for the robustness of our results, we also estimate versions of an Euler equation where planned consumption is proxied with planned changes in spending on durable goods ( $c_{it}^{e,dur}$ ). While it is generally difficult to disentangle spending and consumption in survey measures such as ours, comparing the results of this specification with those where planned consumption is measured by overall spending gives some hint as to which part of overall expenditure drives the result with  $c_{it}^e$ .

Finally, a further robustness check which allows to compare our results more closely with those in [Bachmann et al. \(2015\)](#) and [D'Acunto et al. \(2016\)](#), replaces consumers' individual consumption  $c_{it}$  with their view on the general consumption climate for durable goods ( $c_{it}^{climate}$ ).<sup>3</sup>

### 3 Dataset

Within the new Consumer Survey on Expectations, Consumption and Saving conducted at the University of Hamburg, telephone interviews with a representative sample of German households were conducted in two waves. The first wave was interviewed from October 20, 2015 to December 23, 2015 and consists of 313 interviews.<sup>4</sup> The second wave consists only of respondents who were already interviewed in the first wave and agreed to a second interview six months later, resulting in a small panel dimension. This wave consists of 183 interviews, which were conducted between May 12, 2016 and June 29, 2016. We use sample weighted observations in order to ensure the representativeness of our results with respect to the overall population.

The survey is especially suited for the analysis of an Euler equation relationship, since unlike other existing surveys it includes information on households' individual spending patterns as well as their individual macroeconomic expectations.<sup>5</sup> Specifically, the survey includes information on consumers' expectations regarding a range of macroeconomic variables, of which we mainly use information on expected interest rates and inflation in the present analysis. Moreover, consumers are asked in detail about their current and

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<sup>3</sup>The wording of the survey question on consumers' perception of the general consumption climate is taken from the European Commission Joint Harmonized Survey of Consumers. The question is phrased very closely to a similar question in the University of Michigan Survey of Consumers, see the appendix. This is the question taken as a proxy for current consumption in [Bachmann et al. \(2015\)](#), which they term consumers' "readiness to spend".

<sup>4</sup>The whole survey sample is obtained from both landline and mobile telephone numbers registered in Germany, using the Häder-Gabler approach ([Häder et al., 2009](#)).

<sup>5</sup>Well established surveys on consumers' macroeconomic expectations such as the University of Michigan Survey of Consumers in the US do not include information on their individual spending path, while surveys such as the Bundesbank Panel of Household Finances include very detailed information on households' spending and saving, but only sparsely ask about households' macroeconomic expectations.

planned consumption and savings. The specific wording of the survey questions on current and planned consumption, as well as the interest rate and inflation expectations is given in the appendix.<sup>6</sup> These questions were phrased similarly to comparable questions in the Bundesbank Panel of Household Finances, the European Commission Joint Harmonized Survey of Consumers and the University of Michigan Survey of Consumers. Finally, the survey includes information on a large range of socio-demographic characteristics that we employ as control variables.

In addition to consumers' inflation and nominal interest rate expectations, we control for their qualitative expectations regarding the change in the general economic situation ( $y_{qual,it}^e$ ), the unemployment rate ( $u_{qual,it}^e$ ), stock prices ( $stocks_{qual,it}^e$ ) as well as consumers' expectations on changes in their individual income ( $income_{qual,it}^e$ ).

Specifically, we account for consumers' sex, their age (including a squared term), a dummy for being married (*married*) and for cohabiting with a partner (*cohab\_partner*) and the number of persons in the household (*no\_persons*). Additionally, we control for whether their personal income falls in the lowest category (*inc\_l* for income < 1000 € per month), the medium low category (*inc\_ml* for 1000 € ≤ income < 2000 € per month) or the medium high category (*inc\_mh* for 2000 € ≤ income < 4000 € per month) with personal incomes above 4000 € per month in the reference category. The employment status is measured in four employment groups: Those that do not work are taken as reference category and compared to consumers in a medium low category (*employ\_ml* for those infrequently working or working in so-called mini jobs), a medium high category (*employ\_mh* for those working part-time) and a high category (*employ\_h* for those working full time). Finally, we measure consumers' financial literacy with the three questions proposed in Lusardi and Mitchell (2008), where the index *literacy* measures the number of correct answers, and we account for consumers' financial risk attitude (*risk*) with answers to a qualitative question asking whether they take very high/above average/average/no financial risk in order to earn very high/above average/average/no specified returns.

The survey also records information on consumers' perception of economic news. After asking whether consumers recall any economic news they recently heard, an open question follows asking them what news they recall.<sup>7</sup> The answers are coded into categories. In the regression analysis we test for effects of news on monetary policy, including information on interest rates or currency news (*news\_monetary\_policy*), on inflation (*news\_inflation*), and on financial markets, covering news on banks, stock markets and housing markets (*news\_financial\_markets*).

The economic situation in Germany in December 2015 was characterized by low employment (6.1% unemployment rate) and a booming economy with 2.1% annual growth in real GDP (4<sup>th</sup> quarter), very low annual inflation at 0.3% and low interest rates near the zero lower bound (1.17% Euro area 10-year government benchmark bond yields and

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<sup>6</sup>The complete survey questionnaire (in German) is available from the authors upon request.

<sup>7</sup>A similar question is also included in the University of Michigan Survey of Consumers.

0.64% on bank deposits redeemable within 3 months in the Euro area). By June 2016, unemployment had fallen further to 5.9% with annual real GDP growth at 3.1% in the second quarter of 2016. Annual inflation in June 2016 was again very low at 0.3%, and interest rates had fallen even further (0.82% Euro area 10-year government benchmark bond yields and 0.54% on bank deposits redeemable within 3 months in the Euro area).<sup>8</sup>

Tables 1 and 2 give an indication of the consistency of consumers' perceived consumption and saving climate and of their planned consumption and saving in this environment. More precisely, we want to check whether consumers in the survey perceive consumption and saving as complementary decisions in the sense that if they state that given the current economic conditions now is a good time to consume, or that they plan to consume more in the next 12 months, they simultaneously think that now is not a good time to save, or that they plan to save less.<sup>9</sup>

Table 1: Consistency of Consumption and Saving Climate

Consumption Climate	Saving Climate					Total
	1	2	3	4	5	
1	24 (18.05%)	20 (12.20%)	18 (20.93%)	7 (9.09%)	4 (33.33%)	73 (15.47%)
2	13 (9.77%)	31 (18.90%)	17 (19.77%)	23 (29.87%)	3 (25.00%)	87 (18.43%)
3	96 (72.18%)	113 (68.90%)	51 (59.30%)	47 (61.04%)	5 (41.67%)	312 (66.10%)
Total	133 (100%)	164 (100%)	86 (100%)	77 (100%)	12 (100%)	472 (100%)

Note: Answer categories to the consumption climate question are “1 – A bad time”, “2 – Neither a good, nor a bad time” and “3 – A bad time”. Answer categories to the saving climate question are “1 – A very bad time”, “2 – a relatively bad time”, “3 – Not a good time”, “4 – A relatively good time” and “5 – A very good time”.

Looking at the total number of answers in both waves in Table 1, we observe that the majority of consumers in our survey think that given the current economic condition, now is a good time to purchase durable goods (66.10%), while they state that now is either a bad or a relatively bad time to save ( $\frac{133+164}{472} = 62.92\%$ ). This is plausible considering the very low level of interest rates and the booming economy in Germany in 2015 and 2016. Evaluating the fractions of answers separately, we observe that those consumers reporting a neutral or positive consumption climate (answers 2 and 3) tend to be consistent in the sense that the majority then reports also a neutral or a negative saving climate (answers

<sup>8</sup>Data are from Destatis for the German business cycle data and from the ECB for data on interest rates.

<sup>9</sup>Note that planned consumption and saving might be less symmetric than the perception of the current consumption and saving climate, since for instance events such a foreseen increase in income could lead consumers to simultaneously plan increases in both consumption and saving.

Table 2: Consistency of Planned Consumption and Planned Saving

Planned Consumption	Planned Saving			Total
	1	2	3	
1	13 (13.54%)	17 (6.23%)	14 (27.45%)	44 (10.48%)
2	49 (51.04%)	204 (74.73%)	29 (56.86%)	282 (67.14%)
3	34 (35.42%)	52 (19.05%)	8 (15.69%)	94 (22.38%)
Total	96 (100%)	273 (100%)	51 (100%)	420 (100%)

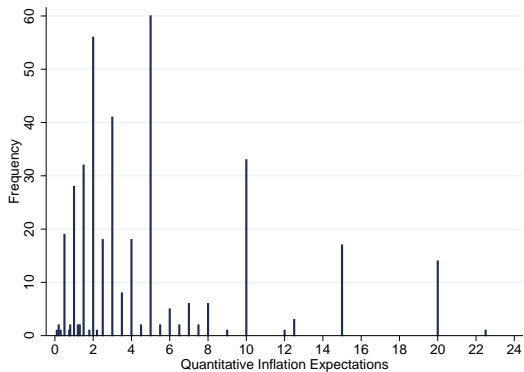
Note: Answer categories to the planned consumption question are “1 – Considerably lower than in an average year”, “2 – About the same” and “3 – Considerably higher than in an average year”. Answer categories to the planned saving question are “1 – A lower fraction of income”, “2 – About the same fraction” and “3 – A higher fraction of income”.

2-4 and 1-2, respectively). Nevertheless, there are also significant fractions of answers in the remaining categories. Finally, it seems that those consumers reporting a negative consumption climate (answer 1) seem generally pessimistic and also report a negative saving climate (answers 1-2).

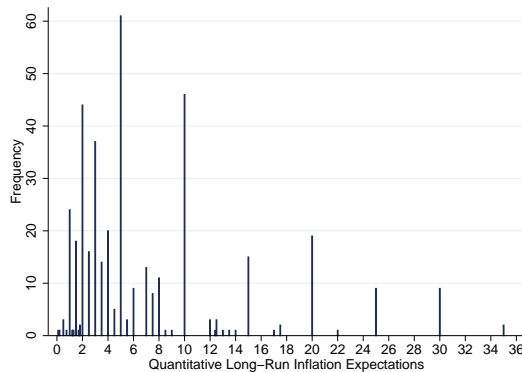
Next, we evaluate the consistency of consumers’ plans regarding individual consumption and saving. As shown in Table 2, the majority of consumers in our dataset plan not to adjust their consumption and saving in the next 12 months. Nevertheless, of those stating that they plan to save less in the next 12 months, a clear majority states the intention to either keep consumption constant or to increase it (86.46% overall). Of those stating that they plan to increase their saving in the next 12 months, the majority plans to either decrease consumption or to keep it constant (84.31% overall).

Figure 1 further presents histograms of consumers’ quantitative inflation and interest rate expectations collected from both waves, where the data was truncated to exclude the upper and lower 2.5% of the respective distributions in order to exclude extreme outliers. Quantitative expectations in the survey show a right-skewed distribution with a surprisingly large range considering the low-inflation and low-interest-rate environment in Germany at the time of the survey. While the majority of respondents expects price increases between 0-5% and interest rates at 0-2%, there is a large degree of heterogeneity in expectations particularly visible in higher numbers of answers at so-called “focal points” such as multiples of 5. The finding that consumers tend to overestimate inflation in recent years is also frequently found in other surveys (Dräger and Fritsche, 2013; Coibion and Gorodnichenko, 2015b). Note that consumers in our survey tend to have higher long-term inflation expectations, which is consistent with expectations of the expansive monetary policy stance and the booming economy pushing up prices in the future.

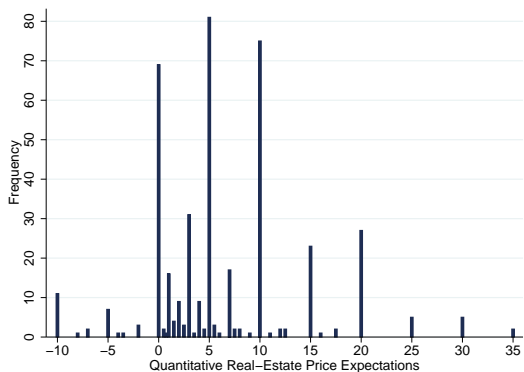
Figure 1: Quantitative Expectations



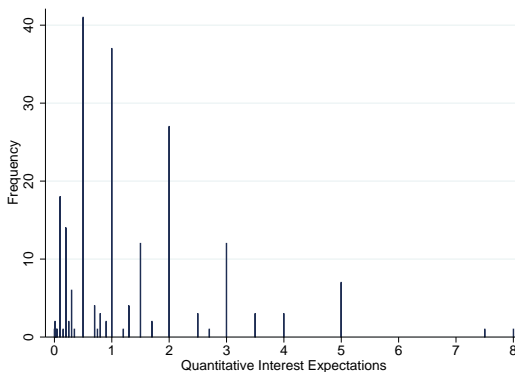
(a) Inflation 1 year ahead



(b) Inflation 5 years ahead



(c) House price inflation



(d) Short-term interest rates

## 4 Results

In this section, we present empirical estimates explaining consumers' current and planned consumption and saving in an Euler equation setting. Since the dependent variables are of a qualitative categorical nature, all models are estimated as ordered probit models, where we report marginal effects for the likelihood of answering in the highest category. All models are estimated with sample weights and robust standard errors. In order to be able to compare the effects across models, we evaluate all marginal effects at a hypothetical representative consumer, which we take to be male, age 49, living in a three-person household, with medium-low personal income, fully employed and risk-averse to taking financial risks.

### 4.1 The Role of Socio-Demographic Factors

We start the empirical analysis by evaluating socio-demographic effects on current and planned consumption, planned durable consumption as well as consumers' perceived consumption climate. The dataset includes a wide variety of socio-demographic characteristics, of which we test the impact of consumers' sex, age, their marital status, whether they are living with a partner, the number of persons in the household, their income and

Table 3: The Role of Socio-Demographic Variables for Consumption

	$C_{it}$	$C_{it}^e$	$C_{it}^{e,dur}$	$C_{it}^{climate}$
<i>sex</i>	0.0483 (0.0525)	-0.0220 (0.0446)	-0.0185 (0.0184)	0.0564 (0.0447)
<i>age</i>	-0.0167*** (0.0033)	-0.0169*** (0.0037)	-0.0067 (0.0062)	-0.0148** (0.0059)
<i>age</i> <sup>2</sup>	0.0001*** (0.0000)	0.0002*** (0.0000)	0.0001 (0.0001)	0.0002*** (0.0000)
<i>married</i>	0.1838** (0.0794)	0.0702 (0.0477)	0.0140 (0.0253)	0.0067 (0.0533)
<i>cohab_partner</i>	-0.1277* (0.0765)	-0.1177*** (0.0456)	0.0019 (0.0223)	0.0047 (0.0566)
<i>no_persons</i>	0.0078 (0.0211)	0.0202 (0.0139)	-0.0019 (0.0084)	0.0122 (0.0164)
<i>inc_l</i>	-0.0505 (0.0887)	-0.1162* (0.0653)	-0.0451 (0.0428)	-0.0773 (0.0934)
<i>inc_ml</i>	-0.0058 (0.0721)	-0.0160 (0.0544)	-0.0250 (0.0283)	-0.1553** (0.0767)
<i>inc_mh</i>	0.0831 (0.0615)	-0.0250 (0.0422)	-0.0053 (0.0255)	-0.0283 (0.0649)
<i>employ_ml</i>	-0.1761 (0.1418)	-0.0669 (0.0908)	-0.0179 (0.0550)	0.0731 (0.0821)
<i>employ_mh</i>	0.0612 (0.0690)	0.1603*** (0.0496)	0.0517 (0.0414)	0.2256*** (0.0753)
<i>employ_h</i>	0.1014 (0.0679)	0.0269 (0.0449)	0.0091 (0.0272)	0.0415 (0.0755)
<i>literacy</i>	0.0300 (0.0339)	-0.0539** (0.0240)	0.0074 (0.0136)	0.0079 (0.0284)
<i>risk</i>	-0.0371 (0.0424)	-0.0429 (0.0264)	0.0230 (0.0187)	0.0395 (0.0415)
N	295	294	296	291
$\chi^2$	40.738	33.014	32.419	27.061
Pseudo R <sup>2</sup>	0.074	0.085	0.051	0.117

Note: Marginal effects for the probability of answering in the highest category are reported from weighted estimations and evaluated at a hypothetical representative consumer. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

employment status, their financial literacy score as well as their stated attitude to taking financial risks, shown in Table 3.

Interestingly, we find no significant effect of any socio-demographic variable on consumers' stated plans for durable consumption. Furthermore, the results suggest that older consumers state both lower current and planned consumption compared to the previous or next 12 months and also rate the current consumption climate lower. This effect is

quadratic and increases with higher age.<sup>10</sup> The lower stated current and planned consumption could indicate that older consumers are less affected by current favorable economic conditions in their consumption patterns. More generally, these findings constitute a well-known empirical puzzle in literature testing life-cycle consumption models (Browning and Crossley, 2001).

As would be expected, the results indicate that consumers are somewhat more likely to state increases in current and planned consumption, or perceive a positive consumption climate, if they have a relatively high employment status or income.<sup>11</sup>

Consumers' economic literacy and their risk behavior on financial markets generally have no impact on their spending plans and assessment, with the only exception being a significant, but somewhat surprising, negative effect of higher financial literacy scores on planned consumption.

## 4.2 Estimation of a Consumption Euler Equation

Next, we test whether consumers' consumption level in the past 12 months relative to an average year was decided in line with a consumption Euler equation as in equation (3). Under our hypothesis, we expect a positive relationship between current and expected future spending, a negative relation with expected nominal interest rates and a positive link to expected inflation.

The results are presented in Table 4. All models include a range of demographic control variables and report marginal effects from ordered probit models for the likelihood of consumers answering "total expenditures in the past 12 months were considerably higher than in an average year". We test a number of variants of the consumption Euler equation, where we proxy expected consumption with consumers' reported planned change in total expenditures and with the planned change in the spending on durable goods. We further estimate an Euler equation where current consumption is proxied with consumers' assessment of the overall consumption climate for durable goods, as in Bachmann et al. (2015). Additionally, we estimate a set of models with qualitative interest rate and inflation expectations, as well as models with quantitative expectations. We include inflation expectations both in levels (measuring the expected change in prices) and as the difference to consumers' reported perception of current inflation  $\pi_t^p$  (thus measuring the expected change in inflation).<sup>12</sup> Note that the sample size drops considerably when we estimate models with quantitative expectations, since only relatively few consumers answered the question on their quantitative interest rate expectations.

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<sup>10</sup>Note that the majority of respondents in our sample is middle-aged and below retirement age, with a mean age of 49.

<sup>11</sup>Note that the income categories are evaluated relative to the high income consumers, while the employment categories are relative to the low employment group. This is because most respondents in the survey are fully employed, i.e. in the highest employment category, therefore we leave out the lowest category in order not to lose too many observations.

<sup>12</sup>The author thanks Geoff Kenny for proposing this measure of the relative change in expectations.

Overall, the results give some support to the hypothesis that consumers' expenditure patterns may indeed be related to life-cycle models of consumption captured in the Euler equation: We find that consumers are more likely to report above-average spending in the past 12 months, if they expect to increase their consumption also in the coming 12 months, thus supporting the hypothesis of consumption smoothing. The effect becomes insignificant in the models with quantitative macroeconomic expectations, while the effect of planned consumption of durables is not significant in any model specification. This result gives some tentative indication that households' current spending is more affected by their future consumption expenditures, rather than the durable part of overall spending.

Nominal interest rate expectations are estimated to have a negative impact on the likelihood of reporting above-average consumption, however, the effect is only significant in the models with quantitative expectations. In addition, we find highly significant positive effects of both qualitative and quantitative inflation expectations in line with the theoretical model. In the model with qualitative expectations, there is also a significantly positive effect of consumers' expected change in inflation. Overall and considering that interest rates were effectively at the zero lower bound at the time of the survey, the results give some indication that perhaps consumers implicitly assume negative shadow interest rates and thereby the positive effect of an increase in expected inflation on the real interest rate.

Finally, when consumers' individual current spending is replaced by their general assessment of the consumption climate for durable goods, neither future planned spending on durables, nor interest rate or inflation expectations have any significant effects. Taken together, our results are more in line with those in [Ichiue and Nishiguchi \(2015\)](#) and [D'Acunto et al. \(2016\)](#), but stand in contrast to the findings by [\(Burke and Ozdagli, 2013\)](#) and [Bachmann et al. \(2015\)](#).



Table 4: Consumption Euler Equation

	Qualitative Expectations			Quantitative Expectations				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$c_{it}$	$c_{it}$	$c_{it}$	$c_{it}^{climate}$	$c_{it}$	$c_{it}$	$c_{it}$	$c_{it}^{climate}$
$c_{it}^e$	0.1895*** (0.0645)		0.2250*** (0.0742)		0.0406 (0.0854)		0.0355 (0.0843)	
$c_{it}^{e,dur}$		0.0342 (0.0376)		-0.0014 (0.0273)		0.0477 (0.0545)		-0.0001 (0.0729)
$i_{qual,it}^e$	-0.0535 (0.0436)	-0.0545 (0.0443)	-0.0576 (0.0468)	-0.0186 (0.0368)				
$\pi_{qual,it}^{e,1yr}$	0.0871*** (0.0225)	0.0981*** (0.0262)		-0.0427 (0.0313)				
$(\pi_{qual,it}^e - \pi_{qual,it}^p)$			0.0552** (0.0243)					
$i_{quant,it}$								
$\pi_{quant,it}^{e,1yr}$					-0.0888* (0.0457)	-0.1029** (0.0474)	-0.0538 (0.0365)	-0.0852 (0.0536)
$(\pi_{quant,it}^e - \pi_{quant,it}^p)$					0.0185* (0.0104)	0.0203* (0.0115)		0.0154 (0.0135)
N	355	356	353	347	117	117	117	117
$\chi^2$	45.092	41.358	47.635	45.869	43.636	46.868	42.302	605.523
Pseudo R <sup>2</sup>	0.143	0.107	0.132	0.116	0.291	0.297	0.272	0.350
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Marginal effects for the probability of answering in the highest category are reported from weighted estimations and evaluated at a hypothetical representative consumer. Models with quantitative expectations are truncated to exclude the lower and upper 2.5% of the distribution. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5: Consumption Euler Equation Controlling for Further Economic Expectations

	Qualitative Expectations			Quantitative Expectations				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$y_{qual,it}^e$	-0.0119 (0.0416)	-0.0350 (0.0463)	-0.0136 (0.0425)	-0.0003 (0.0276)	0.0073 (0.0581)	-0.0178 (0.0635)	0.0364 (0.0530)	0.0047 (0.0493)
$w_{qual,it}^e$	0.0325 (0.0289)	0.0359 (0.0319)	0.0414 (0.0305)	0.0460 (0.0282)	0.0162 (0.0374)	0.0222 (0.0413)	0.0374 (0.0374)	0.1754** (0.0714)
$stocks_{qual,it}^e$	0.0351 (0.0312)	0.0391 (0.0348)	0.0336 (0.0317)	-0.0098 (0.0344)	-0.0025 (0.0407)	-0.0067 (0.0466)	0.0037 (0.0315)	-0.0675 (0.0477)
$income_{qual,it}^e$				0.0847* (0.0435)				0.2157** (0.0890)
$c_{it}^e$	0.2085*** (0.0695)		0.2481*** (0.0792)	0.0792 (0.0499)	0.0503 (0.0903)		0.0452 (0.0908)	0.0636 (0.1004)
$c_{it}^{e,dur}$		0.0384 (0.0421)				0.0624 (0.0556)		
$i_{qual,it}^e$	-0.0803* (0.0476)	-0.0811* (0.0484)	-0.0841 (0.0520)	-0.0945** (0.0403)				
$\pi_{qual,it}^{e,1yr}$	0.0951*** (0.0226)	0.1105*** (0.0250)		0.0616** (0.0245)				
$(\pi_{qual,it}^e - \pi_{qual,it}^p)$			0.0554** (0.0253)					
$i_{quant,it}^e$							-0.0981* (0.0514)	-0.0751* (0.0392)
$\pi_{quant,it}^{e,1yr}$							0.0181* (0.0107)	-0.0050 (0.0113)
$(\pi_{quant,it}^e - \pi_{quant,it}^p)$							-0.0164 (0.0152)	
N	300	302	298	87	106	106	105	56
$\chi^2$	46.913	45.107	47.696	-	43.626	40.833	40.111	-
Pseudo R <sup>2</sup>	0.171	0.132	0.154	0.454	0.301	0.308	0.297	0.604
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Marginal effects for the probability of answering in the highest category are reported from weighted estimations and evaluated at a hypothetical representative consumer. Models with quantitative expectations are truncated to exclude the lower and upper 2.5% of the distribution. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Next, we check the robustness of the results to the inclusion of further (macro)economic expectations, shown in Table 5. In addition to the variables in the Euler equation model, we include consumers' qualitative expectations on changes in the general economic situation, the unemployment rate and stock prices as well as expected changes in consumers' individual income.<sup>13</sup> All our results from the initial models in Table 4 remain robust to the inclusion of these additional controls. Moreover, it seems that macroeconomic expectations not included in the Euler equation model also empirically do not significantly explain changes in consumers' current spending. The only exception is the expected change in individual income, which is significantly positively related with higher spending levels today. This is highly plausible, since expected changes in income are likely closely related to consumers' expenditure path.

### 4.3 The Effect of Financial Market Participation

In this section, we elaborate on the role of financial market participation for consumers' expenditure pattern. Whether consumers participate in financial markets plays an important role for the estimation of consumption Euler equations. According to life-cycle models of consumption, agents will smooth consumption over their life-cycle by saving and dissaving in financial markets, which results in the effect of the real interest rate on current consumption in the Euler equation. Therefore, we expect that consumers who do not save are more likely not to react to real interest rates in their current consumption decision. Instead, they consume only out of current income and therefore may be hand-to-mouth or rule-of-thumb consumers in the terminology of New Keynesian models.<sup>14</sup> By contrast, those participating in financial markets should face the trade-off between current and future consumption, i.e. saving and hence react to their perception of real interest rates.

Table 6 presents the results from estimations of the consumption Euler equation in equation (3) with qualitative inflation and interest expectations, where we distinguish between consumers that do not save, termed hand-to-mouth consumers, those that are participating in financial markets and those who took a mortgage to finance their housing.<sup>15</sup> The first group consists of consumers who answered in the survey that in general they do not save. The second group is defined as those answering that they save either in bonds, stocks, life insurance or some form of private pension fund. Finally, we aim at differentiating between those consumers saving on financial markets and those that save by paying off a large credit (usually at a bank) by estimating the relation separately for those consumers who own a mortgage.

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<sup>13</sup>Note that the question on expected changes in individual income was only included in the second wave of the survey, therefore the sample size drops considerably once we include it in the regression.

<sup>14</sup>Note that consumers may also choose not to save given their preferences even if they could in principle access financial markets.

<sup>15</sup>We do not estimate this with quantitative expectations, since this would result in too few observations.

Table 6: The Role of Financial Market Participation

	Hand-to-mouth (1)	Participating in Financial Markets (2)	With a Credit/ Mortgage (3)
$c_{it}^e$	0.1319* (0.0729)	0.0943 (0.0677)	0.0231 (0.0403)
$i_{qual,it}^e$	0.0330 (0.0210)	-0.0874* (0.0495)	-0.0010 (0.0265)
$\pi_{qual,it}^e$	0.0103 (0.0143)	0.1055*** (0.0277)	0.0100 (0.0207)
N	56	199	98
$\chi^2$	30.776	30.539	17.044
Pseudo R <sup>2</sup>	0.483	0.203	0.113
Demographic Controls	Yes	Yes	Yes

Note: Marginal effects for the probability of answering in the highest category are reported from weighted estimations and evaluated at a hypothetical representative consumer. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The results in Table 6 indeed suggest that there are differences between consumers active and non-active on financial markets. While we find no significant effect of nominal interest rate or inflation expectations on current consumption with households that do not save, the effect is significant and has the correct sign for the group of consumers saving in financial markets. Interestingly, this is not the case for those paying off a mortgage, implying that there are indeed differences also between different forms of saving. Finally, the positive link between planned and current consumption for hand-to-mouth households suggests that they also smooth consumption to some degree, possibly due to habit formation.

#### 4.4 The Effect of News

Next, we evaluate the role of news in an Euler equation setting. Specifically, we estimate level and interaction effects with interest rate and inflation expectations of monetary news observed by the individual consumer. We distinguish between news on monetary policy including news on interest rates, news on inflation and news on issues related to financial markets, i.e. news about banks, stock markets and housing markets. All of these can potentially influence consumers' expectation formation on interest rates or inflation and, thus, constitute potential "shocks" affecting the consumption Euler relationship. In terms of the theory, these news may be regarded as new information obtained by consumers which may affect their expectation formation since they chose to be attentive to these issues (Sims, 2003) or since new information is diffused only gradually throughout the

population (Carroll, 2001b). As sample sizes may drop for specific news, we estimate the relationship only with qualitative expectations in order to avoid further reductions in sample size.

The results are summarized in Table 7, where  $news_{it} * i_{qual,it}^e$  and  $news_{it} * \pi_{qual,it}^e$  stand for the interaction terms of the specific type of news with interest rate and inflation expectations, respectively. First, we observe that our results from the previous section overall remain robust when we add additional news effects. While news on monetary policy have no significant effect, there are some news effects from observed news on inflation and on financial markets.<sup>16</sup>

Table 7: The Euler Equation and News

	(1)	(2)	(3)
$c_{it}^e$	0.2300*** (0.0813)	0.1881*** (0.0699)	0.2114*** (0.0816)
$i_{qual,it}^e$	-0.0455 (0.0462)	-0.0650 (0.0473)	-0.0461 (0.0468)
$\pi_{qual,it}^e$	0.0722** (0.0308)	0.0447* (0.0266)	0.0875*** (0.0289)
$news_{it} * i_{qual,it}^e$	-0.0771 (0.1260)	0.2583 (0.2210)	-0.2304* (0.1298)
$news_{it} * \pi_{qual,it}^e$	0.0400 (0.0950)	0.3166*** (0.1216)	-0.0460 (0.0820)
$news\_monetary\_policy_{it}$	0.2810 (0.4883)		
$news\_inflation_{it}$		-1.7985* (0.9229)	
$news\_financial\_markets_{it}$			0.7315* (0.3793)
N	255	255	255
$\chi^2$	39.368	43.537	46.699
Pseudo R <sup>2</sup>	0.157	0.176	0.156
Demographic Controls	Yes	Yes	Yes

Note: Marginal effects for the probability of answering in the highest category are reported from weighted estimations and evaluated at a hypothetical representative consumer. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

We find that consumers tend to state lower current spending levels if they observed news on inflation, while the impact of their inflation expectations becomes stronger. While

<sup>16</sup>News on inflation in the survey dataset are mainly observed news on rising prices. While this is surprising considering the low inflation environment at the time of the survey, we also note that only 30 consumers stated that they heard any news on inflation. News on financial markets were observed by 48 respondents in the survey and are mainly news about strong stock markets and strongly rising house prices, with some negative news about stability problems in the banking sector.

this is in line with the Euler equation model, it is also likely that the respondents observing news on rising prices have upwards biased inflation expectations compared to the remaining sample and therefore place (overly) large value on their inflation expectations. The effect of financial market news is only marginally significant, but nevertheless suggests that consumers observing (mostly positive) news of financial market developments tend to state higher current spending levels and react more strongly to their interest rate expectations. Overall, these news effects are in line with the life-cycle model of consumption.

## 4.5 Robustness Checks

This section contains robustness checks, where we estimate the consumption Euler equation in its baseline specification separately for the first and the second wave of the survey, see Table 8. We further control for sample selection bias into the second wave by estimating the model with a Heckman correction and check whether the Euler equation relationship also holds in individual changes in expectations.

Regarding the consumption Euler equation estimation with qualitative expectations, the positive impact from expected inflation stays robust across the two waves, while the negative nominal interest rate effect becomes significant only in the second wave and the positive effect of expected consumption is significant only in the first wave. Nevertheless, the signs of the estimated coefficients are consistent across the waves. Comparing the models with quantitative expectations across the waves, it seems that the significantly negative impact of quantitative interest rate expectations is only (marginally) significant in the second wave.

Next, we estimate the models with a Heckman correction that accounts for a potential selection bias for being selected into the second wave. The models are estimated in a two-step procedure where the selection equation measures the probability of being in the second wave conditional on the Euler equation variables and a large set of demographic characteristics. Generally, our results remain robust with the correction and the fact that the correlation coefficient  $\rho$  of the residuals between the measurement and the selection equations is strongly insignificant suggests that sample selection is not a big issue in our dataset. Since due to the correction the models effectively use only observations from the second wave, we can compare the estimates to those from columns (3) and (4). All coefficients remain close to their counterparts without correction and the only difference is that the coefficient on quantitative interest rate expectations now marginally misses significance at the 10% level.

If we estimate the relation in individual differences, coefficients in both models become very small and insignificant, suggesting that there is not enough meaningful individual variation between the waves.

Table 8: Robustness Checks Consumption Euler Equation

	First Wave (1)	(2)	Second Wave (3)	(4)	Heckman corr. (5)	(6)	Individual Differences (7)	(8)
$c_t^e$	0.1637** (0.0667)	0.0135 (0.1187)	0.1184 (0.0768)	0.1785 (0.1940)	0.1179 (0.0719)	0.1609 (0.2821)		
$i_{qual,t}^e$	-0.0306 (0.0512)		-0.0837* (0.0481)		-0.0838* (0.0509)			
$\pi_{qual,t}^{e,1yr}$	0.0824*** (0.0249)		0.0719** (0.0345)		0.0729** (0.0332)			
$i_{quant,t}^e$		-0.1453 (0.0978)		-0.1282* (0.0726)		-0.1240 (0.1431)		
$\pi_{quant,t}^{e,1yr}$		0.0238 (0.0155)		0.0023 (0.0210)		0.0020 (0.0246)		
$\Delta c_t^e$							0.0003 (0.0006)	-0.0034 (0.0084)
$\Delta i_{qual,t}^e$							0.0002 (0.0005)	
$\Delta \pi_{qual,t}^{e,1yr}$							0.0002 (0.0003)	
$\Delta i_{quant,t}^e$								0.0021 (0.0054)
$\Delta \pi_{quant,t}^{e,1yr}$								-0.0002 (0.0004)
N	262	57	93	60	355	116	171	112
$\chi^2$	40.111	28.860	-	-	-	18.220	14.456	13.548
Pseudo R <sup>2</sup>	0.154	0.390	0.365	0.352	-	-	0.113	0.134
$\rho$ selection eq.					-0.023	-0.225		
p-value $\rho = 0, \chi^2$					0.941	0.895		
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Marginal effects for the probability of answering in the highest category are reported from weighted estimations and evaluated at a hypothetical representative consumer. Models with quantitative expectations are truncated to exclude the lower and upper 2.5% of the distribution. P-values for  $\rho = 0$  are from a Wald test ( $\chi^2$  statistics) for independence from the sample selection equation measuring the potential bias for being selected into the second wave. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 5 Conclusion

In this paper, we evaluate a new survey dataset of German consumers with respect to their individual expenditure pattern. Framing the analysis in the Euler equation resulting from consumers' optimal consumption allocation in a life-cycle model, the theory predicts that reported current consumption depends positively on expected consumption, negatively on nominal interest rates and positively on expected inflation.

The results in this paper suggest that German consumers surveyed in two waves at the end of 2015 and in mid-2016 indeed report consumption paths in line with an Euler equation model: Current spending depends positively on planned spending in the next year and is positively correlated with both quantitative and qualitative short-run inflation expectations. Additionally, nominal interest rate expectations are estimated to have a negative correlation with current consumption, albeit only when measured quantitatively. This result might be explained by interest rates being close to the zero lower bound at the time of the survey.

In addition, we find that the perceived real interest rate affects consumers' consumption pattern significantly only in the sub-group of consumers active on financial markets, while there is no effect for consumers that do not save or that are paying off debt. This is again in line with the life-cycle model of consumption. In addition, monetary news observed by the consumer interact with the impact of consumers' real interest rate expectations. For instance, news heard about rising prices may reinforce the positive link between inflation expectations and current spending, while news on positive financial market conditions may strengthen the negative impact of nominal interest rate expectations.

Overall, the analysis yields some interesting insights into consumers' decision making regarding their consumption patterns. Macroeconomic expectations matter, and the effects are in line both with economic theory and with the current German situation of a booming economy with very low inflation and interest rates near the ZLB at the time of the survey. Moreover, the analysis shows that it is important to distinguish between actual consumption paths reported by consumers and their reported "readiness to spend", i.e. the general consumption climate. This could help to explain some of the opposing results regarding the relationship between consumption and inflation expectations in the literature (Burke and Ozdagli, 2013; Bachmann et al., 2015; Ichiue and Nishiguchi, 2015). Additionally, our results could provide evidence in favor of country-specific differences in the relationship between consumption and macroeconomic expectations, since we find similar results to an earlier study using German data from another survey (D'Acunto et al., 2016).

Further research is needed to explore whether our results on consumption patterns are specific to the current zero lower bound environment, or to specific characteristics of German consumers. So far, we can provide some tentative evidence that economic policy in the current situation might try to exploit the link between macroeconomic expectations



and consumers' actual spending, especially when targeting the group of households that save and are affected by financial market conditions.

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## 7 Appendix

### 7.1 Survey Question Wording

The wording of the survey questions regarding current and planned consumption is as follows:

- (Current Consumption  $c_t$ ) “How would you say do your total expenditures in the past 12 months compare to an average year in the past? They were”
  - Considerably higher
  - About the same
  - Considerably lower
  - Don’t know
  - No answer

- (Future Consumption  $c_t^e$ ) *“How would you say will your total expenditures in the next 12 months compare to an average year in the past? They will be”*
  - Considerably higher
  - About the same
  - Considerably lower
  - Don’t know
  - No answer
  
- (Future Durables Consumption  $c_t^{e,dur}$ ) *“In the next 12 months, do you expect to spend more or less on large purchases such as furniture or electronic devices or such than in an average year in the past?”*
  - A lot more
  - Somewhat more
  - About the same
  - Somewhat less
  - A lot less
  - Don’t know
  - No answer
  
- (Consumption Climate  $c_t^{climate}$ ) *“When looking at the current economic situation, do you think now is a good or an bad time for people to make large purchases such as furniture or electronic devices and so on?”*
  - Now is a good time
  - Neither a good, nor a bad time
  - Now is a bad time
  - Don’t know
  - No answer

Regarding the survey questions on consumers’ interest rate and inflation expectations, we compare the results with qualitative and quantitative expectations:

- ( $i_t^{qual}$ ) *“How do you think interest rates on saving accounts on average will develop over the next 12 months? They will”*
  - Increase strongly
  - Increase somewhat

- Stay about the same
  - Decrease somewhat
  - Decrease strongly
  - Don't know
  - No answer
- ( $i_t^{quant}$ ) *“What do you think, how high will interest rates on saving accounts be on average over the next 12 months?”*
    - ... Percent
    - Don't know
    - No answer
- ( $\pi_t^{qual}$ ) *“How do you think prices in general will develop over the next 12 months compared to the previous 12 months? They will”*
    - Increase more than before
    - Increase at about the same rate
    - Increase less strongly than before
    - Stay about the same
    - Fall
    - Don't know
    - No answer
- ( $\pi_t^{quant}$ ) *“How many percent do you think prices in general will increase/decrease on average over the next 12 months?”*
    - ... Percent
    - Don't know
    - No answer