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Wealth variables in the Swiss Household Panel: Imputation and first results

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Ursina Kuhn and Eric Crettaz

Correspondance to:

Swiss Household Panel, FORS, c/o

University of Lausanne, Bâtiment Géopolis, CH-1015 Lausanne

E-mail: ursina.kuhn@fors.unil.ch

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1. Introduction and question wording

Switzerland is one of the wealthiest nations in the world. At the turn of the millennium wealth per capita amounted to US$ 212,394, which was higher than in the United States (US$ 201,319) and much higher than in neighbouring countries (Germany US$ 109,735, Italy US$ 122,250, France US$ 114,650, Davies et al. 2008). According to the World Bank Switzerland was in the top 5 in terms of total wealth per capita, behind Luxembourg, Iceland, Norway and Denmark (World Bank's website, The Wealth of Nations for 2005).

In 2009, the SHP has started to collect limited information on wealth, firstly only for the SHP II sample (as a precaution to attrition effects) and in 2010 for the SHP I sample. Response was only collected in categories for overall wealth and for value of the main residence for owner-occupiers. In 2012, households have been asked about wealth again. The questionnaire collected again only two wealth components: the value of main residence for owner-occupiers (net of mortgages)[1] and other wealth[2]. Households not living in their own property

[1] Question wording: How much money would you get if you sold the house or flat you are living in, after the deduction of the amount needed to reimburse the mortgage and other loans? (Variable h12i110a)

[2] Question wording: In addition to the real estate assets already mentioned, what is the value of other assets owned by your household, such as other real estate assets, savings, stocks and bonds, after the deduction of potential debt? (Variable h12i111a)

have only been asked one global question about wealth.[3] Categories were proposed only if respondents do not answer directly.

For different reasons wealth levels between 2009/2010 and 2012 cannot be compared: The question wordings has been altered, information in 2009/2010 is only available in categories, and only part of the samples have been asked about wealth (PSM II in 2009, PSM I in 2010). In the following, we only discuss the wealth measure of the SHP in 2012.

This documentation documents the imputation of the wealth variable (Chapter 2). Furthermore, it tests the (imputed) variable by providing descriptive statistics (Chapter 3) and first applications of bi- and multivariate models (Chapter 4 and 5). Findings are compared with results from other data sources to assess the plausibility of the results.

2. Imputation of item non-response

Table 1 presents the response rate for the different wealth questions. The item non-response of owner occupiers amounted to 11.1% for the value of the main residence and to 13.2% for other wealth. Other households have non-response rate of 10.9% for total wealth.

	Value of house (owner occupiers)		Other wealth (owner occupiers)		Total wealth (renters)	
	n	%	n	%	n	%
Amount given	1823	77.4%	1734	73.7%	1502	71.0%
Wealth category given	271	11.5%	308	13.1%	382	18.1%
Item non-response	260	11.1%	312	13.2%	231	10.9%
	2354	100.0%	2354	100.0%	2215	100.0%

Table 1: Number of cases and response rates for wealth questions

For the imputation, the variables “other wealth” (for owner occupiers) and “total wealth” (for renting households) are combined (with house owner as a explanatory variable). Values are imputed for three variables:

1. Value of house (conditional for house owners): OLS-regression on logarithm of house value
2. Presence of other wealth (0, wealth>0): logistic regression
3. Amount of other wealth (conditional on presence of other wealth): OLS regression on logarithm of other wealth

[3] Question wording: What is the value of assets owned by your household, such as real estate assets, savings, stocks and bonds, after the deduction of potential debt? (Variable h12i111c)

Item non-response is imputed using iterative imputation with the program mi impute from Stata. More precisely, the value of the house is imputed using other wealth and vice versa. Ten iterations are computed. Besides the other wealth variables, the following independent variables have been included in the regression models:

- Characteristics of main earner within household: educational level (4 levels), age (and square term), occupational status, self-employment, sex, civil status (married, separated/divorced and other), not born in Switzerland, language of interview (French, Italian, German)
- All household members (dummy variables): unemployed person in household, retired person in household, child in household, person not born in Switzerland in household, house owner (only for amount of other wealth)
- Household information: living standard, assessment of income and expenses (household can save, household goes into debt), disposable household income (and square term), household weight, number of waves of panel participation of household, number of persons in household, imputed rent, pre-government income, number of rooms in accommodation
- Social origin of main earner: financial problems at age 15, not living with both parents at age 15, high education of father, high education of mother
- Municipality: wealth municipality (according to official typology), urban municipality (according to official typology), tax level (for imputation of house wealth only)

After the 10^{th} iteration, the R-squared amount to 13.6 for the value of the house and 34.8 for other wealth. For the presence of other wealth (logistic regression), the Pseudo-R square is o 16.4%.

For wealth categories, linear interpolations along the categories are applied to have continuous variables.

The following imputed wealth variables available for SHP data from the SHP webpage:

wealth12hi	Imputed wealth: value of house
wealth12hi_f	Flag imputed wealth: value of house (0 no imputation, 1 category, 2 imputed)
wealth12oti	Imputed wealth: other than house
wealth12oti_f	Flag imputed wealth: value of house (0 no imputation, 1 category, 2 imputed)

3. Comparison SHP wealth data with other data sources

Comparison with SNB statistics

The data from the Swiss National Bank on wealth of private households refer to a definition of wealth which differs from the definition of the OECD and the SHP. The most important difference is that the SNB wealth data include claims from pension funds (2nd pillar old age insurance). These together with life insurance amount to 23.6% of total wealth of private households in 2012 (29.4% of "Reinvermögen").

If we aggregate wealth of the imputed SHP variables to the population, the SHP reports wealth of 1'996'239 Mio CHF, which is 69.3% of the SNB gross wealth if 2nd pillar is excluded from SNB statistics (2'879'845 Mio), and 93.3% of the SNB net worth minus the insurance claims (2'138'999). If insurance claims in the SNB statistics are included, the SHP covers of 53% of SNF gross wealth and 66% of SNB net worth. For real estate (value houses of owner-occupiers), the wealth estimated by the SHP wealth exceeds wealth reported by the SNB statistics by 35%. Although both statistics refer to the market value of the house, the way of estimation is different. However, the overestimation of housing wealth in the SHP is at least partly due to the overrepresentation of owner-occupiers in the SHP. While, 37.2% of all housing units are owner-occupied according to the SFSO in 2012, 45.1% of SHP households are owner occupiers.

Comparison with other Swiss studies

	Gini	Top percent	Mean	Median	% with 0
Davies 2008	0.803	10%- 71.3% 1% - 34.1%			
Credit Suisse 2010	0.88				
Peters 2010	0.854 (2007), 0.746 (2008)				
SILC 2011 (Ecoplan 2014)	0.79		337'283	55'092	
Tax records (Ecoplan 2014)	0.8401 (2003) 0.8347 (2004) 0.8413 (2005) 0.8437 (2006) 0.8536 (2007) 0.8464 (2008) 0.8490 (2009) 0.8510 (2010)	5%- 62% 1% - 40	242'000 (2003) 251'000 (2004) 264'000 (2005) 277'000 (2006) 292'000 (2007) 266'000 (2008) 286'000 (2009) 290'000 (2010)	28'000 (2003) 30'000 (2004) 30'000 (2005) 31'000 (2006) 29'000 (2007) 28'000 (2008) 29'000 (2009) 29'000 (2010)	25.5%
Wanner and Gabadinho (2008)				53'500 (2003)	
SHP 2012 (per capita)	0.797		259'631	60'000	13.9%
SHP 2012 (Household)	0.791		613'671	115'000	

Table 2: Descriptive statistics on wealth in Switzerland by data sources

Comparison SHP - SOEP

For a comparison of wealth in Switzerland (SHP) and Germany (SOEP) some important differences between data sources have to be taken into account. The SHP collects only information on two wealth components, while the SOEP surveys many different wealth components. In the SHP, wealth is collected at the household level and in the SOEP at the individual level. Finally, the SHP does not collect information on debt, which means that wealth inequality in the SHP is underestimated and average wealth levels overestimated.

Nevertheless, this analysis shows a higher wealth level in Switzerland compared to Germany. For example median wealth in Germany in 2012 amounted to only 16'663 Euro compared to 116'795 CHF. At the top, the differences are even stronger. Interestingly, the Gini coefficients of the two countries are very similar with overlapping confidence interval. But with regards to

percentile ratios, Germany shows a much higher inequality. This could be explained by the very high inequality at the very top of the wealth distribution in Switzerland, as also shown by tax records (Martinez and Foellmi 2013).

	Germany, SOEP 2012			Switzerland, SHP 2012		
	Lower bound	Estimate	Upper bound	Lower bound	Estimate	Upper bound
Gini	0.765	0.78	0.794	0.735	0.754	0.774
Percentile ratios						
p90/p50	11.2	13.0	14.8	5.4	5.7	6.0
p75/p50	5.2	6.0	6.8	2.7	2.8	2.9
Mean	79'218	83'308	97'399	279'312	307'650	335'988
Percentiles						
p99	747'813	817'279	886'774	3'902'196	4'885'294	5'508'659
p95	304'770	323'180	341'589	1'039'996	1'110'994	1'227'143
p90	208'303	216'971	225'639	650'000	666'751	712'500
p75	96’519	100’000	103’481	320'000	326'450	339'282
Median	14'200	16'663	19'126	110'000	116'795	125'000
p25	0	0	0	16'667	19'328	20'352
p10	0	0	0	236	345	536
p5	-4'081	-3'150	-2'219	0	0	0
p1	-29'556	-24'100	-18'644	0	0	0

Table 3: Descriptive statistics for individuals from 17 in the SHP 2012 and SOEP 2012 (from Grabka and Westermeier 2014)

4. Wealth in SHP by age group

In line with analysis on tax records, most wealth is owned by households above retirement age (years of age of main income earner). The age group from 75 years and older has the highest average wealth, which is due to the value of the house they live in. Other wealth is highest for the age group 65 to 74 years. Overall, the wealth level of household where the main earner is above 65 years amounts to 652’045 CHF, which is 3.6 times higher than average wealth of households younger than 65 years (181’797 CHF).

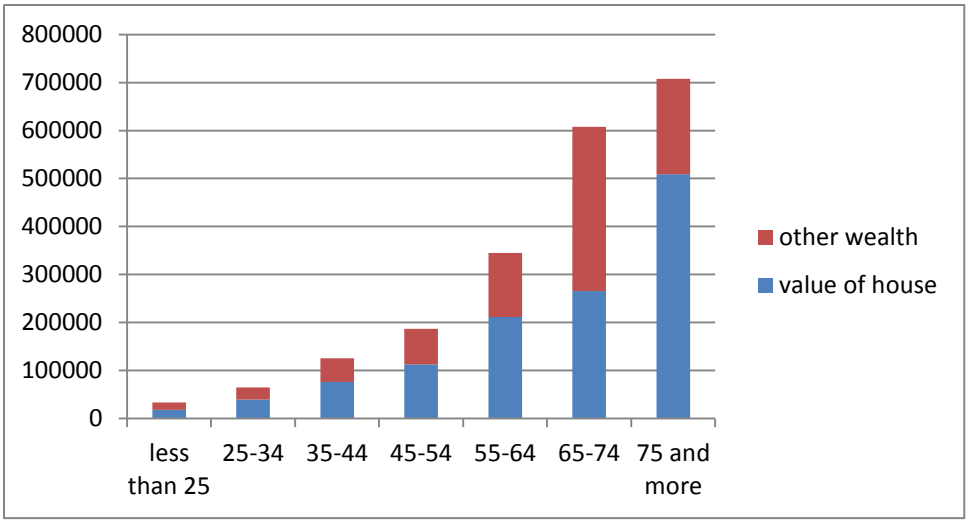

Table 4: Average wealth by age group. Source: SHP 2012

The decomposition of the Theil index shows again the concentration of wealth within the oldest age groups.[4] Inequality within age groups is also highest for the age groups 75+ years, showing that despite high average wealth, many old households do not hold assets.

	Theil Index	Population share	Relative wealth	Absolute contribution	Relative contribution
less than 25	1.17	0.02	0.13	0.00	0.00
25-34	1.39	0.11	0.25	0.04	0.02
35-44	0.98	0.24	0.48	0.12	0.07
45-54	1.29	0.28	0.72	0.26	0.17
55-64	1.21	0.17	1.33	0.28	0.18
65-74	1.37	0.10	2.34	0.31	0.19
75 and more	1.71	0.07	2.73	0.35	0.22
Within				1.36	0.86
Between				0.25	0.16
Total	1.58	1.00		1.58	1.00

Table 5: Decomposition of net worth by age group. Source: SHP 2012

5. Explaining the wealth level

As a further test for the plausibility of the wealth variable in the SHP, we apply a multivariate standard regression model on the wealth level. Wealth (in CHF) has been divided by the number of persons living in a household (wealth per capita). Furthermore, we apply an Inverse Hyperbolic Sine (IHS) Transformation: $ihs(x) = \log\left(\sqrt{x^2 + 1}\right) + x.$

[4] In order to include all household in the analysis, households with no wealth have been given wealth of 0.1 CHF.

The IHS-Transformation is widely used for wealth because of its many desirable features (see references by Friedline et al. 2015).[5] Most importantly, it adjusts for skewness while retaining zero and negative values. It therefore does not have the same drawbacks of the natural log that stack values at 1 or disproportionately misrepresent zero and negative values for certain households. As a dependent variable, the transformed values can be converted back into national currencies for ease of interpretation. Finally, the transformation allows for sensitive changes in wealth, which implies that the HIS transformation is a way to examine wealth along a continuum and to examine disproportionate increases or decreases along this continuum.

As explanatory variables, we include individual and household level variables in line with previous literature (e.g. Frick et al. 2010). We include several individual-level characteristics (e.g. age, migration background, civil status, education, health, professional activity, social origin) which refer to characteristics of the person with the highest income within the household. Household-level variables include the presence of a small child and permanent income, which refers to the mean of equivalised post-government income over all available panel waves.

The aim of this model is not to test theoretically developped hypotheses but to apply the (imputed) variable in a multivariate model to check the plausibility of results. Furthermore, we do not make causal claims. Rather, the model reveals correlations of wealth in Switzerland with various socio-demographic and socio-economic characteristics.

[5] Often, a scale parameter is added to the IHS equation $ihs(x) = \log\left(\theta x + [\theta^2 x^2 + 1]^{\frac{1}{2}}\right)/\theta$ to make the distribution more sensitive to changes in extreme values without distorting errors (Pence 2006).

	b	t
Sex: Male (main earner)	0.228	(1.68)
Age: 25-34 (main earner)	0.108	(0.28)
35-44	1.012**	(2.6)
45-54	1.477***	(3.84)
55-64	1.920***	(4.88)
65-74	2.931***	(6.98)
75+	3.061***	(6.98)
French speaking (main earner)	-0.710***	(5.57)
Italian speaking	-0.256	(0.92)
Migration background (main earner)	-1.104***	(6.62)
Child younger than 4 years in hh	-0.649*	(2.52)
Education: Secondary II	0.724***	(3.57)
Tertiary	1.196***	(5.3)
Health: so, so (Ref)		
well or very well	0.08	(0.34)
bad	-0.483	(1.88)
Civil status/Partnership: Single (Ref)		
Separated	-0.666**	(3.03)
Widow	0.932***	(3.45)
Married	0.860***	(4.55)
Unmarried couple	-0.653*	(2.52)
Employment: inactive (Ref.)		
Private employment	0.119	(0.58)
Public employer	-0.07	(0.31)
Self-employment	0.435	(1.50)
Manager/supervision position	0.155	(1.00)
Social origin of main earner: High education mother	0.477	(1.58
High education father	-0.043	(0.28)
Financial problems in youth	-0.707***	(5.11)
Permanent household income: 1. Quintile (Ref.)		
2. Quintile	1.059***	(5.95)
3. Quintile	1.874***	(10.39)
4. Quintile	2.485***	(13.44)
5. Quintile	3.129***	(16.14)
Imputed wealth (Ref: not imputed)	0.651***	(4.12)
Constant	6.311***	(14.92)
R-Square	0.214	
N	4462	

Table 6: Regression on per capita wealth. Source: SHP 2012

Results of the OLS regression (Table 6) show that – on average – wealth is higher among older and better educated households and individuals. Married and widowed households have higher wealth levels than single housheolds, whereas the wealth of unmarried couples or

separated households is lower than for single households, which might be an age effect. Furthermore birth in Switzerland is associated with a higher wealth level compared to Migrants. Interestingly, occupational variables (e.g. self-employment) do not influence wealth. Neither does health status seem to influence the wealth level. Interestingly, there is no gender wealth gap in this general model. The fact that German-speaking speaking household tend to have higher wealth levels could be explained by the composition of the population or different saving behaviour (Guin 2015).

Not surprisingly, income is related to wealth, in particular for the bottom and the top quintile. Social origin is not important in terms of education of the parents. But individuals who suffered from financial problems in their youth tend to have lower wealth, which could be explained by lower heritage. Finally, wealth tends to be slightly higher for households with imputed wealth compared to households who indicated their wealth level.

Overall, the results seem plausible and are mostly in line with findings on Germany. Exceptions are health status and professional variables, which correlate with wealth levels in Germany but not in Switzerland. Apart from true differences, also methodological aspects could explain these differences. Firstly, the analysis of the German SOEP are conducted at the individual level (rather than at the household level as in Switzerland), and secondly the professional variables refer to experience in the labour market (rather than current profession in the SHP).

6. Conclusion and data availability

The SHP provides a simple measure on the wealth level of households for 2012. Missing values have been imputed and the imputed wealth variables can be downloaded from the SHP webpage by registered users. Although the wealth variable is based only on two questions, applications (univariate measures, regression model) yield similar results to other surveys. However, major limitations of this variable concern households at the extremes of the wealth distribution, because debt is not measured and because the very wealth households are hardly covered by surveys.

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