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Imputing total expenditures from a non-exhaustive list of items: An empirical assessment using the the SAVE data set

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Abstract: General purpose surveys typically refrain from using an exhaustive list of consumption expenditure items since the gain of more precise data on consumption is usually more than offset by the large increase in interview time and respondent effort which reduces response willingness. An alternative is to ask respondents a non-exhaustive list of consumption expenditure items and use those items to impute total consumption by the use of an external data source. This paper uses the *SAVE* (internal) and *EVS* (external) data sets to apply such a procedure.

Keywords: Consumption, Expenditures, Surveys

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1 Introduction

Income and expenditure surveys are available in many countries.[1] They provide a great deal of detailed and supposedly reliable consumption data, but these data only strive or totally lack other data necessary for many research questions. While general-purpose surveys like the German Socio-Economic Panel *GSOEP* or *SAVE* typically are a good source of socio-economic characteristics or other information relevant for savings analysis, they face the immanent problem of lacking detailed information on some other information like consumption. These problems are immanent since these surveys are typically not diary based; this would be way too costly and can usually only be justified by the need for central statistical offices to calculate weights for consumer price indices. The time restrictions for personal household interviews thus make it necessary to look for alternative ways to retrieve useful information.

Browning *et al.* (2003) therefore developed a method for getting a measure for total non-durable expenditures[2] of households without asking an exhaustive list of consumption items and sub-items. This saves time and makes asking consumption questions in general purpose surveys feasible. Furthermore, they also do not rely on a direct question for total consumption expenditures which has been shown to be measured with a large error, see Browning *et al.* (2003) or Battistin *et al.* (2003).

The idea of Browning *et al.* (2003) is to use the exhaustive information from an external survey with exhaustive expenditure items to impute total expenditures in the non-exhaustive survey based on the sub-item. The external data will be a national income and expenditure survey, e.g. with expenditure information from a household diary. I apply this idea to the *SAVE* data set where only a few expenditure items are asked. The external data will be the German Income and Expenditure Survey *(EVS)*. The aim of this paper is to compare the direct measure of total expenditures in *SAVE* with the imputed values. Furthermore, I will test whether some expenditure sub-items can proxy total non-durable expenditures as well for German data, i.e. the *EVS,* as for other national surveys like those used in Browning *et al.* (2003). Finally, I use the imputed expenditure measure to compute household savings as a residual measure (difference of income and total non-durable expenditures).

Winter (2004) presents experimental evidence on how the choice of expenditure categories influences measures of household consumption. He interprets the findings that responses to

[1] E.g., the Income and Expenditure Survey *(EVS)* in Germany, the survey of Family Expenditures *FAMEX* in Canada, the Consumer Expenditure Survey *CEX* in the U.S., or the Survey of Family Budgets *SFB* in Italy.

[2] Browning and Crossley (2004) suggest that non-durable expenditures such as food may be differentially smoothed in response to shocks, and show that much more action appears in small durables.

one-shot questions on total monthly nondurable expenditures differ from the sum of disaggregated categories. Furthermore, he finds underreporting in the one-shot question even when considering that the answers to a detailed list of 35 categories might still also be subject to underreporting.

The structure of this paper will be as follows: In Section 2, I will quickly mention three alternative methods of retrieving information on total expenditures in surveys, which are pointed out by Browning *et al.* (2003). In Section 3, descriptive summaries from the expenditure questions *SAVE* are displayed and compared to the expenditure values from the German *EVS.* It also shows the results from the imputation procedure based on the *EVS* for total expenditures in *SAVE* and compares the imputed to the recall values.

2 Asking expenditure questions in surveys

As pointed out in Section 1, running diary based surveys which might recover reliable detailed consumption values, is burdensome, time consuming and very costly. It would therefore practically be impossible to receive information on consumption and savings related topics from the observed household if we had to use diaries to get a good measure of expenditure data.

Browning *et al.* (2003) discuss three methods to gain information on total expenditure, which will be summarized below. In brief, the first one is to ask a single general total expenditure question, the second one asks for a detailed and exhaustive list of sub-items composing total expenditures while the third one is a nonexhaustive selected subset of the list of total sub-items. General-purpose surveys include retrospective or recall questions on consumption and expenditures. In contrast to the German *EVS,* which delivers diary-based data on expenditures, other national expenditure surveys like the U.S. *CEX* or the Canadian *FAMEX* are partially based on interview recall questions. Beginning with the *SAVE* 2003 wave, the latter method, along with the first one, was applied.

General-purpose surveys include retrospective or recall questions on consumption and expenditures. In contrast to the German *EVS,* which delivers diary-based data on expenditures, other national expenditure surveys like the U.S. *CEX* or the Canadian *FAMEX* are partially based on interview recall questions.

One-shot question for total non-durable expenditures At a first glance, it seems attractive to simply ask one total expenditure question in surveys: it is time saving, and the question can easily be understood. Thinking twice, this option appears far less appealing, since the question is very complex, and respondents tend to give a rough estimate, which then is heavily loaded

with noise.[3]

Battistin *et al.* (2003) compare the expenditure questions from the Bank of Italy Survey on Household Income and Wealth *(SHIW)* with the corresponding diary based survey *(SFB)*. They develop a model for the recall error process to correct for heaping and rounding in the recall values; still, the distribution of true[4] expenditures is different for total non-durable expenditure. They conclude that the *SHIW* reported non-durable expenditure measure diverge from values of the *SFB* and conclude that the recall error is more severe concerning total non-durable consumption than for subcategories like expenditures for 'food at home'.

This is also found by Browning *et al.* (2003) who compared the Canadian Out of Employment Panel *(COEP)* with the Canadian Family Expenditure Survey *(FAMEX)* and *SHIW* to *SFB*. For Italy, they find underreporting of total non-durable expenditures of 24%/30%, and for Canada 37%/32% (total expenditures) when comparing medians/means.

While, in addition to the measurement problem, one might wonder about nonresponse rates to total expenditures, this seems to be less of a problem. Browning *et al.* (2003) report a nonresponse rate of 6.0% for total expenditures, while Winter (2004) finds item nonresponse ('don't know' option) of about one third which in turn compares to the rate of 35.8% reported by Hurd *et al.* (1998). Nonresponse rates of that amount require analyses for response dependence on household and demographic characteristics. While there is evidence of significant demographic and other effects in Hurd et al., which raises the issue on sample selectivity, Winter finds evidence justifying the assumption of random non-response.

Exhaustive list of items The summaries of Browning *et al.* (2003) and Winter (2004) concerning the use of an exhaustive list of expenditure items give the advice that their inclusion in surveys is quite costly in interview time, which is costly in monetary terms as well as in terms of trade-off costs for other questions since there normally is a natural limit of interview time[5]. Apart from the time constraint, many of the items might be reported with noise as well.

Non-exhaustive list of items This paragraph splits into two sections. The first one investigates which sub-items are measured reliably and which ones proxy total expenditures reasonably well. The second one explains how the incomplete measures are used to get a reliable measures for total non-durable expenditure.

Browning *et al.* (2003) have shown that questions on expenditure on 'food at home' are not

[3] which might become quite clear if one tries to guess the own average consumption.
[4] assuming that the diary-based information reflect the truth.

exposed to the same amount of noise as the total non-durable expenditure questions. Means and medians for the just mentioned comparison of survey to diary data are about the same, which is also true for the dispersion of the data. These encouraging results state that respondents are astonishingly well capable to give reliable responses to that question.

Since 'food at home' also represents a large budget item, it is useful for imputing total consumption. Browning *et al.* (2003) explain that even though they cannot present evidence on its accuracy, a 'food outside home' question should be included, since it represents a substitute to food at home; it might also capture heterogeneity of the two budget shares for households having the same level of total expenditure. In addition to the food questions, Browning et al. advise us to also collect information on utilities (or energy costs like water, fuel, electricity) and communication expenditures based on their analysis of the explanatory power of these variables for total expenditure.

The basic idea in the process of using only a sub-group of items to estimate total expenditure is the following. Using expenditure survey data with a precise measure of total expenditure *xtotal;* based on a sum of all sub-item expenditures, one chooses a subset of goods $xi, i = 1, 2...l$ and estimates the following

$$x_{total} = \alpha + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_l x_l + \varepsilon \quad (1)$$

By interpreting the estimated coefficients βi as weights, it is possible to use the βi for predictions of *Xtotai* on the basis of the same goods $xi, i = 1, 2...l$ using data from the general-purpose survey, e.g. *SAVE:*

$$\hat{x}_{total} = \alpha + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + ... + \hat{\beta}_l x_l \quad (2)$$

Browning et al. suggest *not* to include income as an predictor for two reasons. The first one is that they suspect that income is an ill-measured variable, based on the results by Lusardi (1996). The second is that income introduces spurious relationships between income and the result of the imputation, which then invalidates some uses of the imputed total expenditure measure.[6]

3 Descriptive findings in *SA VE* and in the *EVS*

The expenditure questions in the German *SAVE* data set were designed in the way suggested by Browning *et al.* (2003). In 2003, five questions were included to ask for four expenditure

[5] after which interview abortion rates will rise dramatically.
[6] E.g., testing for excess sensitivity.

items[7], and total non-durable expenditures. The four items were 'food at home', 'food outside home', 'telecommunication services' and 'utilities' (heating and energy costs). The exact wording and survey implementation is shown in the Appendix. The inclusion of the consumption questions in that period was especially appealing since in the same year, a wave of the *EVS* survey was conducted.[8] Unfortunately, the 2003 scientific use file containing detailed information on expenditure components is not yet available. This is why for following analyses, the 1998 *EVS* wave is used.

3.1 Expenditure items in SAVE

This section describes empirical findings for the *SAVE* consumption expenditure data. As further explained in the Appendix, energy costs are asked in two questions where the first one collects information on the billing period, while the second one asks for the average costs per bill. The product of these two questions is then recalculated to obtain monthly heating expenditures. Table 1 lists methodological issues of the expenditure items.

The items appear in the order they were asked in the survey, i.e. total non-durable expenditures were asked *after* all sub-items. At first glance, non-response rates seem to be rather low, especially for total non-durable expenditures. Respondents were obviously willing to give an answer despite having refused to answer to the previous questions. Still, the high number of zeros is disturbing: these might be hidden non-responses.

Table 1: Values for different expenditure items

	Food at home		Food outside home		Telecom. Services		Water, fuel, electricity		Total non-durable exp.	
	N	Percent	N	Percent	N	Percent	N	Percent	N	Percent
Nonresponse	21	0.67	115	3.65	47	1.49	782[b]	24.79[b]	18	0.57
Outliers[a]	11	0.35	1	0.03	5	0.16	9	0.38	133	4.24
Zeros	183	5.84	622	20.47	75	2.41	158	6.66	225	7.17
Obs.	2939	93.18	2416	76.60	3027	95.97	2205	69.91	2778	88.08

[a] Outliers defined as values being larger than net household income if income is observed.
[b] Monthly energy costs are calculated from two questions, the billing period and costs per bill. From the 782 missings, 402 were due to the option 'included in monthly rent', 87 to 'heating billing period other than listed', 113 / 180 to nonresponse to the billing period / heating costs questions.
Source: All *SAVE* 2003 and 2004 subsamples

I analyze the potential causes of the zero expenditures in Probit estimations for any of these

[7] One question controlling for the billing period of energy costs.
[8] The German Income and Expenditure Survey *(EVS)* started in 1978 and was repeated on a regular five year interval. It described as a series of cross section, although it contains a considerable true panel component of individuals willing to participate several times. Still, this panel information is *not* available due to the original data law agreements which makes it impossible to track households over time.

expenditure items where the dependent variable was zeros vs. "positive values" on income, age and a set of demographic characteristics. However, one would suspect for example that 'food outside home'-expenditures strongly depend on income, schooling and employment status. This would indicate that at least some of the zero values are not hidden non-responses but might well be due to a lower living standard. Since this question also contains expenditures for food at canteens, the responses might be influenced by the work environment. Tables 8 and 9 shows the results of the probit estimates. For 'food outside home' and 'telecom. services', the income polynomial is highly significant; the higher the income, the lower the probability for zero responses. The minimum effect is at about 5300/4700 e, respectively. This seems to support the hypothesis that not all zero values are due to respondents' uncertainty about the true value, as Winter (2004) proposes for the occurrence of zeros for total non-durable expenditures. Still, dummy variables for the *SAVE* subsamples are significant. While the TPI sample, which surveys skilled interviewees, contains no zero values for three of the items, the random subsample RR 2003 contains significantly more zero value respondents for three items including total non-durable expenditures.

It is not plausible that a household has zero 'food at home'-expenditures, so at least some of the zero expenditures can be attributed to non-response. Moreover, zero values are correlated: giving no answer in e.g. the 'food at home' or the 'total expenditure' question can explain almost half of the zero values of each other and the other two questions.

Given the results, it is not justifiable to drop zero value observations. For the high values, or outliers, shown in Table 1, a similar set of regression was done. The structure was much less stable; many variables predicted the output perfectly which is obvious given the low number of cases. For total non-durable expenditures, there is a clear income and schooling dependence: the higher income and schooling, the lower the probability of outliers. This supports the often expressed reservation against asking total non-durable consumption recall questions. For the following analyses, I will drop outliers for each expenditure item, cf. Table 1.

Figures 1 shows histograms for the expenditure items, which are also depicted in Figure 2, excluding zero values. Both Figures exclude values which are higher than monthly net household income. The figures also show typical effects of recall questions: focal values are relatively frequent. This effect is also shown in Winter (2004) and Battistin *et al.* (2003); the latter also developed methods to account for this heaping and rounding. For total expenditures, 91.16% of the answers were multiples of 50 e, 76.0% multiples of 100, 32.0% of 500 and 20.2% at 1,000 e, not excluding zero values. These rounding effects are less frequent for 'food at home' (43% for multiples of 100 e), but the scale is of course finer.

As an executive summary for the *SAVE* expenditure data, two things are worth noting. First, nonresponse is by no means comparable to the findings by Winter (2004) or Battistin *et al.* (2003); in fact, nonresponse is completely ignorable concerning almost all expenditure items, including total non-durable consumption. Still, zero values are relatively frequent, and it is hard to tell whether these are hidden nonresponses or true zero expenditures. Compared to other data sources, the experiment including these expenditure questions seems very promising, and the next section will confront these values to the German diary based *EVS.*

3.2 Expenditures in the EVS

This study has been done whilst detailed data on different income and expenditure items were not yet available for the 2003 wave. Hence, I use the *EVS* 1998 and multiply all different consumption items being explained in the following by separate price indices[9] for every sub-group.[10]

Total non-durable consumption in the *EVS* was computed as the sum of the following sub-items. Included are all items of the group 'food, drinks, tobacco'; all items of the group 'clothing and shoes'; 'total costs of health care' (out of pocket health); 'total energy expenditures'; 'total education expenditures'; 'total expenditures for food outside home, drinks and lodging'; 'goods and services for housing'; 'traffic'; 'communications'; 'other goods and services[11]; 'expenditures for leisure, entertainment and cultural events'; 'other goods and services'. These categories have to be corrected, i.e. reduced, by expenditures for durable consumption goods: cars, bikes and motorcycles; phones and fax machines; TVs, VCRs, camera and camera equipment, and other durables like music instruments; bijou, watches.

When trying to impute the coefficients estimated for the four subcategories *food at home, food outside home, telecommunications* and *energy,* one must take account of the fact that in the 1998 *EVS,* food at home as well as food outside home, drinks are included as well. In order to replicate the measures used by Browning *et al.* (2003) as closely as possible, I use the 1993 *EVS* to calculate the shares of food alone without drinks in these two subgroups, which is then used to approximate the corresponding 1998 expenditures.[12]

Table 2: Expenditure shares from income and expenditure surveys

[9] *Source:* Federal Statistical Bureau of Germany.
[10] and also, if measures were composite, for every subgroup within that group.
[11] For the latter category (other goods and services), it is recommended that all goods and services are included separately instead of using the whole group for allowing different price indices and has been done accordingly.
[12] This implicitly assumes constant expenditure shares for drinks/foods over the five year gap. The shares are 86% for 'food at home' to 'food, drinks and tobacco at home' and 67% for the food expenditures outside home, respectively.

	EVS (1998[a]/1993),		N=49720	Canada	Italy	Spain
	Mean	Median	Std. Error	FAMEX (1996)	(SFB)	(ECPF)
Food at home	16.9%	16.3%	0.03%	22.1%	32.1%	57.4%
Food outside home	3.5%	2.8%	0.02%	6.3%	5.0%	0.3%
Telecommunications	2.5%	2.1%	0.01%	3.9%	3.3%	n.a.
Energy	8.3%	7.3%	0.02%	8.2%	8.0%	7.8%
Overall total	31.2%	31.1%	0.04%	40.5%	48.5%	49.3%

[a] In prices of 2003.
Source: EVS: Own calculations; FAMEX, SFB, ECPF: Browning et al. (2003).

Table 2 compares the expenditure shares from the *EVS* with the corresponding expenditures in Canada, Italy, and Spain. The differences in the single four shares as well as in the overall totals suggest that total non-durable expenditures calculated from the other three samples is measured more restrictively as in the author's calculations.[13]

Comparison between *EVS* and *SAVE* expenditure data Table 3 compares the total non-durable expenditures from SAVE to the values of the EVS. The ratio of the mean/median expenditures, respectively, in both data sets are even lower than what is reported by Browning et al. (2003), which again might well be due to the fact that total non-durable consumption is calculated less restrictive here. This supports the general finding that recall-based total expenditures suffer significantly from underreporting.

Table 3: Total expenditure measure

	CAPI 2003		RR 2003		CAPI 2004[a]		EVS 1998 [a]
Mean	748.57	49.0%	830.20	54.3%	878.90	57.5%	1529.21
Median	650.00	47.1%	750.00	54.4%	750.00	54.4%	1379.93
Standard Error	28.44		13.97		60.40		3.34
N	483		2184		469		49720
only if expenditures > 0							
Mean	815.04	53.3%	904.97	59.2%	878.90	57.5%	
Median	700.00	50.7%	800.00	58.0%	750.00	54.4%	
Standard Error	29.01		14.08		60.40		
N	441		2001		469		

[a] In prices of 2003.
Notes: All values weighted. Absolute numbers and relative values to *EVS* numbers shown.

Table 4 analogously compares the sub-item expenditures from SAVE to the values of the EVS. And again the results by Browning et al. (2003) can be mimicked: the ratio between the means and medians of both data sets are about 1, which supports the findings that measures for

sub-items, especially 'food at home', work very well for recall-based surveys.

Table 4: Sub-items of household expenditures

	EVS 98 [a]		CAPI 2003		RR 2003		CAPI 2004		*SAVE* 2003 and 2004[b]	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Food at home	254.0	229.4	237.6	200	167.0	50	1165.5	400	232.8	175
Food outside h.	59.7	38.8	57.4	30	27.7	8	76.4	50	51.6	25
Telecom. services	35.3	29	48.1	30	29.1	10	165.2	63	40.8	25
Water,fuel,elec.	120.0	101	117.8	62.5	108.3	79.2	202.9	88	121.8	81

[a] In prices of 2003.
[b] Conditional on each value being larger than zero and the income fraction being smaller than one.
Note: All values weighted.

These findings allow to use the method discussed in Section 2 to impute total non-durable consumption for the *SAVE* data using as an external source the *EVS* data set.

Estimation of weights and imputation of total non-durable consumption

This section presents the estimation results from the method mentioned in Section 2. Different specifications were used to assign weights to different sub-items based on Equation 1. The estimated coefficients for the weights are then applied to the *SAVE* expenditure items to obtain the imputation measure for total non-durable consumption.

Estimation of weights Table 5 reports the results of five experiments. For each I report coefficient estimates and the R^2 for the regression.

Table 5: Regression results for Equation 1

Specification	(1)	(2)	(3)	(4)	(5)
Food at home	2.695	2.189	2.089	1.908	1.596
Food outside home	4.057	3.717	3.871	3.665	3.777
Telecom. services		5.509	4.741	5.529	4.875
Water, fuel, electricity		1.560	1.538	1.358	1.173
Squares and cross products	N	N	Y	N	Y
Demographics	N	N	N	Y	Y
R squared	55.6%	62.4%	63.6%	63.3%	64.4%

[a] Demographics: Age and age sq., household size, home ownership (D).
Source: EVS 1998(1993).
Notes: Results from weighted regressions. t- and p-values not reported: all coefficients significant at the 0.1% level.

The first column of Table 5 reports the results of regressing total non-durable expenditure on two items, only 'food at home' and 'food outside home'. 56% of total non-durable ex-

[13] Total nondurable expenditures in Browning *et al.* (2003) are defined as: food at home, food out, water, fuel, electricity, household operations, clothing, transportation (excluding car purchases) medical care, personal care, recreation (excluding

penditures can be explained by these two predictors; this means that more than half of the variance of total non-durable consumption can be explained by food expenditures only. Including 'telecommunication services' and 'utilities', the explanatory power raises to 62% (2). Browning *et al.* (2003) argue that the assumption of linear Engel curves made in Equation 1 might be too hard a restriction. This is the reason to include squares and cross products of the four expenditure items in (3). Again, Browning et al.'s results are confirmed as the less restrictive functional form only adds minor additional explanatory power, which also is true for including demographic variables (4).[14] Finally, in specification (5), I combine all extensions of specification (1).

Table 6 compares the coefficient estimates and the R^2 from the second column in Table 5 (no squares and cross products, no demographics) with the results of the regressions from Browning et al. conducted for other national surveys. In order to get comparable results, Table 6 shows unweighted estimation results. While the R^2 is fairly lower, especially the 'food at home' weight factor is similar in all three data sets.

Table 6: Comparing the results from the *EVS* to *FAMEX* and *SFB*

	FAMEX	SFB	EVS
Food at home	2.190	2.220	2.231
Food outside home	3.280	2.327	3.731
Telecom. services	3.030	4.347	5.978
Water, fuel, electricity	2.720	1.489	1.578
Squares and cross products	N	N	N
Demographics	N	N	N
R squared	74.3%	63.4%	58.7%

Source: EVS: own calculations, results from unweighted regression; *FAMEX, SFB:* Browning *et al.* (2003).
Note: t- and p-values not reported: all coefficients significant at the 1% level.

Imputation of total expenditures The specification chosen for the imputation in the *SAVE* data set was the one in the fourth column of Table 5, reestimated with the population weights from the *EVS* 1998; the four demographic variables were included, but not cross-terms and square products. The reason for *not* including them lies in the limited improvement over the specification without these terms and in the trade-off argument that outliers within the sub-items[15] could bear the risk of imputing implausible values. The results are shown graphically in Figure 3. The dispersion of the imputed expenditure values in *SAVE* is not much larger than the one from the total non-durable expenditure measure in the *EVS,* and even more, dropping zero

purchases of recreational vehicles), reading material, educational expenses, alcohol and tobacco.
[14] In fact, I tried many different sets of demographic variables. The explanatory differences were very small, and I decided to use the one with the best trade-off of additional explanatory power and no data loss for missing observations in one of the demographic variables in *SAVE*.
[15] which were not controlled for if income was not smaller than each expenditure item.

value sub-items does not affect the shape either.

The comparison between the imputed total non-durable expenditures, the sum of sub-items in *SAVE* and the values from the one-shot question is shown in Figure 4. The distribution for the one-shot question is shifted to the left compared to the imputed values' density; the mean of the one-shot question's values consistently is about one half of the mean of the imputed values. Comparing the simple sum of the sub-items to the one-shot question makes clear that indeed households do not forget to include other expenditures in the one-shot question, which were not asked for before.[16] The mean again is just about one-half of the mean of the one-shot total expenditure question.

A possible threat to the use of the imputed consumption data is that nothing prevents imputed total monthly non-durable expenditures from being smaller than monthly household net income. In the present scheme, 27.4% of the imputed expenditures exceed income, which is a rather high number. Going back to Equation 1 and to Table 5, respectively, and including income (and, additionally, income and income squared) in the weights regression, this does not eliminate the problem. As Table 7 shows, values are still below income in about 20% of all imputed expenditure cases. For the one-shot question, this is applies only for about 5%. Additionally, including income in the imputation procedure would entail an endogeneity problem when analyzing e.g. saving rates, constructed as the residual of income and expenditures, in dependence of income. See also Section 2, Footnote 6.

Table 7: Expenditures below income

		Imputed expenditures		
	One-shot question	No income included	Income	Income and income squared
Below income	133	590	446	422
All	2960	2155	2155	2155
Percent	4.5%	27.4%	20.7%	19.6%

Notes: Three different imputation specifications are compared: no income (only expenditure items plus demographic variables), income, and a second order polynomial for net income; (both in the estimation step in the *EVS* and in imputation step for *SAVE).*

4 Conclusions

Collecting diary-based detailed information on household expenditure is a costly and time consuming procedure. The use of one-shot expenditure questions, in contrast, has its limits, which was shown by many authors including the one from this paper. Instead, a non-exhaustive list of sub-items which includes 'food at home', 'food outside home', 'utilities' and

[16] Remember that questions were ordered first to ask for the sub-items and then for total expenditures.

'telecommunication services' can be used to impute total non-durable expenditure with expenditure allocation weights estimated by diary-based income and expenditure surveys.[17] The *EVS* 1998 was used to compute the weights, which were included in the *SAVE* 2003 and 2004 subsamples to impute total expenditures. Comparing absolute expenditures in the *EVS* and in *SAVE* for the used sub-items, this procedure seems justifiable, which then translates into similar total expenditure distributions. The drawback of this procedure is that nothing prevents expenditures from being larger than monthly revenues, since the estimation of weights cannot account for all household heterogeneity.

[17] It has been shown in the literature that these four items are good proxies of total non-durable expenditures.

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Tables

Table 8: Probit regression for zero values in expenditure items, part 1

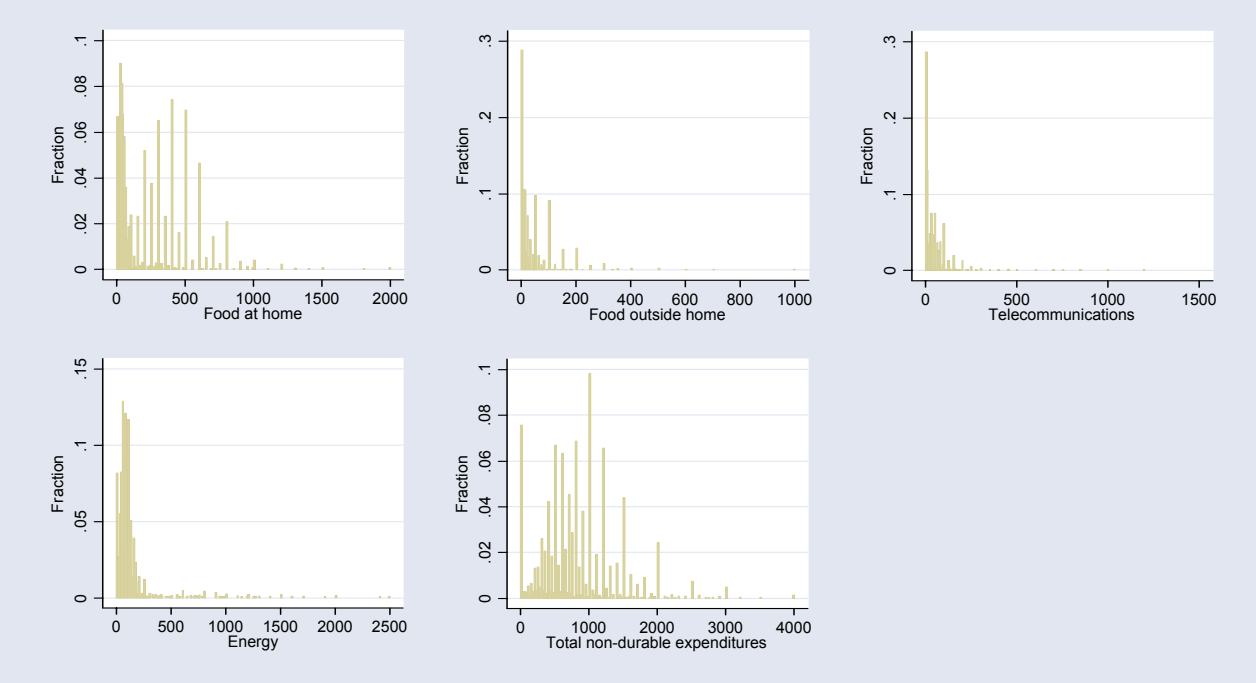
	Food at home		Food outside home		Telecom. m.	
	Coeff.	$P > z$	Coeff.	$P > z$	Coeff.	$P > z$
Net income / 10,000	-0.343	0.703	**-5.031**	0.000	**-3.352**	0.009
Net income / 10,000) sq.	1.134	0.263	**4.691**	0.000	**3.563**	0.018
Age/10	-0.067	0.686	0.198	0.109	0.247	0.263
Age/10 squared	0.010	0.548	-0.002	0.860	-0.022	0.333
Secondary school (D)	0.080	0.441	**-0.197**	0.009	0.045	0.745
Graduation diploma (D)	-0.030	0.842	**-0.288**	0.015	0.013	0.950
University degree (D)	-0.157	0.300	**-0.333**	0.002	-0.298	0.223
Household size	**0.177**	0.001	**0.210**	0.000	0.089	0.223
Kids (D)	-0.045	0.746	0.028	0.787	-0.221	0.215
Kids living in same house (D)	**-0.362**	0.018	0.024	0.827	-0.083	0.684
Job: blue collar (D)	**0.290**	0.065	0.185	0.139	0.137	0.533
Job: civil servant (D)	-0.105	0.670	-0.177	0.419	0.229	0.490
Job: freelancer (D)	0.423	0.194	-0.704	0.144	dropped	
Job: self-employed (D)	0.205	0.351	-0.113	0.582	dropped	
Retired(D)	-0.038	0.851	-0.248	0.076	-0.142	0.589
Work parttime (D)	0.066	0.735	-0.014	0.927	-0.074	0.796
Work little (D)	0.117	0.549	**0.253**	0.081	-0.361	0.276
Work not (D)	0.020	0.906	**0.371**	0.003	0.249	0.254
Unemployed (D)	0.148	0.476	0.076	0.570	-0.022	0.927
Past unemployment 1-6 months	**-0.231**	0.078	-0.121	0.205	0.021	0.905
Past unemp.> 6 months	-0.029	0.853	0.062	0.559	0.144	0.454
Partner	**-0.426**	0.003	-0.105	0.337	**-0.389**	0.030
Widowed (D)	-0.169	0.306	**0.203**	0.075	-0.179	0.366
Separated or divorced (D)	-0.111	0.581	0.132	0.348	-0.062	0.803
Widowd	0.008	0.938	0.095	0.192	0.115	0.397
East Germany (D)	**-0.202**	0.089	**0.275**	0.000	**-0.295**	0.059
Sample: RR 2003	**0.182**	0.071	**0.343**	0.000	-0.137	0.351
Sample: TPI 2004	dropped		**-0.347**	0.010	**-0.881**	0.017
Constant	-1.643	0.000	-1.869	0.000	-1.905	0.001
Obs.	2866		2792		2848	
LR chi2(24)	54.12		464.78		63.95	
Prob > chi2	0 ^{0}.002		0.000		0.000	
Pseudo R2	0. 0479		0.1657		0.1019	

Table 9: Probit regression for zero values in expenditure items, part

	Energy		Total	non-durable exp.
	Coeff.	$P>\|z\|$	Coeff.	$P>\|z\|$
Net income / 10,000	0.765	0.478	0.021	0.980
Net income / 10,000) sq.	-0.594	0.670	0.821	0.401
Age/10	**-0.470**	0.009	**-0.343**	0.024
Age/10 squared	**0.045**	0.014	**0.031**	0.042
Secondary school (D)	0.143	0.198	-0.028	0.776
Graduation diploma (D)	0.078	0.610	-0.202	0.152
University degree (D)	-0.080	0.596	**-0.295**	0.039
Household size	0.087	0.134	0.056	0.283
Kids (D)	**-0.258**	0.080	-0.170	0.203
Kids living in same house (D)	0.053	0.741	0.063	0.661
Job: blue collar (D)	-0.228	0.195	0.112	0.444
Job: civil servant (D)	-0.158	0.467	0.168	0.393
Job: freelancer (D)	0.186	0.578	**0.543**	0.064
Job: self-employed (D)	-0.209	0.391	-0.382	0.172
Retired(D)	-0.208	0.340	-0.015	0.935
Work parttime (D)	-0.078	0.673	-0.155	0.386
Work little (D)	-0.161	0.443	0.089	0.607
Work not (D)	-0.005	0.976	0.008	0.958
Unemployed (D)	-0.168	0.445	-0.132	0.483
Past unemployment 1-6 months	-0.074	0.562	-0.0740	0.548
Past unemp.> 6 months	-0.129	0.406	-0.010	0.942
Partner	**-0.449**	0.002	**-0.248**	0.060
Widowed (D)	0.196	0.208	0.077	0.602
Separated or divorced (D)	-0.074	0.734	-0.130	0.500
Widowd	0.078	0.452	0.118	0.209
East Germany (D)	0.143	0.213	**-0.234**	0.041
Sample: RR 2003	-0.007	0.943	**0.253**	0.009
Sample: TPI 2004	dropped		dropped	
Constant	-0.229	0.613	-0.745	0.052
Obs.	2199		2870	
LR chi2(24)	72.14		65.88	
Prob > chi2	0.000		0.000	
Pseudo R2	0.0668		0.0498	

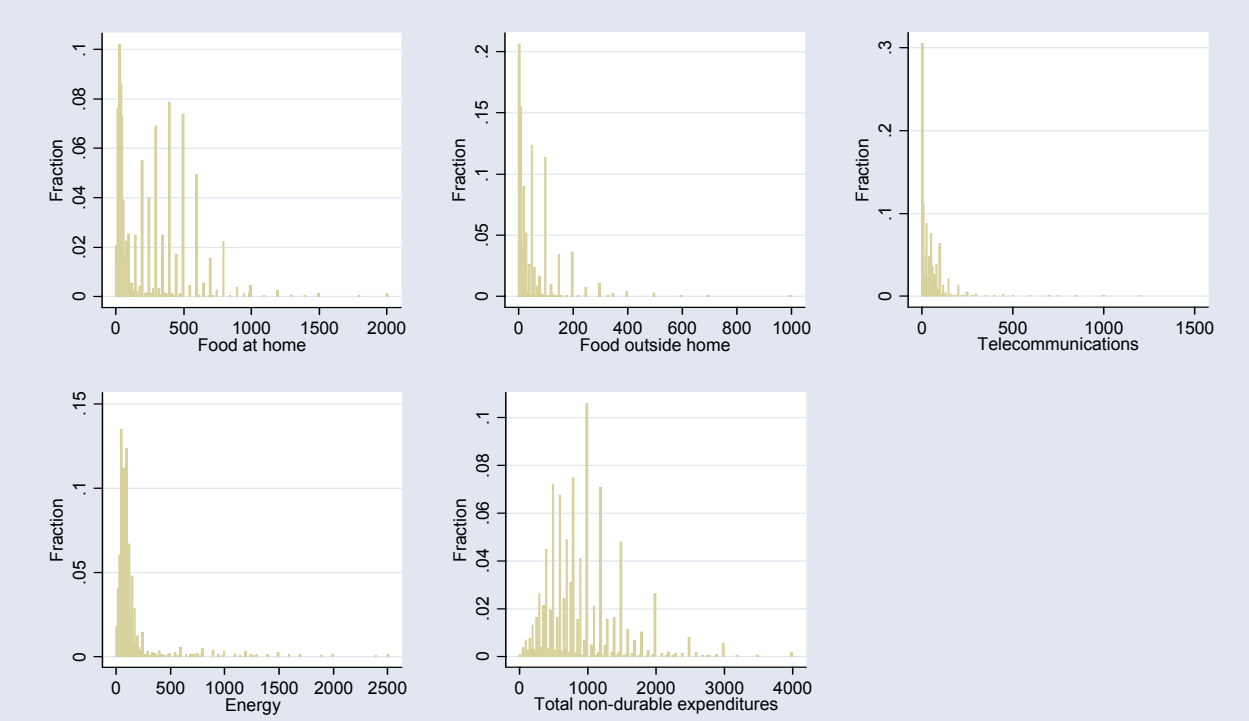
Figures

Figure 1: Distribution of expenditure values



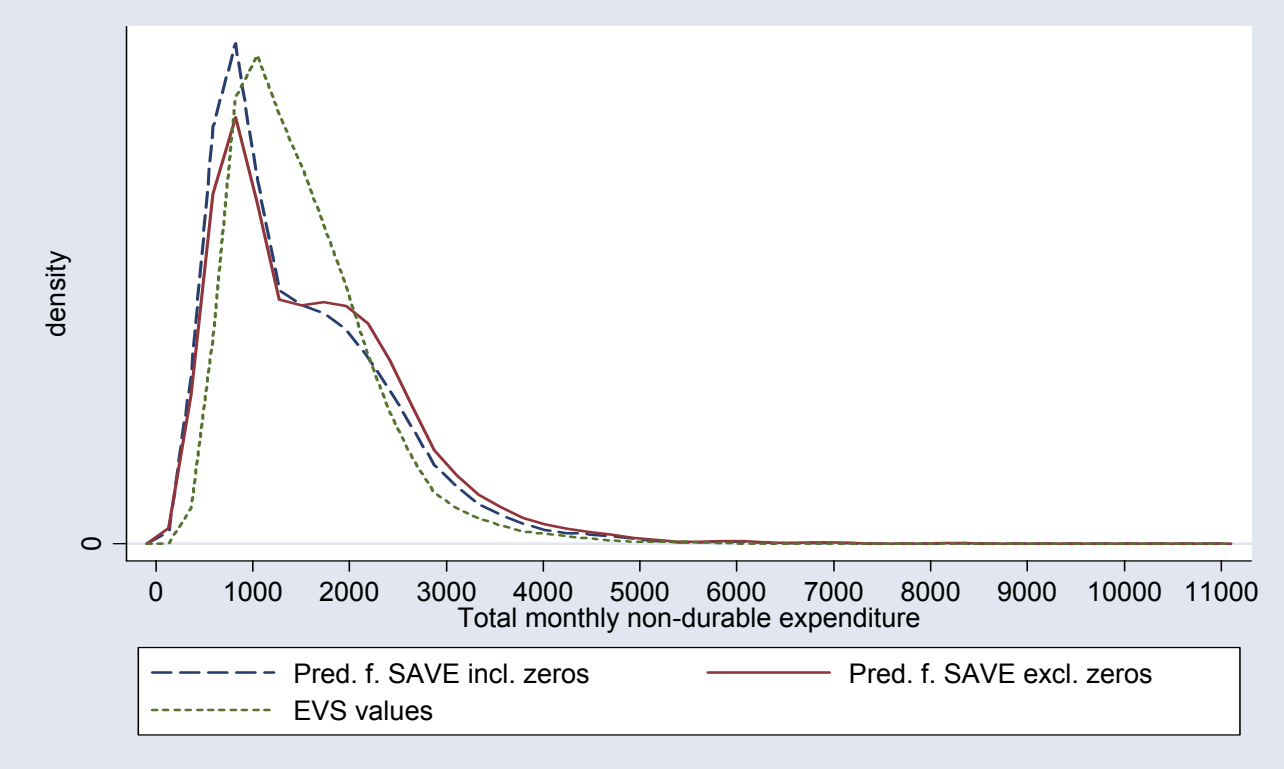
Note: Unweighted values.
Source: SAVE 2003 and 2004 subsamples.

Figure 2: Distribution of expenditure values excluding zeros



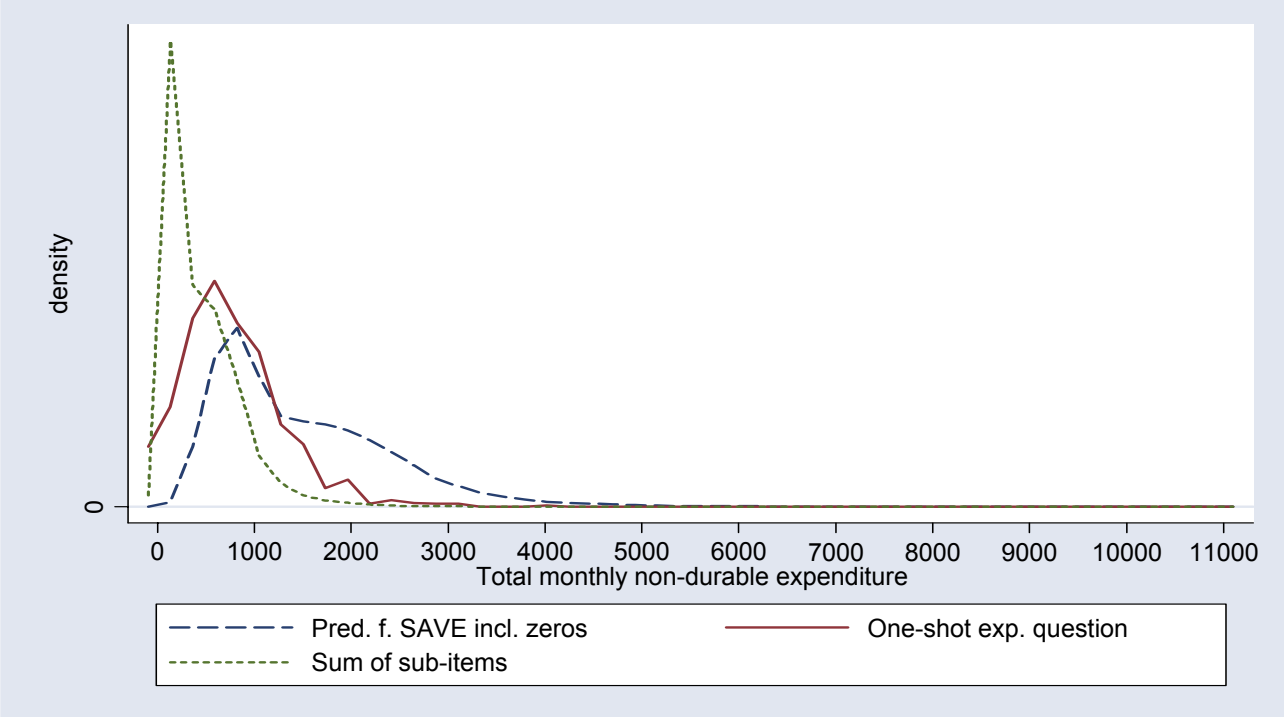
Note: Unweighted values.
Source: SAVE 2003 and 2004 subsamples.

Figure 3: Distributions of total monthly nondurables expenditures measures



Source: SAVE 2003 and 2004 subsamples and *EVS* 1998.
Notes: All values weighted. 1998 *EVS* values in prices of 2003. Kernel density estimates, using the Epanechnikov kernel and optimal band with selection.

Figure 4: Distributions of imputed expenditures, values from SAVE and the sum of sub-



Source: SAVE 2003 and 2004 subsamples.
Notes: All values weighted. Kernel density estimates, using the Epanechnikov kernel and optimal bandwith selection.

Expenditure questions in *SAVE*

Consumption questions were, if not asked within the full P&P interview environment of the TPI subset, part of the CAPI component of the *SAVE* questionnaire. This applies to the CAPI 2003 and the RR 2003 subsamples. The block of consumption questions appeared after the savings questions.

In addition to the interviewers reading the questions, respondents were handed 'showcards' which additionally defined the questions more precisely. Heating costs were asked in a two-step process since first the period was asked for and then the corresponding amount of the bill; this sum, therefore, has to be recalculated on a monthly basis.

The expenditure questions were asked in the way as depicted on the following page.

- *Think of the year 2002(2003). About how much did your household spent on an average month for food you consumed at home?*
  Showcard:
  Count: food and alcohol-free beverages purchased in grocery stores, supermarkets and similar stores
  Don't count: Expenditures for alcoholic beverages like beer, wine and liquors
- *Think of the year 2002(2003): About how much did your household spent on an average month for food outside home, e.g. in restaurants?*
  Showcard:
  Count: meals taken in restaurants, canteens, bars etc.
  Don't count: Expenditures for dropping by bars when nothing was eaten, and expenditures for celebrations like weddings, birthdays etc.
- *Think of the year 2002(2003): About how much did your household spent on an average month for telecommunications, cell phones and internet connections?*
  Showcard:
  Count: Basic and variable fees for fixed networks and cell phones, including text messages; royalties for private internet connections (AOL, MSN)
  Don't count: Purchases of phones and cell phones
- *What is the time period for your heating cost settlement?*
  Weekly; Monthly; every two/three/six months; once a year?
- *What was your last heating bill?*
  Showcard:
  Don't count: Costs for electricity not used for heating (illumination, cooking etc.)?
- *Think again of the year 2002(2003): About how much did your household spent in an average month all in all for all goods and services including purchases in supermarkets, meals in restaurants, telecommunications, heating etc.?*
  Showcard:

  This is the sum of all household's expenses for daily use.
  Count: First four items plus expenses for clothing and health care; royalties for private internet connections (AOL, MSN)
  Don't count: Rent and large irregularly purchases like homes, cars, furniture and large electronic tools like stoves or refrigerators lasting many year

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