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Simeon Vosen

Fixed Amount Saving and the Permanent Income Hypothesis

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Simeon Vosen[1]

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Abstract

According to the German SAVE survey, more than 40 percent of households regularly save fixed amounts rather than flexibly adjusting savings to income variations as assumed by the Permanent Income Hypothesis (PIH). Fixed amount saving behaviour could thus imply a challenge to PIH-based standard models of consumption if it meant that a substantial share of households would consume rather than save transitory income. A deeper examination of the SAVE-data suggests that the PIH could still be compatible with fixed amount saving behaviour since (a) the transitory income component of fixed amount savers' tends to be relatively low and (b) one-off receipts of income likely to be transitory increase the probability of fixed amount savers to alter their saving behaviour and save the residual. Analysis of aggregate data, however, indicates that fixed amount saving nevertheless leads to a rejection of the PIH, accounting for at least some of the excess sensitivity of consumption to predictable income changes observed in Germany.

JEL Classification: D11, D12, E21

Keywords: Fixed Amounts Saving; Permanent Income Hypothesis; Consumption; Excess Sensitivity

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1 Introduction

In economic theory, consumption is usually considered as the primary function whereas savings have a rather passive, residual character. The Permanent Income Hypothesis (PIH) (Friedman 1957) assumes that households consume a fraction of their permanent income and flexibly adjust savings to transitory income flows. According to the German SAVE survey, however, more than 40 percent of German households state to regularly save fixed amounts rather than flexibly adjusting their savings to income variations (Börsch-Supan *et al.* 2009). Since this group also tends to have an above-average income, such behaviour should be highly relevant for the economy as a whole and thus calls for a deeper investigation. If savings are deliberately planned rather than simply adjusted to income fluctuations, saving behaviour becomes a major factor determining the shape and position of the consumption function. Fixed amount saving behaviour in particular seems to imply that transitory income is consumed rather than saved. This would be strongly at odds with the PIH, which has since long been the workhorse of most macroeconomic models. In fact, given the large share of fixed amount savers in Germany and their relative affluence, one may be tempted to reject the PIH right away.

However, the PIH might still be a satisfactory approximation of overall consumption if the transitory income component of fixed amount savers was relatively low. In this case, they would hardly be distinguishable from the residual savers assumed by the PIH. It is also conceivable that fixed amount savers deviate from their usual saving behaviour once they receive sizeable amounts of transitory income and save rather than consume these amounts. In that case, fixed amount savers could in fact be residual savers who just temporarily save fixed amounts in periods with stable income – e.g. through contrac-

tual saving in order to reduce costs of acquiring, absorbing and processing information (Reis 2006). In the first part of the paper, I investigate these scenarios using micro-level data from the German SAVE-panel, which provides detailed information on household's saving behaviour.[1] My findings suggest that fixed amount savers indeed have a relatively low transitory income component. Moreover, one-off receipts of income that should be mostly transitory also increase the likelihood of fixed amount savers to alter their saving rule altogether and become residual savers. Since the absolute size of transitory income cannot be observed, these empirical results cannot be taken as evidence for the PIH to be indeed compatible with fixed amount saving. However, they certainly strengthen the argument that the observed prevalence of fixed amount saving behaviour does not permit a rejection of the PIH right from the outset.

The compatibility of fixed amount saving behaviour with the PIH in the aggregate is then examined proceeding in two steps: First, I test the PIH directly by estimating the sensitivity of consumption to predictable income shocks, a procedure that has been widely used in the literature.[2] Campbell and Mankiw (1989) have estimated the share of people consuming out of expected income changes to be 0.65 in Germany using data ranging from 1962 to 1986. Using post-reunification data, I obtain even slightly higher values. The PIH is therefore rejected, but the question remains whether the excess sensitivity is due to fixed amount saving. Adding a measure of unexpected income changes to the

[1] Schunk (2007) uses the same dataset to examine how saver types are related to saving motives. His findings reveal that households indicating a high importance of old-age provision are particularly likely to regularly save fixed amounts. He reasons that savings planned for retirement should remain untouched during work-life and are therefore made in the form of fixed contractual savings. On the other hand, households with a strong precautionary saving motive are more likely to be residual savers. They believe that they might need their savings at some point in time, and therefore don't want their savings to be bound in rather illiquid contractual savings plans.

[2] For an overview, see Weber (2002).

equation, I can show that fixed amount saving behaviour accounts for at least some of the observed excess sensitivity, which implies that on the aggregate level fixed amount saving behaviour leads to a rejection of the PIH.

The remainder of this paper is structured as follows: Section 2 introduces the theoretical concept of fixed amount saving and shows how it relates to the permanent income hypothesis. In section 3, several different methods are used to estimate the relative size of the transitory income component of fixed amount savers and their response to transitory income shocks. Section 4 utilizes national accounts data, decomposing income shocks into expected and unexpected components, to examine the compatibility of fixed amount saving with the PIH in the aggregate. Section 5 concludes.

2 The Concept s of Fixed Amount Saving and the PIH

Whether or not the PIH is compatible with fixed amount saving behaviour depends on the relative size of the fixed amount savers' transitory income and on how this income component is utilised. To demonstrate this, consider the following expression of Friedman's PIH in which a household's consumption (c_t) behaves proportionally to its permanent income (y_t^P):[3]

$$c_t = \alpha y_t^P \tag{1}$$

The ratio of consumption to permanent income α assumed to be constant is determined by the real interest rate, the household's ratio of nonhuman wealth to permanent income and any factors that affect its anticipations. Since current

[3] One could add a white-noise error term to represent transitory consumption.

income (y_t) is the sum of permanent and transitory income (y_t^T), saving is derived as the residual: $s_t = y_t - c_t = (1-\alpha)y_t^P + y_t^T$. The household sets a plan for consumption and lets savings adjust to transitory income. The marginal propensity to consume out of transitory income ($\partial c_t / \partial y_t^T$) is zero.

The reverse would apply to a fixed amount saving residual consumer who sets a plan for savings and lets consumption adjust to income variations.[4] If the household plans to save a fraction $(1-\alpha)$ of his permanent income, savings are: $s_t = (1-\alpha)y_t^P$.[5] Consumption is derived as the residual and thus a function of both permanent and transitory income:

$$c_t = \alpha y_t^P + y_t^T \tag{2}$$

and $\partial c_t / \partial y_t^T = 1$. In that sense, if y_t^T was relatively large, a Keynesian consumption function would be a more appropriate framework for modelling the consumption behaviour of fixed amount savers with relatively large transitory income components.

However, there are two scenarios in which the PIH could still be compatible with fixed amount saving behaviour:

I. If the transitory income component of fixed amount savers was small.

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[4] The concept of fixed amount savers resembles that of Reis' (2006) inattentive savers who also chose a savings plan and let consumption adjust to income changes. In both cases the household accepts a certain loss of utility resulting from more volatile consumption to save costs of planning. However, there is a major difference between the two concepts: the savings of fixed amount savers are adjusted when permanent income changes. The inattentive savers in Reis' model on the other hand never adjust their saving plans after the first period.

[5] To rule out negative consumption, further assume that $\alpha \geq 1 - y_t / y_t^P$.

II. If fixed amount saving was only a temporary behaviour – in periods absent sizable transitory income flows – of households who generally follow the PIH, adjusting savings to any transitory income shocks.

In scenario I, the PIH could still yield a fairly close approximation of overall consumption behaviour even if fixed amount savers were residual consumers, since Equations (1) and (2) are identical for $y_t^T = 0$. In scenario II, fixed amount savers would in fact be residual savers and their behaviour thus accurately represented by the PIH.

It is interesting to investigate empirically the relationship between fixed amount saving and the PIH on both the individual and the aggregate level. The micro-level analysis allows for a deeper investigation of fixed amount saving with respect to the two scenarios and the question of what drives households' decisions to save fixed amounts. However, since the absolute size of transitory income cannot be observed directly, the micro-level analysis alone does not permit any conclusions with regard to the appropriateness of the PIH as a concept for the overall economy. Analysis on the aggregate level is therefore required as well.

3 Fixed Amount Saving and the PIH on the Individual Level

3.1 Data

To investigate fixed amount saving behaviour on the individual level, I conduct a deeper analysis of the SAVE data. The SAVE survey is an annual household panel that provides detailed information on German households'

saving behaviour and their socio-economic and financial situation.[6] The survey was started in 2001 and has been repeated on a yearly basis since 2005. To increase efficiency and avoid potential biases from systematic nonresponse, missing values have been imputed by a Markov-Chain Monte-Carlo procedure (Schunk 2007) and logical panel imputation (Ziegelmeyer 2009). This procedure was repeated five times, producing 5 separate data-sets.

I use the data from six waves (2005 to 2010). I drop all households in which the respondent to the questionnaire was not the household head, which I define as the household's financial decision taker. The final sample size contains 14988 observations for each of the five imputed data-sets. To obtain descriptive statistics and regression results, I employ Rubin's rule of combination (Rubin 1987) that accounts for missing data uncertainty and is commonly used to combine imputed datasets: All analyses are first conducted separately for each of the 5 data-sets. The combined values are the means of the values obtained for each data-set.[7] The underlying variance is the sum of the within-imputation variance and the between-imputation variance.

In the SAVE questionnaire, households are asked direct questions about their saving behaviour:

„*Which of the following statements describes your own and your partner's saving behaviour best*?"

(A) I/we save a fixed amount regularly, e.g. in savings accounts, savings plans, stocks, life insurance policies, etc.

(B) I/we put something aside every month; the amount depends on to the financial situation.

[6] For a detailed description of the scientific background and the design of the SAVE survey, see Börsch-Supan et al. (2009).

[7] For categorical variables I use the mode instead of the mean.

(C) I/we put something aside when there is something left over.

(D) I/we do not have the financial capability to save.

(E) I/we do not save but rather enjoy life now.

Households are only asked to select the alternative that corresponds best to their actual behaviour. A household who selects (A) obviously does this because he generally saves fixed amounts, but this doesn't rule out that at times it also lets his savings partly adjust to income variations, for instance if income turns out to be unusually high in a period. Households may also wrongly characterize themselves as type (A) savers if they accumulate the bulk of their savings through fixed plans, but additionally save a smaller amount that is flexibly adjusted to the income situation, turning them in effect into type (B) savers.[8] However, as long as the fixed amount savers are not completely flexible in adjusting their savings to transitory income variations, their marginal propensity to consume out of transitory income is substantially larger than zero. It thus doesn't change the story all that much with regard to the appropriateness of the PIH.

For the purpose of this paper, I classify type (A) savers into the category "fixed amount saver", type (B) and (C) savers into the category "residual saver", and type (D) and (E) households into the category "non-saver".[9] Since this paper's focus is not on the determinants of non-saving (such as liquidity constraints or myopia), I mainly concentrate on the first two categories. Details of the construction of the other major variables used in this paper are provided in the Appendix (Table A-1). All monetary variables are deflated using the Con-

[8] These issues are further addressed in section 3.3.

[9] Although the mean income and the mean age of type (C) is below that of type (B) savers, this classification did not qualitatively affect the results of the following analyses. Since both types are in accordance with the PIH, there is no conclusive reason to investigate the 2 groups separately.

sumer Price Index for Germany. To account for differences in household sizes, income and wealth are also divided by the square-root of the respective household size. Table 1 provides some descriptive statistics on the saver types.

Table 1: Saving Rules of German Households (2005-2010)

	Fixed amount savers	Residual savers	Non-savers	Total
Share of all households	0.41	0.37	0.21	1
Average income (EUR)	22 251	19 517	13 971	19 486
Share of total income	0.47	0.38	0.15	1
Mean saving rate[10]	14.3	10.9	2.9	10.6
Mean age	51.9	55.5	51.7	53.2

3.2 The Income Composition of Fixed Amount Savers

In this section, the relative importance of transitory income among fixed amount savers is investigated. Since permanent and transitory income cannot be observed directly, both income components have to be estimated from measured income. To ensure a certain robustness of the estimates, I pursue a number of different approaches.

One approach is to look at the volatility of measured income. As Friedman (1957) notes: *"If Mr. A's measured income fluctuates widely from year to year, while Mr. B's is highly stable, it seems reasonable that Mr. A's measured income is a poorer*

[10] For the definition of saving rates, repayments of all recorded types of housing debt are added to the reported savings of the household (see Table A1 in the Appendix). This may explain why some respondents claiming not to be capable or willing to save still have positive saving rates.

index of his permanent income than Mr. B's of his." If the transitory income component of fixed amount savers were small, one would expect the income volatility of fixed amount savers to be much lower compared to the other saver types. Table 2 shows how the different saver types subjectively assess their income volatility. The share of households that perceive their income not to be volatile at all is about the same among fixed amount savers and residual savers. However, the share of households that assess their income to be very volatile is lower among fixed amount savers compared to the other groups.

Table 2: Saving Rules and Income Volatility (2005-2010)

	Fixed amount savers	Residual savers	Non-savers	Total
Self-assessed income volatility				
Not volatile at all	29.1%	29.3%	24.9%	28.3%
Somewhat volatile	48.0%	44.7%	38.3%	44.7%
Very volatile	22.8%	26.0%	36.8%	27.0%
Measured income volatility				
Variance of income	0.08	0.11	0.15	0.11
Variance of income growth	0.66	1.41	1.99	1.22

Note: To compute the variance of income, all households with less than 2 observations are excluded. Likewise, to compute the variance of income growth all households with less than 3 observations are excluded.

To examine more objective measures of income volatility, I first compute for each group the average variance of households' measured income (in logs) over the sample period. Since productivity and thus real income are affected by work experience, I also compute the variance of income growth. Table 2 shows that the variances of income and particularly of income growth are indeed sub-

stantially lower among fixed amount savers. This lends some support to scenario I. These findings are also in line with Reis' (2006) model of rational inattentiveness according to which the lower the income volatility of a household, the smaller the cost and the longer the duration of inattentiveness in which the household does not update its consumption plans.

To examine if the saving rule is indeed determined by the volatility of income, I employ a multinomial logit model (MNL), regressing the saving rule on the variance of either income or income growth in the previous years. From this, I can examine whether low income volatility increases the likelihood of engaging in fixed amount saving, controlling for other factors that might determine saving behaviour. The estimations are carried out in a cross-section analysis for 2009, using again the variances of income and income growth between 2005 and 2010 as measures of income volatility.[11] I include the following control variables into the regression: income, real net worth, age, and household size as well as dummies for sex, marriage, homeownership, having children, unemployment, college education, civil servants, and self-employment. I also control for retirement, as entering retirement should lead to a drop in income thus increasing the volatility measure although income could be relatively smooth both before and after retirement. To test if the relative odds between any two saver types do not depend on the third type, I conducted a Hausman-McFadden test (Hausman and McFadden, 1984) and a Small-Hsiao test (Small and Hsiao 1985) of Independence of Irrelevant Alternatives (IIA). Both tests indicated that for all specifications, the IIA assumption is not rejected.

[11] Using methods of panel data analysis is not useful in this case, as the computed income volatilities yield only 1 observation per household. I used the cross-sections of 2009 rather than 2010 since both, the volatility that the household has experienced in the past and the volatility expected in the near future, should influence its decision to save fixed or residual amounts.

Table 3 presents the results from the MNL estimations using fixed amount savers as the base category. It turns out that both the variance of income and the variance of income growth increase the probability of being a residual saver or a non-saver rather than a fixed amount saver. Both effects are highly significant. Since the sizes of the logit coefficients cannot be interpreted directly, it is useful to look at the factor coefficients (odds ratios) computed by exponentiation of the

Table 3: MNL Estimations of Saving Behaviour and Income Volatility (Part 1)

	Coef.	SE	Coef.	SE
Residual Saver				
Variance of log income	0.75***	0.23		
Variance of income growth			0.31***	0.11
Income	-0.00**	0.00	-0.00**	0.00
Real net worth	0.00	0.00	0.00	0.00
[Real net worth]^2	-0.00	0.00	-0.00	0.00
Age	0.00	0.01	0.00	0.01
Household size	-0.12**	0.06	-0.13**	0.06
Male	0.02	0.10	0.05	0.10
Married	-0.19	0.13	-0.20	0.13
Homeowner	-0.12	0.12	-0.11	0.12
Children	0.18	0.15	0.18	0.15
College	0.18	0.13	0.16	0.13
Non-employed	0.41***	0.15	0.43***	0.15
Civil Servant	-0.50*	0.26	-0.42*	0.26
Self-employed	0.29	0.20	0.24	0.20
Retired	0.19	0.16	0.16	0.16
Constant	-0.00	0.30	-0.07	0.30

Table 3: MNL Estimations of Saving Behaviour and Income Volatility (Part 2)

	Coef.	SE	Coef.	SE
Non Saver				
Variance of log income	0.83***	0.27		
Variance of income growth			0.42***	0.12
Income	-0.00***	0.00	-0.00***	0.00
Real net worth	-0.00	0.00	-0.00	0.00
[Real net worth]^2	0.00	0.00	0.00	0.00
Age	-0.01	0.01	-0.00	0.01
Household size	-0.05	0.07	-0.06	0.07
Male	-0.13	0.13	-0.11	0.13
Married	-0.42***	0.15	-0.44***	0.15
Homeowner	-0.53***	0.15	-0.55***	0.15
Children	0.14	0.18	0.20	0.18
College	-0.03	0.19	-0.03	0.19
Non-employed	0.90***	0.17	0.90***	0.18
Civil Servant	0.33	0.31	0.33	0.32
Self-employed	0.19	0.29	0.14	0.29
Retired	-0.33	0.19	-0.30	0.19
Constant	0.56	0.36	0.65*	0.37
# Obs.	2144		2098	
Pseudo R^2	0.06		0.07	

Note: Base category: Fixed amount saver. *, **, *** indicate significance at the 10 %, 5 %, 1 % significance level respectively. To compute the variance of income, all households who participated in less than 2 waves were excluded. Likewise, to compute the variance of income growth all households who participated in less than 3 waves were excluded. The Pseudo R^2 was computed as the mean between imputations.

logit coefficients. Table 4 presents for both income volatility variables and for all group comparisons the factor change in odds resulting from a one unit change in the independent variable. Additionally, the standardized odds ratios are pre-

sented which refer to the percentage change in the odds per one standard deviation change in the respective independent variable.

Table 4: Factor Change in Odds Between Saver Types

Independent variable:	Variance of log income		Variance of income growth	
	Odds ratio	Std. odds ratio	Odds ratio	Std. odds ratio
Residual saver vs. fixed amount saver	2.11	30.4	1.36	24.2
Fixed amount saver vs. residual saver	0.47	-23.3	0.74	-19.5
Non-saver vs. fixed amount saver	2.30	34.3	1.52	34.6
Fixed amount saver vs. non-saver	0.44	-25.5	0.66	-25.7
Residual saver vs. non-saver	0.92	-7.9	0.89	-7.7
Non-saver vs. residual saver	1.09	8.6	1.12	8.3

The results of the MNL estimations indicate that a one unit increase in the variance of log income increases the odds of residual versus fixed amount saving by about 111 percent. This means that a change in the variance of log income by one standard deviation increases the odds by more than 30 percent. Looking at the reverse odds ratio of fixed amount savers and residual savers, a standard deviation change in the variance of log income reduces the odds of fixed amount saving versus residual saving by about 23 percent. If the variance of income growth is used as the volatility variable, the effects are just slightly smaller. These estimates suggest that households with stable income are indeed much more likely to be fixed amount savers. The differences are even larger, if fixed amount savers are compared to non-savers.

Another method to estimate the relative importance of permanent and transitory income components goes back to Friedman and Kuznets (1954), who proposed two alternative approaches to estimating the fraction of the variance of measured income contributed by the permanent component: One is derived on the *mean assumption* and the other on the *variability assumption*. The *mean assumption* states that, for a given group of households, the ratio of each household's permanent income to the mean of the group should remain unchanged between two periods. This implies that between these two periods the permanent component of each household's income changes proportionally to the average income of the group:

$$\Delta y_{i,t}^{P} = \Delta \overline{y}_{t} \tag{3}$$

where $y_{i,t}^{P}$ is the permanent income of household *i* in period *t*, and $\overline{y}_{t}$ is the average household income in this period. Consequently, if all income values are denoted in logs, the fraction of the variances of incomes contributed by the permanent component (P_Y) can be estimated by regressing the logarithms of income in two successive years on each other:

$$P_{Yt} = \eta_{Yt,Yt-n} \tag{4}$$

where $\eta_{Yt,Yt-n}$ is the elasticity of income between two periods and $n \geq 1$the timely distance between the two periods. In this concept, the permanent component is defined as the component attributable to factors affecting income alike in all periods from *t-n* to *t*, and the corresponding transitory components as the components affecting income only in *t-n* or in *t* respectively. The income component attributed to factors affecting income in more than one but not all periods is referred to as "quasi-permanent" income. Since only the permanent component P_{Yt} is estimated, a problem of the *mean assumption* lies in the inseparability of the transitory component from the quasi-permanent components. Moreover, the

elasticity between incomes in two periods is likely to decline if n is increased. Therefore, the estimate of P_{Yt} can also be expected to be smaller for larger values of n.

The *variability assumption* states that the fraction of the cross-sectional variability in current income contributed by the permanent component is the same in successive periods, i.e. that $P_{Yt} = P_{Yt-n}$. Under this assumption, the contribution of the permanent component can be computed as the correlation coefficient between measured incomes in two successive periods:

$$P_Y = \rho_{Yt,Yt-n} \tag{5}$$

Friedman and Kuznets (1954) remarked that the *variability assumption* is stronger, as it requires the variances of the permanent and transitory components to change proportionally. While that seems reasonable with regard to income changes caused by the business cycle, there is no conclusive reason why transitory income shouldn't become more or less variable relative to permanent income independently of aggregate fluctuations.

Table 5 shows estimates of P_Y computed under the *mean* and the *variability assumptions*. The results are rather mixed. For n=1 and n=2, the P_Y estimates for the fixed amount savers are higher compared to the residual savers in all but one years under the mean assumption and also under the variability assumption. However, for n=3, the estimates for the residual savers tend to be somewhat higher.

Table 5: Estimates of the Percentage of the Total Variance of Income Attributable to Permanent Components

	Fixed amount saver			Residual saver			Non-saver		
Timely distance between periods	1	2	3	1	2	3	1	2	3
Mean Assumption									
$P_{Y,2006}$	0.52			0.60			0.50		
$P_{Y,2007}$	0.65	0.59		0.62	0.52		0.60	0.59	
$P_{Y,2008}$	0.73	0.62	0.47	0.65	0.60	0.57	0.72	0.60	0.58
$P_{Y,2009}$	0.72	0.62	0.55	0.68	0.58	0.56	0.69	0.61	0.57
$P_{Y,2010}$	0.74	0.64	0.55	0.69	0.62	0.57	0.65	0.62	0.57
Variability Assumption									
P_Y	0.72	0.68	0.62	0.71	0.65	.064	0.65	0.64	0.62

Alternatively, one can get a sense of the relative importance of the permanent income component by running panel-regressions of total income on variables that typically determine permanent income. I use real net-worth, age, marital status, college education, and household size as well as dummies for non-employment and part-time work, civil servants, self-employment, retirement, homeownership and having children. Following Lusardi (1999), the occupation and education dummies are also interacted with age. Finally, I include fixed effects to account for the time invariant determinants of permanent income such as sex, place of birth, socio-economic background, etc. I run separate regressions for each saver type and compare the fit of the fixed amount savers regression to that of the other saver types. For Y^T/Y of fixed amount savers to be small, the fit of regressing Y on the determinants of Y^P should be higher compared to other savers.

Table 6: Proportion of Income Variance Explained by Determinants of Permanent Income

	Fixed amount saver		Residual saver		Non-saver	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Real net worth	0.00***	0.00	0.00**	0.00	0.00	0.00
[Real net worth]^2	-0.00***	0.00	-0.00*	0.00	0.00	0.00
Age	-0.00	0.00	-0.01	0.00	-0.01	0.01
Married	0.07**	0. 03	0.11***	0.04	0.13**	0.06
College	0.29***	0.10	0.59***	0.14	0.28	0.27
Household size	-0.18***	0.01	-0.13***	0.01	-0.13***	0.02
Non-employed	-0.10***	0.03	-0.09***	0.03	-0.13***	0.05
Part-time work	-0.05***	0.03	-0.06*	0.03	-0.11**	0.05
Civil Servant	-0.09	0.26	-0.05	0.42	0.37	0.90
Self-employed	-0.06	0.06	-0.21***	0.07	-0.17*	0.10
College*age	-0.00**	0.00	-0.01***	0.00	-0.00	0.00
Civil Servant*age	-0.00	0.01	0.00	0.01	-0.01	0.02
Self-employed*age	0.00	0.00	0.00***	0.00	0.00*	0.00
Retired	0.00	0.03	0.02	0.03	0.09*	0.05
Homeowner	-0.02	0.03	-0.02	0.04	0.01	0.06
Children	0.06	0.03	0.06	0.04	-0.07	0.62
Fixed effects	yes		yes		yes	
# Obs.	6215		5599		3204	
Adjusted R^2	0.82		0.79		0.77	

Note: Dependent variable: Log income. *, **, *** indicate significance at the 10 %, 5 %, 1 % significance level respectively. The adjusted R^2 was computed as the mean between imputations.

Table 6 displays the regression results. It turns out that the fit of the regression is indeed best for the fixed amount savers. The adjusted R^2 is 0.82 compared to 0.79 for the residual savers and 0.77 for the non-savers. These results therefore also suggest that income of fixed amount savers is more permanent in nature than that of the other groups.

Overall, the estimation results in this chapter indicate that the transitory income component of fixed amounts is indeed lower compared to other types of savers. It therefore seems well possible that transitory income of fixed amount savers is low enough for the PIH to yield a fairly close approximation of overall consumption.

3.3 Fixed Amount Savers' Response to Transitory Income Shocks

To investigate the second scenario, namely if fixed amount savers save any sizeable amounts of transitory income once they are received, I investigate their response to receipts of irregular payments which should mostly be transitory income. In the SAVE-survey, household are asked whether they have received any large unusual payments or inheritances of over € 500 in the previous year. If this is the case, they are also asked for what purposes they used at least € 250 of the received sum. Table 7 summarises for each group of savers the share of households that used at least € 250 for various saving or consumption purposes. Positions 1-5 can be characterised as forms of saving. In the concept of the PIH, purchases of durables (position 6) are also regarded as savings. Positions 7-9 on the other hand all reflect various forms of consumption. Table 7 also presents for each group of savers the share of households that engaged in at least one form of saving and the share of households that engaged in at least one form of

consumption. It turns out that no group strictly sticks to its saving rule once unusual payments are received, as among all groups a majority engages in at least one form of consumption and also in at least one form of saving. More than two thirds of the fixed amount savers engaged in at least one form of saving, which almost equals the share among residual savers. This suggests that fixed amount savers might indeed save rather than consume larger transitory income receipts.

Table 7: Usage of Unusual Income Receipts

Position	Form of usage	Fixed amount savers	Residual savers	Non-savers
1	Savings investment with a clearly defined purpose (e.g. in the form of a building society savings agreement, whole life insurance policy, private pension plan)	19.1%	14.9%	7.7%
2	Other financial investment, e.g. purchase of shares or securities	19.8%	21.0%	8.5%
3	Purchase of a flat or house	3.1%	3.4%	2.2%
4	Extension or renovation of a flat or house	25.5%	24.9%	23.4%
5	Repayment of debts	17.0%	15.0%	23.1%
6	Purchase of items of daily use, e.g. vehicle, furniture	29.1%	28.3%	25.9%
7	Vacation trip	29.5%	25.4%	22.9%
8	Presents to relatives or friends	10.0%	10.7%	8.4%
9	Purchase of things of daily life	33.5%	32.2%	48.2%
10	Miscellaneous	14.6%	16.9%	23.1%
	At least one form of saving (1-6)	68.4%	68.4%	53.1%
	At least one form of consumption (7-9)	59.0%	55.4%	66.4%

There are, however, some caveats associated with drawing conclusion from Table 7 with regard to the reaction of fixed amount savers to transitory income shocks. First, if the receipts were unexpected, they should also (at least marginally) increase permanent income. It is therefore not unusual when fixed amount savers as well as residual savers adjust both saving and consumption. Second, the SAVE questionnaire asks specifically for the type of unusual income payments, but the question on the form of usage refers to the total sum of those receipts. However, some of those payments, such as income tax repayments and profits-related bonuses may well occur quite regularly and thus not be as unusual as the survey implies. Therefore, they may be considered by the respondents as permanent rather than transitory income. Finally, larger receipts of transitory income may cause fixed amount savers to change their saving rule and subsequently characterise themselves as residual savers.

Table 8: Mean Transition Probabilities Between Groups (2005-2010)

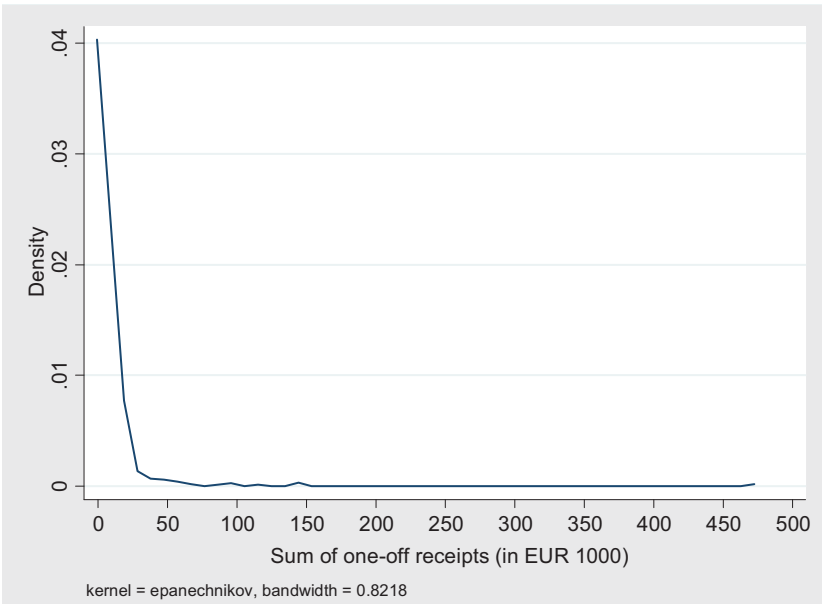
	Saving rule in t		
Saving rule in t-1	Fixed amount saver	Residual saver	Non-saver
Fixed amount saver	71.5%	22.1%	6.4%
Residual saver	24.2%	62.3%	13.5%
Non-saver	12.3%	26.4%	61.4%

Table 8 displays a transition matrix which shows that shifts between fixed amount saving and residual saving behaviour take place regularly. The mean transition probabilities from the fixed amount saver group to the residual saver group and vice versa are both more than 20 percent. This suggests that fixed amount savers indeed adjust their saving rule under certain circumstances. The

odds for a fixed amount saver to become a residual saver within a period versus remaining a fixed amount saver are on average 1 to 3.41 (71.5/22.1=3.41).

Employing a logistic model with fixed effects, I can conduct conditional likelihood estimations (CML) to examine whether the transition probabilities of fixed amount savers to become residual savers are affected by receipts of those unusual income types in the questionnaire that are likely to really be one-off receipts, namely financial gifts, paid out life insurances, paid out building society savings agreements, and lottery winnings.[12] From these data, I construct a

Figure 1: Kernel Density Estimate on the Sum of One-off Receipts (2005-2010)



[12] The model does not permit the examination of negative transitory income shocks, e.g. due to illness. Since fixed amount saving often takes place in the form of contractual saving, downward adjustments of the saved amount may be costly and fixed amount savers thus less flexible to alter their saving rule.

dummy variable that equals one if households received income in at least one of these categories. To investigate if the transition probability depends on the size of these one-off receipts, I run an alternative regression using the total sum of the one-off receipts instead of the dummy variable. To get a better idea of the magnitude and distribution of the one-off receipts, Figure 1 displays the kernel density estimate restricted to the households that received one-off payments. Most of the payments received were just above the € 1500 threshold, few were in excess of € 30000.

Since I'm only interested in how the transition probabilities from fixed amount savers to residual savers are affected by the one-off receipts, I drop the non-savers group from the sample for this exercise. The dependent variable is now a dummy that denotes 1 for residual savers and 0 for fixed amount savers. I include the same set of control variables into the regression equation as in the MNL regressions in section 2.1. When regressing the saver type on the total sum of the one-off receipts, I use income lagged one period instead of current income, since those receipts form part of total income. This should still allow me to relate the magnitude of the transitory income shock to the household's overall income level.

Table 9 shows the odds ratios obtained from the regressions. It turns out that the occurrence of one-off receipts increases the odds for a transition from fixed amount saving to residual saving by 25 percent.[13] This lends additional support to the hypothesis that fixed amount savers change their saving behaviour once they receive sizeable amounts of transitory income. The size of the one-off receipts also matters significantly, although the effect is not too large, as

[13] The reverse odds for a residual saver to become a fixed saver decrease by 83 percent.

Table 9: CML Estimations of Transitory Income Shocks

	Odds ratio	SE	Odds ratio	SE
One-off receipts (dummy)	1.25**	0.13		
One-off receipts (sum)			1.02***	0.00
Income	1.00	0.00		
Income (lag)			1.00	0.00
Real net worth	1.00*	0.00	1.00	0.00
[Real net worth]^2	1.00	0.00	1.00	0.00
Age	1.06***	0.02	1.11***	0.03
Household size	0.87**	0.05	0.88*	0.06
Married	1.01	0.18	1.13	0.26
Homeowner	1.11	0.17	1.20	0.24
Children	1.02	0.18	0.85	0.19
College	0.73*	0.14	0.82	0.19
Non-employed	1.09	0.15	1.12	0.19
Civil Servant	0.71	0.29	0.82	0.43
Self-employed	0.89	0.08	0.93	0.11
Retired	1.00	0.15	0.96	0.18
Fixed effects	yes		yes	
# Obs.	6071		3957	
Pseudo R^2	0.01		0.01	

Note: The dependent variable is a dummy that denotes 1 for residual savers and 0 for fixed amount savers. *, **, *** indicate significance at the 10 %, 5 %, 1 % significance level respectively. The Pseudo R^2 was computed as the mean between imputations.

a one unit increase, corresponding to a 1000 Euro increase, raises the odds of a transition from fixed amount saving to residual saving by just 2 percent. As Figure 1 showed, receipts of very large sums were rather rare. This indicates that the size of transitory income receipt matters not as much as the occurrence of such receipts as such.

4 Fixed Amount Saving and the PIH in the Aggregate

In this section, the compatibility of fixed amount saving behaviour with the PIH is examined in the aggregate. Specifically, it is tested whether fixed amount saving can explain the excess sensitivity of consumption to predictable income shocks that several studies have found for Germany (Campbell and Mankiw 1989, Dreger and Kosfeld 2003, DeJuan *et al.* 2006).

Assuming rational expectations, households use all available information to forecast future income. As a result, the PIH predicts that anticipated changes in income should not affect consumption, as they have already been factored into expected permanent income, and thus changed consumption at the time the expectation was formed. Changes in consumption occur only due to unexpected changes in permanent income and are thus unpredictable. The empirical validity of this random-walk hypothesis (Hall 1978) has been subject to a large literature. In a prominent series of papers, Campbell and Mankiw (1989, 1990, 1991; hereafter Campbell-Mankiw) nested Hall's random-walk model in a more general model in which some fraction of income λ accrues to "rule-of-thumb" consumers who simply consume 100 percent of their current income in every period. The remaining (1- λ) fraction of income accrues to agents following the

PIH. The fraction of "rule-of-thumb" consumers can be estimated directly using per capita values of consumption and income:

$$\Delta c_t = \lambda \Delta y_t + (1-\lambda)\varepsilon_t \tag{6}$$

where ε_t indicates that y^P follows a random walk and is not predictable.[14] Equation (6) is estimated by TSLS, using lagged variables that can predict income growth as instruments for Δy_t. The instruments are lagged two or more periods since consumption and income are measured as quarterly averages and thus the change in consumption has a first-order autocorrelation if the PIH holds in continuous time. Besides this, aggregate data are published with a lag of up to 2 month and thus possibly not part of the information sets available to the individual when expectations are formed (Goodfriend 1986). First lags could therefore be illegitimate instruments. Using instruments lagged more than one period also has the advantage that it is allows for transitory consumption or measurement error in consumption which could generate a moving-average error and thus be correlated with the first lag of income.

For estimated values of λ significantly larger than zero, the PIH is rejected. Using data ranging from 1962 to 1986, Campbell and Mankiw (1989) estimate the share of "rule-of-thumb" consumers in Germany to be 0.65.[15] However, it is

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[14] Equation (6) is typically specified in logs rather than levels. This poses the problem that λ cannot exactly be interpreted as the proportion of disposable income that is allocated to "rule-of-thumb" consumers. On the other hand, the processes driving consumption and income tend to be log-linear rather than linear. As Campbell und Mankiw (1991) note, the model specified in logs can also accommodate time-varying ex ante real interest rates and random ex post real interest rates, whereas the model specified in levels rests on the assumption that the real interest rate is constant.

[15] The PIH in principle refers to non-durable consumption. For Germany, quarterly time series are only available for total consumption, which includes spending on durables. However, assuming exponential depreciation, durability could merely introduce a first-order moving average term into to the change in consumer spending (Mankiw 1982). Using instruments that

also conceivable that fixed amount saving behaviour rather than "rule-of-thumb" consumption causes the λ in Campbell-Mankiw to be significantly larger than zero. This can easily be demonstrated within the Campbell-Mankiw framework: Assume that λ represents the fraction of income that accrues to fixed amount saving residual consumers as described in section 2 instead of "rule-of-thumb" consumers. The remainder $(1-\lambda)$ accrues to residual savers following the PIH as in Campbell-Mankiw. Aggregate consumption at time *t* in an economy consisting only of fixed amount savers and residual savers following the PIH would then be:

$$C_t = \lambda(\alpha Y_t^P + Y_t^T) + (1-\lambda)\alpha Y_t^P \tag{7}$$

which can be rearranged to:

$$C_t = \lambda Y_t + (\alpha - \lambda) Y_t^P \tag{8}$$

Assuming rational expectations, the change in consumption is:

$$\Delta C_t = \lambda \Delta Y_t + (\alpha - \lambda)\varepsilon_t \tag{9}$$

The only difference to Campbell-Mankiw is that since fixed amount savers may save a part of their changes in permanent income $(0 \le \alpha \le 1)$, aggregate consumption out of changes in permanent income may be lower compared to Campbell-Mankiw.[16] Since both models are estimated by running the same regression:

$$\Delta c_t = \mu + \lambda \Delta \hat{y}_t + u_t \tag{10}$$

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are lagged two or more periods, the procedure is thus not affected by using a consumption series that includes durables.

[16] Fixed amount saving may thus also be able to explain the excess smoothness of consumption in response to permanent income shocks (Deaton 1987) as fixed amounts adjust savings in response to a permanent shock.

where $\Delta\hat{y}_t$ is the change in income predicted in the first stage of the TSLS regression, any detected positive coefficient λ in Campbell-Mankiw could have been caused by fixed amount saving behaviour just as well as by simple myopic hand-to-mouth behaviour or other factors that have been discussed in the literature, namely liquidity constraints and loss aversion (Bowman *et al.* 1999) or "keeping up with the Joneses" behaviour (Gali 1994).

Shea (1995) proposed a simple way by which the relevance of these alternative explanations can be tested: Instead of Equation (10) one can run the following regression:

$$\Delta c_t = \mu + \lambda_1(POS_t)\Delta\hat{y}_t + \lambda_2(NEG_t)\Delta\hat{y}_t + u_t \qquad (11)$$

where POS is a dummy variable for periods in which expected income growth is positive, and NEG is a dummy variable for periods in which expected income growth is negative. Under the PIH, the coefficients of both dummies should equal zero, under myopia, the coefficients should be positive and equal. With liquidity constraints, both coefficients should be positive, and λ_1 should be greater than λ_2, as liquidity constrained households may not be able to increase consumption when expected income goes up. With loss aversion, both coefficients should be positive, and λ_1 should be lower than λ_2, as households are less prone to negatively adjust their consumption to expected income declines than to income increases. Unfortunately, this approach does not allow for detecting a possible role of fixed amount saving behaviour in causing excess sensitivity, since there is no conclusive reason why fixed amount saving behaviour should entail an asymmetric response to expected positive and negative income shocks.

However, fixed amount saving behaviour should entail a unique asymmetry in the response to predicted and unpredicted income shocks. Defining

unpredicted income changes as the residual between predicted and actual changes in consumption, I can estimate the following regression:

$$\Delta c_t = \mu + \lambda \Delta \hat{y}_t + \phi \varepsilon_t + u_t \tag{12}$$

where ε_t is the residual of the first stage of a TSLS-regression of Equation (10).[17] The additional error term u_t is added to represent measurement error and innovations in permanent income resulting from expected future income changes. By construction, ε_t has mean zero and is uncorrelated with both $\hat{y}_t$ and its own lags. Table 10 summarizes the relative sizes of λ and ϕ to be expected under different forms of consumption behaviour.

Table 10: Consumption Elasticities of Expected and Unexpected Income Shocks Under Different Forms of Consumption Behaviour

Fixed amount saving	$\lambda = 1$	$>$	$0 < \phi < 1$
PIH	$\lambda = 0$	$<$	$0 < \phi < 1$
Myopia	$\lambda = 1$	$=$	$\phi = 1$
Liquidity constrains (pos. shock)	$\lambda = 1$	$=$	$\phi = 1$
Liquidity constrains (neg. shock)	$0 < \lambda \leq 1$	$\leq$	$\phi = 1$
Loss aversion (pos. shock)	$\lambda = 0$	$<$	$0 < \phi < 1$
Loss aversion (neg. shock)	$0 < \lambda \leq 1$	$\leq$	$0 < \phi \leq 1$
Inattentive consumer	$0 \leq \lambda < 1$	$\leq$	$0 < \phi < 1$
Inattentive saver	$\lambda = 1$	$=$	$\phi = 1$

[17] Flavin (1981) uses a similar approach to quantify the revision in permanent income induced by an innovation in the current income process.

Fixed amount savers differ from other consumer types in that the elasticity of consumption to expected income shocks should be larger than the one to unexpected income shocks ($\lambda > \phi$). This is because fixed amount savers should adjust savings once the expectation is formed. At the time the expected income change occurs, savings are not further adjusted. Unexpected changes in income on the other hand also affect savings to the degree to which the income shock is permanent. For all other consumer types the elasticity of consumption to expected income shocks should be either equal or smaller than the one to unexpected income shocks ($\lambda \leq \phi$): Individuals following the PIH should react only to unexpected income shocks to the extent that permanent income is affected ($\lambda < \phi$). Myopic individuals should display the same reaction to expected and unexpected income shocks ($\lambda = \phi$). Liquidity constrained individuals should react like myopic individuals to positive income shocks ($\lambda = \phi$) and to unexpected negative shocks. In case of an expected negative shock, they may have partly reduced consumption earlier, when the expectation was formed ($\lambda \leq \phi$). Under loss aversion, individuals should react to positive income shocks like individuals following the PIH. Their reaction to anticipated negative shocks should not be larger than to unanticipated negative shock ($\lambda \leq \phi$), as loss averse individuals might have at least partly adjusted consumption earlier, when the negative expectations were formed. One can also distinct the response of fixed amount savers to expected and unexpected income shocks from that of inattentive savers and inattentive consumers (Reis, 2005). Inattentive consumers only differ from consumers following the PIH in that they face costs of planning leading them to only sporadically update their information and consumption plans. Their reaction to unpredicted shocks therefore equals that of individuals following the PIH. Their reaction to predictable shocks depends on the last date the information was updated. If the inattentive consumer updated her plans in

the last period, using all available information on her income in the present period, her behaviour also equals that of the individuals following the PIH. With an increasing duration of inattentiveness preceding the present, her response to predictable income shocks converges to that to unpredicted shocks $(\lambda \leq \phi)$. Inattentive savers behave just like myopic individuals as the consumption plans are never updated $(\lambda = \phi)$.

If both $\lambda > 0$ and $\lambda > \phi$ were observed empirically, it would therefore strongly indicate that fixed amount saving accounts for at least some of the excess sensitivity of consumption to predictable income changes and is therefore not compatible with the PIH. When interpreting ϕ, it has to be kept in mind that in Equation (12) unexpected income is not exogenous as a rise in consumption affects income as well. ϕ is therefore biased upwardly as the correlation between consumption and unexpected income is positive. Naturally, unexpected income growth cannot be instrumented. However, if $\lambda > \phi$ is observed empirically with ϕ being upwardly biased, it should hold all the more for an unbiased ϕ. It therefore rather strengthens the argument that the overall excess sensitivity is caused by fixed amount saving when $\lambda > \phi$ is observed.

Table 11 first presents estimates of λ in a TSLS-regression of the log change in per-capita consumption on the log change in per-capita disposable income. Variables are deflated by the consumption deflator. Heteroscedasticity- and autocorrelation-consistent standard errors are reported in parentheses. The first eight regressions are computed using the same set of instruments as Campbell-Mankiw: lagged income growth (model I and II), lagged consumption growth (models III and IV), lagged changes in quarterly averages of nominal yields in

one-year government bonds (models V and VI)[18], a restricted error-correction model (ECM) for consumption and income (model VII) and the same ECM with bond yields (model VIII). I additionally ran regressions in which the instrument sets are selected by their in-sample predictive power in the first stage regression as measured by either the adjusted R^2 (model IX) or a Bayesian Information Criterion (BIC) (model X). The final regression (model XI) uses the same instruments as in model VIII but without the error-correction term which was insignificant in model VIII. I also experimented with other variables thought to predict disposable income (stock prices measured by the German stock index DAX, the consumer confidence indicator of the European Commission, and government consumption), but none of those seemed to have any predictive power for income growth. The data-sample comprises quarterly data of German real consumption from 1991:Q1 to 2012:Q2.

Table 11 also shows tests for overidentifying restrictions (*J*-Statistic). These are not passed by models III-VI. Obviously, those instruments are very weak and have no predictive power for income growth. I therefore exclude models III-VI from the following analysis. The estimates for λ of the other models range from 0.74 to 0.91 and are highly significant. This suggests an even higher excess sensitivity in Germany than estimated by Campbell and Mankiw ($\lambda = 0.65$) for the pre-reunification period.

[18] Campbell-Mankiw used 3-month bill rates. I experimented with bonds with different durations and found that the one-year bonds had the highest – though also weak – predictive power for income growth.

Table 11: TSLS-estimates for Excess Sensitivity (λ)

		1st-stage regressions		2nd stage regressions		
Model	Instruments	$\bar{R}^2$	BIC	Λ (s.e.)	*J*-stat. (*v*-value)	$\bar{R}^2$
I	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$	0.10	-6.59	0.91 (0.18)	3.34 (0.19)	0.67
II	$\Delta y_{t-2},\ldots,\Delta y_{t-6}$	0.06	-6.50	0.85 (0.19)	6.78 (0.15)	0.67
III	$\Delta c_{t-2},\ldots,\Delta c_{t-4}$	0.05	-6.53	1.07 (0.25)	0.04 (0.98)	0.58
IV	$\Delta c_{t-2},\ldots,\Delta c_{t-6}$	-0.00	-6.42	1.12 (0.28)	0.83 (0.93)	0.51
V	$\Delta i_{t-2},\ldots,\Delta i_{t-4}$	-0.03	-6.45	0.94 (0.90)	0.85 (0.65)	0.65
VI	$\Delta i_{t-2},\ldots,\Delta i_{t-6}$	-0.04	-6.39	0.72 (0.44)	1.28 (0.86)	0.69
VII	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$, $c_{t-2} - y_{t-2}$	0.22	-6.57	0.74 (0.14)	6.64 (0.35)	0.70
VIII	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$, $\Delta i_{t-2},\ldots,\Delta i_{t-4}$, $c_{t-2} - y_{t-2}$	0.19	-6.41	0.76 (0.14)	8.26 (0.50)	0.70
IX	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$	0.23	-6.62	0.75 (0.14)	5.85 (0.32)	0.70
X	$\Delta y_{t-2},\ldots,\Delta y_{t-6}$, $\Delta c_{t-2},\ldots,\Delta c_{t-6}$	0.26	-6.52	0.74 (0.17)	17.86 (0.07)	0.69
XI	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$, $\Delta i_{t-2},\ldots,\Delta i_{t-4}$	0.20	-6.46	0.77 (0.14)	7.53 (0.48)	0.70

Estimates of the elasticities of consumption changes with respect to expected and unexpected income changes are presented in Table 12. The results

generally support the hypothesis that the overall excess sensitivity is caused by fixed amount saving, as all the λ estimates exceed those for ϕ. According to the F-statistics for testing $\lambda = \phi$, the differences are not significant, but this could be due to the bias in ϕ.

Table 12: Consumption out of Predicted and Unpredicted Changes in Income

Model	Instruments	λ (s.e.)	ϕ (s.e.)	F-Test $\lambda = \phi$	$\bar{R}^2$
I	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$	0.90 (0.17)	0.70 (0.12)	1.67	0.70
II	$\Delta y_{t-2},\ldots,\Delta y_{t-6}$	0.84 (0.19)	0.70 (0.12)	0.79	0.69
VII	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$, $c_{t-2} - y_{t-2}$	0.74 (0.15)	0.72 (0.12)	0.01	0.70
VIII	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$, $\Delta i_{t-2},\ldots,\Delta i_{t-4}$, $c_{t-2} - y_{t-2}$	0.75 (0.14)	0.71 (0.12)	0.12	0.70
IX	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$	0.75 (0.15)	0.72 (0.12)	0.08	0.70
X	$\Delta y_{t-2},\ldots,\Delta y_{t-6}$, $\Delta c_{t-2},\ldots,\Delta c_{t-6}$	0.75 (0.18)	0.70 (0.10)	0.14	0.69
XI	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$, $\Delta i_{t-2},\ldots,\Delta i_{t-4}$	0.72 (0.15)	0.67 (0.11)	0.27	0.73

Note: [*] indicates a rejection of $\lambda = \phi$ at the 10 % significance level.

Some studies in the literature have added other variables to Equation (10), relaxing the PIH's assumption of a time-separable utility function and constant real interest rates.[19] Cushing (1992) and Fuhrer (2000) added consumption

[19] See Weber (2002) for an overview.

growth lagged 1 period to account for costs of rapidly adjusting consumption and habit persistence. Other variables include government consumption (Aschauer 1985) and predicted real interest rates (Campbell-Mankiw 1989, Cushing 1992). Table 13 shows that the resulting estimates of λ and ϕ are around 3-9 percentage points lower. But qualitatively the picture remains unchanged. The λ estimates are still significantly positive and in all estimations consumption responds more sensitive to predicted changes in consumption

Table 13: Consumption out of Predicted and Unpredicted Changes in Income with Control Variables

					Control variables			
Model	Instruments	λ (s.e.)	ϕ (s.e.)	F-Test $\lambda = \phi$	Δc_{t-1} (s.e.)	Δg_t (s.e.)	$\hat{r}_t$ (s.e.)	$\bar{R}^2$
I	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$	0.85 (0.18)	0.60 (0.11)	2.86 [*]	-0.01 (0.08)	-0.15 (0.06)	0.00 (0.00)	0.73
II	$\Delta y_{t-2},\ldots,\Delta y_{t-6}$	0.77 (0.20)	0.60 (0.12)	1.20	-0.03 (0.08)	-0.14 (0.06)	0.00 (0.00)	0.72
VII	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$, $c_{t-2} - y_{t-2}$	0.66 (0.15)	0.62 (0.11)	0.14	-0.01 (0.07)	-0.14 (0.06)	0.00 (0.00)	0.72
VIII	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$, $\Delta i_{t-2},\ldots,\Delta i_{t-4}$, $c_{t-2} - y_{t-2}$	0.68 (0.15)	0.61 (0.11)	0.46	-0.01 (0.07)	-0.14 (0.06)	0.00 (0.00)	0.73
IX	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$	0.67 (0.15)	0.62 (0.11)	0.29	-0.01 (0.07)	-0.14 (0.06)	0.00 (0.00)	0.72
X	$\Delta y_{t-2},\ldots,\Delta y_{t-6}$, $\Delta c_{t-2},\ldots,\Delta c_{t-6}$	0.66 (0.18)	0.60 (0.10)	0.26	-0.03 (0.08)	-0.13 (0.06)	0.00 (0.00)	0.72
XI	$\Delta y_{t-2},\ldots,\Delta y_{t-4}$, $\Delta c_{t-2},\ldots,\Delta c_{t-4}$, $\Delta i_{t-2},\ldots,\Delta i_{t-4}$	0.69 (0.15)	0.61 (0.11)	0.68	-0.02 (0.07)	-0.14 (0.06)	0.00 (0.00)	0.73

Note: [*] indicates a rejection of $\lambda = \phi$ at the 10 % significance level.

than to unpredicted consumption, suggesting that fixed amount saving behaviour is indeed at odds with the rational expectations version of the PIH. Again, the differences are not significant in all but one case (model I), but given the upward-bias in ϕ, they seem reasonable large to suggest that the excess sensitivity is indeed caused by fixed amount saving.

5 Conclusions

In this paper, I examined the compatibility of fixed amount saving behaviour with the PIH. I showed that fixed amount saving behaviour, while strongly at odds with the PIH in theory, does not permit a rejection of the PIH right away. Firstly, investigations of household-level data from the SAVE survey suggested that the transitory income component of fixed amount savers' tends to be relatively low. This implies that even if fixed savers were residual consumers, the PIH could still yield a fairly close approximation of overall consumption as long as the fixed amount savers plausibly continue to remain relatively unaffected by transitory income shocks. Secondly, analysis of fixed amount savers' response to larger irregular receipts of income indicated that fixed amount savers not only save at least part of those income receipts and thus temporarily deviate from their saving rule. They are also more likely to alter their saving rule and become residual savers.

Nevertheless, the findings based on analysis of aggregate data indicated that fixed amount saving behaviour accounts for at least some of the excess sensitivity of consumption to predictable income changes observed in Germany. This implies that fixed amount saving behaviour is in fact not compatible with the type of PIH-based consumption functions that modern rational expectations models typically include. Instead, it seems favourable for models with forward-

looking agents to use Campbell-Mankiw-type consumption functions that allow for consumption out of predictable income changes and thus account for the importance that a large proportion of the population attaches to planning savings rather than consumption.

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Appendix

Table A-1: Definitions of Variables

Variable	Definition
Household head	Respondent states to be the household's financial decision taker or to take all decisions jointly with his/her partner.
Income	Reported average net monthly income × 12 + unusual payments
Unusual payments	Tax refunds + profits-related bonuses + lottery winnings + building society savings agreement paid out + life insurance or other form of pension paid out + received financial gifts + other unusual payments
Saving rate	(Reported savings of last year + Repayments of all recorded types of housing debt last year excluding interests paid)/ Income
Real Net Worth	(Deposits of savings accounts + building society + fixed income securities+ equity and real estate funds + other financial wealth + old age provision + value business assets + value other wealth + owner occupied real estate + other real estate) – (value of building society loan + value of mortgage + value of consumption loan + value of family loan + value other loans)