The PHF: a survey of household wealth and finances in Germany

The Bundesbank conducted its first survey of the wealth and finances of households resident in Germany between September 2010 and July 2011. The results of this voluntary survey have been summarised under the name "Panel on Household Finances" (Private Haushalte und ihre Finanzen*, or PHF). The data mainly comprise households' balance sheets, their pension entitlements, savings activity and income, data on employment, consumption, beliefs and expectations and a large number of demographic characteristics. The PHF is part of a new, harmonised survey being carried out in all euro-area countries. It will therefore be relatively easy to place the German results in a European context.*

In future, the data will provide a comprehensive view of households' assets and debts and their determinants, thus allowing a better understanding of issues such as saving and consumption behaviour, the distribution of wealth or insolvency risks.

A representative sample comprising 3,565 households provided data for the first survey wave between September 2010 and July 2011. Wealthy households are overrepresented to enable a better analysis of the composition and distribution of wealth. The next wave is tentatively scheduled for 2014, and will involve as many of the households surveyed in the first wave as possible.

This article introduces the underlying framework of the PHF and explains the various steps of statistical data processing. Some of these steps have not yet been completed, meaning that the figures presented here are provisional. However, this article can already provide an initial impression of selected results. What the article shows, in particular, is how housing wealth is distributed in Germany and the size of the associated debt burden borne by the various household groups. The US subprime crisis showed just how important such information can be.

An initiative of the European System of Central Banks

Common euro-area blueprint

In 2006, at the initiative of the ECB, a group of economists and statisticians from Eurosystem central banks began working on a joint survey of household finances, the Household Finance and Consumption Survey (HFCS). To make the results comparable across countries, a common blueprint for the questionnaires was developed as a template for new surveys and as a point of orientation for surveys already in place in some euro-area countries. The blueprint determines the content of the survey (output harmonisation), while national central banks are free to choose what they consider to be the best method of conducting the survey, thus allowing the special institutional features of a country to be taken into account. Moreover, the national surveys contain many variables which are either specific or especially important to that particular country.

Heterogeneity of households

Households vary widely

Households' financial situation, as well as their borrowing and savings behaviour, are key ingredients of an economy's ability to grow, and also impact on financial stability. They determine how unexpected developments, such as a drop in income caused by the loss of a job, can be cushioned and whether a household will become overindebted. Heterogeneity – another term for individual variability – is a decisive factor. Assuming a notional "representative household" is often insufficient to provide an understanding of consumption and saving decisions and the effects of monetary policy, much as the concept of a "representative bank" does not permit a proper analysis of financial stability. This is especially the case when – as with data on wealth – the differences between households are very large. The HFCS in general and the German PHF in particular therefore collect household and individual data. Some examples below shall serve to highlight the benefits of using such data.

Debt

Households: total debt and average debt

The informative value of aggregated data on household debt is constrained in a number of ways. The Bundesbank's borrowers statistics show that the total debt of households (employees, sole proprietors and entrepreneurs) stood at €1,403 billion at the end of 2010. Dividing this figure by the number of households at that particular time yields an average household debt of €34,813. However, such averages mask important information which can only be obtained using microdata. Provisional PHF figures show that only 41.9% of German households are actually in debt at all. These households must consequently bear an average debt of €83,098. Yet this does not tell the whole story, either. In fact, it is less the averages and more the tails of distributions which matter for financial stability. Heavily indebted households whose incomes are insufficient to service their debts flee into bankruptcy, leaving their creditors to foot the bill. Central banks therefore need to be able to assess how concentrated indebtedness is and how much debt is borne by those households for which the ratio of payment obligations to disposable income exceeds a given threshold. Information on distributions is necessary to breathe life into terms such as "loss given default" or "value at risk". The section on mortgage debt below serves to illustrate the importance of information on distribution.

Tails of distributions are important

Analysis of individual behaviour

Few owners of homes and property in Germany

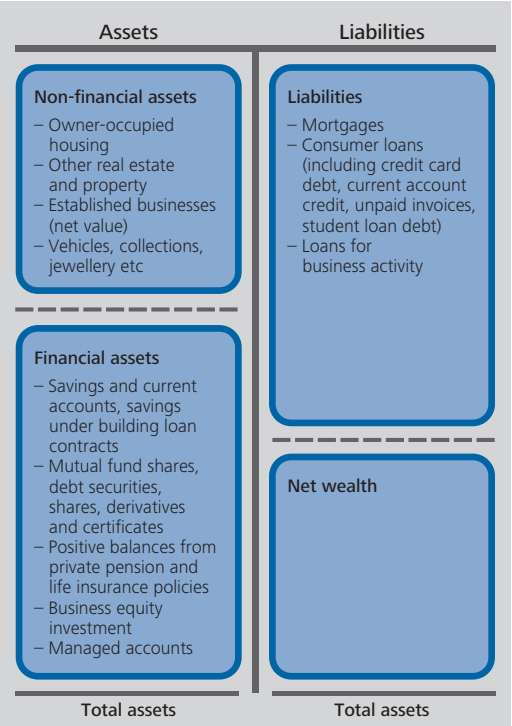
To understand individual behaviour, we have to look at the dependent variable, such as wealth or its components, as well as its possible determinants at the level of the individual. As a case in point, the ownership of homes and property is much less widespread in Germany than in comparable countries in Europe and elsewhere. This has important ramifications for the distribution of wealth and debt. In order to explain the distribution of home and property owner-

ship, we have to observe, at the level of the individual, as many determinants for the acquisition of property as possible, and, preferably, compare them across countries. Such determinants include income, transaction costs, financing constraints, tax considerations and family structure, along with the significance of inheritance for the transfer of property ownership.

Shareholding low and concentrated on a small number of households

Another example is the well-known stylised fact that aggregate household shareholding is very low in the light of the risk and return structures. At least this applies if we refer to the standard portfolio selection models. Without micro data, we cannot even obtain the fundamental insight that these are also threshold effects – most households in Germany do not hold shares, either directly or indirectly. Economic researchers can use multivariate distributions to establish which households hold shares, how the value of the wealth tied up in shares is distributed and how these two elements correlate with individual characteristics.

Balance sheet of a household – a schematic overview



Deutsche Bundesbank

Content and focal point of the PHF[1]

Modules in the PHF

At the heart of the PHF is a detailed breakdown of assets and liabilities. The chart above provides a schematic overview. The PHF contains the following modules.

- Household structure
- Socioeconomic characteristics
- Consumption
- Non-financial assets and their financing
- Liabilities
- Businesses and financial assets
- Inheritances and gifts
- Employment
- Old-age provision
- Income

Key themes: saving and pensions

While it shares the common core seen in all national HFCS surveys, the German PHF has certain distinctive features. Firstly, the survey stresses two key themes of German economic policy: pensions and saving. Whereas the prototype HFCS largely omits household saving, the PHF requests information on saving in relation to all relevant categories of wealth. But the outlook is different as well: while the HFCS guidelines only provide for a cross-section, the decision to conduct the German survey as a panel also allows us to observe the accumulation of assets over the life-cycle.

Three prominent predecessors in Germany served as models for the PHF. The Federal Statistical Office's large-scale Sample Survey of Income and Expenditure *(Einkommens- und Verbrauchsstichprobe, EVS)* also provides an outline of the structures of household assets in

1 For a more detailed description of the survey see U von Kalckreuth et al, The PHF: a comprehensive panel survey on household finances and wealth in Germany, discussion paper from the Deutsche Bundesbank's Research Centre, forthcoming. More information is also available on the Bundesbank's website at http://www.bundesbank.de/vfz/vfz_panel.en.php.

Germany.[2] The methodology for recording private saving was developed in SAVE, an academic study organised by MEA in Munich. The self-renewing panel structure was borrowed from the SOEP (*Sozio-ökonomisches Panel,* or Socioeconomic Panel) conducted by DIW Berlin. The PHF merges the successful methodological traits of these studies in a new set of statistics which is conceptually firmly grounded in the structure of the household balance sheet and is fully comparable with similar surveys in all other euro-area countries.[3] The PHF's panel dimension, moreover, enables a precise understanding of asset formation over time and, on this basis, allows sound statements to be made about the long-term trend in the distribution of wealth.

The design of the survey

Random sample …

Participation in the survey is voluntary. It is designed to be representative of the population. Any household in Germany has a given likelihood of making it into the sample. Conversely, the probability of being selected can be stated for each household in the sample. This is a precondition for ensuring that the determination of design weights ist statistically robust. The survey's design ensured that wealthy households had a higher probability of being selected for the sample. They are intentionally overrepresented. Wealth is considerably more concentrated than income, and a proportional sample would contain only a few wealthy households. It would thus be impossible to obtain any useful information on many categories of wealth. To oversample wealthy households, a relatively large number of smaller and medium-sized communities with high income tax revenue were selected, and in cities the sample also used microgeographic information relating to street sections, such as purchasing power, building type and quality of the residential area.

… with wealthy households being intentionally oversampled

Panel structure

All participating households will be contacted again in the subsequent waves. If the household composition changes – such as by adult children moving out or through divorce – all household members will be tracked. The new households created by such splitting-off will be added to the panel. Refreshment samples will be needed to offset natural reduction in the panel size (panel mortality). However, this is also a way of taking account of new or underrepresented socio-demographic groups. The second wave is currently scheduled for spring 2014.

Computer-assisted interview

The lion's share of the questionnaire refers to the household as a whole. A household member with particularly good knowledge of the overall household's financial situation was asked these questions in a computer-assisted personal interview (CAPI). Moreover, the survey also collects information from individual household members on several issues: income, old-age provision and employment. For this part of the survey, there was also the option of using paper versions and an online interface alongside the CAPI.

The PHF is a data set intended for scientific purposes, and it is also available to external researchers. Before the data are passed on to academic users for specific projects, they are carefully anonymised to ensure that survey information cannot be matched with participating households under any circumstances. The applicants and their projects are also vetted. An anonymised data set which can be released for use by researchers will probably be ready in the spring of 2013.

2 However, it is impossible to generate the variables of the HFCS blueprint using EVS data. The PHF models wealth structures and indebtedness in greater detail than the EVS, which focuses chiefly on income and expenditure. The EVS omits households with a net monthly income of more than €18,000. The EVS' roughly 13,000 households are selected using quotas and not at random.
3 It is also highly comparable with the US Federal Reserve System's Survey of Consumer Finances (SCF), which was a key model for the common structure of the European HFCS.

Field phase and participation

The sampling and field work were carried out by the infas Institute, which is based in Bonn. The field phase of the first wave ran from September 2010 to July 2011. 20,501 addresses were used in total, and 3,565 valid household interviews were conducted. The response rate was 18.6%.[4] It is lower than the response rate for directly comparable studies in other countries and is also somewhat disappointing by German standards.

Comparison with microcensus shows sample to be highly representative

A high non-response rate can indicate a systematic bias in the sample composition. However, there is no sign of severe selection bias in the PHF survey either after comparison with external statistics or following a statistical study of response behaviour. The charts in this section compare the population structure data from the 2010 microcensus with the composition of the PHF sample. The PHF households are assigned inverse selection probabilities given by the sample design (design weights) in order to make up for the oversampling of wealthy households. The adjacent chart shows the age composition of the German population according to the microcensus compared with the (design-weighted) PHF sample. The youngest age cohort is somewhat underrepresented and the group aged 55 to 74 is somewhat overrepresented. The upper chart on page 34 on household size shows that single-person households occur a bit too frequently yet coverage of large households is also good. The comparison according to employment status of the main income earner in the lower chart on page 34 shows clearly that both the unemployed and non-labour force members are overrepresented, whereas workers are less well represented. Such discrepancies can be resolved by adjusting the weights.

Income distribution in the sample

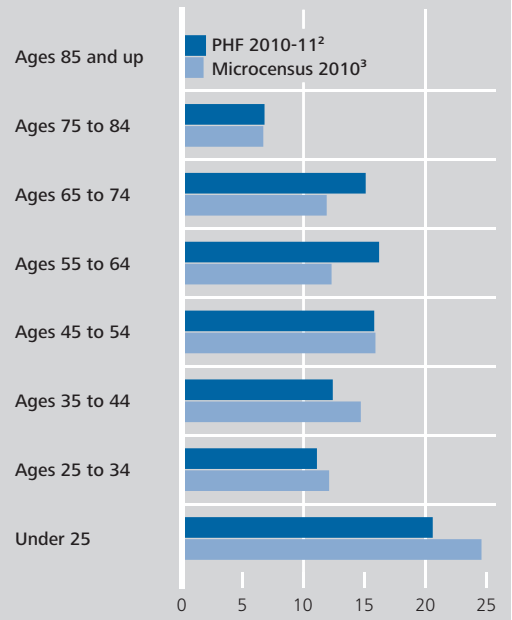
The table on page 35 shows the income distribution in the sample, a decisive factor in the representativeness of a survey on wealth. In the PHF, a household's total income can be calculated from the sum of its components, a large percentage of which are even available for individuals. For comparison purposes, household income here, just like in the microcensus, is determined based on the response to a question about the household's total income.[5] In order to show the impact of oversampling, the table shows both the unweighted and the weighted composition of the PHF sample. The unweighted composition in the second column of the table on page 35 is produced by simple counting.

Intentional oversampling of wealthy households successful

This shows clearly that the oversampling of wealthy households was actually rather successful. The four highest income categories are

Persons in households, by age

Design-weighted PHF sample[1] compared with microcensus; percentage of persons in the surveyed households



1 PHF sample: the Panel on Household Finances (PHF) survey conducted by the Deutsche Bundesbank. Survey period: September 2010 to July 2011. **2** Design-weighted extrapolation. **3** Source: Destatis (2011); Bevölkerung und Erwerbstätigkeit, Haushalte und Familien, Ergebnisse des Mikrozensus 2010, Fachserie 1, Reihe 3.

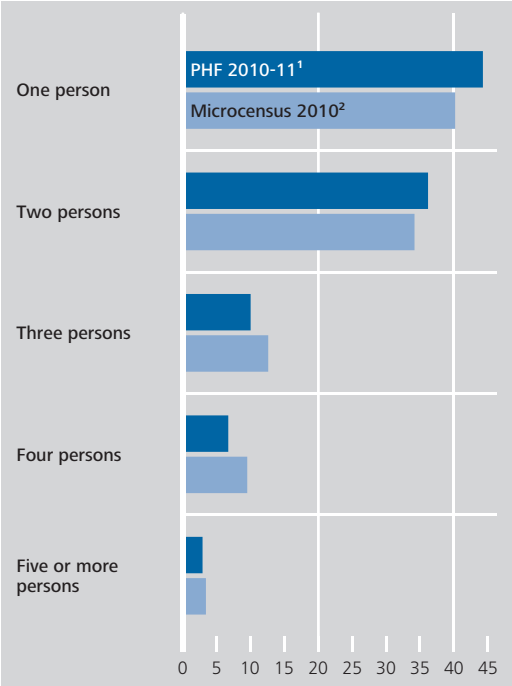
Deutsche Bundesbank

4 The addresses which are not in the target group because, for instance, the households have since moved to an unknown address were removed from the numerator of the quotient. Valid household interviews were included in the denominator even if some interviews of individuals were missing.

5 Asking interviewees to name a figure for total income produces values which are systematically too low because of memory gaps among the respondents. Here, however, the focus is on the structural comparison.

Households, by household size

Design-weighted PHF sample compared with microcensus; percentage of surveyed households

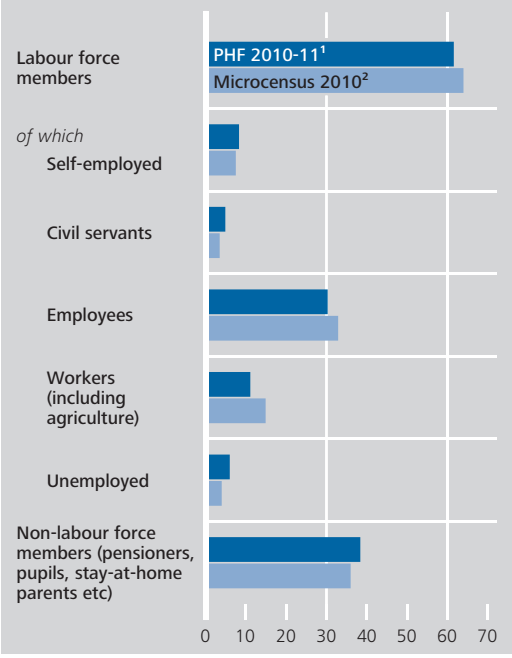


1 Design-weighted extrapolation. **2** Source: Destatis (2011); Bevölkerung und Erwerbstätigkeit, Haushalte und Familien, Ergebnisse des Mikrozensus 2010, Fachserie 1, Reihe 3.

Deutsche Bundesbank

Households, by employment status of the main income earner

Design-weighted PHF sample compared with microcensus; percentage of surveyed households



1 Design-weighted extrapolation. **2** Source: Destatis (2011); special analysis commissioned by the Deutsche Bundesbank, results of 2010 microcensus.

Deutsche Bundesbank

clearly overrepresented, with the top category (total monthly income of €4,500 or more) occurring in the sample more than twice as frequently as in the population at large. If we use design weights to neutralise the effect of oversampling (third column), this creates a picture that is extremely close to the income distribution seen in the microcensus.

Finally, looking at households' ownership of their main residences is also informative. The chart below compares the share of households in owner-occupied housing to all households and also by household size. Relative to all German households in the microcensus, this share was 40.9% in 2006. The percentage extrapolated from PHF data using design weights is 44.2%, indicating a certain selection bias towards homeowners. The chart also shows that the bias is attributable mainly to single-person households and childless couples.

The design-weighted share of foreigners in the PHF is 5.9%, compared with 8.7% in the entire population. The composition of countries of origin is satisfactory. However, the migrants in the sample could well be better integrated into the majority population than the migrant population as a whole.

On the whole, the identified selection bias is relatively small and can be offset by modifying the weights on the basis of statistical models of response behaviour and adjusting marginal distributions for the overall population.

Participants' response behaviour

Item non-response

Data on wealth are considered extremely sensitive and complex. This makes item non-response – the fact that even those willing to participate do not respond to all questions – a particular problem. The reason is not necessarily that participants are unwilling to respond; often they do not understand the question or do not know the answer themselves. Item non-

response is frequently systematic, ie correlated with the true value of the missing response. For instance, someone with no debt whatsoever knows it and will also be perfectly willing to say so. In that case, debt is correctly entered as "0". An indebted respondent, however, may not know the exact amount or may be embarrassed to talk about it. This is sufficient for a correlation. If we ignore item non-response – eg by setting all missing responses to 0 or looking only at the responses that are there – the mean values will be skewed downward depending on the strength of the correlation between the true value and willingness to respond. In certain cases, such a bias can be mitigated or eliminated by imputation. This means replacing missing data with values that "fit" the interviewee based on the existing responses. Imputation in the PHF is explained on pages 37 to 39.

Imputation of missing data

In wealth surveys, it is typically data on the value of wealth or debt that is most difficult to obtain. It is more difficult to give an exact figure than a simple yes or no answer. In the PHF, information on figures can be given at three levels. The interviewee is initially asked for an exact value. If s/he cannot answer the question, s/he is asked to give an upper or lower threshold for the value. If this also fails, the interviewee can choose from a list of pre-defined ranges. Such information makes the imputation much more accurate.

Total item non-response pleasingly low

The table on page 36 shows item non-response to several particularly sensitive questions revolving around numerical values. The first column in the table shows the percentage of responses which did not state an exact numerical value. The second column lists the frequency with which neither an exact figure nor a range was given. As in other surveys on wealth, it is particularly difficult to state the value of an existing self-owned business. No response whatsoever is given to this question in 12.1% of cases. There are also some financial indicators which cause difficulty: the value of a household's bonds and debt securities is completely

Households, by monthly net household income*

Per cent

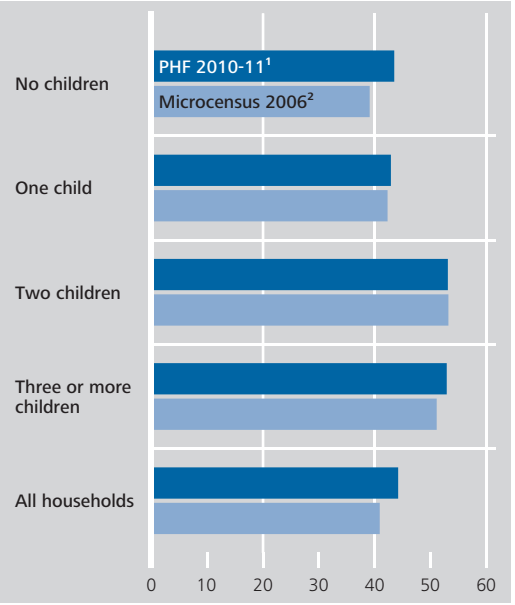
Monthly net household income	Microcensus 2010[1]	PHF 2010-11[2] (unweighted)	PHF 2010-11[3] (weighted)
Less than €500	2.2	1.7	3.3
€500 to less than €900	10.9	5.5	10.0
€900 to less than €1,300	15.5	9.2	15.2
€1,300 to less than €1,500	8.0	4.8	7.1
€1,500 to less than €1,700	7.4	6.2	7.6
€1,700 to less than €2,000	9.5	7.0	8.4
€2,000 to less than €2,600	15.6	17.4	16.9
€2,600 to less than €3,200	10.6	13.7	11.1
€3,200 to less than €4,500	12.4	16.8	10.6
€4,500 or more	7.9	17.8	9.7

Sources: Destatis (2011), Bevölkerung und Erwerbstätigkeit – Haushalte und Familien – Ergebnisse des Mikrozensus 2010 – Fachserie 1 Reihe 3; PHF 2010-11. * PHF sample compared with microcensus. **1** Percentage of all households providing an answer. **2** Unweighted sample percentages, with the effects of oversampling visible. **3** Design-weighted extrapolation, with the effects of oversampling neutralised.

Deutsche Bundesbank

Households in owner-occupied housing, by number of children below the age of 18

Design-weighted PHF sample compared with microcensus; percentage of respective category



1 Design-weighted extrapolation. **2** Source: Destatis (2008); Mikrozensus, Zusatzerhebung 2006, Bestand und Struktur der Wohneinheiten, Wohnsituation der Haushalte, Fachserie 5, Heft 1.

Deutsche Bundesbank

Item non-response to selected questions

Percentage of all households that were supposed to respond to the question

Question	No exact value given	No value given
Value of the first property purchased	7.9	2.9
Value of the first mortgage	8.0	3.0
Value of all cars	4.9	1.7
Size of credit card debt	5.6	1.4
Value of business owned by the household	23.2	12.1
Value of mutual funds	12.6	6.4
Value of fixed-interest bonds	17.1	12.4
Value of shares	11.9	7.6
Total value of assets held in safe custody	9.5	5.4
Value of savings under building loan contracts	10.6	4.9
Employee income	5.1	2.7

Source: raw data from the PHF survey 2010-11.
Deutsche Bundesbank

missing in around 12.4% of cases in which the existence of such instruments is reported. Most other questions about values, however, were answered considerably more successfully – including, rather surprisingly, the questions about the level of debt. The incidence of item non-response to other types of questions was generally very low.

PHF data: initial impressions

Careful statistical processing necessary

The processing of the survey is currently still in progress. The first step is to carefully edit the responses for logical consistency and coherence of content, which includes a search for "outliers". This also frequently reveals written errors made by the interviewers. These must be corrected or, alternatively, the value is set to "missing". Imputation supplements the data set with missing data based on conditional probability distributions of the relevant variables. Weights are adjusted to eliminate bias caused by the unit non-response of some participants. Once enough information on non-respondents is available, a statistical response behaviour model can be used to adjust the weights. Any remaining bias can be eliminated by making adjustments to the marginal distributions (calibration).

The PHF data are therefore still provisional five months after completion of the field phase, as is usual for such surveys. However, it is already possible at this juncture to obtain an impression of the data base's performance. It is not primarily about estimating large aggregates; the financial components of household wealth, including debt, are modelled well on the whole by the statistics provided by the Bundesbank, especially the financial accounts, banking statistics and securities deposit statistics. Moreover, the Bundesbank and the Federal Statistical Office have jointly compiled a balance sheet for the household sector which also includes non-financial assets.[6] The PHF will also be able to fill knowledge gaps in the calculation of aggregated asset positions, especially by capturing certain market values for business equity investments in unlisted corporations and for existing housing. However, the PHF's true strength lies in its ability to break down aggregates by population group, to look at size distributions and to use interrelationships between variables at the level of the individual. Some of this will be illustrated in the following paragraphs using property ownership and the attendant indebtedness as an example.[7] The US subprime mortgage crisis made it clear just how important it is to have a clear picture of how property ownership and indebtedness are distributed. When the real estate bubble burst, many households turned out to be overindebted.

Property ownership – the asset side

Disaggregated analysis of property ownership

The tables on pages 40 and 41 give an overview of the frequency and value of property ownership. The table on page 40 gives the percentage of households which own property.

6 Federal Statistical Office and Deutsche Bundesbank: Sektorale und Gesamtwirtschaftliche Vermögensbilanzen 1992-2010, Wiesbaden, 2010.
7 The analytic weights used for this evaluation are provisional and are close to the design weights. Although they have been corrected for non-response based on an estimated model of response behaviour, they are not calibrated.

Imputation of the survey data

Item non-response and imputation

The term item non-response is used to describe the lack of responses to individual questions from surveyed households or individuals. This leads to missing data, with which a number of problems are associated. First, standard data analysis techniques can generally only be applied to complete data sets, and simply omitting all data sets containing missing values can severely diminish and distort the information content. Second, the occurrence of item non-response is not a random process, but depends rather on the characteristics of the household. If this mechanism is not taken into account, this leads to biased estimations for the variables concerned.

A case in point is indebtedness. If overindebted households often tend not to answer such questions, this results in distorted estimations if only the available answers are considered. This effect can be significantly reduced by replacing the missing value using a mathematical procedure which simulates the mechanism underlying the non-response.

This type of procedure which serves to replace missing values using estimated values is known as imputation. All imputation procedures of this kind are based on the "missing at random" assumption, which states that the probability of a missing observation can be fully explained using the observed values in the data set. However, it is not possible to verify whether this assumption is indeed true. Even if this condition does not hold, imputation can still simulate that particular share of the mechanism underlying the non-response which can be derived from the observed data.

Imputation in the PHF

A linear stochastic regression model is used for imputing continuous variables (especially euro amounts) in the PHF. Missing values are substituted by their best linear predicted value, plus a normally distributed random variable. The prediction equation is

$$\hat{y}_{mis} = \mathbf{X}\hat{\beta} + \hat{u}\,; \quad \hat{u} \sim N(0, \hat{\sigma}^2\mathbf{I})\,;$$
$$\hat{\beta} \quad = (\mathbf{X}'\mathbf{X})^{-1}\,\mathbf{X}'y$$

where y is the variable to be imputed, y_{mis} is an individual missing value, $\hat{y}_{mis}$ is its substitute, n is the number of observed values of y, and k is the number of selected regressors for the imputation of y. $\mathbf{X}$ is the nxk matrix, which is made up of the n values of the k regressors. The variance $\hat{\sigma}^2$ is estimated using the residuals from the prediction equation.

For the imputation of the value of the house, for example, we use regressors which allow good predictions, such as the value of the total assets of the household as well as socio-demographic information, such as age and level of education. If the respondent did not report the exact value, but specified an upper or a lower bound for the value, the imputation is repeated until the substitute value falls into the interval.

Binary variables are imputed in a similar way using a linear stochastic model. Binary variables are often indicator variables, such as the question of whether the household owns any property. The number of missing values in the PHF resulting from such questions is relatively small.

Hot deck imputation is used for the imputation of categorical variables. Here, a miss-

ing value is replaced by an observed value of another household, which should resemble the household with the missing value as much as possible in terms of the selected characteristics. One example to demonstrate the use of a hot deck procedure is the imputation of the highest level of education completed, which can be entered in nine different categories in the PHF.

If the regressors are correctly selected, then the characteristic features of the distribution of the imputed variables are retained. The retention of the general statistical features of the entire data set, especially the covariance structure, is the main objective of the stochastic imputation and takes precedence over finding the most probable value in each individual case.

The imputation algorithm must reflect the logical structure of the questionnaire to ensure the consistency of the data. This may also embrace imputed values for questions that were not even asked during the interview. If, for example, the question relating to the ownership of property was answered with "don't know", the entire property section of the questionnaire is left out during the interview. If the initial question is imputed as "yes", then the subsequent property-related questions also have to be imputed. All imputed values are marked for the data users with a special imputation flag in the corresponding flag variable.

The significance of multiple imputation

Simple imputation, ie the creation of a single imputed data set, does not take into account the uncertainty of the selected imputation model because all the values in the imputed data set are treated like "real" observed values. As a consequence, variances and covariances in the imputed data set are underestimated. This is why several imputed data sets are generated – hence the name multiple imputation – whereby every missing value is replaced by a number of independently imputed values, known as implicates. This routine is based on the bootstrap procedure. The variance of a multiply imputed data set is calculated as the sum of the weighted variances within each implicate and the variance between the implicates (the latter is not taken into consideration in the simple imputation method). Five imputed data sets are generated in the PHF. The inclusion of five data sets is a generally accepted norm, which has been agreed on between the central banks participating in the HFCS.

The imputation of the PHF data is done iteratively. In the first iteration, all imputed variables containing missing values are replaced by a value which is estimated purely on the basis of the observed data. The second iteration and all following iterations recalculate these values in the light of the previous iteration, thereby building a complete data set without missing values in the predictors as a basis for the imputation. The key criterion for the convergence of the procedure is that the variance between the implicates is small in comparison with the variance within the implicates. A sufficient convergence is generally achieved after six iterations.

During the imputation and analysis of the results, problems frequently become apparent in the data, such as inadmissible or implausible values, which are then rectified in the course of a further editing procedure. A two-way process therefore occurs between editing and imputation, which has a positive impact on the quality of the data.

Example

Finally, an example may prove helpful. As part of the module focusing on financial assets, respondents were asked to specify the value of any tradable shares that they own. A total of 646 respondents said that their household owns shares. Of these respondents, 553 answered the question relating to the value of these assets by specifying a figure, 27 opted to select an interval and 66 did not provide any further details.

Missing values will not cause any major problems as long as intervals are available. Either the interval midpoint can be used for analytical purposes or a value in the interval can be simulated based on the assumption of equal distribution. By contrast, if no further information is provided, this can lead to severe bias.

The imputation algorithm provides proxy values in all 66 cases where no interval is available. The 580 remaining values yield a mean (unweighted) portfolio value of €67,026, which is significantly higher than the median of €14,100 owing to a number of very high realisations. The 66 imputed values lie closer to the mode, with a mean average of €44,645 and a median of €8,875. Overall, the mean and the median amount to €64,739 and €13,000 respectively after imputation. The weighted volume of equity holdings (after extrapolation) amounts to €126.9 billion before imputation and €135.2 billion after imputation.

Ownership of the main residence is shown separately. In addition, the table displays the composition of housing wealth both by type of property and also by their owners' membership of various socio-demographic groups. With regard to the property type, a distinction is first made between owner-occupied housing (main residence) and other property, with ownership of the main residence broken down further into houses, flats and mixed-use property (such as a residential house with a shop on the ground floor or a farm building). The composition of owners is broken down by age group, labour market status, household income and number of children below the age of 18. In the table on page 41, the average gross value of housing and property wealth, the average net value (ie less existing mortgage loans) and the relevant medians are calculated for property owners in the population at large and those in certain groups of the population. It should be noted that these calculations include the entire housing wealth of a household, which can also encompass multiple properties. The table also shows the percentage of owner-occupied housing either inherited or received as a gift. The estimated averages are a good fit with the sectoral balance sheet compiled by the Federal Statistical Office and the Bundesbank: households' housing wealth extrapolated from the PHF data amounts to €5,024 billion (including the value of business property belonging to the self-employed and sole proprietors), while the estimate in the sectoral balance sheet is €5,197 billion for residential housing and land underlying buildings and structures.[8]

Ownership rate high among older households, …

In the case of property ownership as a whole, as well as owner-occupied housing, there is a kind of life-cycle. Home ownership is low

8 See Federal Statistical Office and Deutsche Bundesbank (2010), op cit. The figures for the sectoral balance sheet include property owned by private not-for-profit organisations and the property owned by self-employed and sole-proprietor housing companies. Such property is not included in the PHF if owned by a business belonging to the household.

Share of households which own property*

Per cent

Item	Share of households which own property	Share of households which own their main residence	of which			Share of households which own property other than their main residence
			House ownership	Flat ownership	Ownership of mixed-use buildings/farms	
Total	44.9	39.7	67.6	27.8	4.6	17.1
Ownership rates by age of main income earner						
Under 40	20.0	16.2	63.9	35.5	0.6	8.1
40-49	51.4	43.7	70.4	24.8	4.8	18.0
50-59	56.6	50.7	66.6	25.9	7.6	25.1
60-64	59.5	52.9	65.2	31.4	3.5	23.6
65 or older	55.5	51.5	68.5	27.4	4.1	19.0
Ownership rate by employment status of main income earner[1]						
Labour force member	44.0	38.1	67.3	27.6	5.0	17.7
of which						
Self-employed	67.9	59.8	63.6	19.9	16.5	36.4
Civil servant	65.2	59.0	62.4	35.9	1.7	22.5
Employee	46.2	38.7	70.4	27.7	1.9	19.5
Worker	37.1	33.4	68.0	27.4	4.6	9.5
Unemployed	9.4	8.4	49.1	50.9	0.0	1.2
Non-labour force member	46.5	42.7	68.0	28.1	3.8	15.9
of which						
Pensioner	54.9	50.9	67.9	28.2	3.9	17.9
Ownership rate by monthly net household income[2]						
Less than €900	14.3	12.8	51.6	36.4	12.0	2.6
€900 to less than €1,300	20.7	19.3	55.8	38.5	5.8	4.1
€1,300 to less than €2,000	37.0	30.6	63.3	35.9	0.8	11.5
€2,000 to less than €3,200	56.3	49.7	67.2	27.5	5.3	20.3
€3,200 to less than €4,500	76.2	69.6	70.5	25.9	3.7	32.2
€4,500 to less than €6,000	86.8	79.0	83.0	11.9	5.0	43.1
€6,000 to less than €7,500	91.7	79.1	64.1	31.2	4.7	64.1
€7,500 or more	89.5	79.2	87.2	5.0	7.8	67.7
Ownership rate by number of children below the age of 18						
Households with no children below the age of 18	43.9	38.9	66.1	29.2	4.7	17.0
Households with …						
one child	47.3	39.2	75.5	19.5	5.0	17.4
two children	52.7	48.4	68.6	28.2	3.2	19.4
three and more children	52.6	47.4	83.9	12.7	3.4	14.6

Source: PHF 2010-11. * Imputation and analytic weights are provisional. 1 Categorised on the basis of the most important status. 2 Derived from a self-assessment of total income.

Deutsche Bundesbank

among the young cohort and rises with advancing age, peaking in the 60 to 64 age bracket. Inheritance is also a significant factor in explaining this finding, alongside purchasing. Among households where the main income earner is 50 or older, the percentage of owner-occupied housing surpasses the 50% mark. Unless this is caused by cohort effects, most Germans will be able to fulfil their dream of owning their own home at least sometime later in life.

… the self-employed and civil servants, …

If property-owning households are grouped by employment status of the main income earner, certain socio-economic patterns come to the surface. Property ownership predominates among the self-employed and entrepreneurs, at 67.9%. The average value of owned property is also highest in this group. Civil servant households are not far behind, with a home and property ownership rate of 65.2%. Civil servants are also on a level pegging with the self-employed and entrepreneurs in terms of median gross housing wealth, yet the mean value of their homes and property is much lower – the very expensive properties are missing from this employment category. Home-owning employees possess almost the same mean amount of housing and property wealth as civil servants; however, property ownership

Households which own property: average asset values*

Item	Mean gross housing wealth[1]	Mean net housing wealth[1,2]	Median gross housing wealth[1]	Median net housing wealth[1,2]	Percentage of households owning their main residence which obtained ownership through inheritance or as a gift
	€ thousand				Per cent
Total	297.4	246.1	200.0	152.5	23.4
Average asset values by age of main income earner					
Under 40	229.4	142.5	180.0	100.0	12.5
40-49	272.8	196.8	200.0	140.0	25.0
50-59	375.0	316.8	200.0	160.0	24.6
60-64	296.2	260.9	184.0	150.0	18.8
65 or older	286.3	266.9	190.0	184.0	26.7
Average asset values by employment status of main income earner[3]					
Labour force member	313.1	243.5	200.0	150.0	21.8
of which					
Self-employed	503.9	418.8	250.0	190.0	25.6
Civil servant	288.4	204.2	250.0	150.0	18.3
Employee	301.7	232.8	200.0	152.5	20.1
Worker	182.2	133.7	145.0	100.0	24.0
Unemployed	85.5	41.1	60.0	22.5	32.5
Non-labour force member	269.9	250.7	182.5	170.0	26.0
of which					
Pensioner	264.5	245.9	185.0	180.0	26.9
Average asset values by monthly net household income[4]					
Less than €900	104.8	77.2	77.0	45.0	42.2
€900 to less than €1,300	183.1	168.8	120.0	110.0	34.7
€1,300 to less than €2,000	170.6	150.3	150.0	130.0	33.3
€2,000 to less than €3,200	262.0	222.5	180.0	150.0	19.6
€3,200 to less than €4,500	324.7	250.4	250.0	170.0	19.3
€4,500 to less than €6,000	405.0	300.2	300.0	230.0	17.1
€6,000 to less than €7,500	864.0	776.6	490.0	420.0	13.2
€7,500 or more	914.1	747.4	660.0	397.0	8.2
Average asset values by number of children below the age of 18					
Households with no children below the age of 18	298.8	256.0	190.0	160.0	24.4
Households with …					
one child	286.1	213.2	190.0	147.0	23.5
two children	294.1	196.5	230.0	150.0	14.8
three or more children	303.7	202.2	200.0	108.0	18.3

Source: PHF 2010-11. * Imputation and analytic weights are provisional. **1** Excluding 105 households reporting implausible values on partial ownership. **2** Gross housing wealth less all mortgages secured by these properties. **3** Categorised on the basis of the most important status. **4** Derived from a self-assessment of total income.

Deutsche Bundesbank

is less widespread among employees, at 46.2%. The ownership ratio among households headed by workers is even lower, yet at 37.1% it is still well above that of the unemployed (9.4%). The high incidence of property ownership among non-labour force households is surprising at first glance. This effect is determined by the home ownership ratio of pensioners; more than half of this group own their own homes.

… among higher-earning households …

Breaking down households by household income reveals a close correspondence between income and property ownership – including with regard to the mean and median values of homes and property. Finally, having children in the household also appears to favourably influence the tendency to acquire property. The ownership rate for the main residence is under 40% for households with one child or none whatsoever but increases sharply at two or more children.

… and those with several children

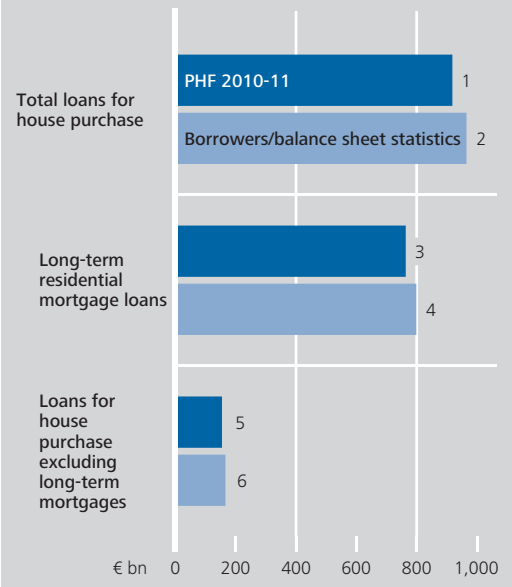
Inheritances and gifts

Inheritances and property ownership

A total of 23% of households that own their main residence obtained it as either an inheritance or a gift. This demonstrates the major importance of intergenerational transfers for the distribution of wealth, given the large values

Households' residential financing: a comparison between the PHF and the banking statistics/balance sheet statistics*

Provisional extrapolation from PHF sample



***** From the PHF sample: all households, all lenders. Imputation and analytic weights are provisional. Borrowers/balance sheet statistics: loans to economically dependent and other individuals, plus loans to self-employed persons and sole proprietors. Loans granted by MFIs including building loan corporations but excluding insurance companies and other parties such as employers and individuals. As at 31 December 2010. **1** All residential mortgage loans (including for renovation) and all loans for house purchase not secured by mortgage. **2** Loans to individuals resident in Germany for house purchase. **3** Mortgage loans for house purchase (including renovation) to households resident in Germany secured by residential property and with a maturity of more than five years. **4** Loans for house purchase to individuals resident in Germany secured by residential property and with an original maturity of more than five years. **5** All loans for house purchase (including renovation) not secured by mortgage and all short-term mortgage loans for house purchase (including renovation) with maturities of up to five years. **6** Loans to individuals resident in Germany for house purchase excluding mortgage loans with a maturity of more than five years.

Deutsche Bundesbank

often associated with property ownership. Inheritances and gifts can also be an instrument of social compensation. The table on page 41 shows that low-income and unemployed households also own property, and a disproportionately high percentage of these households acquired this property as an inheritance or a gift. Naturally, the percentage of inheritance is higher for older property owners.

Mortgages

If the property is not an inheritance or a gift, the flip side of property ownership is its financing. Purchasing property often involves many years of paying off mortgages. Since questions regarding debt are considered sensitive, the statistical analysis begins with validation of the PHF data on property financing.

Comparison with borrowers statistics

According to the Bundesbank's borrowers statistics, at the end of 2010 a total of €965 billion in loans had been granted to households to finance the purchase of residential property. Of this figure, €799 billion were mortgage loans with an original maturity of more than five years and €166 billion were either unsecured loans or mortgages with an original maturity of five years or less (see adjacent chart). These figures correspond closely with the PHF data for households. Extrapolated using provisional analytic weights, the PHF data produce a figure of around €918 billion in loans for house purchase, with longer-term mortgages making up around €764 billion and unsecured lending and shorter-term mortgages together accounting for another €155 billion or so.[9]

Mortgage loans not evenly distributed

In the tables on the following pages, the assets from housing and property wealth are therefore contrasted with liabilities in the form of loans of all maturities secured by mortgage. The table on page 43 presents an overview of mortgage loans. 44.8% of property owners have a mortgage loan to pay off. This percentage is naturally higher for younger households. Only 19.6% of pensioners who own homes and property are still paying off a mortgage, and in the case of main residences, the figure is only 16.2%. For a wide area of the income distribution, the percentage of property owners owing money on mortgage loans is larger for

9 This consistency is quite remarkable. It is much less pronounced for loans which are not for house purchase, such as consumer loans or loans to finance business activity. Only 26.0% of their total volume can be reproduced by the PHF. At 17.1%, the share that can be reproduced is even smaller for the self-employed and entrepreneurs than for economically dependent households, which still report 34.4% of their other borrowing. The gap may therefore be due in part to problems drawing a line between the private and business spheres. Around €18.8 billion in loans in the PHF cannot be assigned to any category from the borrowers statistics because of the failure to collect information on their characteristics.

**Households which own property:
Share of households with mortgage loans and average loan sizes***

Item	Share of households which own property and hold at least one mortgage loan	Share of households which own their main residence and hold at least one mortgage loan secured by the main residence	Share of households which own other property and hold at least one mortgage loan secured by other properties	Average size of real estate loans of households which own property and hold mortgage loans
	Per cent			€ thousand
Total	44.8	42.2	32.7	117.5
Share of households and average loan size by age of main income earner				
Under 40	59.4	64.0	35.8	144.3
40-49	64.7	65.2	39.3	118.6
50-59	55.8	52.1	41.5	111.1
60-64	37.7	32.6	26.4	102.8
65 or older	19.6	16.0	20.5	103.9
Share of households and average loan size by employment status of main income earner[1]				
Labour force member	58.7	57.4	38.7	121.6
of which				
Self-employed	61.8	55.3	43.6	149.9
Civil servant	63.9	56.0	43.2	133.2
Employee	57.7	58.7	37.1	119.0
Worker	57.6	58.7	35.1	87.8
Unemployed	43.3	48.7	0.0	98.5
Non-labour force member	20.7	17.3	20.4	96.9
of which				
Pensioner	19.6	16.2	19.5	92.1
Share of households and average loan size by monthly net household income[2]				
Less than €900	40.7	42.4	22.7	57.2
€900 to less than €1,300	21.2	20.5	27.7	66.7
€1,300 to less than €2,000	27.4	26.9	26.3	76.6
€2,000 to less than €3,200	43.8	42.5	24.3	91.4
€3,200 to less than €4,500	61.1	57.8	36.5	119.5
€4,500 to less than €6,000	58.9	50.0	48.8	184.1
€6,000 to less than €7,500	57.0	50.8	36.2	169.0
€7,500 or more	73.1	52.7	49.9	242.1
Share of households and average loan size by number of children below the age of 18				
Households with no children below the age of 18	39.0	35.7	31.4	112.9
Households with …				
one child	67.1	69.7	35.3	115.5
two children	70.6	68.9	44.0	138.4
three or more children	71.8	72.8	31.7	139.5

Source: PHF 2010-11. * Imputation and analytic weights are provisional. **1** Categorised on the basis of the most important status. **2** Derived from a self-assessment of total income.

Deutsche Bundesbank

higher-earning households. This is not a contradiction in terms since a large number of lower-income property owners are inheritors.

The average outstanding amount of mortgage loans (among households that report them) is €117,461. The conditional averages vary between the population groups in the study in the expected manner. Lower-income households have smaller outstanding mortgages than higher-income ones, and younger mortgage holders have larger mortgage debts than older groups. In both cases, this is a consequence of intertemporal budget constraints.

Distribution of housing wealth by size

Distributions …

It is possible to examine how housing wealth is distributed by recording, at household level, gross housing wealth and the attendant mortgages. The table on page 41 shows the distribution of gross and net housing wealth by socio-demographic group, and the table above draws attention to the fact that the significance of mortgage loans varies widely between the different groups. The table on page 44 brings together information on gross values, outstanding debt, net values and interest rate burdens in a single table on size distribution. The

… of gross and net values …

… borrowing and interest rate burden

Distribution of housing wealth and mortgage debt for property owners*

Item	Gross housing wealth	Size of mortgage loans	Net housing wealth[1]	Monthly interest payments as a percentage of calculated monthly net household income[2]
	€ thousand			Per cent
Mean	297.4	51.0	246.1	5.6
1st decile	55.0	0	19.0	0
2nd decile	100.0	0	49.0	0
3rd decile	125.0	0	82.0	0
4th decile	155.0	0	120.0	0
5th decile	200.0	0	152.5	0
6th decile	240.0	15.0	190.0	1.5
7th decile	300.0	49.1	250.0	5.1
8th decile	380.0	90.0	336.6	9.6
9th decile	550.0	160.0	490.0	16.8
95%	812.5	220.0	735.0	25.4
97.5%	1,190.0	300.0	1,040.0	32.3

Source: PHF 2010-11. * Excluding 105 households reporting implausible values on partial ownership. Imputation and analytic weights are provisional. 1 Gross housing wealth less all loans secured by these properties. 2 Calculated from the incomes of the household members.
Deutsche Bundesbank

values are ordered by size, and the rows show nine deciles, the 95% quantile and the 97.5% quantile. The first decile is the value that is less than or equal to the lowest 10% of values; the second decile is equal to or greater than the lowest 20%, and so on. The 95% quantile and 97.5% quantile are exceeded by only 5% and 2.5% of observed values respectively. The reliability of the 97.5% quantile is limited owing to the low number of data points. The figures are based on the sum total of all surveyed households in Germany which own homes and property. All these households have a positive gross housing wealth, but not all hold mortgages. The first five deciles therefore show a value of zero for mortgage loans. The averages in the first row for outstanding mortgage debt and the interest rate burden refer to all property owners, including those with no debt.

Median gross housing wealth (among owners) stands at €200,000 and median net housing wealth at €152,500, underlining the major importance of property for household wealth. The third column is not calculated as the difference of the first two: the distributions given in the columns are not connected with one another, and the quantile values do not refer to the same households. The values for the 95% and 97.5% quantiles show once again that efforts to include wealthy households in the PHF were not in vain.

Inequality among property owners

Wealth is more concentrated than incomes, and the table describes inequality also within the category of property owners. The last decile, ie the 10% of property owners with the largest gross housing wealth, hold 40.2% of overall housing wealth. Setting the bar at the top 20% of property owners (or around 9% of all households if non-owners are also included) increases the figure to 55.3%. Net housing wealth is even slightly more concentrated: the relevant values are 43.9% and 59.9% respectively.

Burden through interest payments

The fourth column contains interest payments as a percentage of household income, arranged by their size. The higher quantiles in this column should be treated with particular caution since the household income in the denominator is potentially flawed and extremes at the tails of the distributions could also reflect measurement errors. With that proviso, there is good news at the end of the table. Mortgage interest rates have been rather low for quite some time now, and this has impacted broadly on the interest rate burden on existing loans. Values for the interest rate burden near the tails of the distributions still seem to be manageable. The finances of private mortgage holders in Germany and the recoverability of their loans will therefore be in good shape if interest rates remain at their current level. The survey data, however, can also be used to simulate the effect of a change in this interest rate level, since they include information on interest rate fixation periods and maturities.

Outlook

The PHF is a new and very fruitful resource for monetary policymakers and researchers alike. Work in 2012 will be dedicated not only to finalising the data base but also to carrying out a targeted evaluation in order to draw a precise outline of the structure of household finances in Germany.