The (In)Validity of the Ricardian Equivalence Theorem – Findings from a Representative German Population Survey

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Abstract

In this paper, we utilise data from a German population survey to test the validity of the Ricardian equivalence theorem (RET). In 2013, 2,000 representatively chosen people were asked whether they have altered their consumption and saving behaviour in response to the significant increase in public debt that occurred between 2008 and 2012. Our findings suggest that, in general, RET does not hold. Only 7% of our respondents reported consuming a smaller proportion of their income, and saving a larger proportion, in response to public debt accumulation. In the case of respondents required to pay social security contributions, we can control for their expectations about the future and find that 36% behave in line with RET. We interpret our findings as microeconomic evidence in support of the 'rule-of-thumb' consumer assumptions employed in macroeconomic models. Moreover, using multinominal logit regressions, we find that individuals' consumption responses are significantly related to their economic situation, time preferences, education, and age.

JEL Code: D12, D91, E21, H31.

Keywords: Ricardian equivalence, public debt, private consumption, private saving, survey, Germany.

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1. Introduction

The recent financial crises and the associated economic downturn have revitalised research into the efficacy of fiscal stimuli and the size of fiscal multipliers. In contrast to ambiguous results in older literature, recent studies report notable and robust effects of fiscal policy on the real economy (e.g., for the United States: Romer and Romer, 2010; Favero and Giavazzi, 2012; for Germany: Hayo and Uhl, 2014; for the United Kingdom: Cloyne, 2013).

These empirical findings contradict predictions derived from the Ricardian equivalence theorem (RET), which plays an important role in macroeconomic theory. RET suggests that fiscal stimuli—that is, deficit-financed public spending hikes or tax cuts—will lead to a crowding out of private consumption, thus decreasing the effectiveness of fiscal policy in boosting economic activity. Although studies showing the effectiveness of fiscal policy may cast doubt on RET's validity, ultimately, they provide only indirect evidence of RET's usefulness for explaining empirical data. Hence, a large number of empirical studies attempt to directly test RET.

The results from these studies lead to widely varied interpretations. For instance, Seater (1993: 182) states: 'Although tests of Ricardian equivalence do not quite give an unambiguous verdict on that proposition's validity, I think it reasonable to conclude that Ricardian equivalence is strongly supported by the data'. Quite the reverse is claimed by Romer (2006: 572), who writes that 'there is little reason to expect Ricardian equivalence to provide a good first approximation in practice'.

Underlying these results are two dominant strands of empirical research.[1] The first strand employs macroeconomic data to test empirical predictions following from RET. Particularly common is the estimation of (static) aggregate consumption functions as well as consumption Euler equations using multivariate regression analysis or VAR models (e.g., Feldstein, 1982; Evans, 1988, 1991; Becker, 1997). Relying on microeconomic data to check the validity of RET, the second strand utilises laboratory experiments (e.g., Adji et al., 2009; Cadsby and Frank, 1991; Slate et al., 1995). However, findings are generally inconclusive. Within both literature strands, there are some studies that provide evidence in support of RET and some that reject the existence of a Ricardian motive in private consumption. Moreover, both macroeconometric and experimental approaches have been fiercely criticised. Macroeconometric studies are not only subject to a serious identification problem due to the simultaneity of aggregate income, consumption, government revenues, and expenditures, as

[1] See Seater (1993) and Ricciuti (2003) for detailed literature reviews.

well as public debt, but may also suffer from various types of misspecification (e.g., Bernheim, 1987; Cardia, 1997). Experimental laboratory setups, on the other hand, involve hypothetical scenarios and decisions made in a highly artificial environment, thus raising questions about their relevance for daily decision making and casting doubt on their ability to ensure external validity for a representative sample of the population.

There is a third, infrequently employed, way of testing RET: directly asking people about their economic reactions. We believe that the survey framework, although not without its own problems, is a promising alternative to the other two ways of testing RET. Bearing in mind the methodological drawbacks of the extant literature, we designed a specific population survey to assess the relevance of RET for peoples' consumption choices. In the first quarter of 2013, roughly 2,000 representatively chosen German citizens aged 14 or older were interviewed face-to-face with the help of pen pads. The survey was carried out by the GfK, the largest survey institute in Germany.

In a first step, the interviewees were asked whether the noticeable increase in public debt in Germany between 2008 and 2012 has affected the share of income they spend or save. We believe the timing of the survey facilitates the purpose of our analysis. The German government's reliance on deficit financing in the aftermath of the recent financial and economic crisis allows us to study changes in private consumption in response to an actual and notable increase in public debt. Thus, in contrast to laboratory studies, our survey refers to a real-world scenario. Relevance is enhanced by the fact that the increase in public debt was significant enough to exert a noticeable influence on the government's intertemporal budget constraint. Over the course of the crisis, the debt-to-GDP ratio of the German general government rose from 65% in 2007 to 81% in 2012. In 2009, that is, right in the middle of this period, the German parliament introduced a balanced budget rule via a constitutional amendment. According to this rule, the public budget deficit at the federal-government level must not exceed 0.35% of GDP from 2016 onward. Thus, at the time the survey took place, it was already clear that the deficit-financed fiscal stimulus was only transitory and the adoption of austerity measures to be expected.

In a second step, we evaluate individual consumption reactions to a specific real-world fiscal policy change in Germany. A reduction in individual contributions to the statutory pension insurance system meant an increase in disposable income for wage earners and can be interpreted as a change in taxes for this group (see Hayo and Uhl, 2015). Referring to this payroll tax cut, interviewees were asked (i) whether they use the additional disposable income

for consumption or saving and (ii) whether they believe that the contribution cut implies higher contributions in the future or a reduction in pension payments.

While we do not have direct evidence that Germans are aware of the transversality condition and the possibility that it can be violated, our survey participants expressed great concern over the long-term development of public debt. Hayo and Neumeier (2016a) show that the German population has a clear preference for fiscal consolidation and Hayo and Neumeier (2016b) provide evidence of overwhelming public support for the introduction of the balanced budget rule noted above.

Our survey allows us to directly link cause—that is, public debt accumulation—and consequence—that is, changes in private consumption. We believe that this approach avoids the type of identification issues that commonly afflict macroeconometric studies and, thereby, provides more direct evidence as to the chain of causation.

Moreover, the representativeness of our data ensures external validity to a much larger degree than that achieved by using small samples of, typically, economics students. Thus, instead of measuring a specific group's response to an artificial and counterfactual scenario, we ask a representative sample of ordinary people about their actual reaction to a real-world event they can relate to and that has been widely and repeatedly discussed in all forms of media.

In addition, the large number of individual observations makes it possible to investigate whether the inclination to behave in a (non-)Ricardian manner is related to interviewees' personal characteristics. In the extant literature, several studies cast doubt on the general validity of RET by pointing out various restrictive assumptions underlying its theoretical framework. Our survey framework allows us to evaluate the importance of factors believed to invalidate RET, such as economic well-being, time preferences, and (economic) sophistication.

The question of whether consumers decrease consumption in response to higher public debt is important not only for assessing the effectiveness of fiscal policy, but also relevant for the design of macroeconomic models. Standard real business cycle models typically assume infinitely-lived Ricardian consumers and have difficulties explaining empirical evidence suggesting notable effects of fiscal policy on economic activity. For instance, in Romer and Romer (2010), Hayo and Uhl (2014), or Cloyne (2013), the tax multiplier for GDP is estimated to be larger than 2 in absolute terms. In an attempt to reconcile theory and evidence, some macroeconomic researchers introduce so-called rule-of-thumb consumers into their models, whose consumption expenditures are assumed to be independent from the current or

future fiscal policy stance (e.g., Galí et al., 2007; Mankiw, 2000). Yet other researchers resolve the contradiction by differentiating between 'patient' savers and 'impatient' borrowers and by introducing liquidity constraints into their models (e.g., Eggertsson and Krugman, 2012; Bilbiie et al., 2013). In contrast to existing macroeconomic approaches suffering from identification issues, our microeconomic analysis allows us to assess the adequacy of the *rule-of-thumb* consumer assumption made in this strand of macroeconomic literature as well as the importance of time preferences and, to some extent, liquidity constraints relevant for individuals' consumption expenditure.

The remainder of the paper is organised as follows. Section 2 discusses the related literature. Section 3 introduces the survey and sets out our research hypotheses. In Section 4, we discuss our empirical approach and present our findings on the link between consumers' reactions to public debt incurrence and their individual characteristics. In Section 5, we evaluate individual consumption and saving responses to the payroll taxation reduction. Section 6 concludes.

2. Related Literature

To the best of our knowledge, the only survey-based direct test of RET was attempted by Allers et al. (1998). Those authors utilise data from a mail-in newspaper survey conducted in the Netherlands, where questionnaires were sent to subscribers of regional newspapers. In the questionnaire, people were asked whether they would save extra money in case of increasing public debt so as to be able to pay higher taxes in the future. The authors' main results, based on descriptive statistics, suggest that respondents do not engage in Ricardian-style behaviour and that those with lower levels of education, as well as older respondents, are more likely to increase their savings.

We believe that Allers et al. (1998) do not exploit a number of potential advantages of the survey approach and we improve on their attempt by modifying the research framework in several important ways. First, using state-of-the-art survey methods, the respondents in our sample are representatively and randomly chosen, thereby minimising concern about external validity and selection bias. Hence, the quality of our data makes it possible to draw conclusions for the German population.[2] Second, the interviews employed in our analysis were carried out face-to-face by professional interviewers with the help of pen pads, allowing

[2] Note that Allers et al. (1998) are aware of the deficiency of their dataset and attempt to address the issue by computing representative weights for their sample using Census data. However, this type of weighing cannot address possible selection biases.

us to ask theoretically interesting and complex questions. Third, our data contain additional information about the respondents, specifically sociodemographic characteristics, time preferences, economic knowledge, and attitudes toward fiscal consolidation, making it possible to test several theoretically informed hypotheses.

Utilising survey data from Germany and Austria, respectively, Heinemann and Henninghausen (2012) and Stix (2013) also claim to test RET. However, we believe that these scholars provide, at best, an indirect test. They study the association between factors invalidating RET—such as credit constraints or the absence of a bequest motive—and individual support for fiscal consolidation, arguing that persons for whom such invalidating factors are more relevant should favour deficit spending. In our view, this approach suffers from an identification problem as, a priori, it is not clear whether attitudes toward public indebtedness are actually linked to individual consumption behaviour. In fact, in our empirical analysis, we find no statistically significant association between individual attitudes toward fiscal consolidation and a Ricardian consumption motive.

Also related to our analysis are studies by Johnson et al. (2006), Parker et al. (2013), and Shapiro and Slemrod (2009), who use survey data from the United States to evaluate individual consumption responses to one-time tax rebates. Johnson et al. (2006) and Parker et al. (2013) find that people tend to spend most of the additional disposable income generated by the tax rebates in 2001 and 2008; Shapiro and Slemrod (2009) report that most people intend to use the money to pay off debt. These studies are closely linked to the second part of our analysis, in which we analyse consumption responses to a recent payroll tax reduction in Germany. The main difference between this work and our analysis is that we account for the role played by individual expectations about the future fiscal consequences of the tax reduction. Finally, Hayo and Uhl (2014, 2015) utilise data from the same survey to study wage earners' consumption and labour supply responses, respectively, to a payroll tax cut. However, their interest is not in testing the validity of RET, but in assessing the effectiveness of fiscal stimuli.

3. Data and Research Hypotheses

According to Barro (1974, 1979), RET implies that individuals view taxes and public debt as equivalent means of financing public expenditure. Consumers are assumed to be well aware of the government's intertemporal budget constraint and, thus, in the event of a government deficit, anticipate that taxes will need to be raised in the future to repay this debt. Thus, financing current government expenditure via debt only postpones taxation. Since the

optimal level of consumption is supposed to depend on (expected) lifetime income rather than on current income, the timing of taxation does not affect a household's optimal consumption plan, that is, the desired level of current and future consumption. Consequently, individuals save the additional disposable income generated by the fiscal stimulus and increase savings with the aim of smoothing consumption over time.[3] Therefore, any fiscal stimulus created by a deficit-financed tax cut (or expenditure increase) will reduce the *share* of disposable income people use for consumption (while the level of private consumption remains unchanged) and lead to an equivalent increase in private savings. However, as is widely acknowledged, the validity of RET is sensitive to the assumptions Barro (1974, 1979) makes in his theoretical framework (see, e.g., Romer, 2006).

To assess whether or not individuals alter their consumption behaviour in response to an increase in public debt, we included the following question in our survey:

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?

*Yes, I now spend **a smaller proportion** of my income and save **a larger proportion***	□
*Yes, I now 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	□

RET implies that respondents will choose the first option, that is, spend a smaller proportion of income and save a larger proportion. However, we also offered the opposite course of action as an option; respondents could indicate that they spend a larger proportion of their income and save a smaller proportion. Respondents could also answer that they did not alter their consumption behaviour at all.[4]

[3] Note that, under certain circumstances, RET implies that the *level* of private consumption decreases in response to an increase in public debt. As pointed out by Barro (1974), the conclusion that an individual's optimal consumption plan is not affected by public debt accumulation hinges on the assumption that an increase in public debt does not alter perceived net household wealth. If, however, perceived household wealth decreased in response to public debt accumulation (which would be the case, for instance, if tax collection or bond issuance are associated with transaction costs), then also the *level* of private consumption may decrease. In a similar vein, if the increase in public debt is due to an increase in public expenditure and if consumers expect this increase to be persistent (implying that taxes need to be raised in the future), then the optimal level of current and future private consumption decreases.

[4] Note that in Germany, income tax and social security contributions are collected via wage deductions. They are paid directly by the employer, who is required to withhold them from the employee's wage. Thus, in Germany, the term 'income' is equivalent to 'net disposable income'. See also the discussion in Hayo and Uhl (2015). Moreover, the professional interviewers who carried out the interviews were explicitly instructed to explain the items to the respondents and to answer any questions.

In addition, we evaluate individual consumption reactions to a real-world reduction of contributions to the statutory pension insurance system that occurred a few months before the survey was conducted. Referring to this payroll tax cut, interviewees were asked whether they use the additional disposable income for consumption or saving. This inquiry was followed by two related questions. First, we asked the interviewees whether they believe that the contribution cut implies higher contributions in the future. Second, the interviewees were asked whether they think that the tax cut will lead to lower pension payments. RET implies that respondents who expect that the payroll tax cut will lead to a future tax hike or lower pension payments will save the additional disposable income.

A concern about using surveys is that stated behaviour and actual behaviour may not necessarily be the same. One reason for noncongruence could be errors in recollection. However, given that the public debt situation received extensive media coverage during the sample period of our survey, this does not seem particularly likely. A further drawback of our design is that we are not able to assess by how much consumption and saving have changed in response to the recent rise in public debt. As a consequence, we are not able to precisely estimate the magnitude or even the direction of the aggregate effect.

At the micro level, individual consumption responses to public debt accumulation may vary because people are differently affected by certain factors that may invalidate RET. We discuss some of these factors below and derive empirically testable hypotheses to evaluate their importance.[5] A detailed description of our survey and the variables, together with descriptive statistics, is provided in Hayo et al. (2014).

Economic well-being. Two arguments in the literature link private consumption and public indebtedness to an individual's personal economic situation. First, Cukierman and Meltzer (1989) provide an extension of Barro's (1979) theoretical framework in which individuals differ in their abilities and, consequently, in the level of earned income. In this framework, people who are comparatively worse-off would like to borrow resources from future generations in order to increase their current consumption. Since individuals are bequest constrained in the sense that they cannot leave a negative bequest, economically deprived people favour deficit spending and, thus, do not reduce the proportion of income they consume in response to public debt incurrence. Second, and in a similar vein, financial market imperfections, such as credit constraints or differential borrowing rates, may invalidate RET (e.g., Heller and Starr, 1979; Hayford, 1989). In this context, public debt can be interpreted as

[5] Seater (1993) and Ricciuti (2003) provide similar discussions.

a loan made to the current generation of consumers, allowing them to circumvent a binding credit constraint. Since people who are comparably worse-off are more likely to face higher credit costs or even a binding credit constraint, they may be less inclined to reduce consumption in the event of public debt accumulation.

We assess the interviewees' personal economic situations with three variables, two objective indicators and a subjective one: (i) net monthly household income (in €1,000), (ii) the household's real wealth (a binary variable indicating whether the respondent lives in a self-owned house/flat or a rented house/flat), and (iii) a subjective assessment of each interviewee's personal economic situation, ranging from 1 (absolutely dissatisfied) to 5 (absolutely satisfied).

Time horizon and time preference. The validity of RET is particularly sensitive to the assumptions made concerning the time horizon of the current generation of consumers. More precisely, RET holds only if the current generation that benefits from deficit spending either (i) has to carry the burden of a future debt reduction or (ii) cares about the welfare of future generations, that is, has a bequest motive. At the individual level, the first point relates to a person's remaining life expectancy, whereas the second appears more relevant for people with children (e.g., Heinemann and Henninghausen, 2012). In the empirical analysis, we use the respondent's age as a proxy for remaining life expectancy and include a dummy variable for respondents with children.

Another crucial assumption underlying RET is that the discount function applied by individuals corresponds to the yield curve of government bonds. However, empirical research on intertemporal choice documents that people's subjective discount factors between two consecutive periods are typically larger than the corresponding interest rate, indicating that they are less forward-looking than assumed (e.g., Thaler and Shefrin, 1981). Both theoretical and empirical evidence suggests that the higher a person's discount rate, the stronger the inclination to opt for deficit spending (e.g., Huber and Runkel, 2008; Hayo and Neumeier, 2016a). Analysing the effect of expansionary fiscal policy on private consumption, Eggertsson and Krugman (2012) and Bibliie et al. (2013) develop models in which consumers differ with respect to their discount rates. More precisely, they introduce two types of consumers: impatient borrowers, characterised by a high discount rate, and patient savers, characterised by a low discount rate. In both models, borrowers are subject to a liquidity constraint. They show that under these assumptions, impatient consumers tend to increase

consumption in response to a deficit-financed fiscal stimulus.[6] Consequently, we hypothesise that a high discount rate implies that a person is less likely to reduce consumption in response to public debt accumulation.

To measure the interviewees' time preferences, we include a simple experiment in our survey. Respondents were asked to choose between a safe payoff of €1,000 paid in six months and a higher payoff of €$X_{i,12}$ paid in twelve months. The respondents' choice of $X_{i,12}$ is then used to compute the marginal rate of intertemporal substitution (β) between two consecutive future periods, that is, $\beta = 1{,}000/X_{i,12}$. The larger β, the lower a person's discount rate.

Knowledge/information set. In Barro's (1979) theoretical framework, people are assumed to be able to evaluate the future burden associated with deficit financing and capable of solving an intertemporal optimisation problem in order to derive their 'optimal' consumption plan. In practice, this requires not only sufficient information about public-debt-related economic measures so as to be able to assess the costs arising from public debt incurrence, but also a certain level of intellectual sophistication. However, survey evidence indicates that people are rather ignorant about economic measures in general (Blinder and Krueger, 2004) and public debt in particular (Hayo and Neumeier, 2016a). As argued by Reiter (1999), imperfect information about public debt and the associated costs may invalidate RET, as may a lack of sophistication.

To measure the interviewees' factual knowledge about economic variables necessary for assessing the public debt situation, we asked three multiple-choice questions: (i) the size of the federal government's budget deficit in 2012 (in relation to GDP), (ii) the current interest rate on government bonds with a maturity of 10 years, and (iii) the inflation rate in 2012. In each case, respondents could choose from among four answers and we use the total number of correct answers, ranging from 0 to 3, as our indicator of economic knowledge. In the empirical estimations, we employ four dummy variables reflecting the possible number of correct answers. We further control for interviewees' level of education so as to capture the effect of intellectual sophistication, differentiating between those who completed lower secondary school (*Hauptschule*), middle secondary school (*Realschule*), upper secondary school (*Abitur*), and those who have not yet completed school.

[6] Bibliee et al. (2013) study the consequences of a deficit-financed tax cut in the presence of borrowing constraints for impatient consumers. Their findings suggest that expansionary fiscal policy may have a positive present-value multiplier for private consumption. Eggertsson and Krugman (2012) analyse the effect of a public-debt-induced economic slump on private consumption. In their model, the economic downturn forces indebted consumers into rapid deleveraging. They show that under certain circumstances, a further increase in public debt may increase the level of consumption among liquidity-constrained impatient agents.

Further controls. We include several additional characteristics of our respondents as control variables. Specifically, we control for respondents' employment status, differentiating between employed, unemployed, students, and retirees; marital status, differentiating between singles, people living in a partnership, married people, and divorced or widowed people; and sex. We assessed the respondents' risk attitudes by conducting a simple experiment. Respondents were asked to choose between receiving a safe payoff of €X or taking part in a lottery in which they could win either €1,000 or nothing (the odds are 50:50). The choice of X was then used to compute an individual's risk attitude parameter, which, by construction, varies between −1 (maximum risk aversion) and +1 (maximum risk propensity).[7] Finally, we captured interviewees' attitudes toward fiscal consolidation by asking whether, in their opinion, the state should reduce public debt, keep public debt at the current level, or incur additional public debt. Both Heinemann and Henninghausen (2012) and Stix (2013) argue that those opposing public debt reduction are less likely to exhibit a Ricardian consumption motive, thus assuming that one can detect RET behaviour from individual attitudes toward public debt incurrence.

4. Consumption Change in Response to Public Debt Incurrence

In this section, we focus on consumption responses to the increase in public debt. We first take a look at bivariate relationships between private consumption responses to public debt incurrence and the covariates described in Section 3. In Table 1, we provide cross-tabulations showing conditional distributions of answers for various subgroups of the German population. The table also contains the results of Pearson's χ^2 tests of the associations' statistical significance.

The first row of Table 1 suggests that only 7% of our respondents reacted to the increase in public indebtedness in a way that is consistent with RET, namely, reducing consumption and increasing savings. The largest share of German citizens—roughly three-quarters—did not adjust their consumption behaviour at all. Nearly 18% report behaviour that is completely opposite to what RET would predict, that is, they consume a larger part of their income in response to public debt accumulation. Thus, we have evidence that the vast majority of Germans (93%) do not engage in the economic adjustment implied by RET.

We interpret our finding as evidence in support of the assumption of rule-of-thumb consumers (Galí et al., 2007; Mankiw, 2000). Moreover, our result suggests that this

[7] The risk attitude parameter is computed as $\lambda = (X-500)/500$.

behaviour is even more prevalent than usually assumed in these macroeconomic models: rule-of-thumb consumers make up the vast majority of the population, at least in Germany, and thus appear to constitute the rule and not the exception.

Table 1: Attitudes toward debt brake and public indebtedness—joint distribution of answers

	Consume less	Consume more	No change in consumption	No. of obs.	Cramér's V / Pearson's χ^2
Total	7.00	17.63	75.37	2,042	
Low income (< €1,500)	8.72	15.01	76.27	493	
Medium income (€1,500–€3,000)	6.17	18.75	75.08	1,264	0.040 $\chi^2(4)=6.46$
High income (> €3,500)	7.72	17.19	75.09	285	
Dissatisfied with current economic situation	4.77	15.51	79.71	419	
Neither/nor	6.93	17.25	75.82	765	0.046 $\chi^2(4)=8.45$*
Satisfied with current economic situation	8.16	19.00	72.84	858	
No self-owned house/flat	7.25	16.56	76.19	966	0.027 $\chi^2(2)=1.50$
Self-owned house/flat	6.78	18.59	74.63	1,076	
Weak future orientation ($\beta \leq .5$)	5.91	16.78	77.30	1,269	
Medium future orientation ($.5 < \beta \leq .9$)	8.32	17.23	74.46	505	0.056 $\chi^2(4)=12.86$**
Strong future orientation ($\beta > .9$)	9.70	22.39	67.91	268	
No correct answer	8.74	16.70	74.56	515	
One correct answer	6.40	18.10	75.50	906	0.030 $\chi^2(6)=3.62$
Two correct answers	6.24	17.77	75.99	529	
Three correct answers	7.61	17.39	75.00	92	
Risk averse ($\lambda \leq -0.6$)	7.01	18.29	74.7	585	
Risk neutral ($-0.6 < \lambda < 0.6$)	6.16	18.47	75.38	796	0.028 $\chi^2(4)=3.26$
Risk prone ($\lambda \geq 0.6$)	8.02	16.04	75.95	661	
Lower secondary school	7.48	17.55	74.97	735	
Middle secondary school	6.86	18.95	74.19	860	0.052 $\chi^2(6)=12.47$*
Higher secondary school	6.53	17.09	76.38	398	
Schooling not yet complete	6.12	0.00	93.88	49	

Table 1 (continued)

	Consume less	Consume more	No change in consumption	No. of obs.	Cramér's V / Pearson's χ^2
Age 16–24	8.96	9.43	81.60	212	
Age 25–39	8.09	18.60	73.32	371	0.063
Age 40–64	6.95	19.53	73.52	978	$\chi^2(6)=16.26$**
Age 65+	5.41	16.63	77.96	481	
Children	6.46	18.22	75.33	1,301	0.033
No children	7.96	16.60	75.44	741	$\chi^2(2)=2.23$
Reduce public debt	7.15	17.51	75.34	1,525	
Keep debt constant	7.02	17.98	75.00	484	0.025
Incur additional public debt	0.00	18.18	81.82	33	$\chi^2(4)=2.56$

Notes: First three columns show conditional distribution of answers in percent. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

In addition, almost one-fifth of our respondents report consuming a larger share of their income, that is, they are engaging in what one could call 'anti-Ricardian' behaviour. There are at least three possible explanations for such behaviour. First, the decrease in propensity to save may reflect widespread fear of rising inflation rates caused by the large fiscal stimulus. However, Consensus Economics forecasts reported that long-term inflation expectations in the euro area were close to 2% in 2012 and early 2013. Alternatively, break-even inflation rates, a financial-market-based indicator of future inflation, signal that from mid-2012 onward, inflation expectations started a downward slide that lasted until early 2014.[8] Moreover, the inflation explanation does not necessarily support important aspects of RET. Arguably, it implies that people undertake financial planning within a limited time horizon, as a hike in inflation rates would make it less painful for households to pay the higher taxes imposed in the future to repay public debt. Hence, we believe that the 'fear of inflation' explanation is unlikely.

Second, the increase in the share of income used for consumption may be a consequence of binding liquidity constraints. A cash-constrained person experiencing an increase in disposable income may use the additional income for consumption even though this income hike is associated with an increase in public debt and future taxes (see Section 3). However, it does not seem plausible that such a large percentage of the German population suffers from

[8] Break-even inflation rates are computed as the spread between the yield on a nominal bond and that on an inflation-linked bond of the same maturity.

severe liquidity constraints, which suggests that the explanation for this consumption behaviour must be looked for elsewhere.

Third, the government's fiscal behaviour may have shifted peoples' opinion about consumption and saving.[9] Decisions about the 'appropriate' share of income to save and consume may be affected not only by economic calculus, but also by socially constituted norms and values. Social psychology employs 'social identity theory' to explain individual behaviour (see, e.g., Tajfel, 1978; Turner et al., 1987). Akerlof and Kranton (2010) integrate this concept into a traditional microeconomics framework that is based on the idea that individuals try to bolster self-esteem via group membership. If individuals identify themselves with a group, and this membership is a salient feature of an individual's personality, it is likely that the individual will adjust his or her behaviour to match that of the group. If we assume now that the government is a focal point for a majority of voters, its fiscal behaviour may establish a 'standard' to be followed for many citizens. The decline in fiscal discipline may have altered the general public's attitude toward saving and consumption, leading to an increase in aggregate spending. Social identity theory is obviously a very different theoretical framework than RET, less rigorous and not necessarily in accordance with standard economic theory. However, by using social stratification theory, Hayo and Neumeier (2014, 2016b) are more successful in explaining government deficits in Germany and the OECD countries than are the typical public choice approaches. Thus, it could be that consumption and saving decisions are more affected by subconscious modes of thinking than by intertemporal optimisation.

To sum up, at the aggregate level, we find no support for RET but instead find economic reactions suggesting either the practical irrelevance of RET or a dominating influence of noneconomic influences, as, for instance, provided by social identity theory.

Moving from the aggregate perspective to the distribution of answers within various subgroups of the German population, we find that respondents who assess their personal economic situation as good, have a strong future orientation, and are younger are somewhat more likely to behave in a Ricardian manner, that is, they are more inclined to consume a smaller share of their income in reaction to public debt accumulation. This finding could be interpreted as evidence supporting the importance of liquidity constraints and consumption patience and, thus, the adequacy of the borrowers/savers framework (Eggertsson and

[9] Empirical evidence suggests that public opinions about various issues, such as public spending, taxation, and regulation, are, indeed, influenced by politics as well as by policymakers (e.g., Page et al., 1987; Page and Shapiro, 1983). Thus, political decisions are not just a mere reflection of public opinion, as many public choice approaches suggest.

Krugman, 2012; Bibliie et al., 2013). In this context, public debt is regarded as a transfer from savers to liquidity-constrained, present-oriented borrowers, allowing them to circumvent their liquidity constraints and increase consumption. However, the absolute share of interviewees reporting that they increased consumption is also higher within these subgroups of the population, which contradicts our research hypotheses. Put differently, it appears that the well-to-do, people who are forward-looking, and younger persons are more likely to adjust consumption when the government takes on additional debt—but not notably.

We find no significant association between individual attitudes toward public debt incurrence and consumption behaviour. This finding casts doubt on the identification scheme put forward by Heinemann and Henninghausen (2012) and Stix (2013), who argue that one can draw conclusions about a Ricardian motive from individual attitudes toward fiscal consolidation and vice versa. In contrast, our results suggest that the share of respondents who actually consume a larger part of their income in response to public debt accumulation is roughly the same across supporters and opponents of fiscal consolidation.

Cross-tabulations are very useful for studying the associations between the variables of interest as they do not require assumptions about the underlying functional relationships, but they do not take the joint variation of the covariates into consideration and, thus, do not have a *ceteris paribus* interpretation. To account for potential collinear relationships between our covariates, we continue our analysis using multinominal logit regressions. The estimation results are shown in Table 2.

Among the group of economic variables, subjective assessment of personal economic well-being is significantly positively related to the propensity to consume. Thus, when controlling for the influence of other factors, we still obtain the same result as in our bivariate analysis. The more satisfied the respondent is with her economic situation, the higher the likelihood that she behaves in accordance with RET, that is, that she reduces consumption in response to public debt accumulation. This result is in line with Cukierman and Meltzer's (1989) hypothesis. Considering the magnitude of the reaction, we find that a 1 point increase in the indicator for subjective economic well-being is associated with a 2 percentage points (pp) higher likelihood of reducing consumption expenses and a 3 pp lower likelihood of not adjusting consumption at all.

Table 2: Determinants of individual consumption response to public debt accumulation

Variables	Consume less	Consume more	No change in consumption
Economic situation			
HH income	−0.011	−0.001	0.012
Subjective well-being	0.021***	0.010	−0.030***
Property	−0.003	0.030*	−0.0298
Time preferences/horizon			
β	0.050*	0.056	−0.106**
Age	−0.0003	0.001	−0.0003
Children	−0.002	0.009	−0.007
Economic literacy			
No correct answers (reference category)			
One correct answer	−0.025	0.009	0.016
Two correct answers	−0.029*	0.003	0.026
Three correct answers	−0.012	0.004	0.008
Education			
Lower second. school (reference category)			
Middle second. school	−0.017	0.010	0.007
Higher second. school	−0.020	−0.004	0.023
Employment			
Employed (reference category)			
Unemployed	−0.050**	−0.009	0.059
Retired	−0.034**	−0.055**	0.089***
Student	−0.014	−0.175***	0.210***
Voc. training/military service	−0.034	−0.094***	0.107***
Housewife/househusband	−0.002	0.052	−0.052
Other controls			
Female	0.011	−0.032*	0.021
Living in partnership	−0.031	0.008	0.023
Married	−0.015	−0.055	0.070*
Divorced/widowed	−0.015	−0.022	0.037
Risk attitudes	0.008	−0.017	0.009
Observations	2,042		
Pseudo-R^2	0.03		
LR χ^2 (42)	84.87***		

Notes: Results are based on multinominal logit maximum likelihood estimation. Marginal effects based on sample averages are reported. White (1980) robust standard errors are used. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

A respondent's employment status has a particularly strong effect on consumption behaviour. Unemployed and retired people are significantly less likely to reduce consumption following the increase in public debt than are regularly employed people. This could be because the former groups are credit constrained and less likely to be affected by a future tax increase as they do not pay income tax. The average marginal effects are −5 pp and −3 pp, respectively. Students and trainees/members of the military are significantly less likely to consume a larger part of their income than are employed persons and, at the same time, more

likely not to change their consumption and saving behaviour at all. The effects are of notable size: a student (trainee) has an 18 pp (9 pp) lower likelihood of spending more and saving less than an employee and a 21 pp (11 pp) higher likelihood of not adjusting her consumption expenses, indicating that these groups are in general less responsive to public debt incurrence.

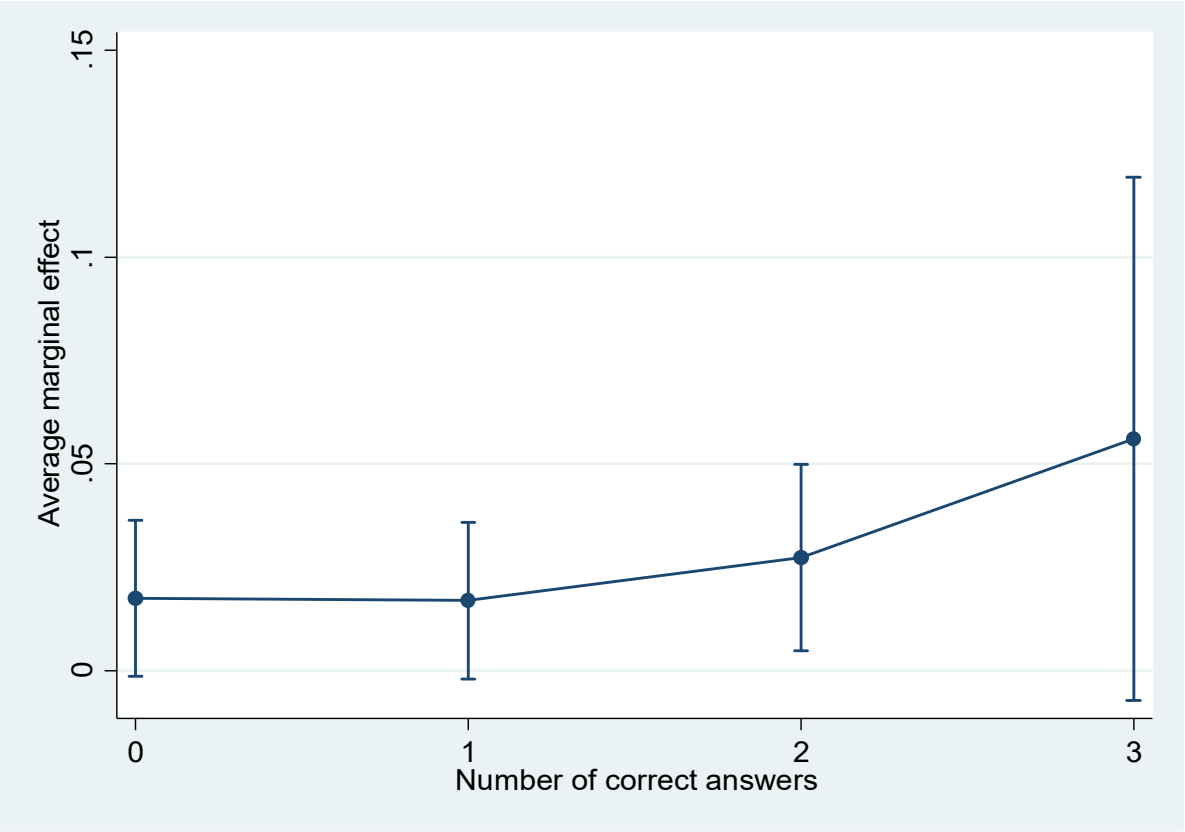
We now investigate whether there are interaction effects between the explanatory variables in our regression model. In a first step, we interact our indicator capturing the respondents' economic literacy with, on the one hand, the economic indicators and, on the other hand, the time preference indicators. Arguably, if people are unaware of the current fiscal situation, they may not alter consumption behaviour in response to an increase in public debt—regardless of their economic situation or time preferences. Our findings suggest that the marginal effect of respondents' subjective economic well-being is systematically related to their economic literacy. This relationship is illustrated in Figure 1. The better informed a person is about economic variables helpful for assessing government debt, the greater the marginal effect of economic well-being on the likelihood of acting in accordance with RET. A 1 point increase in the indicator for subjective economic well-being is associated with a roughly 2 pp higher likelihood of reducing consumption when respondents are poorly informed about economic indicators. For those who have answered two/three questions correctly, this effect grows to 3 pp/6 pp. The marginal effects of other economic indicators and the time preference indicators do not vary systematically with economic literacy.[10]

Next, we consecutively interact our time preference indicators—the variables *β*, *age*, and *children*—with the economic variables and our indicator capturing the respondents' economic knowledge. Our hypothesis is that people who are particularly present oriented may not care much about a future tax increase and, thus, will tend not to react in accordance with RET. As in the case of economic literacy, only the marginal effect of the respondents' subjective economic well-being varies with time preferences. The larger β, the more likely it is that persons assessing their economic situation as good behave in line with RET. Figure 2 shows the marginal effect of subjective well-being on the likelihood of consuming less and saving more for different in-sample realisations of β. The marginal effect of subjective economic well-being for people who are particularly concerned about the present—i.e., who have a β of 0.4—is as low as 1.9 pp. In contrast, for people who are relatively forward-looking (β=1), the likelihood of saving more and consuming less in response to public debt acceleration increases by 2.2 pp with every 1 point increase in the well-being indicator. However,

[10] Results are available on request.

estimation uncertainty is quite high, especially for high values of β and, consequently, the differences in marginal effects are not statistically significant. Finally, the marginal effect of subjective well-being does not appear to be related to other indicators of respondents' time horizons, that is, age and having children.[11]

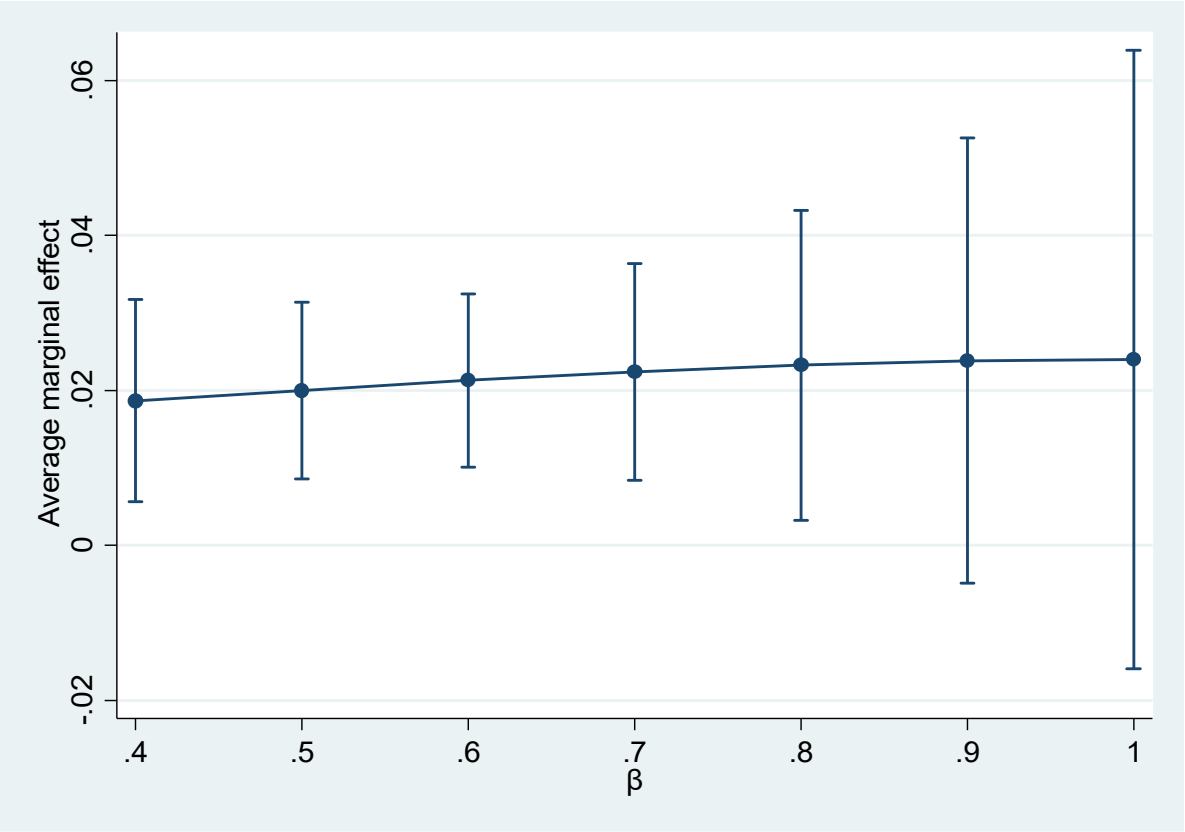
Figure 1: Interaction effect of subjective economic well-being and economic literacy



Notes: The figure shows average marginal effects of subjective well-being for different realizations of the economic literacy indicator, along with 90% confidence intervals.

[11] Results are available on request.

Figure 2: Interaction effect of subjective economic well-being and β



Notes: The figure shows average marginal effects of subjective well-being for different realizations of β, along with 90% confidence intervals.

5. Consumption Change in Response to a Payroll Tax Reduction

Thus far, our results cast serious doubt on the validity of RET, as only a small fraction of interviewees actually reduced the share of income used for consumption in response to the significant increase in public debt. Note, however, that not all respondents who took part in the survey may have been directly affected by the deficit-financed fiscal stimulus or expect to bear the future costs associated with the public debt hike. As RET suggests that a person's consumption plan depends on both the present and (expected) future fiscal policy stance, neglecting the role played by an individual's expectations about the future consequences of the rise in public debt may lead to an inaccurate picture.

To address this concern, our survey contains three additional items, allowing us to evaluate individual consumption and saving responses to a specific tax reduction. At the beginning of 2013, the contribution rate to the statutory pension insurance system was reduced from 19.6% to 18.9% of gross income, thereby decreasing the overall tax burden and increasing net income. In our survey, respondents were asked whether they use the additional disposable income to increase (i) consumption or (ii) savings/repay debt. Then, we asked two questions

designed to elicit interviewees' expectations about the future consequences of the payroll tax reduction. First, respondents were asked whether they believe that the cut in the contribution rate will lead to a higher contribution rate in the future. Second, the interviewees were asked whether they think that the contribution rate cut implies lower future pension payments. In each case, respondents could answer either yes or no. Note that only those respondents actually subject to payroll taxation were asked these questions, that is, employed persons as well as persons in vocational training. As a consequence, our sample size is reduced by more than half.[12] While this specific subgroup is not representative of the total population, it seems likely that its members—labour income earners—have relatively more influence over household consumption decisions than those not engaged in earning an income.

Based on the answers to these questions, we sort the interviewees into three groups. 'Ricardians' are those who expect that either the future contribution rate will rise or pension payments will decrease and, at the same time, state that they use the additional disposable income to increase savings/repay debt. 'Anti-Ricardians' are those who report that they use the additional income for consumption despite the expectation that future contributions will rise and/or pension payments will decrease. The 'unclear' are those who do not expect future contributions to rise and/or pension payments to decrease.

'Ricardians' make up 36% of the respondents, which is five times larger than the number presented in Section 3 (7%). However, the share of 'anti-Ricardians' is also larger in this context: 46% compared to the 18% reported in Section 3. Thus, relatively more persons behave in a way completely inconsistent with RET. Moreover, together with the 'unclears', about two-thirds of the population subject to obligatory social security contributions does not behave in line with RET.

Next, we investigate whether the individual-level variables and their effects on the three groups of respondents differ across the two samples. As in Section 3, we run a multinominal logit regression using a variable indicating which group a respondent is assigned to as the dependent variable and the same controls as before. The results are set out in Table 3.

[12] Note that for unemployed persons, contributions are directly paid by the *Bundesagentur für Arbeit*, i.e., the German federal job centre. Thus, these people's disposable income was not affected by the contribution rate cut and we thus omit them from the subsequent analysis.

Table 3: Determinants of individual consumption response to a payroll tax reduction

Variables	Ricardian	Anti-Ricardian	Unclear
Economic situation			
HH income	−0.028	0.035*	−0.007
Subjective well-being	0.035*	−0.029	−0.006
Property	0.048	−0.074**	0.026
Time preferences/horizon			
β	0.094	−0.116	0.022
Age	0.0001	0.001	−0.001
Children	0.067*	−0.085**	0.018
Economic literacy			
No correct answers (reference category)			
One correct answer	−0.098**	0.048	0.051
Two correct answers	−0.043	0.047	−0.004
Three correct answers	−0.058	0.028	0.030
Education			
Lower second. school (reference category)			
Middle second. school	−0.086**	0.089**	−0.003
Higher second. school	−0.027	−0.035	0.062
Employment			
Employed (reference category)			
Unemployed	n.a.	n.a.	n.a.
Retired	n.a.	n.a.	n.a.
Student	n.a.	n.a.	n.a.
Voc. training/military service	−0.047	0.047	0.0004
Housewife/househusband	n.a.	n.a.	n.a.
Other controls			
Female	−0.028	0.056*	−0.028
Living in partnership	−0.063	0.041	0.022
Married	−0.082	0.055	0.027
Divorced/widowed	−0.006	0.021	−0.015
Risk attitudes	−0.003	−0.025	0.027
Observations	976		
Pseudo-R^2	0.02		
LR χ^2 (42)	43.09*		

Notes: Results are based on multinominal logit maximum likelihood estimation. Marginal effects based on sample averages are reported. White (1980) robust standard errors are used. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

In general, the estimates shown in Table 3 are qualitatively similar to those presented in Table 2. In most cases, the signs of the coefficients are unchanged, but standard errors and, correspondingly, p-values are larger, reflecting the smaller sample size. In line with the findings in Section 3, subjective well-being and time preferences are positively related to the propensity of behaving in a Ricardian manner (although the latter effect is not significant at conventional levels), while economic literacy decreases the likelihood of behaving in accordance with RET. To check whether there are significant differences across the

coefficients in Tables 2 and 3, we estimate a seemingly unrelated regression system and test whether the estimates are equal across the equations. Our results indicate that there is no statistically significant difference between the coefficients estimated for the two samples.[13] Thus, RET fares somewhat better in this subgroup of the population, especially when assuming that this group has a relatively stronger influence on consumption decisions than others in a household. Still, given that even in this specific group, two-thirds of respondents do not behave in line with RET, we think that our general conclusion about the small practical importance of RET continues to hold.

6. Concluding Remarks

In this paper, we test the validity of the Ricardian equivalence theorem (RET) using a survey-based approach, which we believe has a number of advantages compared to macroeconometric or experimental laboratory studies. Employing data from a specifically designed, representative German population survey carried out in 2013, we investigate whether interviewees have altered their consumption and saving behaviour in response to the recent notable increase in public debt. In addition, we evaluate consumption and saving responses to a reduction in payroll taxation implemented shortly before the survey was conducted. The dataset consists of about 2,000 observations and contains a great deal of information about our respondents, which allows us to evaluate the importance of a number of factors believed to invalidate RET, thereby putting theoretically informed hypotheses to an empirical test. Our specific research design improves upon the existing survey literature on RET, as it avoids serious problems of identification, as encountered by Heinemann and Henninghausen (2012) and Stix (2013), as well as selection biases, possibly affecting the study by Allers et al. (1998).

Interpreting the results of the previous empirical literature, Barro (1989: 49) concludes that ‘results are all over the map, with some favoring Ricardian equivalence, and others not’. In contrast, our study clearly suggests that RET does not hold. Only 7% of our respondents report consuming a smaller proportion of their income, and saving a larger proportion, in response to the recent increase in public debt. About 18% claim to have done the opposite of what would be expected by RET, that is, they consume a larger part of their income in response to public debt accumulation. The largest fraction of our respondents, roughly three-quarters, state that they have not altered their consumption and saving behaviour at all.

[13] The χ^2 test statistic for the equality test of coefficients is 35.8, the corresponding p-value 29.4%.

To test the robustness of this finding, we utilise additional information collected for a subgroup of the population, namely, those affected by a reduction in obligatory social security contributions that occurred a few months before the survey was conducted. These respondents were asked additional questions designed to elicit their expectations about the future. They were asked whether they believe that the cut in the contribution rate will lead to (i) a higher contribution rate in the future and/or (ii) lower future pension payments. Based on the answers to these questions and their consumption responses, we sorted interviewees to three groups: 'Ricardians', 'anti-Ricardians', and 'unclears'. Of this subgroup of the population, 36% fall into the 'Ricardian' category, whereas 46% and 18% are 'anti-Ricardians' and 'unclears', respectively. This implies that even when focussing on those respondents who likely have more influence over household consumption decisions, and taking into account their future expectations regarding the tax change, two-thirds do not behave in line with RET.

Regarding the implications for macroeconomic theory, we interpret our finding as supporting the assumption that there are rule-of-thumb or impatient consumers (Bilbee et al., 2013; Galí et al., 2007; Mankiw, 2000). However, our result suggests that non-Ricardian behaviour is even more prevalent than is usually assumed in macroeconomic models and that it reflects the norm rather than the exception, at least in our dataset.

Rejecting RET can be rationalised by a violation of one or more of the underlying assumptions, some of which are quite demanding. In contrast, we find it puzzling that, depending on sample and definition, about 20–45% of the respondents engage in 'anti-Ricardian' behaviour. We discuss three explanations for this finding at the aggregate level: (i) widespread fear of inflation, (ii) liquidity constraints, and (iii) alternative behavioural assumptions. Our conclusion is that fear of inflation is not a likely explanation. Liquidity constraints are certainly possible, but it is not entirely plausible that such a large percentage of the population is liquidity constrained. Alternative behavioural assumptions may explain our results. In particular, social identity theory could be employed to argue that the government's fiscal behaviour may have shifted peoples' opinion about consumption and saving. Put differently, the government sector may act as a role model for the household sector.

At the individual level, we find that people who assess their personal economic situation as good, are more forward-looking, and younger are more likely to react to public debt incurrence, but not in a systematic way, as both the share of respondents who have reduced consumption as well as the share of those who consume more is still larger within these groups. Arguably, the estimation results for the personal economic situation indicator suggest a rejection of Cukierman and Meltzer's (1989) hypothesis. Moreover, other hypotheses put

forward in the literature, related to time preference and time horizon, knowledge/information set, and other controls, do not receive direct empirical support either. Finally, we find no significant differences with respect to the individual-level influences in our two samples, i.e., general population and those subject to payroll taxation, or for different definitions of 'Ricardian' consumers.

Studying interaction effects of subjective economic well-being and economic literacy provides some evidence in support of the hypothesis that RET-consistent behaviour is more likely if economic actors are better informed. The interaction effect between subjective economic well-being and time preference suggests that more patient individuals tend to react more in line with RET.

Thus, at least some aspects of intertemporal optimisation behaviour seem to be relevant for the German reaction to fiscal deficits. However, overall, we must conclude that RET has little practical relevance for people's economic behaviour.

Like all research methods, our survey-based approach has a number of potential drawbacks. First, we are measuring stated behaviour and not actual behaviour, which are not necessarily the same. One reason for such noncongruence could be errors in recollection. However, given that the public debt situation received extensive coverage in all forms of mass media, this does not seem particularly likely. Moreover, deviations may occur in both directions and thus cancel out across the sample. Another reason could be social desirability bias, as respondents may try to please the interviewer rather than state their own views. We do not think that such bias is a major problem here as it is not obvious what the socially desired answer to the relevant survey question should be. Moreover, pre-tests did not indicate that respondents felt obliged to answer the question in a particular way.

Second, there could be issues related to sampling errors. While these can never be completely avoided, our sample is carefully chosen and corresponds in many core aspects to the profile of the general population. Employing professional interviewers makes it less likely that different survey processes were used for different respondents or that the respondents misunderstood the survey questions.

Third, our analysis may suffer from problems of operationalisation, that is, our empirical indicators may not capture our theoretical variables of interest very well. For instance, proxying wealth by homeownership may be problematic if people hold very different assets in their respective portfolios. Additionally, our indicator for time preference could be problematic, as it suffers from the same problem that plagues many experimental laboratory studies, namely, that the setup is artificial.

Fourth, in terms of interpretation, we are neither able to assess by how much consumption and saving have changed in response to the recent rise in public debt nor in what direction the aggregate effect goes, that is, whether aggregate consumption and saving have increased or decreased. However, given that the share of respondents who reduce consumption is very low across all income groups and also much lower than the share of people who state that they increased spending, it is tempting to conclude that a deficit-financed fiscal stimulus can lead to a crowding in of private consumption rather than a crowding out. Whether this result is particular to our analysis of a specific country in a specific economic situation, as well as the development of a consistent theoretical framework explaining this behaviour, is beyond the scope of our paper and must be left for future research.

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