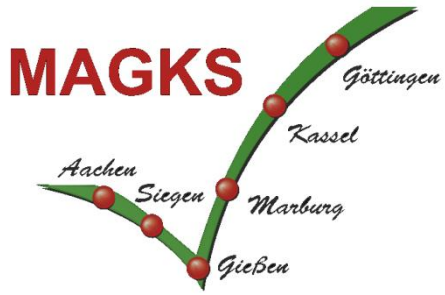

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Taxation and Consumption:

Evidence from a Representative Survey of the German Population*

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July 2014

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Taxation and Consumption:

Evidence from a Representative Survey of the German Population

Abstract Using a representative survey of the German population, this paper studies self-reported individual consumption responses to a recent payroll tax reduction. About 55 per cent of the respondents report that they spend the extra money, indicating considerable potential for tax changes to affect consumption and economic activity. Our analysis of the socio-demographic and economic covariates of consumption responses suggests, among other effects, that interest rates are related to consumption responses to tax changes, and that households with higher income have a higher propensity to consume.

Keywords Taxation · Consumption · Representative population survey · Germany

JEL Classification E21 · E62 · H30

1 Introduction

The 2007 financial crisis and the associated economic slump, together with the ongoing economic crisis in the euro area, have generated renewed interest in the consequences for economic activity of changes in government fiscal policy. In Germany, private final consumption expenditure accounts for around 60 per cent of GDP, which suggests that consumption responses are highly relevant in analysing the macroeconomic consequences of tax changes. Not only are consumption responses to tax changes a prominent feature of the public debate over the effectiveness of fiscal stimulus, they are also at the core of the transmission of fiscal policy shocks in most macroeconomic models.[2] Thus, understanding consumption responses to tax changes in Germany is important for both economic policy and academic research. In this paper, we study the effects on consumption of a recently enacted payroll tax change using a representative survey conducted on our behalf by GfK in the first quarter of 2013.

At the beginning of 2013, contribution rates to the statutory pension insurance were decreased from 19.6 per cent to 18.9 per cent. We interpret this tax change as an exogenous shock and study the link between taxation and consumption by directly asking a representative sample of respondents how they spent the extra money. In using a representative survey analysis to study self-reported consumption responses to legislated tax changes, we follow Sahm et al. (2012) and Shapiro and Slemrod (1995, 2003, 2009), who use survey methodology to investigate the impacts of various US tax changes on consumption. Shapiro and Slemrod (1995) examine the effects of a change in tax withholding enacted 1992 and find that almost 43 per cent of households report that they spent the temporary increase in income. Given that the tax measure induced only a change in the timing of taxation, this is a remarkably high number. Shapiro and Slemrod (2003) find that 22 per cent of respondents report to have (mostly) consumed the additional income generated by the 2001 tax rebates, and Shapiro and Slemrod (2009) put that number at 20 per cent for the 2008 tax rebates. Coronado et al. (2005) investigate self-reported consumption responses to the child credit rebate and the change in withholding taxes enacted in 2003 and conclude that around 21–24 per cent of households spent the additional income. Jappelli and Pistaferri (2012) use the 2010 Italian survey of household income and wealth to study how much of a (hypothetical) unexpected transitory income change respondents would consume and find that, on average, consumers would have spent 48 per cent of the additional funds.

To the best of our knowledge, we are the first to conduct a comparable survey for Germany. When asking respondents about whether they plan to save or spend the additional household income, 55 per cent stated that they intend to increase spending. In comparison to other microeconometric estimates, this is at the upper end of the distribution of estimates. Thus, our survey analysis suggests that German tax changes likely affect economic activity. Using a back-of-the-envelope calculation to transform our qualitative estimate into a quantitative one, we find a marginal propensity to consume of around 0.53, which is compatible with a relatively strong impact of taxation on consumption. This microeconomic-based finding is compatible with recent macroeconomic evidence from Hayo and Uhl (2013). Using narratively identified German tax shocks

[2] This is well documented in the case of the United States (see, e.g., Broda and Parker, 2008). In Germany, much of the business cycle stimulus after the 2007 financial crisis was implemented in the *Gesetz zur Sicherung von Beschäftigung und Stabilität in Deutschland*. The draft bill contains a justification for the business cycle stimulus: the government argues that tax reductions strengthen domestic demand. The bill was introduced in parliament by finance minister Peer Steinbrück, who stressed that the business cycle stimulus would lead to a substantial financial relief for taxpayers and hence strengthen aggregate demand.

to study the consequences of tax changes for GDP and consumption in a vector-autoregressive model, they find that a unit increase in taxes reduces consumption by 1.8.

Although the use of survey methods in economic research is increasing (Blinder and Krueger, 2004; Shapiro and Slemrod, 2009; Jappelli and Pistaferri, 2012; Hayo and Neuenkirch, 2013; Hayo and Neumeier, 2013; among others), they are still used relatively seldom. In particular, directly asking respondents about their response to economic policy is a nonstandard approach in economics. One general concern with using survey methods in economics is measurement error. However, in our view, assuming, or not, that survey responses accurately measure economic concepts is no more or less troublesome than the untestable identification assumptions typically present in econometric approaches. More precisely, empirical evidence on the effects of fiscal policy is often based on analysis of aggregate economic time series and to deduce causal effects from such an analysis it is necessary to presuppose identification assumptions (Sims, 2010). By analysing self-reported consumption responses to a recent payroll tax change using a representative survey of the German population, we circumvent these identifying assumptions. Thus, this study can be seen as a useful and novel contribution to the macroeconomic literature on how tax changes affect consumption and economic activity in Germany (Perotti, 2004; Baum and Koester, 2011; Hayo and Uhl, 2013).

An advantage of our survey data is that they allow analysing correlations of consumption responses with other economic and socio-demographic variables. Due to this, our analysis makes at least three important contributions to the literature. First, assuming forward-looking consumers, standard macroeconomic theory predicts that temporary and permanent tax changes have different impacts. Whether this is true in practice is of interest because many stimulus measures are of a temporary nature.[3] Although we cannot differentiate between the effects of temporary and permanent tax changes using only this one exogenous tax change, we can test an important implication of the permanent income model: consumers expecting the tax change to be temporary should be less inclined to increase consumption in response to the rate cut. We find that respondents expecting the tax reduction to be only temporary react similarly to those expecting a permanent reduction, which we interpret as evidence against the permanent income hypothesis.

Second, the macroeconomic environment in which the 2013 payroll tax change took place is special in the sense that interest rates are at a historic low. This situation has led to lively public debate about whether low interest rates are a strong deterrent to savings.[4] We find that respondents who perceive the attractiveness of saving to be low have a higher propensity to spend, which reinforces these concerns.

Third, we find that households with higher income are more likely to spend the additional income resulting from the tax reduction, which runs counter to conventional wisdom and is of practical relevance because many stimulus measures are based on the idea that low-income households spend a particularly large fraction of their income.[5]

[3] The 2008 tax rebate studied in Shapiro and Slemrod (2009) is one example. In Germany, a one-time €100 child benefit payment was implemented as part of the business cycle stimulus in 2009.

[4] Two newspaper articles on this topic are *Niedrige Zinsen: Deutsche sparen zu wenig für ihre Altersvorsorge* (Low interest rates: Germans do not save enough for their retirement) from Frankfurter Allgemeine Zeitung online on 20 August 2013 and *Die Deutschen sparen nicht mehr* (Germans no longer save) from Handelsblatt online on 22 November 2013.

[5] For the United States, this is established in Shapiro and Slemrod (2009). For Germany, this idea is present in the official government justification of business cycle stimulus measures accompanying the *Gesetz zur Sicherung von Beschäftigung und Stabilität in Deutschland*.

Section 2 briefly discusses the survey design. Section 3 shows descriptive statistics of consumption responses to tax changes and compares the survey findings to available estimates from the literature. Section 4 analyses determinants of consumption responses to the 2013 payroll tax change. Section 5 concludes. The Appendix lists the survey questions.

2 Survey Design

At the beginning of 2013, contribution rates to the statutory pension insurance system in Germany were reduced from 19.6 per cent to 18.9 per cent, thereby lessening the overall tax burden of employees and employers. This payroll tax reduction is the real-world framework for our representative survey on consumption responses to tax changes.

Extant survey analyses of consumption responses to tax changes (Sahm et al., 2012; Shapiro and Slemrod, 1995, 2003, 2009) mainly study exceptionally large tax changes. On the one hand, large tax changes could enhance identification of the effects in the sense that respondents may have spent some time thinking about how they will respond. On the other hand, the tax change we study is of a more realistic size: a narrative of German tax legislation shows that its magnitude is similar to the vast majority of tax changes (Uhl, 2013). We find it important to study tax changes of more normal size because estimating average tax responses based on exceptional circumstances may bias the results. Moreover, doing so makes our findings directly relevant for the evaluation of 'normal' tax changes, which occur much more frequently.

The survey was conducted as part of an omnibus survey between 15 February 2013 and 1 March 2013 and administered by GfK. GfK is one of the largest private research companies in Germany working in the fields of market research and public opinion. The original sample consists of 2,042 representatively selected persons from the general German population aged 14 or above. The survey was conducted via face-to-face interviews using pen-pads. The interviewers followed specific instructions described in the survey instrument. The GfK uses quota sampling, which makes the sample distributions comparable to the population distribution in terms of the following six dimensions: sex, age, household size, city size, occupation of head of household, and state of residence. Generally, sample and population distributions are similar, as shown in the survey documentation (Hayo et al., 2014). Sample weights representing the inverse probability of being included in the sample could be used to compensate for over- or underrepresentation of an individual. Reported statistical results are based on unweighted observations. Reflecting the similarity between sample and actual distribution, no notable changes occur when using weighted observations. We report heteroscedasticity-robust, consistent standard errors.

Statutory pension insurance in Germany is a pay-as-you-go system, where current contributions are used to pay for current pensions. The pension insurance contribution rate is split between employers and employees and financed by a proportionate tax on monthly income up to €4,900 in East Germany and €5,800 in West Germany. Future pension entitlements depend on the insured's income, but not on the contribution rate. The rate change studied here had to be implemented because the statutory pension insurance is not allowed to accumulate a substantial surplus. It is therefore exogenous with respect to the consumption response.[6]

[6] At the beginning of the survey, we briefly describe the tax change and then explicitly ask about the respondent's reaction to the rate change. Even if the respondent reacted to the rate change prior to its actual implementation, our survey item—to be presented in the next section—would likely capture its effect. We have no information about individuals' awareness of the rate change and its effect on responses, but judging from the

In principle, the macroeconomic environment prevalent at the time of implementing the rate change, as well as other tax changes occurring at the same time, could influence the way our respondents answer the survey.[7] However, the German population has been relatively little affected by the ongoing crisis in the euro area; indeed, labour market conditions have been robust. Moreover, as we ask about self-reported responses to a real-world rate change, we do not face the identification problem of finding exogenous variation in taxation that plagues the standard empirical literature.

The payroll tax change that forms the basis of our analysis affects only a subsample of the general German population. All employees pay into the statutory pension insurance system. Also, some employers, freelancers, and the insignificantly employed contribute to the government pension insurance system, some voluntarily and some compulsorily. We collected the information necessary to assess whether a respondent is contributing to the statutory pension insurance. The *Bundesagentur für Arbeit* (Federal Employment Agency) directly pays pension insurance contributions for the unemployed. Public servants and those not part of the labour force—including pensioners and the inactive working-age population—are not subject to payroll taxation. Filtering was employed to ensure that only respondents who are subject to payroll taxation were surveyed. Specifically, this includes all employees and those employers, freelancers, and insignificantly employed who stated that they contribute to the statutory pension insurance system.

Specific survey items are discussed as appropriate throughout the analysis. The Appendix contains a list of all survey items used in this paper. However, the survey is part of a large project involving a diverse set of contemporaneous fiscal policy issues,[8] and so to preserve space, full documentation, including the survey instrument as well as extensive descriptive statistics, can be found in a companion paper (Hayo et al., 2014).

3 Consumption Responses to Tax Changes in our Survey and in the Literature

In the survey, we first briefly described the payroll tax change and explained its consequences for the household budget. Following Sahm et al. (2012) and Shapiro and Slemrod (1995, 2003, 2009), we then measured consumption responses to the recent tax change by asking:

> *Thinking about your household's financial situation, will you use the additional budget mostly to increase spending, mostly to increase saving, or mostly to pay off debt?*[9]

The item does not give a quantitative estimate of the fraction of the additional budget that is spent—the marginal propensity to consume (MPC)—but instead measures qualitatively whether respondents will mostly spend or mostly save the additional funds. This is in contrast to Jappelli and Pistaferri (2012), who directly ask respondents to state the fraction of the additional budget that is spent. We opted for the qualitative approach because we think it is more robust with respect to

relatively low level of factual economic knowledge that we find in our sample, it seems unlikely that very many respondents anticipated this change.

[7] For instance, independently from the change in social security tax, the income-tax-free amount was increased from €7,834 to €8,130.

[8] Hayo and Neumeier (2013) study public preferences as to the composition of government expenditures and for public debt.

[9] This is an English translation of the German original. The German original of the survey instrument is included in the survey documentation (Hayo et al., 2014).

measurement error in the respondents' replies. The qualitative question requires less processing capacity and hence may be answered more accurately; the drawback, of course, is that such an approach does not allow quantitatively estimating the size of the consumption response. Table 1 shows the self-reported response to the payroll tax change.

Table 1: Consumption responses to the 2013 payroll tax change

	Proportion	Standard error	Confidence interval (95%)	Frequency
Mostly spend	0.55	0.02	[0.52, 0.58]	565
Mostly repay debt	0.18	0.01	[0.16, 0.20]	183
Mostly save	0.27	0.01	[0.24, 0.30]	277

Notes: See Item 1 in Appendix A. Based on 1,025 observations.

Table 1 shows that 55 per cent of interviewed persons stated that they use the additional income resulting from the tax reduction to increase spending, which suggests that taxation can notably affect consumption. Given the qualitative nature of the question, it is not possible to derive a quantitative estimate of the consumption response—the marginal propensity to consume (MPC)—without additional assumptions. To transform the qualitative numbers into a quantitative estimate we follow Shapiro and Slemrod (2009). The method is based on assuming that respondents choose to answer 'mostly spend' if their MPC is at least 50 per cent, and that respondents' MPC within answer categories is uniformly distributed. In our sample, 55 per cent of respondents answer 'mostly spend' and, accordingly, are assumed to have a MPC between 50 and 100 per cent (75 per cent on average), and 45 per cent are assumed to have a MPC between 0 and 50 per cent (25 per cent on average). The weighted average produces our estimate for the overall MPC of 0.53.

Comparing this estimated MPC for Germany with those derived in other studies, most of which focus on the United States, we find that it is at the upper end of the spectrum. Shapiro and Slemrod (1995) study the consequences for consumption of a reduction in withholding taxes and report that around 40 per cent of respondents increased spending. Shapiro and Slemrod (2003) analyse the 2001 income tax rebate and estimate the marginal rate of consumption to be as low as 0.22. Results for the 2008 tax change (Shapiro and Slemrod, 2009) are comparable to the latter estimate. Based on the timing of the 2001 income tax rebate, Johnson et al. (2006) estimate that households spent between 20 and 40 per cent of the tax rebate within the first three months after implementation of the tax change. Jappelli and Pistaferri (2012) estimate an average marginal propensity to consume of 0.48 for transitory changes in income. Hence, in comparison to estimates from other microeconomic studies, our estimate for the marginal propensity to consume is at the upper end of the distribution. See Shapiro and Slemrod (2003) for an extensive list of MPC estimates.

4 Characterising Savers and Consumers

4.1 Variables and Economic Hypotheses

Next, we investigate correlates of consumption responses by running a logistic regression with the dependent variable taking the value 1 when the respondent answered 'mostly spend' and 0 when the respondent answered 'mostly repaying debt' or 'mostly saving'. Combining the latter two categories seems justified because in economic theory the two behaviours are generally equivalent. Moreover, this is the approach taken in much of the extant literature (Shapiro and Slemrod, 2003),

thus improving comparability of our work with that of others. [10] This section introduces theoretical hypotheses and operationalisation of the variables, which are summarised in Table 2. Coefficients or marginal effects in the logit regression are estimated conditional on all other covariates included in the logit regression. For some policy applications, however, unconditional covariances are also relevant. Thus, in addition to the multivariate regression approach, we compute cross-tabulations. To economise on space we do not provide the tables when discussing the results, but instead refer to interesting descriptive statistics and the Fisher exact test for independence across categories of a covariate.

Permanent income theory predicts that temporary tax changes have a smaller impact on consumption than do permanent tax changes (Friedman, 1957). This hypothesis is of practical interest because many business cycle stimulus measures are temporary. We cannot formally test this hypothesis using only a single tax change, but we can investigate one implication of the permanent income model: respondents perceiving the current rate change to be temporary should be less inclined to increase spending. Specifically, we use two items from the survey (Items 2 and 3 in the Appendix) to assess whether the respondent regards the outward shift of the budget constraint caused by the tax change to be temporary or permanent. First, we ask the respondents whether they expect future tax rate increases as a consequence of the current cut and, second, we ask if they think the current cut might lower pension payments in the future. In the regressions, we introduce a dummy variable taking on the value 1 in case either question is answered affirmatively, and 0 otherwise.

In dynamic models with intertemporally optimising consumers, the expected return on savings governs the intertemporal allocation of funds and is relevant for computing lifetime income. Some versions of the permanent income model predict that the consumption response to transitory changes in income is smaller in a low interest rate environment (Hall, 1978). In more general models of intertemporal optimization, the effect of interest rates on the consumption response to changes in income is ambiguous and may depend on specification of the utility function. In practice, the effects of interest rates on consumption and saving decisions are of interest because of widespread fears that current low interest rates are a major deterrent to saving. We measure the perceived attractiveness of saving in a historical perspective by asking respondents to state their perceptions of the current return on savings on a five-point scale ranging from 'much less than 10 years ago' to 'much more than 10 years ago' (Item 6 in Appendix A). This allows investigating the question of whether subjective perceptions of interest rate variations are relevant for households' consumption responses. In our regression, we include a dummy variable taking the value 1 in the event respondents perceive saving to be 'much less attractive' or 'less attractive'.

Table 2: Variables and economic hypotheses

Concept	Hypothesis	Measurement
Temporary vs. permanent tax shocks	The permanent income model predicts that temporary tax changes have a smaller impact than permanent tax changes.	We measure whether the respondent perceives shift of the budget constraint as permanent or temporary by including a dummy variable that takes the value 1 if the respondent either expects a future rate

[10] A multinominal logistic regression based on all three categories of our item ('spend', 'save', and 'repay debt') yields very similar conclusions for the spend category, but is not informative with respect to differences between 'save' and 'repay debt', which further supports our approach of combining these two categories.

		increase or a future pension reduction.
Returns on savings	The permanent income model predicts that tax changes have a smaller impact on consumption when interest rates are low. More generally, the effect of interest rates on the consumption response to tax changes is ambiguous. The relation between interest rates and consumption and saving behaviour is relevant in policy debates because of wide-spread fears that current low interest rates negatively affect savings.	Respondents state their assessment of saving's profitability (much less than 10 years ago to much more than 10 years ago) on a five-point scale. For the regression, we include a dummy variable that takes the value 1 if a respondent perceives saving returns to be less or much less than 10 years ago.
Expectation on future economic situation	Intertemporally optimising economic agents expecting a worsening of their economic situation have a greater incentive to increase saving today, because the marginal utility of future income has increased. The 'animal spirits' hypothesis claims that more optimistic respondents are more free-spending.	Respondents state their expectation about their future economic situation ('much worse than today' to 'much better than today'). For the regression, we include a dummy variable that takes the value 1 if a respondent expects his or her future economic situation to be worse or much worse than today.
Discount factors	The consumer's Euler equation relates consumption decisions to a measure of time preferences β. In the behavioural economic literature, a great deal of emphasis is put on an additional parameter capturing short-run impatience.	Discount factors as well as the additional discount factors for short-run impatience are derived in behavioural experiments (Items 11 and 12 in the Appendix).
Risk propensity	More risk-loving people may have different consumption and saving behaviour, e.g., because of precautionary saving.	An indicator for risk propensity is derived in a behavioural experiment (Item 10 in the Appendix).
Ricardian consumers	Over the last years, Germany's debt strongly increased and respondents taking the intertemporal budget constraint of the government into account should have decreased spending and increased saving, respectively.	Respondents are asked whether they have adjusted their spending behaviour in response to the recent hike in public debt. We then include a dummy variable capturing 'Ricardian consumers'.
Economic knowledge	Dynamic optimisation requires agents to know the value of the real interest rates. Ricardian equivalence is based on a rational agent who takes the government's dynamic budget constraint into account. Blinder and Krueger (2004) show that economic knowledge affects individuals' opinions on economic policy.	Dummy variables indicating if respondents are able to choose, from a list of four, the correct previous year's budget deficit as well as the current rates of inflation and interest. Dummy variable indicating higher education as a proxy for information processing capability (at least university-entry diploma).
Income	Household income is added to test the Keynesian assumption that low-income households have a higher propensity to spend.	Respondents state their monetary net household income on an 11-point scale, which we collapse into three categories: low, medium, and high household income.
Socioeconomic controls	Various other variables control for potential influences outside the canonical model.	Dummy variables taking on the value 1 if the respondent is from East Germany, female, in a relationship, respectively. Number of children and age of respondent are also included.

We also investigate whether a respondent's expectations about future income are relevant for consumption responses. Intertemporally optimising economic agents expecting a worsening of their economic situation have a greater incentive to increase saving today because the marginal utility of future income has increased. Building on Keynes's (1936) 'animal spirits' idea, behavioural economics argues that waves of optimism and pessimism influence economic behaviour and, specifically, that optimistic consumers are more free-spending (Akerlof and Shiller, 2010; De Grauwe, 2012). To investigate the importance of income expectations to individual consumption decisions, we asked

respondents to state their expected future economic situation on a five-point scale, ranging from 'much worse than today' to 'much better than today'. We include a dummy that takes the value 1 if a respondent expects his or her future economic situation to be worse or much worse than today.

Intertemporal preferences play an important role in intertemporal utility optimisation. Typical consumer Euler equations contain the agent's discount factor β. We derive a measure for β in a behavioural 'experiment'[11] (Item 12 in the Appendix). Specifically, the respondents could choose between a fixed payment of €1,000 in six months, or a higher payment in 12 months. The higher the payment in 12 months required to induce the respondent to forego the fixed payment in six months, the lower the discount factor.[12] Intertemporal optimisation predicts that the higher the discount factor β, the greater the incentive to save and, correspondingly, the smaller the incentive to consume the additional funds. We estimate the ordinary discount factor as

$$\beta = \frac{1000}{x_{12}}, \tag{1}$$

where x_{12} is the amount the respondent requires in 12 months to forego payment of €1,000 in six months. Behavioural economists argue that a hyperbolic utility function that allows for additional short-run impatience is a better description of agents' utility (Ainslie, 1975; Thaler and Shefrin, 1981; Laibson, 1997; Angeletos et al., 2001). Hence, we include an additional discount factor measuring short-run impatience to control for deviations from standard economic theory. The additional measure of short-run impatience is estimated as

$$\delta = \frac{x_{12}}{x_6}, \tag{2}$$

where x_6 is the amount the respondent requires in six months to forego payment of €1,000 today (Item 11 in the Appendix). A low value of δ implies that the agent requires a lower payment in 12 months to forego payment in six months than he or she does in six months to forego payment today, and hence expresses short-run impatience.

We also include a measure of risk propensity derived from a behavioural experiment in which respondents are repeatedly asked to choose between a safe payoff and a lottery (Item 10 in the Appendix). The higher the safe payoff required to forego the lottery, the greater the respondent's risk propensity. Theory does not give us clear guidance on this issue, but we expect that more risk-averse respondents save a greater share of the tax reduction because of a precautionary saving motive.

Over the last years, public debt in Germany has increased dramatically. Rational economic agents behaving in accordance with Ricardian theory (Barro, 1974, 1979) should increase private saving so as to be able to offset the likely future increase in taxation. The recent build-up of public debt can be interpreted as a natural experiment that may help us identify Ricardian consumers. We enquired into respondents' reaction to the recent increase in public debt. Specifically, we asked them to state whether they are spending less, spending more, or have not changed their spending and saving behaviour. We then include a dummy variable for 'Ricardian consumers' that takes the value 1 if respondents spend less and save more in reaction to the increased public debt. The payroll tax cut

[11] The question was asked in a hypothetical way and did not actually involve monetary payments. However, the 'experiment' is taken from the German Socioeconomic Panel (SOEP) questionnaire, where actual monetary payments were made. As the distribution of answers is similar to the SOEP data, the lack of incentivisation appears unproblematic.

[12] We focus on the time span from six to 12 months, rather than the time span from today to six months to avoid measurement error due to extreme short-run impatience or hyperbolic discounting (Thaler and Shefrin, 1981; Ainslie, 1975).

studied in this paper is a particularly interesting case because the budget of the statutory pension insurance system is somewhat more transparent than that of the general government. The pension insurance system is required to ensure that its current revenues match the level of predetermined pension benefits. Assuming that the defined pension benefits remain fixed, then either transfers from the general government budget to the pension budget or an increase in contribution rates will be necessary to offset demographic development toward an aging society.[13] Hence, Ricardian agents have a clear incentive to save in response to the recent rate cut so as to offset variations in their intertemporal consumption level.

A small literature studies how economic knowledge influences economic behaviour and opinions on economic policy. Walstad (1997) uses survey analysis to investigate the relationship between economic knowledge and opinions on economic topics and finds, *inter alia*, that respondents with more economic knowledge are more favourable to using fiscal stimulus to combat unemployment. Hayo (1999) analyses the relationship between objective knowledge about the EU and opinions about the European Monetary Union and finds that objective knowledge is positively associated with support for European monetary integration. Blinder and Krueger (2004) use survey methods to analyse the role of economic knowledge in shaping opinions and conclude that economic knowledge is less important than ideology, but more important than variables reflecting respondents' self-interest. Van der Cruijsen et al. (2013) use a household survey to study the relationship between economic knowledge and opinions about banking supervision. They conclude that more informed respondents have more realistic views on banking supervision and, hence, act in a more financially prudent manner. Lusardi and Mitchell (2007) and van Rooij et al. (2011) find that more knowledgeable persons tend to do more planning for retirement.

We add to this literature by investigating whether economic knowledge is systematically associated with consumption responses to tax changes. Intertemporal utility maximisation requires economic agents to know the actual value of real interest rates. Likewise, Ricardian equivalence is based on the idea that rational agents take the government's intertemporal budget constraint into account. Thus, both arguments require respondents to have information about macroeconomic variables. We test whether economic agents with correct knowledge about these variables react differently to the tax change than those with incorrect or no knowledge. We measure economic knowledge by asking respondents to choose—from four options—the correct last year's budget deficit, as well as current long-term interest and inflation rates (Items 7 to 9 in the Appendix). In the regression, we then include dummy variables measuring whether the knowledge questions were answered correctly. Pertaining to information processing capability, we also include a dummy for higher education that takes the value 1 if the respondent has at least a university-entry diploma. It could be argued that economic knowledge will enable the respondent to better analyse macroeconomic conditions. If so, respondents able to correctly assess the currently low interest rates may show different consumption responses. Similarly, respondents who closely monitor budget deficits may be more worried about the government's intertemporal budget constraint and, hence, be less inclined to increase spending. Lusardi and Mitchell (2007) report that economic competence not only increases planning for retirement but is also associated with higher savings.

A better understanding of economic covariates associated with individual reactions could be helpful to economic policymakers in designing a business cycle stimulus. For example, there is debate

[13] This is evident in the report of the responsible parliamentary committee referring to the law implementing the payroll tax change *(Gesetz zur Festsetzung der Beitragssätze in der gesetzlichen Rentenversicherung für das Jahr 2013)*.

about whether different income levels are associated with different propensities to consume. The common view, which is based on Keynes (1936), is that households with smaller income are more likely to spend the additional income (Shapiro and Slemrod, 2009). Thus, measures targeted at low-income households are often proposed as particularly effective approaches to business cycle stimulus.[14] To study the impact of income on responses to the tax change, we introduce a dummy variable for medium net income (more than 1€,500, but less than €3,500) and a dummy for high net income (more than €3,500).

We also control for a wide range of socio-demographic variables. The influence of socio-demographic variables on consumption responses has the potential to identify those individuals who will have a particularly sensitive reaction to tax changes. We include dummy variables for the respondent's sex, age, home region (East or West Germany), and being in a relationship.

4.2 Empirical Results

Table 3 contains the estimated average marginal effects. We find that variation in perception of the tax change as either temporary or permanent does not appear to matter, and our evidence suggests that temporary and permanent tax changes should have a similar impact. Although the proportion of spenders among those who perceive the rate cut to be temporary is greater (0.56) than among those who perceive the rate cut to be permanent (0.52), a Fisher exact test shows that the difference is not statistically significant. Comparing our findings to extant literature, we find that Shapiro and Slemrod (1995) report that 43 per cent of respondents increased spending after a temporary tax change, which supports our conclusion that temporary tax change can have a large impact. Likewise, Jappelli and Pistaferri (2012) find that consumers would on average spend 48 per cent of an unexpected transitory income change. Poterba (1988) estimates that up to 24 per cent of a temporary tax cut is consumed. Blinder (1981) concludes that temporary tax cuts have a much smaller impact than permanent ones, as do Watanabe et al. (2001), who study the consequences of Japanese tax changes.

Individuals assessing the current return on savings to be low have a 10 percentage point (pp) higher probability of stating that they plan to spend the additional money. The effect is significant at the 1 per cent level. In fact, respondents reporting the current attractiveness of savings as low spend the additional funds in 59 per cent of all cases, and the Fisher exact test finds the difference in spending rates to be significantly different across answer categories (p-value 0.00).[15] This finding suggests that interest rates are an important determinant of consumption and saving decisions, and hence reinforces concerns that the current low level of interest rates causes lower savings. Given that the theoretical prediction was ambiguous, it is interesting that our survey evidence suggests that consumption responses to changes in income are stronger in a low interest rate environment. This finding is in contravention of permanent income models that predict consumption responses to transitory changes in income to be smaller under low interest rates.

[14] This argument is discussed in Shapiro and Slemrod (2009). For Germany, the draft bill of the *Gesetz zur Sicherung von Beschäftigung und Stabilität in Deutschland* contains an official justification for the measures enacted to combat the recession following the 2007 financial crisis. A good example is the reduction in the marginal tax rate for low incomes, which is justified as specifically strengthening the domestic demand of low and medium income households. The bill also contains a one-time €100 child benefit payment, which is justified similarly.

[15] One reason for this variation across respondents despite the same macroeconomic interest rate could be differences in personal investment opportunities. Another reason could be that respondents are not equally aware of the current interest rate situation, as only 36 per cent of respondents are able to identify the correct long-term interest rate from a list of four options.

Table 3: Consumption responses and covariates

	Marginal effects	Confidence intervals
Anticipating tax change as temporary	0.03	[-0.06, 0.11]
Perceiving current returns on savings as low	0.10***	[0.03, 0.18]
Expect worsening in economic situation	-0.01	[-0.11, 0.08]
Discount factor	-0.27***	[-0.47, -0.08]
Additional hyperbolic discount factor	-0.05	[-0.19, 0.09]
Index for risk propensity	-0.02	[-0.08, 0.03]
Ricardian consumer	-0.22***	[-0.34, -0.11]
Correct knowledge of budget deficit	0.04	[-0.07, 0.16]
Correct knowledge of interest rate	-0.03	[-0.10, 0.04]
Correct knowledge of inflation rate	-0.01	[-0.08, 0.07]
Household income	Base category 'Low income'	
Medium income	0.08	[-0.03, 0.18]
High income	0.14**	[0.01, 0.26]
East Germany	0.02	[-0.06, 0.10]
Female	0.04	[-0.03, 0.10]
Number of children	-0.04**	[-0.07, -0.0001]
Age	0.001	[-0.003, 0.004]
Higher education	-0.07	[-0.16, 0.01]
In relationship	0.01	[-0.07, 0.10]

Notes: Table shows average marginal effects of logistic regression with dependent variable 'increase spending' coded as 1, 'repay debt' or 'save' coded as 0 (Item 1 in Appendix A). Confidence interval based on 95% level of confidence. Based on 832 observations. ** significant at 5%, *** significant at 1%.

The respondents' expectations of future economic outcomes are statistically insignificant. Thus, variation in expected income over the business cycle does not affect the impact of tax changes.

Our indicator for the discount factor is statistically significant and suggests that economic agents who discount the future less heavily have a 27 pp lower probability of spending the additional funds. This is in line with intertemporal utility optimisation. Our indicator for the additional discount factor reflecting short-run impatience, however, is not statistically significant, providing evidence that nonstandard utility functions may not be important in explaining consumption responses to tax changes. Our indicator for risk preferences is not statistically significant, either.

Respondents identified as Ricardian have a 22 pp lower probability of spending the additional funds, which is significant at the 1 per cent level. This supports the theoretical hypothesis. However, only 86 out of 1,025 respondents stated that they spent less and increased savings in response to the recent accumulation of public debt, suggesting that the Ricardian argument is of limited practical importance. Moreover, drawing on Mankiw's (2000) distinction of economic agents as either 'Savers' or 'Spenders', it could be argued that 'Savers' tend to save irrespective of Ricardian arguments.

All three knowledge variables, as well as the dummy variable indicating higher education, are insignificant. This suggests that economic knowledge is not associated with different consumption reactions to tax changes. Referring to the demands placed on consumers in typical rational expectations models, it is interesting to note that only around 9 per cent of respondents were able to

correctly answer the question about last year's budget deficit, 36 per cent chose the correct long-term interest rate, and around 66 per cent selected the correct current rate of inflation. Based on these outcomes, it appears that respondents in Germany are not particularly well informed about macroeconomic variables that are highly relevant in widely used models, such as those building on intertemporal utility maximisation, permanent income theory, or Ricardian equivalence. We find that with an average of slightly below 40 per cent of correct answers across the three knowledge questions, we are at the lower end of the range reported in other studies. In Walstad (1997), 43 per cent of economic knowledge questions were answered correctly by respondents in the United States. A question referring to the size of the US federal deficit, however, was answered correctly by only 19 per cent of respondents. In Hayo (1999), around 48 per cent of knowledge questions were answered correctly by citizens of EU member countries. Walstad and Rebeck (2002) compare outcomes from five surveys on economic knowledge and conclude that on average, 48 per cent of all knowledge questions are answered correctly.

We find that high-income households have a 14 pp higher probability of increasing spending in response to tax changes, which is significant at the 1 per cent level. In fact, the proportion of respondents replying 'mostly spend' monotonically increases from 49 per cent in the low-income class to 57 per cent for medium income and 60 per cent for high income. This contradicts the conventional wisdom, based on Keynes (1936), which assumes a higher marginal propensity to consume for low-income households. However, Coronado et al. (2005) study self-reported qualitative consumption responses to the child credit rebate and the change in the withholding tax enacted in the United States in 2003 and also find that households with higher incomes are more likely to spend the additional money. Shapiro and Slemrod (2009) do not find strong evidence for variations in response patterns across income categories, but report a somewhat lower proportion of respondents who plan to spend the additional money in the lower income brackets. The finding in Shapiro and Slemrod (2003) is similar. Hence, tax multipliers appear higher in the case of tax reductions for high-income households.

In our set of socio-demographic variables, we find that households with children are 4 pp less likely to spend the additional funds. Similar to the result for income, this finding raises questions about the effectiveness of specific business cycle stimulus measures, such as the 2009 €100 increase in child benefits. However, the effects relating to income level and number of children are each significant only at the 5 per cent level. Other socio-demographic variables are insignificant.

5 Conclusion

The general conclusion from our analysis of a representative population survey is that the effect of typically sized tax reductions on aggregate consumption and economic activity is economically relevant in Germany, as 55 per cent of the respondents report that they want to spend the extra money. In our view, this reveals considerable potential for taxation to affect consumption and hence economic activity. One way of comparing our results with the macroeconometric literature on fiscal multipliers is to transform our estimate of the marginal propensity to consume into a traditional Keynesian tax multiplier –MPC/(1-MPC) of -1.13. Hayo and Uhl (2013) use narratively identified tax shocks for Germany to study the consequences of tax changes for GDP and consumption in a vector-autoregressive model and find peak effects of a unit increase in the tax-to-GDP ratio of -2.4 per cent on GDP and -1.8 per cent on consumption, which is not incompatible with the conclusions from our qualitative survey.

With the help of individual socio-demographic and economic variables, we investigate widely employed assumptions about consumption responses to tax changes, with several interesting results. First, we asked our respondents whether they perceive the current rate cut to be temporary or permanent. We find no significant difference in consumption responses across this dimension, which casts some doubt on a core premise of the permanent income hypothesis. Second, we discover that individual returns on savings have a significant effect on consumption spending after a tax reduction: if returns are considered to be relatively low, the consumption response is relatively stronger. This finding poses a challenge to permanent income models, which predict consumption responses to transitory changes in income to be smaller under low interest rates. Third, expectations about future economic situation are not significant, which is neither consistent with consumers' reacting to life-time income nor the behavioural economics concept of 'animal spirits'. Fourth, estimated discount factors have a significant effect on the decision about how to use the additional income. The lower the discount factor, the greater the likelihood that the additional income from the tax reduction is spent, which is in line with intertemporal utility maximisation. Our indicator for short-run impatience is not statistically significant, suggesting that the emphasis in behavioural economics on hyperbolic discounting (Thaler and Shefrin, 1981) may not be warranted in the present context. Fifth, variations in risk propensities are not statistically significant. Sixth, we find evidence that 'Ricardian consumers' spent significantly less of the tax reduction. However, only about 8 per cent of consumers are Ricardian, meaning that the practical relevance of this effect is small. Seventh, the various indicators for economic knowledge are neither individually nor jointly statistically significant, which suggests that economic knowledge is not associated with different consumption reactions to tax changes. Indeed, our results throw doubt on the practical relevance of rational expectation models, as the German population's degree of knowledge about important economic variables is fairly low. Eighth, it is often argued that targeting policy measures at low-income households is a particularly effective approach to business cycle stabilisation. In contrast, our evidence suggests that consumption responses are particularly pronounced at the upper end of the income distribution.

We see further scope for studying self-reported responses to tax changes using survey methods. Typically, investment is much more volatile than consumption and reacts far more sensitively to tax changes (Cloyne, 2013; Hayo and Uhl, 2013; Mertens and Ravn, 2012; Romer and Romer, 2010). Thus, investment responses appear to be particularly relevant in discovering macroeconomic responses to changes in taxation. Moreover, studying self-reported responses to tax changes at the firm level would be of interest.

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Appendix: Summary of the Survey Instrument

No	Item
Intro	At the beginning of 2013, contribution rates to the statutory pension system have been reduced. In effect, this reduces the overall tax burden. We are interested in your responses to the rate cut.
1	Thinking about your household's financial situation, will you use the additional budget mostly to increase spending, mostly to increase saving, or mostly to pay off debt? Reply: 'Increase spending', 'Repay debt', 'Increase savings'
2	Will the recent cut in pension insurance contribution rates lead to higher contribution rates in the future? Reply: 'Yes', 'No'
3	Will the recent cut in pension insurance contribution rates lead to lower pension payments? Reply: 'Yes', 'No'
4	How do you expect your economic situation to be in one year? Reply: 'Much worse than today' (–2) to 'Much better than today' (+2)
5	How profitable do you think savings are in Germany today compared with ten years ago? Reply: 'Much less than ten years ago' (–2) to 'Much more than ten years ago' (+2)
6	How large was the budget deficit of the federal government in 2012? Reply: '**1%**', '3%', '5%', '7%'
7	What is the current interest rate on long-term government bonds (maturity 10 years), approximately? Reply: '**1.5%**', '3%', '5.5%', '10%'
8	How large was the rate of inflation in 2012, approximately? Reply: '0%', '**2%**', '5%', '10%'
9	Between 2008 and 2012, we have seen a rapid acceleration of public debt. Did this increasing reliance on debt financing lead to changes in the way you spend or save? Reply: 'Yes, I now spend a smaller proportion of my income and save a larger proportion', 'Yes, I spend a larger proportion of my income and save a smaller proportion', 'No, I did not change my behaviour in consequence to the rapid increase in public debt'
10	In this experiment you can choose between a safe payment, and a lottery where you win €1,000 with 50% probability and nothing with 50% probability. You start with the amount '€0' and choose the safe amount for which you forego the lottery. Reply: '€0', '€100', '€200', '€300', '€400', '€500', '€600', '€700', '€800', '€900'

No	Item
11	In this experiment you can choose between a fixed amount of €1,000 paid immediately, and a higher amount paid to you in 6 months. You start with the amount '€1,000' and choose the amount for which you decide to take the payment in 6 months. Reply: '€1,000', '€1,010', '€1,020', '€1,030', '€1,050', '€1,075', '€1,100', '€1,150', '€1,200', '€1,300', '€1,400', '€1,500', '€1,750', '€2,000'
12	In this experiment you can choose between a fixed amount of €1,000 paid in 6 months, and a higher amount paid to you in 12 months. You start with the amount '€1,000' and choose the amount for which you decide to take the payment in 12 months. Reply: '€1,000', '€1,010', '€1,020', '€1,030', '€1,050', '€1,075', '€1,100', '€1,150', '€1,200', '€1,300€', '€1,400', '€1,500', '€1,750', '€2,000'

Notes: Items 4 and 5 have a five-point scale. In Items 6, 7, and 8, correct answers are in bold. To preserve space, Items 10, 11, and 12 are presented in slightly different form compared to the actual survey text. For a full documentation of the survey, including the German original of the survey instrument, see Hayo et al. (2014).