Compiling a Harmonized Database from Germany's 1978 to 2003 Sample Surveys of Income and Expenditure

Timm Bönke
Carsten Schröder
Clive Werdt

Compiling a Harmonized Database from Germany's 1978 to 2003 Sample Surveys of Income and Expenditure

Timm Bönke
Freie Universität Berlin, Boltzmannstr. 20
14195 Berlin, Germany

Carsten Schröder[*]
University of Kiel, Olshausenstr. 40
24098 Kiel, Germany

Clive Werdt
Freie Universität Berlin, Boltzmannstr. 20
14195 Berlin, Germany

February 22, 2010

Abstract. We outline a procedure for combining six cross-sections of the German Sample Survey of Income and Expenditure, and discuss potential pitfalls of such a venture. Particularly, we investigate the consequences of a major break in the survey design for inter-temporal comparisons of expenditure categories: a reduction of the surveying period from twelve to three month taking place between the census years 1993 and 1998. We demonstrate that for several commodities a division-by-four of annually-surveyed expenses cannot guarantee inter-temporal comparability of expenditure distributions. We suggest and test the performance of several alternative conversion procedures. Suitability of conversion strategies hinges upon good-specific purchase properties.

Keywords: German Sample Survey of Income and Expenditure, annual vs. trimestrial data

JEL-classification: C8, D1, D3, I3

1 Introduction

The German Sample Survey of Income and Expenditure (IES) is a representative cross-sectional household sample collected in five-year intervals. Since year 1978, six waves have been provided by the German Federal Statistical Office. Covering two and a half decades, the IES cross sections contain valuable long-run micro-level information on household socio-economic and demographic characteristics.[1] Particularly, IES is the only German database providing simultaneously in-depth information on income, wealth (accumulation), expenditures, paid taxes and contributions, and inventories. To unlock the data's full potentials, the cross sections need to be combined in a way that the information content of variables is inter-temporally consistent. In this article, we investigate the possibilities and challenges of such a venture.

Two major obstacles make the pooling of IES cross sections a challenging enterprise. First, over time labels and attributes of various variables have been changed, and variables have been added, merged or discarded. Moreover, *reporting periods* differ: Some IES flow variables are provided on a monthly, some on a quarterly or annual level. Also the coding of missing values has changed over time. Hence, the first task is to ensure a consistent definition of variables and variable attributes. The second obstacle is a break in the survey design: the *surveying period* has been reduced from twelve month to a quarter. Until year 1993, households were surveyed over a full year and provided information on their economic activities over the whole period. Since year 1998, households are asked to provide information on their economic activities within a three month period. In each quarter, about 25 percent of the respondents is interviewed. As a result, a missing-information problem emerges for the non-surveyed three quarters.

For various variables, the missing-information problem should not complicate the constructing of a pooled IES database, henceforth referred to as PIES. For example, socio-demographic information (education levels, household composition, etc.) and household wealth should hardly be affected by the reduction of the surveying period. However, even after adjusting for different reporting periods, the information content of flow variables might be sensitive to the survey break. To achieve comparability of annually and quarterly surveyed flow variables two strategies come to mind. Either quarterly-surveyed data might be extrapolated to match a full year. Choosing this course of action implies a missing information problem. Or annually-surveyed data might be converted to quarterly data. Choosing this course of action implies an information reduction. As the shortened three-month surveying period will be retained for future IES cross sections, we recommend an annual-to-quarter conversion to minimize conversion-driven biases.

---

[1] For applications of the data, see, for example, Becker and Hauser (1994, 1996), Faik and Schlomann (1997), Hauser (1999), German Federal Ministry of Labor and Social Affairs (2008), Bönke et al. (2010) and references cited therein.

Maybe the most intuitive annual-to-quarter (A-to-Q) conversion strategy is a division of annually-surveyed (and reported) flow variables by four. Indeed, for several high-frequency expenditure and income variables such a division-by-four procedure leads to wave-specific expenditure/income distributions with similar statistical properties before and after the reduction of the surveying period. In case of low-frequency goods and unsteady or extraordinary income components (e.g., returns on investment or irregular transfers), however, the division-by-four strategy may generate inconsistent results.

The implications of the division-by-four procedure for the inter-temporal comparability of flow variables can best be illustrated by means of two prototype examples: expenses for food and for a new car. Food is bought by most households on an almost daily basis. Hence, purchases will be observed for nearly all households no matter if the surveyed period is a quarter or a year. Moreover, ignoring seasonal effects, a household's annually-surveyed expenditures divided by four should be close to the reported amount within a quarter. However, the purchase frequency for new cars is substantially lower, typically less then once a year. Hence, if a household bought a car in a specific year and the surveying period is three month, the probability that the purchase falls in the surveyed quarter is 25 percent only. Moreover, if the purchase is made within the surveyed quarter, expenses will not differ from annual expenses. Accordingly, a division of the annually-surveyed amounts by four (while leaving the quarterly-surveyed amounts unchanged) will lead to incomparably low expenditure levels and does not account for the reduced probability that a purchase is observed. Instead, to ensure inter-temporal comparability it may be advantageous to apply another conversion strategy to annually surveyed car expenses: to randomly replace three out of four positive amounts by zero while leaving the remaining positive amounts unaltered.

In this article, we investigate the suitability of several conversion strategies, including the two aforementioned strategies. The suitability of a conversion strategy is assessed by comparing statistical measures derived from the *converted annually*-surveyed and the *unconverted quarterly*-surveyed expenditures for the same good. Considered statistical measures include conditional frequencies, means, standard errors, and kurtosis. Plausibility checks by means of visual comparisons are also provided.

The remainder of this article is organized as follows. Section 2 introduces the IES and explains how we have merged the six IES cross sections. Section 3 illustrates the consequences of the survey period shortening for the information content of expenditure variables by means of two stylized examples; it outlines our conversion framework and its technical implementation. Section 4 presents expenditure-category specific assessments of conversion strategies, and Section 5 concludes.

2 Database and harmonization of variables

The IES is a representative cross-sectional household sample collected in five-year intervals by the German Federal Statistical Office. The first wave has been conducted in the early 1960th,[2] yet reasonable data quality is ensured from year 1978 and onwards only. Since then, six cross sections have been compiled and are available for researchers in form of scientific use files. These six scientific use files (1978-2003) form the database underlying PIES.

The IES is a quota sample, i.e. a convenience sample ensuring a certain distribution of demographic variables according to a quota plan: respondents are assigned to demographic groups/strata, each being defined by a specific combination of several socio-economic and socio-demographic characteristics, until a specific quota is reached. Participation in the IES is voluntary, and, per cross section, about 0.2 percent of the population participates. Prior to German reunification, only West German households have been surveyed. Until year 1988, participation was restricted to West German residents with German nationality.

The IES questionnaire consists of three parts. In the introductory interview ("Einführungsinterview") information on household socio-demographics, socio-economics and wealth is collected. In household diaries ("Haushaltsbuch"), households report individual earnings and expenses for various kinds of goods and services. Finally, from all the surveyed households a sub-sample is asked to report commodity specific expenditures on a daily-level basis ("Feinaufzeichnungsheft").

The collected data is stored in several hundred variables, whereof some contain household-while others contain individual-level information. Each IES variable is labeled with a prefix "EF" and a unique serial field identification number.[3] For example, in the IES 1988, EF2 gives the region of residence, while EF454 reports returns from sublease. Various field identification numbers have changed over time. Several tables in the Appendix document the wave-specific EF-identifiers of variables underlying the PIES aggregates.[4]

Altogether, IES variables can be classified in seven broad categories: (A) socio-economic and demographic characteristics, (B) expenditures, (C) incomes and other revenues, (D) paid taxes and contributions, (E) inventories, (F) wealth, and (G) wealth accumulation. The following paragraphs briefly introduce each of the seven categories.

---

[2] See Becker et al. (2002) for details.

[3] The Federal Statistical Office provides different IES data releases. Therefore, sample design and content may differ, especially variable names. We always refer to the Scientific Use File drawn as 80% sample of the original IES database in the respective survey year.

[4] We are indebted to colleagues at the German Federal Statistical Office for their most valuable support.

A. Socio-economic and socio-demographic characteristics. The variable set contains both household- and individual level information. Collected characteristics include region of residence, number of household members, gender, education level, employment and social insurance status, etc. The IES provides personal characteristics for up to nine household members. The first person is the so-called household head, the person of age 20 to 85 and contributing most to household income. The IES variables entering the PIES together with respective harmonized categories and contents are summarized in Table A1 of the Appendix. The upper panel of Table A1 provides household-level socio-demographics, e.g. the region of residence, household size and the number of employed household members. The lower panel summarizes the individual-level information. Each individual-level variable has a unique identifier and a serial number (1 to 9) indicating the person it relates to.

Not all socio-economic and demographic variables assembled in PIES have been collected in all the six IES surveys. For example, educational attainments of household members have not been surveyed between 1978 and 1988. In the 1993 cross section, education attainments of the household head and her/his partner have been surveyed, and of all household members in the later waves. Moreover, changing variable attributes can lead to slight differences in the information content of some PIES variables. For example, seven different social statuses are distinguished in year 1978, nine in 1988, and eleven in 2003. Such inconsistencies are reported in the notes appearing at the bottom of Table A1.

B. Expenditures on goods and services. The IES provides detailed information on household expenditures on services, durable and non durable goods. Amongst others, expenditure categories include food and beverages, electric devices, new cars, various services (e.g., car repairs), or insurances. Over time, the level of dis-aggregation differs. To ensure inter-temporal consistency of PIES expenditure variables, v_i, we have merged IES expenditure variables in several broader categories summarized in Table A2 in the Appendix. All reported levels of IES variables prior to 1998 are converted to yearly level if necessary.[5] Finally, to correct for price changes, expenditure categories are deflated using official consumer price indices for Germany.[6] Altogether, the German

---

[5] Before 1998, expenditures are reported monthly or annually. From 1998 and on, expenditure is always reported per quarter and is left unaltered.

[6] The single exception is the PIES category "food, beverages and tobacco".

Federal Statistical Office distinguishes price indices for twelve consumption categories, K_i (see Table A3 in the Appendix). Table A2 summarizes the K_i each expenditure category relates to.[7]

C. Incomes and other revenues. Table A5 in the Appendix summarizes the IES income categories. Nine broad household-level income categories (e.g., net, gross, disposable, earned household income), total returns, and several sub-categories are provided. For example, earned income is further distinguished in earned income from self employment, earned income from dependent employment and other benefits provided by the employer. Household-level income categories are indicated by a "_hh" appearing as the ending of the corresponding PIES variables. PIES individual-level incomes variables are indicated by the ending "_1" to "_7").[8] Again, we account for the fact that until 1993 some variables are reported per month while others are reported per year. We do not adjust social-transfer variables according to changes in Germany's welfare system.

D. Taxes and contributions. The IES also provides comprehensive information on households' tax burdens, social-security and other contributions. Examples include income and church taxes, payments for compulsory and voluntary insurances. All tax and contribution variables included in PIES appear in Table A6. Again, the ending "_hh" denotes household-level information, whereas individual-level information is indicated by serial numbers "_1" to "_7". Again, we do not control for changes in the legal framework when generating the PIES variables.

E. Inventories. The IES contains several variables documenting households' inventories, e.g. the number of cars and motorbikes, whether the household owns real estate, etc. Inventories are reported in quantities (e.g., the number of new cars in a household's possession), or a dummy variable indicates whether the inventory is in a household's possession (dummy=1) or not (dummy=0). All the inventories entering the PIES database are provided in Table A7 in the Appendix. In case of inter-temporal comparisons it must be kept in mind that technical progress has changed the qualitative properties of several inventories. Prominent examples include audio or video techniques.

---

[7] For all expenditure categories, year 2005 serves as the reference year with all prices equal to 100, which is used for an incorporating the inflation rate into the conversion strategies. IES expenditure variables which cannot be assigned to one of the twelve expenditure categories are summarized in Table A4 in the Appendix. For some categories, the IES provides quantities (i.e. kilograms of fossil and liters of liquid fuels in a household's possession) next to monetary amounts.

[8] Information is provided for the first seven household members at most even if household size exceeds seven members.

F. Wealth. All IES variables on monetary and real wealth are household-level information. Pertaining to real estate, both a self assessed and a market value is reported in the IES. A detailed overview of the derived PIES wealth variables can be found in Appendix A8.

G. Wealth accumulation. The IES provides household-level information on period-specific monetary savings (in the form of assets, building loan agreements, life insurances, bankbooks, etc.) and period-specific acquirement and maintenance of real estate. Table A9 in the Appendix reports all the PIES variables providing information on households' wealth accumulation.

For several PIES variables, information is incomplete. Missing information can be of two types. Uninformative missings result from the fact that the information simply is not provided in IES. For example, until year 1998, individual-level information is provided for up to seven household members, whereas in 2003 several variables are provided for up to six persons only. It can also be the case that a variable in a IES wave is not collected at all. In PIES, uninformative missings are always indicated by a "-1". The IES also contains informative missings. Particularly, when quantities or monetary amounts are involved, and the quantities/amounts are zero for a household, this is sometimes indicated by "0", by "." or by "3." In PIES all the informative missings are indicated by a dot (".") to ease the data handling.

3 Converting annually- to quarterly-surveyed expenditures

3.1 The problem in a nutshell

To understand how a surveying-period reduction impacts on the information content of an expenditure variable, let us consider two stylized types of commodities: a high-frequency good (e.g., food) which is purchased continuously and with high frequency, e.g. on a daily basis; and a low-frequency good (e.g., furniture) which is purchased once per year. Moreover, let us assume that seasonal effects do not occur. In a world with four households, the true expenditure amounts by quarter are provided in the "de facto" matrix of Figure 1. Each row of the matrix pertains to a specific household while each column relates to a quarter.

The upper panel of Figure 1 relates to the high frequency good. Hence, $v_{p,h} > 0$ denotes expenses of household h in quarter p. Is the surveying period a full year, expenses for all four quarters are observed, and $\sum_{p=1}^{4} v_{p,h}$ is stored in IES. The resulting vector is labeled "annual". If every household is surveyed in a random quarter only (the respective quarter is indicated by semi-

bold entries in the "de facto" matrix), only the expenses within the surveyed quarter will be observed. Then the vector "quarter" forms the basis of the respective IES expenditure category. For the high-frequency-good, expected values in quarters p and q for household h should be equal. Therefore, $E\left[v_{p,h}\right]=E\left[v_{q,h}\right]$ for all $p \neq q$, and deflating all the amounts contained in the "annual" vector by four should yield amounts comparable to the "quarter" vector.

$$
\underbrace{\begin{pmatrix} v_{Q1,1} & v_{Q2,1} & v_{Q3,1} & \mathbf{v_{Q4,1}} \\ v_{Q1,2} & v_{Q2,2} & \mathbf{v_{Q3,2}} & v_{Q4,2} \\ \mathbf{v_{Q1,3}} & v_{Q2,3} & v_{Q3,3} & v_{Q4,3} \\ v_{Q1,4} & \mathbf{v_{Q2,4}} & v_{Q3,4} & v_{Q4,4} \end{pmatrix}}_{de\ facto} \Leftrightarrow \underbrace{\begin{pmatrix} \sum_{i=1}^{4} v_{Qi,1} \\ \sum_{i=1}^{4} v_{Qi,2} \\ \sum_{i=1}^{4} v_{Qi,3} \\ \sum_{i=1}^{4} v_{Qi,4} \end{pmatrix}}_{annual} \Leftrightarrow \underbrace{\begin{pmatrix} v_{Q4,1} \\ v_{Q3,2} \\ v_{Q1,3} \\ v_{Q2,4} \end{pmatrix}}_{quarter}
$$

$$
\underbrace{\begin{pmatrix} 0 & v_{Q2,1} & 0 & 0 \\ 0 & 0 & 0 & v_{Q4,2} \\ \mathbf{v_{Q1,3}} & 0 & 0 & 0 \\ 0 & 0 & v_{Q3,4} & 0 \end{pmatrix}}_{de\ facto} \Leftrightarrow \underbrace{\begin{pmatrix} v_{Q2,1} \\ v_{Q4,2} \\ \mathbf{v_{Q1,3}} \\ v_{Q3,4} \end{pmatrix}}_{annual} \Leftrightarrow \underbrace{\begin{pmatrix} 0 \\ 0 \\ \mathbf{v_{Q1,3}} \\ 0 \end{pmatrix}}_{quarter}
$$
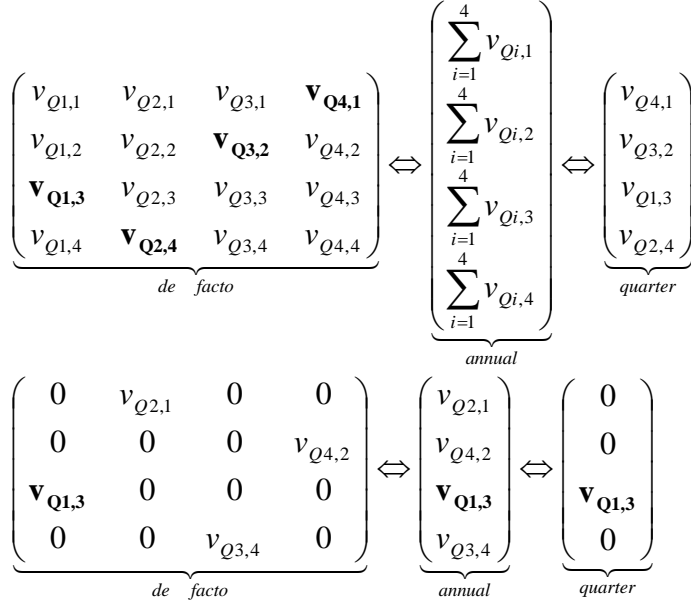
Figure 1. Information content of annually- vs. quarterly-surveyed data

The lower panel of Figure 1 relates to the low-frequency good. Accordingly, the "de facto" matrix in the lower panel contains one strictly positive element in every row. As for the high-frequency good, the "annual" vector stores the total annual expenditures. The quarter vector, however, contains three zero elements and only one strictly positive element. The positive element relates to the household who made the purchase during the surveyed quarter. In case of congruence, expenses in the "quarter" vector and in the "annual" vector are equal. Hence, the conditional expected values in quarters p and q for household h will differ, and $E\left[v_{p,h} \mid v_{p,h}>0\right] \neq E\left[v_{q,h}\right]=0$ for all $p \neq q$.[9] Accordingly, a by-four-division of all the entries in the "annual" will not yield an expenditure distribution different from the one derived from the "quarter" vector.

---

[9] The same problem corroborates to high-frequency goods and services with respective expenditures being made once a year. Insurance fees or club-membership fees are examples.

3.2 Methodology and measures

The surveying-period reduction requires an 'adequate' adjustment of the expenditure variables: adequate in the sense that the converted annually-surveyed data for period t, according to some statistical measure, is similar to its quarterly-surveyed counterpart in $t+5$. The basic idea is to take the 1993 annually- and the 1998 quarterly-surveyed data, and identify the conversion strategy for the 1993 data so that the converted data resemble closest, according to some statistical measures, the 1998 data. The selected conversion strategy is then applied to the whole period 1978 to 1993.

Technically speaking, consider V_A as a row vector containing the *price adjusted* expenditures for a specific good reported by a household when the surveyed period is a full year, and V_Q when the surveyed period is a quarter.[10] An A-to-Q conversion requires the choice of a discount factor, α, and of a frequency transformation, $T(V_A) = \tilde{V}_A$. For example, in case of a division-by-four strategy, $\alpha = 1/4$ and $\tilde{V}_A = V_A$. By means of four statistical measures and two derived indices we seek to assess the suitability of eight conversion strategies, CS_j with $j = 1,...,8$, listed in the Table 1 below.[11]

Table 1 about here

CS_1 leaves the annually-surveyed data unaltered, and can be seen as a benchmark. CS_2 may be appropriate for high-frequency goods such as food or beverages; CS_3 for low-frequency goods such as cars, refrigerators, and other electric devices. CS_4, CS_5 and CS_8 may be useful when purchases are made irregularly and the purchase frequency is low. Expenditures for a driver's license or repairs of durables may be seen as examples. CS_6 and CS_7 may be useful if expenses typically take place about twice a year, e.g. expenses for holidays.

3.3 Assessing the suitability of conversion strategies

Under the assumption that the fundamentals determining expenses for a good are the same in 1993 and 1998, the appropriateness of a conversion strategy can be assessed by comparing statistical measures of the converted annually-surveyed data with the same measures for the quarterly-surveyed data. Our assessments are based on four statistical measures, S_m, with $m = 1,...,4$. S_1 is

---

[10] Table A3 summarizes the consumer prices for different commodity categories for the period 1973 to 2008.

[11] Of course, other conceivable strategies exist. The suggested evaluation strategy, can accommodate all conceivable strategies, though.

the fraction of all households interviewed in a cross section with strictly positive expenditures, for the considered good. S_2 is conditional mean expenditures given that household expenditure is non-negative, while S_3 is the associated conditional standard error and S_4 the conditional kurtosis.

A conversion strategy CS_i weakly dominates all the other strategies CS_j with $j \neq i$ according to statistical measure S_m if,

$$(1) \qquad \left| \frac{S_m\left(\alpha_i \cdot T_i(V_A)\right)}{S_m(V_Q)} - 1 \right| \leq \left| \frac{S_m\left(\alpha_j \cdot T_j(V_A)\right)}{S_m(V_Q)} - 1 \right| \quad \forall j.$$

We rely on the concept of *weak* dominance as statistical measures resulting from different conversion strategies can be coincide (asymptotically). Particularly, for the share of households reporting strictly positive expenditures, S_1, we have,

$$(2) \qquad S_1\left(\alpha_1 \cdot T_1(V_A)\right) = S_1\left(\alpha_2 \cdot T_2(V_A)\right) = S_1\left(\alpha_4 \cdot T_4(V_A)\right) = S_1\left(\alpha_5 \cdot T_5(V_A)\right),$$

$$(3) \qquad S_1\left(\alpha_6 \cdot T_6(V_A)\right) \approx S_1\left(\alpha_7 \cdot T_7(V_A)\right), \text{ and}$$

$$(4) \qquad S_1\left(\alpha_3 \cdot T_3(V_A)\right) \approx S_1\left(\alpha_8 \cdot T_8(V_A)\right).$$

For the conditional means S_2 we have:

$$(5) \qquad S_2\left(\alpha_2 \cdot T_2(V_A)\right) \approx S_2\left(\alpha_3 \cdot T_3(V_A)\right) \approx S_2\left(\alpha_6 \cdot T_6(V_A)\right) \approx S_2\left(\alpha_8 \cdot T_8(V_A)\right), \text{ and}$$

$$(6) \qquad S_2\left(\alpha_5 \cdot T_5(V_A)\right) \approx S_2\left(\alpha_7 \cdot T_7(V_A)\right).$$

Last, for the conditional kurtosis S_4 we have,

$$(7) \qquad S_4\left(\alpha_1 \cdot T_1(V_A)\right) = S_4\left(\alpha_2 \cdot T_2(V_A)\right) = S_4\left(\alpha_4 \cdot T_4(V_A)\right) = S_4\left(\alpha_5 \cdot T_5(V_A)\right) = S_4\left(\alpha_7 \cdot T_7(V_A)\right), \text{ and}$$

$$(8) \qquad S_4\left(\alpha_3 \cdot T_3(V_A)\right) = S_4\left(\alpha_8 \cdot T_8(V_A)\right).$$

Frequently, none of the eight conversion strategies weakly dominates the others by means of all four criteria. Then, the selection of an appropriate conversion strategy requires a judgment from the side of the researcher. For example, a weighted performance index I_i^O capturing the ordinal ordering of the conversion strategies according to each statistical measure can be computed,

$$(9) \qquad I_i^O = \sum_{m=1}^{4} w_m \cdot Rank_i(S_m),$$

where $Rank_i(S_m) = 1,...,8$ denotes the relative performance of conversion strategy i, and $Rank_i(S_m) = 1$ ($Rank_i(S_m) = 8$) indicates that i is the best (worst) performing strategy according to measure S_m. The weight assigned to a measure is denoted w_m with $\sum_{m=1}^{4} w_m = 1$. The best-

performing conversion strategy for the variable in question is the strategy i with the smallest index $I_i^O \ \forall i$.

Such an ordinal ranking is not as innocuous as it may seem. As stated in equation (2) to (8), some statistical measure yield (asymptotically) equal results for a number of conversion strategies. Hence, even a slight underperformance according to one of these measures can cause a considerable penalty for the respective conversion strategy. The selection of the weights w_m may counteract the problem. At the same time, the researcher's selection of the weights should reflect her assessment on the relative relevance of a specific statistic relative to another.

Alternatively, the performance of conversion strategies can be assessed by means of deviations in the measures for the converted 1993 and the unconverted 1998 data. The according index I_i^D based on the absolute value of deviation is defined as,

$$(10) \qquad I_i^D = \sum_{m=1}^{4} w_m \cdot \left| \frac{S_m\left(\alpha_i \cdot T_i\left(V_A\right)\right)}{S_m\left(V_Q\right)} - 1 \right|,$$

with w_m again denoting the weight assigned to a measure. Conversion strategy i weakly-dominates all other strategies if $I_i^D \leq I_j^D \quad \forall j \neq i$.

We have implemented the frequency transformations, $T_i\left(V_A\right)$, by means of a random-number generating process. For example, in case of conversion strategy CS_3 three out of four positive amounts must be replaced by zeros. For this reason, we have generated a random variable, r_h, from the interval $[1,4]$ for each household, and replaced positive expenses by zero whenever $r_h < 3$. Accordingly, a conversion strategy's performance might hinge upon the random-number generating process. For this reason, all four measures and performance indices are computed for 200 bootstrapped samples. The weakly dominant conversion strategy possesses the highest probability of providing us with the closest measures for the converted 1993 and the unconverted 1998 data.

4 Empirical implementation

4.1 Illustration

This section seeks to illustrate the suggested methodology by means of three exemplarily chosen commodities: "food, beverages, tobacco" (PIES variable v_0), "new cars" (v_{24}) and "holidays and travels" (v_{49}). For each commodity, we assess the performance of the 'standard' CS_2 conversion

relative to the best-performing conversion strategy. Corresponding results are summarized in Table 2. Column three lists the measures obtained from the year 1993 data after conversion, column four provides the same measures for the 1998 unconverted data. The adjacent column gives the relative deviations of the measures in percent, $\left(S_m \left(\alpha_i \cdot T_i \left(V_A \right) \right) \big/ S_m \left(V_Q \right) - 1 \right) \cdot 100$, reflecting the conversion strategies' performances.

Table 2 about here

For example, take the results for "food, beverages, tobacco" (v_0) appearing in the first panel of Table 2. For the year 1993 CS_2 converted data, we obtain $\left(99.973; 1,053.529; 565.767; 6.717 \right)$ as the vector of statistical measures. Accordingly, almost every household reports positive expenditures for category v_0, the conditional mean of quarterly expenditures is about € 1,054, the conditional standard error is around € 566, and the Kurtosis is approximately 6.7. The adjacent column provides the same statistics for the unconverted 1998 data, whereas the last column gives the relative deviations of the year 1993 and 1998 measures. Apparently, for v_0, CS_2 gives quite satisfactory results. As many households purchase "food, beverages, tobacco" on an almost daily basis, the good fit of CS_2 should not come as a surprise.

In case of v_{24} and v_{49}, however, CS_2 yields to statistical measures for 1993 which substantially differ from the unconverted 1998 data. The variable v_{24} relates to expenditures for "new cars" while v_{49} relates to "holidays and travels". As can be taken from the second panel of Table 2, the fraction of households with positive expenditures for "new cars" for year 1998 is substantially lower than for the converted 1993 data. Moreover, the conditional mean for year 1998 is about three times higher than for 1993. We are confident that these differences do not result from a structural break in consumption patterns. Instead, the shortening of the surveying period is the most plausible cause: Most German households buy a new car at most once per year, so that the probability of observing expenses for new cars in the data is lowered to 25 percent if the surveying period is reduced from twelve to three months. However, if a purchase is observed, the reported expenditure level should not be affected by the length of the surveying period. The conversion strategy compatible with this presumption is CS_3. Indeed, for CS_3 the statistical measures of the two years are close. Also for v_{49}, strategy CS_2 performs badly. Instead, CS_6 gives particularly

close statistics for the converted 1993 and the unconverted 1998 data. The good performance of CS_6 may be driven by the fact that many households take a vacation twice a year.

Figure 2 provides further evidence on the appropriateness of CS_2 in case of variable v_0. The figure consists of two graphs. The left-hand graph provides histograms for v_0 for all the surveyed households in a cross section. The right-hand graph is based on the sub-sample of households with strictly positive v_0-related expenditures. In both graphs, grey bars rely on the converted year 1993 data, while black dashed bars rely on the year 1998 data. Apparently, the 1993 and 1998 histograms almost coincide. Figures 3 and 4 provide histograms for expenditure categories v_{24} and v_{49}. For both categories, four histograms are provided. Corresponding to Figure 1, the two upper histograms depict the 1998 and 1993 distributions when CS_2 is applied. Underneath, the histograms display the distributions obtained from the best-performing conversion strategy. Both Figures accentuate the need for carefully selecting an adequate conversion strategy, good by good.

Figures 2-4 about here

4.2 Assessment of conversion strategies

For each expenditure category, Table 3 identifies the best-performing conversion strategy according to deviations in the four statistical measures, and according to the indices I_i^D and I_i^O. In the column "best conversion strategy by measure," we give the best conversion strategy according to each measure, S_1 to S_4, resulting from the 200 bootstrapped samples. In the adjacent columns, we provide the best performing strategy according to I_i^D and I_i^O when $\left(w_1 = 0.3; w_2 = 0.3; w_3 = 0.3; w_4 = 0.1 \right)$.

For several expenditure categories, none of the conversion strategies dominates all the others by means of all four measures simultaneously. For twenty variables, however, all four statistical measures identify the same best-performing conversion strategy, i.e. CS_2. For 38 variables, three out of four statistical measures give equivalent recommendations: Conversion strategy CS_2 (CS_4, CS_5, CS_6, CS_7, CS_8) is recommended in 29 (2,1,1,3,2) times simultaneously by three out of four measures. In 40 out 54 cases both indices identify the same best-performing conversion strategy.

Inconsistencies between different measures and indices should not be overrated. For some variables, measures for different conversion strategies are close, and differences in the Indices can

13

change in the underlying weights, w_m. Most importantly, we want to stress that the standard "division-by-four" strategy (CS_2) performs rather poorly for several variables. In combination with the illustrations provided in the previous sections, our findings emphasize the need for a careful, variable-specific selection of conversion strategies. Instead, simply implementing the "division-by-four" strategy for all annually surveyed flow variables (or a "multiplication-by-four" strategy to adjust the quarterly-surveyed data) will lead to heavily biased distributions.

Table 3 about here

5 Concluding remarks

Germany's IES contains valuable information for various research questions. With six cross sections and covering two and a half decades, the different IES cross-sections offer unique long-run information on households' incomes, wealth (accumulation) and expenditures. Yet, the pooling of the cross sections is not as easy as it may seem at a first glance: It not suffices to cope with changing variable definitions and different currencies (Euro vs. Deutschmark). Most problematic is the shortening of the surveying period from twelve to three months from year 1998 and on.

Particularly, a simple division of annually-surveyed (and reported) expenditures by four is not appropriate for all expenditure categories, as it can lead to inter-temporally inconsistent expenditure distributions. Against this backdrop, we have implemented different procedures for converting annually-surveyed data so that they resemble closest, according to several statistical measures, the quarterly-surveyed unconverted data. Appropriateness of conversion strategies rests upon good-specific purchase frequencies. For high-frequency goods, a division of annually-surveyed expenditures by four gives a distribution with properties being similar to a distribution based on quarterly-surveyed data. For other goods, other conversion strategies are preferable. Altogether, we have examined the performance of eight different conversion strategies, and we have summarized results for an extensive set of expenditure categories.

We want to emphasize that an equivalent problem may also arise for other flow variables, i.e. household incomes. Hence, sensible investigations on the long-run dynamics of income and expenditure distributions, inequality and poverty must ensure an adequate treatment of the 1993/1998 survey break. Otherwise, derived measures may reflect changes in the survey design rather than changes in peoples' living conditions.

References

Becker, I., Frick, J.R., Grabka, M.M., Hauser, R., Krause, P., and G.G. Wagner (2002): A Comparison of the Main Household Income Surveys for Germany: EVS and SOEP, in: Hauser, R., and I. Becker (eds.), *Reporting on Income Distribution and Poverty. Perspectives from a German and European Point of View*, Heidelberg: Springer, 55-90.

Becker, I., and R. Hauser (1996): Einkommensverteilung und Armut in Deutschland von 1962 bis 1995. Frankfurt/Main, Institut für VWL. EVS-Projekt.

Becker, I., and R. Hauser (1994): Die Entwicklung der Einkommensverteilung in der Bundesrepublik Deutschland in den siebziger und achtziger Jahren. 3. Frankfurt/Main, Institut für VWL. EVS-Projekt.

Bönke, T. Schulte, K., and C. Schröder: Incomes and Inequality in the Long Run: The Case of German Elderly, *German Economic Review* (forthcoming).

Faik, J., and H. Schlomann (1997): Die Entwicklung der Vermögensverteilung in Deutschland. in: E.-U. Huster (ed.), Reichtum in Deutschland. Die Gewinner der sozialen Polarisierung, Campus: Frankfurt/Main, New York, 89-126.

German Federal Statistical Office (2005): Wirtschaftsrechnungen. Einkommens- und Verbrauchsstichprobe - Aufgabe, Methode und Durchführung der EVS 2003, 15, 7.

German Federal Statistical Office (2002): Wirtschaftsrechnungen. Einkommens- und Verbrauchsstichprobe - Aufgabe, Methode und Durchführung der EVS 1998, 15, 7.

German Federal Statistical Office (2000): Einkommen und Einnahmen privater Haushalte in Deutschland – Ergebnisse der Einkommens- und Verbrauchsstichprobe für das erste Halbjahr 1998, *Wirtschaft und Statistik*, 2, 125-13.

German Federal Ministry of Labor and Social Affairs (2008): Der 3. Armuts- und Reichtumsbericht der Bundesregierung, Berlin.

Hauser, R. (1999): Personelle Primär- und Sekundärverteilung der Einkommen unter dem Einfluss sich ändernder wirtschaftlicher und politischer Rahmenbedingungen. Eine empirische Analyse auf der Basis der Einkommens- und Verbrauchsstichproben 1973-1993, *Allgemeines Statistisches Archiv*, 83, 88-110.

Table 1. Conversion strategies

Conversion strategy	Discount factor	Frequency transformation	Interpretation
1	$\alpha = 1$	$\tilde{V}_A = V_A$	Leave all the annual values unchanged.
2	$\alpha = 0.25$	$\tilde{V}_A = V_A$	Multiply each and every amount by 0.25.
3	$\alpha = 1$	$\tilde{V}_A = T_3(V_A)$	Randomly replace three out of four positive amounts by zero.
4	$\alpha = 0.75$	$\tilde{V}_A = V_A$	Multiply each and every amount by 0.75, and refrain from making a frequency transformation.
5	$\alpha = 0.5$	$\tilde{V}_A = V_A$	Multiply each and every amount by 0.5, and refrain from making a frequency transformation.
6	$\alpha = 0.5$	$\tilde{V}_A = T_6(V_A)$	Multiply each and every amount by 0.5, and randomly replace each second positive amount by zero.
7	$\alpha = 1$	$\tilde{V}_A = T_7(V_A)$	Randomly replace each second positive amount by zero.
8	$\alpha = 0.25$	$\tilde{V}_A = T_8(V_A)$	Multiply each and every amount by 0.25, and randomly replace three out of four positive amounts by zero.

Table 2. Performance of conversion strategies

PIES variable	Statistical measure	Conversion strategy	1993 Post-conversion estimate	1998 Non-converted estimate	Relative deviation in percent
v_0	S_1	CS_2	99.973	100.00	0.027
	S_2		1,053.529	1,016.729	-3.493
	S_3		565.767	523.932	-7.394
	S_4		6.717	4.655	-30.698
v_{24}	S_1	CS_2	6.480	1.706	-73.680
	S_2		3,942.418	15,760.200	299.760
	S_3		1,910.411	6,276.221	228.527
	S_4		14.503	5.756	-60.312
	S_1	CS_3	1.641		3.943
	S_2		15,947.500		-1.174
	S_3		7,505.910		-16.383
	S_4		11.959		-51.869
v_{49}	S_1	CS_2	84.919	48.465	-42.927
	S_2		303.170	657.878	88.589
	S_3		368.175	842.016	109.584
	S_4		27.624	25.257	-1.336
	S_1	CS_6	42.282		14.624
	S_2		691.623		-4.879
	S_3		781.539		7.738
	S_4		20.357		24.070

Note. Unweighted estimates. Expenditures have been adjusted according to changes in consumer prices between 1993 and 1998. Relative deviations are given by the ratio of the post-conversion measure for year 1993 divided by the year 1998 measure.

Table 3. Conversion strategies by expenditure types

PIES variable	Variable	Best ranked conversion strategy by measure				I_i^O	I_i^D
		1	2	3	4		
v_0	Food, beverages, tobacco	2	8	2	3	2	2
v_{01}	Expenses for restaurants, takeaway food, etc.	2	2	2	3	2	2
v_{02}	Clothing	2	2	2	5	2	2
v_{05}	Shoes and shoe repair	2	2	2	2	2	2
v_{06}	Housing: rent for house or flat	2	8	2	2	2	2
v_{07}	Housing: sublease	7	2	2	3	8	2
v_{08}	Housing: imputed	2	8	2	2	2	2
v_{09}	Housing: Gas and electricity	2	8	2	3	2	2
v_{10}	Housing: Solid fuels (coal, wood) for heating	3	6	6	2	8	8
v_{11}	Housing: Liquid fuels for heating	7	6	8	3	6	6
v_{12}	Housing: contributions for heating and warm water	2	2	2	3	2	2
v_{14}	Electric appliances	3	4	7	2	4	3
v_{15}	Electric domestic appliances	2	8	2	5	2	2
v_{16}	Refrigerator	3	4	7	3	4	3
v_{17}	Washing machine, drying machine, ironing machine	3	7	7	3	3	3
v_{18}	Dishes and other durables for housekeeping	2	8	2	5	2	2
v_{19}	Materials for renovating of flat or house	7	4	6	2	4	6
v_{20}	Wages paid for renovating of flat or house	7	4	8	2	4	6
v_{21}	Domestic services and repairs	2	8	2	2	2	2
v_{24}	Expenses for new car	3	7	7	3	3	3
v_{25}	Expenses for old car	3	7	7	2	3	3
v_{26a}	Expenses for motorbike	3	7	7	5	3	7
v_{26b}	Expenses for bike	3	4	7	2	4	3
v_{27}	Fuel and lubricants	2	8	2	2	2	2
v_{28}	Repairs of car and motorbike	2	8	5	3	2	2
v_{29}	Car/bike accessory	2	6	5	3	5	5
v_{30}	Rent for garage and parking	3	2	4	3	8	8
v_{32}	Tickets for bus, train, etc.	2	8	2	3	2	2
v_{33}	Phone & fax charges	2	2	2	3	2	2
v_{34}	Post services	2	2	2	5	2	2

Table 3 continued

v_{35}	Durables personal hygiene	2	2	2	2	2	2
v_{36}	Durables personal health	2	4	4	3	4	8
v_{37}	Non-durables personal health	2	2	2	5	2	2
v_{38}	Hospital & nursing home	7	6	6	3	6	6
v_{39}	Doctor charges	7	6	5	3	6	5
v_{40}	Dentist charges	7	8	5	3	8	6
v_{41a}	TV and video	3	4	7	5	4	3
v_{41b}	Computer	2	6	5	2	5	5
v_{42}	Optic devices (camera, etc.)	2	2	2	3	2	2
v_{43}	Books and booklets	2	8	2	5	2	2
v_{44}	Newspaper and magazines	2	8	2	5	2	2
v_{45}	Theater, concert, cinema, sport events	2	2	2	2	2	2
v_{46}	Durables recreation	7	4	7	5	4	7
v_{47}	Toys for children	2	8	2	4	2	2
v_{48}	External child care	2	2	2	5	2	2
v_{49}	Holidays and travels	7	6	4	5	6	6
v_{50}	TV and radio charges	2	8	2	3	2	8
v_{51}	Culture and recreation: other expenditures	2	8	2	5	2	2
v_{52}	Repairs durables	2	8	2	3	2	2
v_{53}	Clocks and adornments	7	2	5	5	2	5
v_{54}	Bank and insurance services	2	2	2	2	2	2
v_{59}	Automobile insurance	2	4	4	3	4	4
v_{80}	Driver's license	2	8	2	2	2	2
v_{81}	Lease for garden	2	2	2	5	2	2

Note. Own calculations.

19

Figure 2. Histograms for expenditure category v_0

Note. Black dashed bars indicate year 1998; grey bars refer to 1993. Upper row: conversion strategy 2 (which is also identified as the best) (left graph: all observations, right graph: only observation with positive expenditure level).

Database. IES 1993 and IES 1998.

Figure 3. Histograms for expenditure category v_{24}

Note. Black dashed bars indicate year 1998; grey bars refer to 1993. Upper row: conversion strategy 2, Lower row: best conversion strategy (3). Left graph: all observations, right graph: only observation with positive expenditure level.
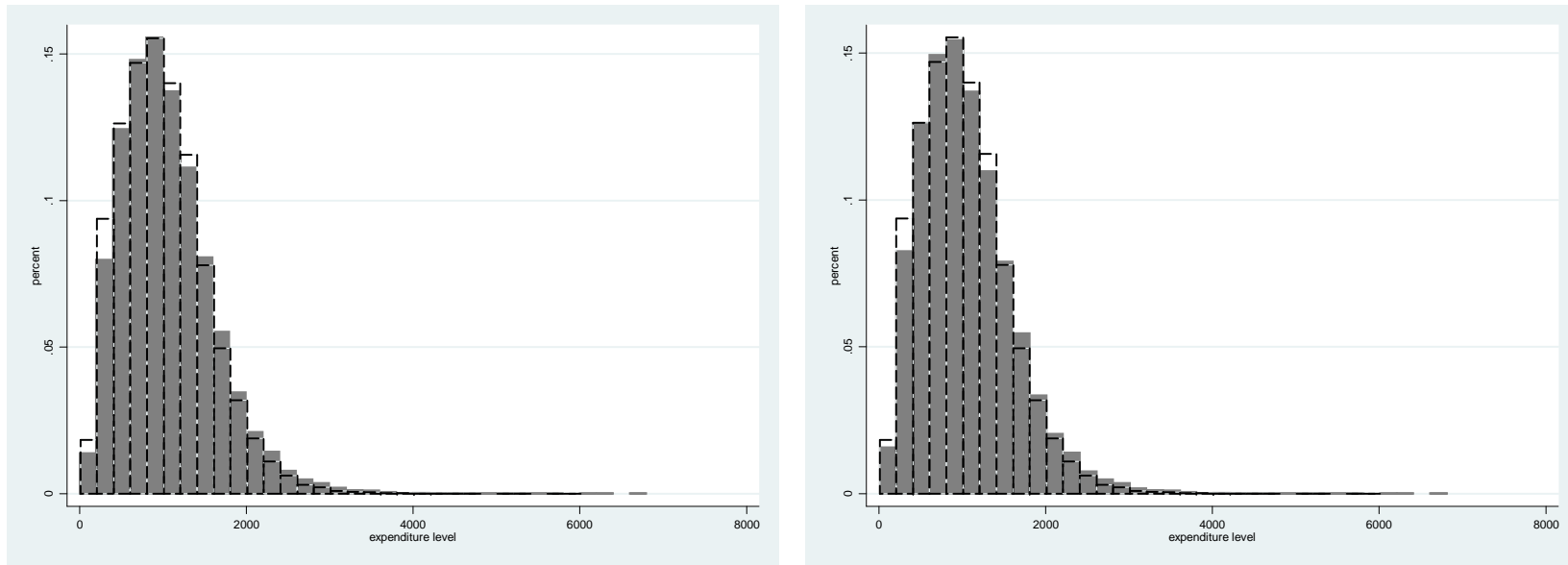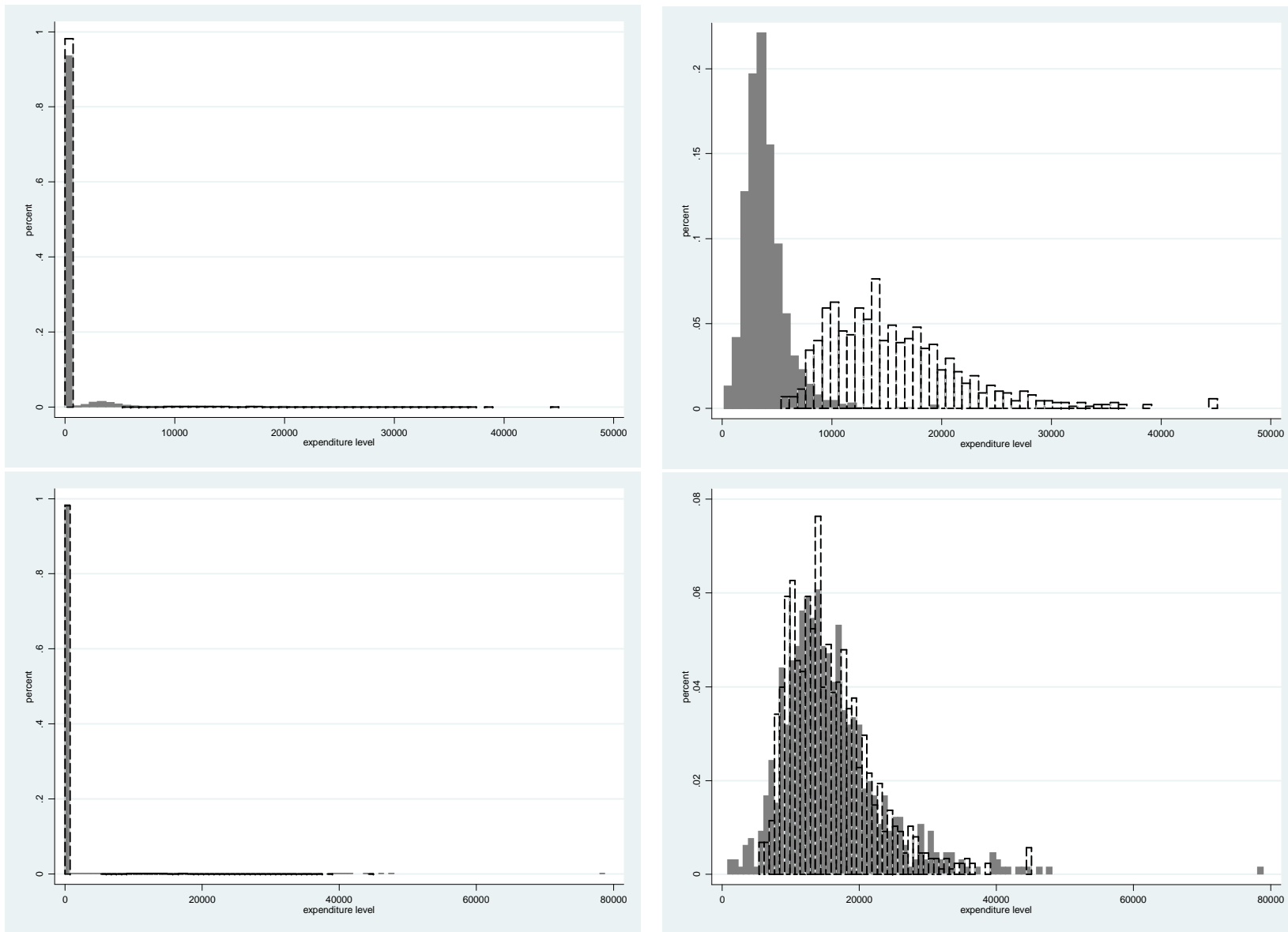
Database. IES 1993 and IES 1998.
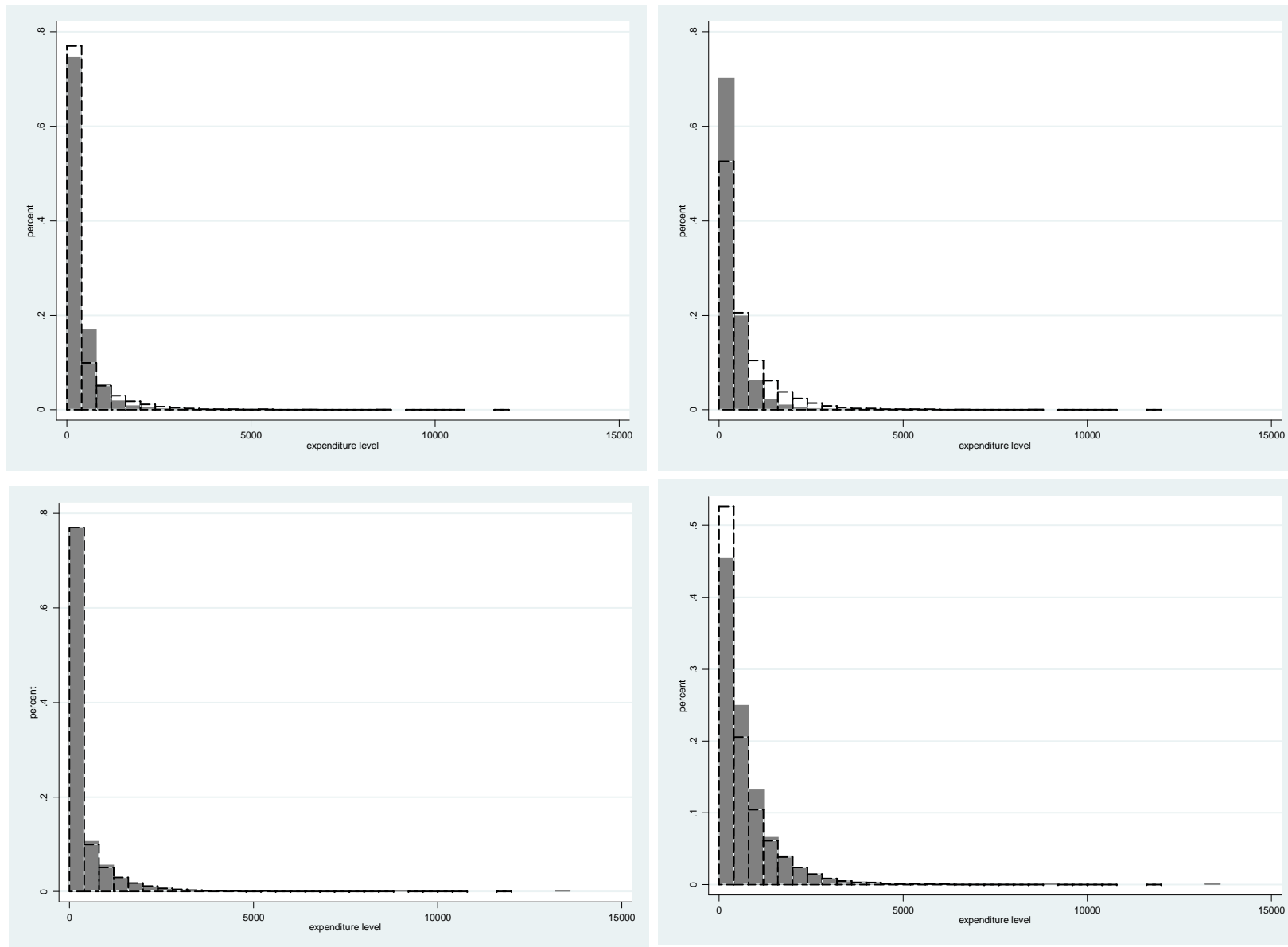
Figure 4. Histograms for expenditure category v_{249}

Note. Black dashed bars indicate year 1998; grey bars refer to 1993. Upper row: conversion strategy 2, Lower row: best conversion strategy (3). Left graph: all observations, right graph: only observation with positive expenditure level.

Database. IES 1993 and IES 1998.

APPENDIX

Table A1. Socio-economic and demographic variables

PIES variable	Variable description	Variable coding (categories)	Not available in wave
HOUSEHOLD LEVEL			
hhid	Household identification number		
year	Year when the IES data have been collected		
w_bnd	Frequency weight for the federal level		
w_lnd	Frequency weight for the federal state level		
land	Federal state	01 = Schleswig-Holstein; 02 = Hamburg; 03 = Lower Saxony; 04 = Bremen; 05 = North Rhine-Westphalia; 06 = Hesse; 07 = Rhineland-Palatinate; 08 = Baden-Württemberg; 09 = Bavaria; 10 = Saarland; 11 = Berlin-West; 12 = Brandenburg;13 = Mecklenburg-Western Pomerania; 14 = Saxony; 15 = Saxony-Anhalt; 16 = Thuringia; 22 = Berlin-East	
hhtyp	Household type	1 = alone living female; 2 = alone living male; 3 =single parent with child(ren); 4 = (Married) couple without children; 5 = (Married) couple with children; 6 = other household type	
n_pershh	Number of household members	1 – 9 (where 9 means nine and more)	
n_earner	Number of employed household members	0 – 4 employees (where 4 means four and more)	
n_increc	Number of income recipients in the household	0 – 5 (where 5 means five and more earners)	
d_socwel	Social assistance recipients in the household	0 = no; 1 = yes	

Table A1 continued

INDIVIDUAL LEVEL			
Person 1			
poshh_1	Position in the household	1 = head of the household	
sex_1	Gender	1 = male; 2 = female	
byear_1	Birth year		
famst_1	Marital status	1 = unmarried; 2 =married; 3 = widowed; 4 = divorced	
nation_1	Nationality	1 = German; 2 = other nationality	
educ_1	Highest occupational level of education	1 = university degree; 2 = univ. of appl. sciences degree; 3 = apprenticeship completed at technical school (and equivalent degrees); 4 = apprenticeship completed; 5 =student or trainee; [A] 6 = no occupational degree, pupil[A]	78 – 88
labst_1	Employment status	1 = self-employed farmer; 2 = self employed; 3 = civil servant; 4 = white-collar worker; 5 = blue-collar worker; 6=jobless; [B] 7 = not working[B]	
penst_1	Old age insurance	1 = compulsory insured employee; 2 = compulsory insured self employed person; 3 = voluntarily insured; 4 = not insured	
carest_1	Long term care insurance	1 = self compulsory insured in public system; 2 = compulsory insured in public system via partner; 3 = self compulsory insured in private system; 4 = compulsory insured in private system via partner; 5 = none of the above	78 – 93
living_1	Predominant sustenance status	1 = employment, old-age part time; 2 = pensioner; 3 = (married) partner, parents, wealth, public transfers	
hwork_1	Weekly hours of work	0=zero; 9= less than ten; 10-80 = ten to less than 80; 80= 80 and more	78 – 98

Table A1 continued

Person 2			
poshh_2	Status in the household	2 = (marital) partner; 3 = child of person 1 or 2; 4 = other household member	
sex_2	Gender	1 = male; 2 = female	
byear_2	Birth year		
famst_2	Marital status	1 = unmarried; 2 = married; 3 = widowed; 4 = divorced	
nation_2	Nationality	1 = German; 2 = other nationality	78 – 83
labst_2	Employment status	1 = self-employed farmer; 2 = self employed; 3 = civil servant; 4 = white-collar worker; 5 = blue-collar worker; 6=jobless; [C] 7 = not working[C]	
educ_2	Highest occupational level of education	1 = university degree; 2 = univ. of appl. sciences degree; 3 = apprenticeship completed at technical school (and equivalent degrees); 4 = apprenticeship completed; 5 =student or trainee; [D] 6 = no occupational degree, pupil[D]	78 - 88
penst_2	Old age insurance	1 = compulsory insured employee; 2 = compulsory insured self employed person; 3 = voluntarily insured; 4 = not insured	
carest_2	Long term care insurance	1 = self compulsory insured in public system; 2 = compulsory insured in public system via partner; 3 = self compulsory insured in private system; 4 = compulsory insured in private system via partner; 5 = none of the above	78 – 93
living_2	Predominant sustenance status	1 = employment, old-age part time; 2 = pensioner; 3 = (married) partner, parents, wealth, public transfers	
hwork_2	Weekly hours of work	0=zero; 9= less than ten; 10-80 = ten to less than 80; 80= 80 and more	78 – 98

Person 3-9   See person 2

Notes. [A] In 1993 categories 5 and 6 not distinguished. [B] In 1978 categories 6 and 7 are not distinguished. Reported is category 7. [C] In 1978 categories 6 and 7 are not distinguished. Reported is category 7. [D] In 1993 education is reported for the first person and her partner only; no distinction is made between categories 5 and 6.

Table A2. IES expenditure categories and corresponding IES variables

Expenditure category	IES category	PIES variable	Original field identifiers (EF) in original IES wave					
			1978	1983	1988	1993	1998	2003
Food, beverages, tobacco	K_1, K_2	v_0	476, 477	544, 545	544, 545, 547	642, 643, 644	737	225-229
Expenses in restaurants, takeaway food, etc.	K_{11}	v_{01}	478	546	546	645	847-849	343, 344
Clothing	K_3	v_{02}	479, 480-484, 486-489	547-576	548-560, 575-577	664-693	741-745	230-235
Services for clothes and shoes	K_3	v_{03}	485, 490, 494	582, 583	583, 584	---	[746, 750]	236, 237, 242
Shoes and shoe repair	K_3	v_{05}	491-493	577-581	578-582	694-697	747-749	238-241
Housing: rent for house and flat	K_4	v_{06}	495	584	585	702	751, 757	245, 246
Housing: sublease	K_4	v_{07}	496	585	586	703	752, 760	243, 244
Housing: imputed rent	K_4	v_{08}	497	586	587	704	763, 764	247-249, 251, 302, 303
Housing: gas and electricity	K_4	v_{09}	498	587, 588, 595	588-590, 597	705, 707,719	770, 771, 773, 774	258, 259
Housing: solid fuels for heating	K_4	v_{10}	499-502	590-593	592-595	711, 713, 715, 717	779, 780	261
Housing: liquid fuels for heating	K_4	v_{11}	503	589	591	709	776, 777	260
Housing: contributions for heating and warm water	K_4	v_{12}	504	594	596	718	782, 783	262
Furniture, mattresses, carpets, soft furnishings	K_5	v_{13}	505-507	596-600	598-602	[721-725]	785,786,788	264, 265, 267,268
Electric appliances	K_5	v_{14}	508-510, 514-516	601, 602, 605	603, 604, 607	726, 727, 731	789	271
Electric domestic appliances (others)	K_5	v_{15}	511, 517	607	609	732	792	272
Refrigerator	K_5	v_{16}	512	603	605	728	790	269

Table A2 continued

Washing machine, drying machine, ironing machine	K_5	v_{17}	513	604	606	729	791	270
Dishes and other durables for housekeeping	K_5	v_{18}	518-519	608	610	733	794	274, 275, 277
Materials for renovation of flat or house	K_4	v_{19}	520	612	615	738	766, 767	252, 253
Wages paid for renovation of flat or house	K_4	v_{20}	521	613	616	739	768,769	254, 255
Domestic services and repairs	K_5	v_{21}	522, 523, 530, 531	611	613, 614	736, 737	793, 797 [787]	266, 273, 279
Domestic animals, plants, and small electric devices	K_5	v_{22}	524-527, [579]	606, 669-674, 676, 677 [675]	608, 676-681 [682-684]	730, 805-808	[795, 831, 832]	276, 324-326
Housekeeping (expenses for non-durables such as detergents)	K_5	v_{23}	528, 529	609, 610	611, 612	734, 735	[796]	278
Expenses for purchase of new car	K_7	v_{24}	532	625	630	755	805	292
Expenses for purchase of used car	K_7	v_{25}	533	626	631	756	806	293
Expenses for purchase of motorbike	K_7	v_{26a}	---	627	632	757	807	294
Expenses for purchase of bike	K_7	v_{26b}	---	628	633	758	808	295
Fuel and lubricants	K_7	v_{27}	535, 544	631, 638	636	761, 762, 768	810	299
Repairs of car/motorbikes	K_7	v_{28}	[536, 542]	[633, 634]	[638, 639]	764	811	300
Car/bike accessory	K_7	v_{29}	538-540 [537]	632 [629, 632]	634, 637 [635]	759, 763	809	297, 298
Rent for garage and parking	K_7	v_{30}	[541]	[636]	[641]	766	812	301

Table A2 continued

Public transportation (tickets for bus, train, etc.)	K_7	v_{32}	545, 546	639, 640	644, 645	771-773	814-818	305-308
Phone and fax charges	K_8	v_{33}	547	641	646	774	821	311-313
Post services	K_8	v_{34}	548	642	647	775	819	309
Durables personal hygiene	K_{12}	v_{35}	549-551	620-624	625-629	750-754	853, 854	346-350
Durables personal health	K_6	v_{36}	552, 557	615, 618	620, 623	743, 747, 748	800, 803, 857	284, 286, 287, 290, 354
Non-durables personal health	K_6	v_{37}	553	614	617-619	740-742	798, 799	280-283
Hospital and nursing home	K_6	v_{38}	554	619	624	749	804	291
Doctor charges	K_6	v_{39}	555	616	621	744	801	288
Dentist charges	K_6	v_{40}	556	617	622	745, 746	802	285, 289
TV and video	K_9	v_{41a}	559, 560	643, 644, 646	648, 649, 651	777, 780, 779	823	315
Computer	K_9	v_{41b}	---	651	656	785	825	317
Optic devices	K_9	v_{42}	563-565, 573, 574	648-650, 662, 658	653-655, 663, 667	782-784, 796, 793	824	316
Books and booklets	K_9	v_{43}	566	660	665	794	840	333
Newspapers and magazines	K_9	v_{44}	567	661	666	795	839	334
Theater, concert, cinema and sport events	K_9	v_{45}	568-570	666	671, 672	800, 801	834	328
Durables for recreation	K_9	v_{46}	571, 572, 576,578	652, 654-657	657, 659-662	787, 788, 790-792	828	296, 320, 323

Table A2 continued

Toys for children	K_9	v_{47}	575	653	658	789	830	322
External child care	K_9	v_{48}	583	665, 664	669, 670	798, 799	845, 858	339, 341
Holidays and travel	K_{11}	v_{49}	584, 593-595	679, 684-692	686, 691-699	776, 819, 820-827	842, 843, 851	337, 338, 345
TV and radio charges	K_9	v_{50}	585	667	673	802	835	330
Lotto, toto and other gambling	K_9	v_{51}	[586, 590-592, 597, 598]	668, 681-683, 694, 702, 703	674, 675, 688-690, 701, 709-714	804, 816-818, 829, 849, 850-855	836-838	329-332, 368, 369, 372
Repairs durables	K_5	v_{52}	587	678	685	814	829	319, 321
Clocks and adornments	K_{12}	v_{53}	588, 589	680	687	815	855	352
Bank and insurance devices	K_{12}	v_{54}	596	693	700	828	859	355
Automobile insurance	K_{12}	v_{59}	603	700	707	846	866	364
Driver's license	K_7	v_{80}	---	635, 637	640 [642]	769, 770 [767]	813	304
Lease for garden	K_{12}	v_{81}	---	707	717	---	896	398

Note. Field identification numbers in brackets and appearing in grey color are not included in our database, yet can be provided by the German Federal Statistical Office. Whenever "---" appears, the variable is not surveyed in the respective year.

Table A3. Changes in consumer prices

Category	Type of expenditure	1993	1998	2003	2008
K_1	Food and non-alcoholic beverages	91.9	97.2	100.3	112.3
K_2	Alcoholic beverages and tobacco	70.8	75.3	86.3	108.4
K_3	Clothing and shoes	97.8	101.5	102.6	101.4
K_4	Housing rent, water, electricity, gas and other fuels	77.1	87.7	95.8	108.5
K_5	Furniture and related items for the household and its maintenance	93.7	98.1	100.5	102.5
K_6	Health care	69.5	83.1	82.5	103
K_7	Transport	73.7	81.3	93.9	110.5
K_8	Communication	135.3	132.2	102.7	91.8
K_9	Leisure, entertainment and culture	95.5	100.6	102	99.8
K_{10}	Education	65.5	84.6	95	137.9
K_{11}	Accommodation and related services	84.4	90.9	99.1	106.3
K_{12}	Other goods and services	79.5	88	97.9	105.9

Table A4. Further expenditure categories

Expenditure category	PIES variable	Original field identifiers (EF) in original IES wave					
		1978	1983	1988	1993	1998	2003
Voluntary contributions: pension, old age and burial funds	v_{54}	599	695	702	843	723-729	217u1-217u6
Voluntary contributions: public pension fund	v_{56}	600	696	703	841	709-715	215u1-215u6
Voluntary contributions: public health insurance	v_{57}	601	697	704	842	716-722	214u1-214u6
Voluntary contributions: private health insurance	v_{58}	602	698	705	845	730-736	218u1-218u6
Voluntary contributions: other contributions	v_{58a}	604	699, 701	706, 708	847, 848	[867, 868, 870]	363, 366, 367
Automobile tax	v_{60}	605	704	715	836	864	360
Inheritance and gift tax, dog and other minor taxes	v_{61}	606	705, 706	716	835	667-673,863	358, 361, 362,
Reported: Food and beverages during vacations	v_{75}	625	726, 727	736	646, 662, 663	---	---
Reported: kg of black coal	v_{76}	626	731	742	712	---	---
Reported: kg of brown coal	v_{77}	627	733	744	716	---	---
Reported: kg of brown coke	v_{78}	628	732	743	714	---	---
Reported: liters of heating oil	v_{79}	629	730	741	710	---	---

Note. Field identification numbers in brackets and appearing in grey color are not included in our database, yet can be provided by the German Federal Statistical Office. Whenever "---" appears, the variable is not surveyed in the respective year.

Table A5. Income categories

Income category	PIES variable	Original field identifiers (EF) in original IES wave					
		1978	1983	1988	1993	1998	2003
Household gross income	ygross	27	27	17	96	115	40
Household net income	ynet	28	28	19	98	116	41
Disposable household income	ydisp	29	29	20	99	117	42
Earned income	yearn	n.a.	30	21	100	118	43
Earned income from dependent employment	yempl	n.a.	31	22	101	119	44
Earned income from self employment	yself	n.a.	32	23	102	120	45
Investment income	yprop	n.a.	33	24	103	121	47
Income from public transfers	ypubtra	n.a.	34	25	104	122	48
Income from private transfers	ypritra	n.a.	35	26	105	123	49
Total returns	totinc	30	38	29	108	124	50
Earned income							
Earned income from self employment	e01hh; e01u1-e01u7	157-163; 164-170; 171-177; 178-184; 185-191; 192-198	195-201; 202-208; 209-215; 216-222; 223-229; 230-236	194-200; 201-207; 208-214; 215-221; 222-228; 229-235	324 - 330; 331 - 337; 338 - 344; 345 - 351; 352 - 358; 359 - 365	328-334; 335-341; 342-348	121-124
Earned income from dependent employment	e02hh; e02u1-e02u7	149-156	187-194	186-193	303 – 309	251-257; 314-320; 321-327; 258-264; 272-278; 279-285; 286-292	100; 102; 103; 104; 99; 108-120
Other benefits from employer	e03hh; e03u1-e03u7	n.a.	n.a.	n.a.	n.a.	265-271; 293-299; 300-306; 307-313	101; 105-107
Public transfers							
Sickness benefit	e04hh; e04u1-e04u7	262-268; 393; 409[A]	300-306; 447; 458 [A]	299-305; 454; 465 [A]	429 - 435; 590; [A] 591 [A]	405-411; 412-418	133; 134
(Gross)Pension PAYG, own entitlement	e05hh; e05u1-e05u7	199-205	237-243	236 - 242	366-372	349-355	125
(Gross)Pension PAYG, surviving dependents	e06hh; e06u1-e06u7	206-212; 213 – 219	244-250; 251-257	243-249; 250 - 256	373 - 379; 380 - 386	377-383	126

Table A5 continued

(Gross)Pension, pension schemes of the liberal profession	e07hh; e07u1-e07u7	n.a.	n.a.	n.a.	n.a.	356-362	127
Benefits from PAYG to social insurance	e08hh; e08u1-e08u7	n.a.	n.a.	n.a.	n.a.	363-369; 370-376	128; 129
Other pensions from supplementary insurance (own entitlements and surviving dependents)	e09hh; e09u1-e09u7	241-247; 248-254; 255-261	279-285; 286-292; 293-299	278-284; 285-291; 292-298	387 - 393; 394 - 400; 401-407	384-390; 391-397	130;131
Other pensions (accident insurance, war victim insurance, pension paid abroad, EU social funds, other entitlements from statutory pension funds)	e10hh; e10u1-e10u7	220-226; 227-233; 234-240; 290-296; 297-303; 304-310	258-264; 265-271; 272-278; 356-362; 363-369; 370-376	257-263; 264-270; 271-277; 362-368; 369-375; 376-382	408 - 414; 415 - 421; 422 - 428; 485 - 491; 492 – 498	398-404; 503-509; 510-516; 517-523; 524-530	132; 147; 148; 150
Early retirement and part-time work pensions	e11hh; e11u1-e11u7	n.a.	n.a.	n.a.	513-519	559-565	156
(Gross)Pensions for civil servants (own entitlements and surviving dependents)	e12hh; e12u1-e12u7	332-338; 339-345; 346 - 352	377-383; 384-390; 391-397	383-389; 390-396; 397 - 403	520 - 526; 527 - 533; 534 - 540	566-572; 573-579	158; 159
Federal Education and Trainings Assistance (BAföG)	e13hh; e13u1-e13u7	325-331	328-334	334-340	478-484	496-502	146
Other routine transfers from employment promotion	e14hh; e14u1-e14u7	283-289	321-327	320-326	450-456	433-439	137; 149
Unemployment benefits, short-time and bad-weather allowance	e15hh; e15u1-e15u7	269-275; 276-282	307-313; 314-320	306-312; 313-319	436-442; 443-449	419-425; 426-432	135; 136
Other one-time transfers from employment promotion and social insurance	e16hh; e16u1-e16u7	394; 410 [A]	448; 459 [A]	455; 466 [A]	592 [A]; 593 [A]	440-446	138
Housing allowance	e17hh; e17u1-e17u7	391	445	452	589	461-467	141
Social welfare for living	e18hh; e18u1-e18u7	318 – 324	349-355	355-361	464 – 470	475-481	143
Unemployment assistance (Arbeitslosenhilfe)	e19hh; e19u1-u7	311-317	342-348	348 – 354	506 – 512	552-558	155
Need-oriented basic social care	e20hh; e19u1-u7	n.a.	n.a.	n.a.	n.a.	n.a.	157

Table A5 continued

Social welfare in special life circumstances	e21hh; e21u1-e21u7	395; 411	449; 460	456; 467	596; 597	482-488	144
Children allowance	e22hh; e22u1-e22u7	390	444	451	588	447-453	139
Maternity allowance	e23hh; e23u1-e23u7	n.a.	335-341	341-347	457-463	454-460	140
Maintenance advance (Unterhaltsvorschussleistungen)	e24hh; e24u1-e24u7	n.a.	n.a.	n.a.	n.a.	468-474	142
Child-raising allowance	e25hh; e25u1-e25u7	n.a.	n.a.	327-333	471-477	489-495	145
Other transfers, equalization of burdens pensions, nursing allowance	e26hh; e26u1-e26u7	n.a.	n.a.	n.a.	n.a.	531-537; 538-544	151; 152
Other transfers from local authorities (home buyer allowance and related benefits)	e27hh; e27u1-e27u7	398; 414	452; 463	459; 470	499-505; 600; 601	545-551	153; 154
Incomes from wealth							
Net revenues rent and lease	e28hh	388 minus 497	440 minus 586	446	583	602	163
Rent value of condo	e29hh	497	586	447	584	603-605	164
Revenues from monetary assets	e30hh	389	441-443	448-450	585-587	606-608	165-167
Incomes from non-public transfers							
Company pension	e31hh; e31_u1-u7	353-359	398-411	404-417	541-554	580-593	160; 161
Other non-public transfers	e32hh	360-366; 367-373; 374-380; 381-387; 399; 415	412-418; 419-425; 426-432; 433-439; 453; 464	418-424; 425-431; 432-438; 439-445; 460; 471	555-561; 562-568; 569-575; 576-582; 602-605	611-614; 615; 616	170-174; 176; 175
Other returns							
Sublease	e33hh	392	446	453	614	617	177
Revenues from sale of goods	e34hh	404-406	469-471	476-478	615; 616	618; 619; 620	178; 179; 180
Tax refund	e35hh	396; 412	450; 461	457; 468	594; 595	609	168
Revenues from release of property							
Private pensions and life insurance	e36hh; e36u1-e36u7	426	481	488	625	594-600	162

Note. [A] classified in income brackets.

Table A6. Taxes and contributions

Taxes and contributions	PIES variable	Original field identifiers (EF) in original IES wave					
		1978	**1983**	**1988**	**1993**	**1998**	**2003**
Deductions from income	s0hh	48	59	50	124	138	67
Other taxes	s01hh	n.a.	n.a.	n.a.	125	139	68
Church tax	s02hh; s02u1-s02u7	462-468	523-529	530-536	833	653-659	207u1-207u6
Payroll taxes	s03hh; s03u1-s03u7	448-461	509-522	516-529	830; 831	646-652	208u1-208u6
Solidarity surcharge (investment grant in 1983)	s04hh; s04u1-s04u7	n.a.	537-543	n.a.	n.a.	660-666	209u1-209u6
Property tax	s05hh; s05u1-s05u7	469-475	530-536	537-543	832	n.a.	n.a.
Car tax	s06hh	605	704	715	836	864	360
Legacy, gift dog and other taxes, other contributions	s07hh	606	705; 606	716	834; 835; 837	667-672; 863; 865	358; 359; 361; 362
Some of all social security contributions	s09hh	n.a.	n.a.	n.a.	126	140	69
Obligatory contributions public health insurance	s10hh; s10u1-s10u7	441-447	488-494	495-501	839	695-701	210u1-210u6
Obligatory contributions unemployment insurance	s11hh; s11u1-s11u7	n.a.	502-507	509-515	840	702-708	211u1-211u6
Obligatory contributions PAYG pension	s12hh; s12u1-s12u7	434-440	495-501	502-508	838	674-680	212u1-212u6
Voluntary contributions public health insurance	s13hh; s13u1-s13u7	601	697	704	842	716-722	214u1-214u6
Voluntary contributions PAYG pension	s14hh; s14u1-s14u7	600	696	703	841	709-715	215u1-215u6
Obligatory contributions long term care insurance	s15hh; s15u1-s15u7	n.a.	n.a.	n.a.	n.a.	681-687	216u1-216u6
Contributions private health insurance	s16hh; s16u1-s16u7	602	698	705	844; 845	730-736	218u1-218u6
Obligatory contributions private long term care insurance	s17hh; s17u1-s17u7	n.a.	n.a.	n.a.	n.a.	688-694	219u1-219u6
Other deductions (garnishment of wages, etc.)	s18hh; s18u1-s18u7	n.a.	n.a.	714	854	141	220u1-220u6

Note. Since 2003, taxes and contributions are only reported for the first six persons in the household. Before, taxes and contributions of the first seven household members have been reported. To ensure comparability of the household-level aggregates, we derive it always for only the first six persons in the household.

Table A7. Inventories

Type of inventory	PIES variable	Original field identifiers (EF) in original IES wave					
		1978	1983	1988	1993	1998	2003
Number of new cars	i_1	55	65u1	65u1	186u1	218	408
Number of used cars	i_2	56	66u1	66u1	187u1	219	409
Number of leased cars	i_3	n.a.	n.a.	67u1	188u1	220	E410
Number of motorbikes	i_4	57	67u1, 68u1	68u1, 69u1	189u1, 190u1	221	411
Number of bikes	i_5	58	69u1	70u1	191u1	222	412
Number of TVs	i_6	59, 60	70u1, 71u1	71u1, 72u1	192u1, 193u1	223	413
Number of PCs & notebooks	i_7	n.a.	n.a.	n.a.	202u1	229, 230	427, 428
Number of refrigerators and freezers	i_8	79-81	89u1, 90u1, 91u1	91u1, 92u1, 93u1	209u1, 210u1, 211u1	240, 241	436, 437
Number of dishwashers	i_9	82	92u1	94u1	212u1	242	438
Number of washing machines & dryers	i_10	87-89	97u1, 98u1, 99u1	99u1, 100u1	217u1, 218u1	245, 246	441, 442
Dummy living in own property	d_h_1	if 92=1	if 104=1	if 104=1,2,3,4	if 178=1,2,3,4	if 205=1,2	if 19=1,2
Dummy tenant	d_h_2	if 92=2,3	if 104=2,3	if 104=5,6	if 178=5,6	if 205=3	if 19=3
Dummy owner of family home	d_h_3	if 94=1	if 102=1	if 102=1	if 148=1	if 204=1	n.a.
Dummy owner of multi family home	d_h_4	if 94=2	if 102=2,3	if 102=2,3	if 148=2,3	if 204=2,3	n.a.
Dummy owner of other building	d_h_5	if 94=3	if 102=4	if 102=4	if 148=4	if 204=4	n.a.
Living space (square meters)	h_qm	95	105	105	152	206	20
Number of rooms	h_room	96	106	106u1	150	208	n.a.

Note. In 1978 up to three, in 1983 up to nine items per wealth category are reported in i_1 to i_9.

Table A8. Wealth

Type of Wealth	PIES variable	Original field identifiers (EF) in original IES wave					
		1978	1983	1988	1993	1998	2003
Assessed value real estate	w01	111	172	172	232	200	456
Market value real estate	w02	n.a.	n.a.	n.a.	233	201	457
Remainder of debt (mortgages and building loans)	w03	117	173	173	237	203	459
Home purchase savings	w04	133	183	175	244	152	462
Savings (positive)	w05	119	174	174	254	153	466
Remaining monetary assets	w06	n.a.	184	184	255	155	469
Other stocks and stake holdings	w07	n.a.	179; 181	180; 182	250; 252	156	472; 474
Insurance assets (Versicherungsguthaben)	w08	130	176-178; 180; 182	177-179; 181; 183	247-249; 251; 253	154; 157	473; 475

Table A9. Wealth accumulation

Type of wealth accumulation	PIES variable	Original field identifiers (EF) in original IES wave					
		1978	1983	1988	1993	1998	2003
Purchase of lots, buildings, expenditures for house construction	v62	608	709	719	863	876	379
Maintenance of own buildings and condos	v63	609	710	720	864	882, 883	380, 381
Retained profits	v64	610	708	718	865	880	382
Deposit bankbook	v65	611, 612	714	724	871, 872	885, 889	387, 388
Deposit building loan agreement	v66	613	713	723	874, 875	888	389
Purchase assets	v67	614	711, 712	722, 721	876, 877	892-894	390-393
Contributions for life assurance etc.	v68	615	715	725	879, 880	895, 869	365, 394
Repayment and interest payment of installment credit	v69	617	718	728	861, 862	874, 875	374, 377
Repayment and interest credits, loans, mortgages (private persons and firms)	v70	618-620	719-721	729, 730, 731	856-859	872	375
Reported: expenses for maintenance of buildings and land	v71	621	722	732, 733	867-870	882-884	386
Reported: Repayment and interest credits, loans, mortgages	v72	622, 623	723, 724	734	860	873	376
Other expenses for wealth accumulation	v82	616	717	727	866	881	383

Diskussionsbeiträge
des Fachbereichs Wirtschaftswissenschaft
der Freien Universität Berlin

2010

2010/1   BÖNKE, Timm / Sebastian EICHFELDER
Horizontal equity in the German tax-benefit system
Economics

2010/2   BECKER, Sascha / Dieter NAUTZ
Inflation, Price Dispersion and Market Integration through the Lens of a Monetary
Search Model
Economics

2010/3   CORNEO, Giacomo / Matthias KEESE / Carsten SCHRÖDER
The Effect of Saving Subsidies on Household Saving
Economics