Appendix A: Methodoloy – technical details

A1 Environmental impact calculus

Households' environmental impacts are obtained from raw data according to standardised input-output calculations. Let the satellite accounts be arranged in a $M \times N$ matrix **Q**, with each element Q_{ij} representing the environmental intervention (emission, resource use, disturbance etc) in terms of indicator i of industrial sector j. In our case, **Q** holds $M = 4$ environmental indicators, and $N = 8 \times 344 = 2752$ industrial sectors of the Australian economy, or 344 for each of the eight Australian States and Territories.[1] Emissions are measured in t CO_2-e = tonnes of carbon dioxide equivalent, water use in GL = Gigalitres = 10^9 litres, material flow in t = tonnes, and land disturbance in ha = hectares, so that the units of elements in **Q** are {t CO_2-e, GL, t, ha}.[2] Let **T** be a $N \times N$ domestic input-output table of the Australian economy, with $N = 8 \times 344$ industry sectors (Gallego and Lenzen 2009). Let **y** be a $N \times S$ vector constructed from the HES, holding expenditures on 344 commodities, of $S = 1563$ household samples in 8 States. The units of elements in **T** and **y** are Australian Dollars (AU$). Then,

$$\mathbf{E} = \mathbf{Q}(\widehat{\mathbf{T1} + \mathbf{y}})\left(\mathbf{I} - \mathbf{T}(\widehat{\mathbf{T1} + \mathbf{y}})^{-1}\right)^{-1}\mathbf{y} = \mathbf{Q}\hat{\mathbf{x}}^{-1}\left(\mathbf{I} - \mathbf{T}\hat{\mathbf{x}}^{-1}\right)^{-1}\mathbf{y} = \mathbf{q}(\mathbf{I} - \mathbf{A})^{-1}\mathbf{y} = \mathbf{m}\mathbf{y} \quad \text{(A1.1)}$$

is a $M \times S$ vector of total environmental impact, with elements E_{ik} representing the environmental impact of household sample k in terms of environmental indicator i. In Equation A1.1, **I** is a $N \times N$ identity matrix with $I_{ij} = 1$ if $i = j$ and $I_{ij} = 0$ if $i \neq j$. $\hat{\mathbf{x}}$ is a diagonal matrix of gross output $\mathbf{x} = \mathbf{T1} + \mathbf{y}$, with $\mathbf{1} = \{1,...,1\}^t$ being the transposed summation operator. **q** contains so-called environmental intensities measuring for each industry sector j its environmental impact q_{ij} in terms of indicator i, per unit of its gross output. **A** is called the direct requirements matrix holding the domestic industrial production recipe. Each element A_{ij} measures the input of industry i's output into production of industry j, per unit of j's gross output. The units of elements in **E** are {t CO_2-e, GL, t, ha}. The $M \times N$ matrix $\mathbf{m} = \mathbf{Q}(\mathbf{I} - \mathbf{A})^{-1}$ contains so-called environmental multipliers. Each element m_{ij} represents the total (that is life-cycle, or supply-chain) environmental impact in terms if indicator i, associated with the final purchase of a dollar unit of commodity j.[3] Since **T** is a domestic input-output table, **m** excludes environmental impacts occurring overseas during the production of imports into Australia. The units of elements in **m** are {t CO_2-e/AU$, GL/AU$, t/AU$, ha/AU$}.

[1] NSW = New South Wales, Vic = Victoria, Qld = Queensland, SA = South Australia, WA = Western Australia, Tas = Tasmania, NT = Northern Territory, ACT = Australian Capital Territory.

[2] For further information see ISA 2010.

[3] We have added direct effects such as emissions from burning natural gas or town gas in the house, or petrol in the private car, to the indirect supply-chain effects in **q**.

A2 Concordances used for matching explanatory variables

HES variable	AUWS variables used to construct match to HES variable										
Inc	income	houseinc									
size	alone	partner	house	house2	housemem						
age	age	age1	age2	age3	age4	age5	age6	age7	age8	age9	age10
emp	work	workpt									
pop	postcode										
qual	edulevl	educat	educode								
Ten	home	rent	mort								
born	cob	ctzshp	ethnic								
Car	car										
NSW	postcode	loc	state								
VIC	postcode	loc	state								
QLD	postcode	loc	state								
WA	postcode	loc	state								
SA	postcode	loc	state								
TAS	postcode	loc	state								
NT	postcode	loc	state								
ACT	postcode	loc	state								

Tab. A2.1: AUWS variables used to match HES variables

A2a		A2b					
HES variable	index	AUWS *educode*	HES	AUWS *edulvl*	HES	AUWS *educat*	HES
Postgraduate Degree	5	1	0	1	0	0	0
Graduate Diploma and Graduate Certificate	4	2	0	2	1	1	0
Bachelor Degree	3	3	0	3	3.5	2	1.5
Advanced Diploma and Diploma	2	4	1	4	5	3	4
Certificate	1	5	2				
		6	4				

Tab. A2.2: Definition of qualification indices (A2.2a), and correspondence between AUWS and HES indices (A2.2b).

A3a		A3b					
HES variable	index	AUWS *mort*	HES	AUWS *rent*	HES	AUWS *home*	HES
Owners without a mortgage	5	1	4	1	2.5	1	2.5
Owners with a mortgage	4	2	-	2	4.5	2	4
Renters from state or territory housing authority	2					3	5
Renters-other	3						
Other	1						

Tab. A2.3: Definition of tenure type indices (A2.3a), and correspondence between AUWS and HES indices (A2.3b).

A3 Dealing with missing information

The AUWS is incomplete in a way that there is not a single one amongst the 36,209 samples where all 17 variables are observed (Fig. A3.1). This means that a so-called complete-case analysis, where samples afflicted by missing data are simply discarded, was not possible. Similarly, the limited overlap of available cases between variables meant that we were unable to impute missing values for each variable (for example by linear regression) based on the remaining variables. We also did not replace missing values by the mean of existing observations (so-called mean imputation), because of the bias and overstated precision associated with this method (Little 1992).

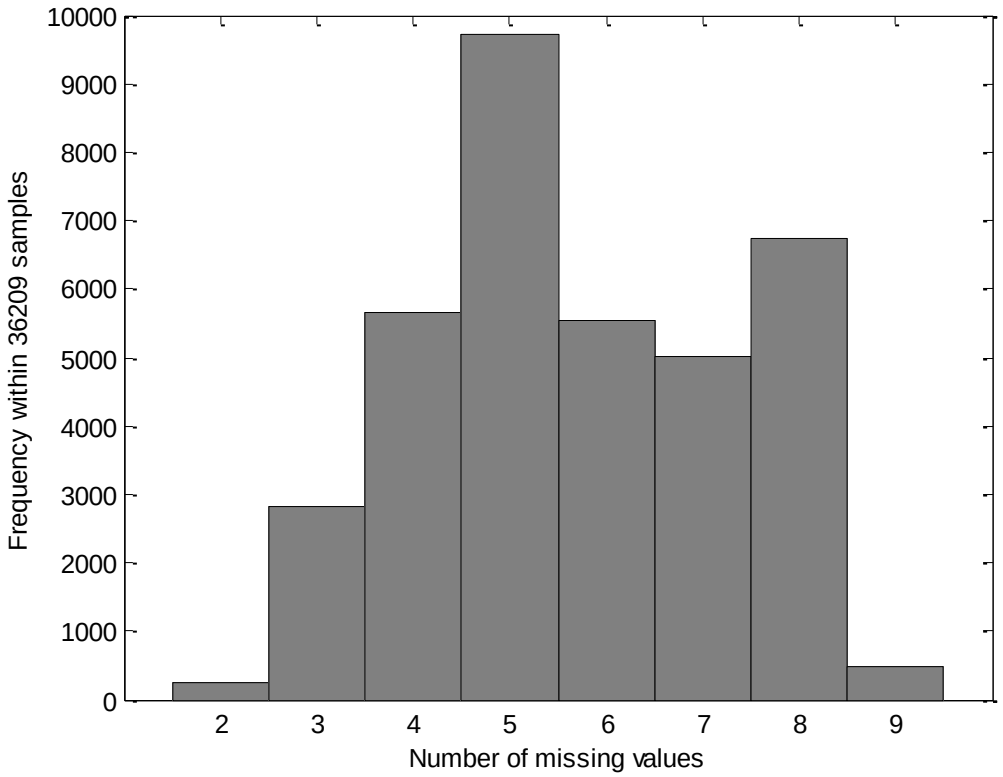

Fig. A3.1: Frequency of missing values in the AUWS. In most samples, information is missing on between 4 and 8 variables. None of these variables is a State dummy variable.

Next, we checked the possibility of undertaking a so-called available-case analysis, where both the suite of explanatory variables and the sample population is reduced in order to yield the explanatory variable set with the largest amount of available data (Little 1992). The optimum choice includes 13 variables and 8,611 samples (Tab. A3.1). Reducing our population to this set would have meant excluding 'Qualification', 'Tenure type', 'Migrants' and 'Car ownership', as well as reducing the sample population to a quarter of its original size. We therefore did not follow this approach, however we used available-case analyses in order to test the robustness of our regressions (see Appendix D).

	Top-ranked set	2nd–ranked set	3rd–ranked set
Available data (% of total AUWS)	25.5 %	15.1 %	12.1 %
Number of samples	8611	6638	4430
Number of variables	13	10	12
Variables	Median age Household size Income Household members employed Population density 8 State dummies	Median age Population density 8 State dummies	Median age Household size Income Population density 8 State dummies

Tab. A3.1: Analysis of the set of explanatory variables with the largest amount of available data.

We therefore substituted missing ABWS and HES data with information from the Australian Census (Table A3.2).

Cover sheet: Area	B32: Fully owned	B39: Postgraduate Degree
Postcode	B32: Being purchased	B39: Graduate Diploma and Graduate Certificate
B01: Total persons	B32: Real estate agent	B39: Bachelor Degree
B02: Median age of persons	B32: State or territory housing authority	B39: Advanced Diploma and Diploma
B02: Average household size	B32: Person not in same household	B39: Certificate, Total
B02: Median household income ($/weekly)	B32: Housing co- operative /community/church group	
B09: Australia, Persons	B32: Other landlord type	B41: Total labour force male
B29: None	B32: Landlord type not stated	B41: Total labour force female
B29: 1 motor vehicle	B32: Other tenure type	
B29: 2 motor vehicles		
B29: 3 motor vehicles		
B29: 4 or more motor vehicles		

Tab. A3.2: Census data used for populating missing AUWS and HES data.

Appendix B: Raw sample characteristics

The raw AUWS data are unpublished, but the single-household samples were available to the authors. Because of confidentiality requirements, the published HES and Census data are aggregates over many households. This leads to the AUWS explanatory variables often spreading over a much wider range than the HES and Census explanatory variables (Fig. B.1).

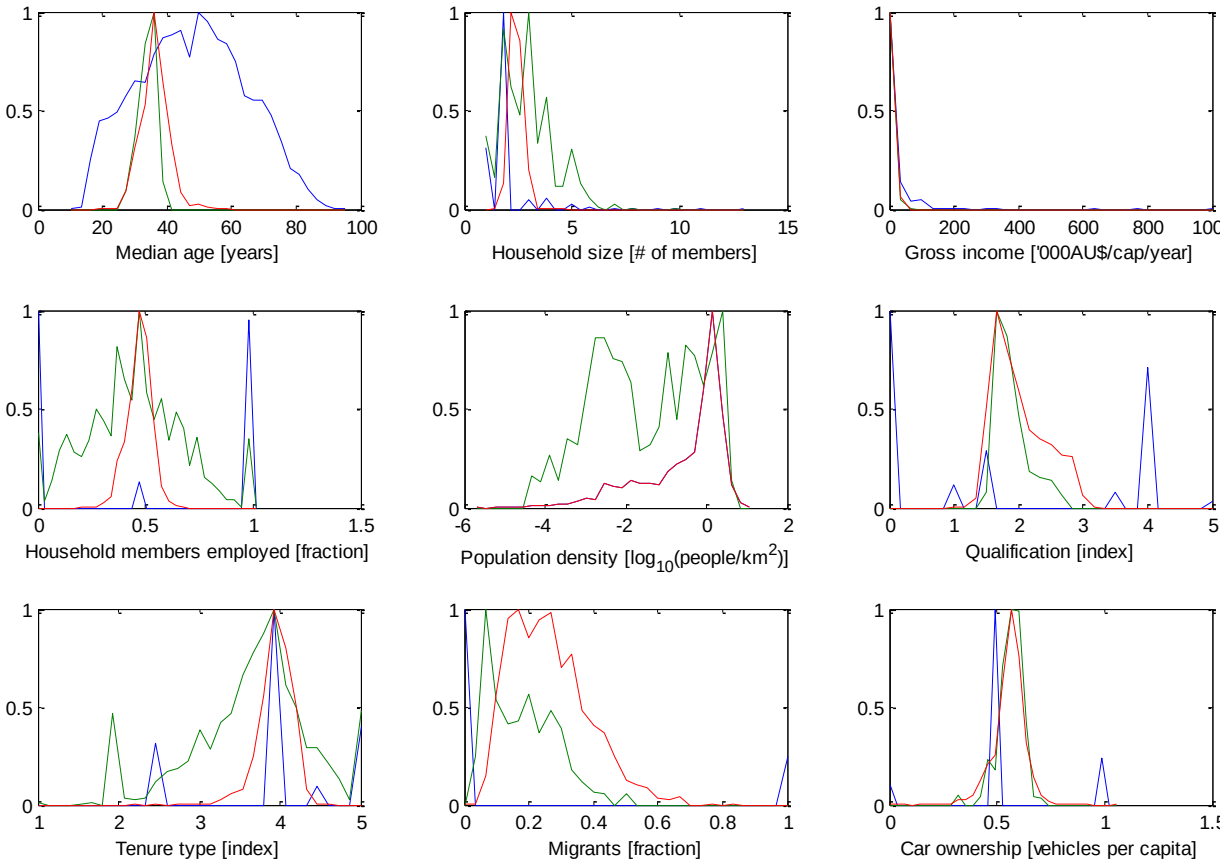

Fig. B.1: Normalised frequency distributions of explanatory variables (raw data). Blue: AUWS, before filling in of missing data; green: HES; red: Census.

Appendix C: Detailed multiple regression results

Equation		*age*	*size*	*inc*	*qual*	*ten*	*born*	*car*	*NSW*	*Vic*	*Qld*	*WA*	*SA*	*Tas*	*NT*	β_0	R^2
	Units	/year	/member	/AU$1k	/index point	/index point	/%	/vehicle	/move	/move	/move	/move	/move	/move	/move		
1a	*SWB* points/	0.08 ***	1.25 ***	0.054 ***	0.31 ***	2.73 ***	-2.1 ***	-0.06	-0.3	0.5 ***	0.9 ***	-0.2	0.4 **	-0.1	2.3 ***	55.1 ***	0.026
1b	*SWB* points/	2.96 ***	1.11 ***	0.051 ***	0.31 **	2.84 ***	-2.1 ***	-0.02	-0.3	0.4 ***	0.8 ***	-0.2	0.4 **	-0.2	2.3 ***	47.8 ***	0.023
1c	*SWB* points/	0.09 ***	3.65 ***	0.056 ***	0.30 ***	2.58 ***	-2.1 ***	0.41	-0.2	0.5 **	0.9 ***	-0.2	0.4 **	-0.1	2.3 ***	55.0 ***	0.030
1d	*SWB* points/	0.09 ***	1.46 ***	2.32 ***	0.11 ***	2.71 ***	-2.1 ***	-0.31	-0.2	0.5 ***	0.9 ***	-0.2	0.5 **	0.0	2.1 ***	49.2 ***	0.028
1e	*SWB* points/	0.08 ***	1.25 ***	0.054 ***	0.31 ***	2.73 ***	-2.1 ***	-0.06	-0.3	0.5 ***	0.9 ***	-0.2	0.4 **	-0.1	2.3 ***	55.1 ***	0.027
2a	% *SWB*/	0.12 ***	2.07 ***	0.09 ***	0.58 ***	4.34 ***	-2.8 ***	0.31	-0.5 *	0.6 **	1.3 ***	-0.1	0.7 **	0.1	3.9 ***	4.0 ***	0.023
2b	% *SWB*/	4.00 ***	1.86 ***	0.08 ***	0.58 ***	4.51 ***	-2.8 ***	0.38	-0.5	0.6 **	1.3 ***	-0.1	0.7 **	0.0	3.8 ***	3.9 ***	0.020
2c	% *SWB*/	0.13 ***	6.05 ***	0.09 ***	0.57 ***	4.09 ***	-2.8 ***	1.09	-0.4 *	0.7 **	1.3 ***	-0.1	0.7 **	0.2	3.9 ***	4.0 ***	0.026
2d	% *SWB*/	0.13 ***	2.43 ***	3.76 ***	0.25 ***	4.31 ***	-2.9 ***	-0.10 **	-0.4	0.7 **	1.4 ***	-0.1	0.8 **	0.3	3.5 ***	3.9 ***	0.025
2e	% *SWB*/	0.12 ***	2.07 ***	0.09 ***	0.58 ***	4.34 ***	-2.8 ***	0.31	-0.5 *	0.6 **	1.3 ***	-0.1	0.7 **	0.1	3.9 ***	4.0 ***	0.023

Tab. C.1: Regression coefficients β_i for the AUWS data set x_i, obtained from regressions $SWB = f(\beta_i, x_i)$ according to Equations 1 and 2. ***Empl* and *pop* are excluded from the variable set.** *** significantly different from zero at the 99% level of confidence, ** 95%, * 90%, grey font: significance below 90%. Units of coefficients can be read from column 2 and row 2. For example the unit of the coefficient for equation 1d and the variable *size* is change in *SWB* points per unit change in the number of household members. Grey background indicates a percentage change in the explanatory variable. For example the unit of the coefficient for equation 2d and the variable *inc* is the percentage change in *SWB* points per percentage change in per-capita income.

Equation		*age*	*size*	*inc*	*qual*	*ten*	*born*	*car*	*NSW*	*Vic*	*Qld*	*WA*	*SA*	*Tas*	*NT*	β_0	R^2
	Units	/year	/member	/AU$1k	/index point	/index point	/%	/vehicle	/move	/move	/move	/move	/move	/move	/move		
3a	t CO_2-e/	0.04	-2.2 ***	0.36 ***	4.33 ***	1.0 ***	-4.1 ***	0.8	1.9 ***	2.8 ***	1.3 ***	1.3 **	0.0	-3.1 ***	3.0 ***	0.3 *	0.74
3b	t CO_2-e/	0.67 *	-2.3 ***	0.36 ***	4.24 ***	1.0 ***	-4.4 ***	0.0	1.8 ***	2.8 ***	1.2 **	1.3 **	0.1	-3.1 ***	2.8 ***	0.3 *	0.74
3c	t CO_2-e/	0.02	-6.0 ***	0.35 ***	4.32 ***	1.1 ***	-4.1 ***	0.8	1.9 ***	2.8 ***	1.3 **	1.4 **	0.1	-3.1 ***	3.1 ***	0.2	0.75
3d	t CO_2-e/	-0.07	-2.5 ***	4.39 ***	5.26 ***	0.9 ***	-5.6 ***	-3.0	2.0 ***	2.9 ***	1.0 ***	1.4 ***	0.2	-3.4 ***	2.7 ***	0.3	0.72
3e	t CO_2-e/	0.04	-2.2 ***	0.36 ***	4.33 ***	1.0 ***	-4.1 ***	0.8	1.9 ***	2.8 ***	1.3 ***	1.3 **	0.0	-3.1 ***	3.0 ***	0.3 *	0.74
4a	% *GHG*/	1.41 ***	-13.0 ***	2.1 ***	38.4 ***	13.6 ***	25.7 ***	109.7 ***	23.5 ***	17.0 ***	22.0 ***	15.8 ***	5.1 **	-14.8 ***	46.7 ***	0.02 ***	0.98
4b	% *GHG*/	57.45 ***	-13.3 ***	2.1 ***	22.0 ***	8.5 ***	4.7 ***	-25.2 ***	1.7 ***	6.4 ***	1.1 ***	4.6 ***	-7.0 ***	-28.8 ***	17.2 ***	-0.01 ***	0.98
4c	% *GHG*/	1.32 ***	-32.9 ***	2.1 ***	38.5 ***	13.7 ***	23.6	107.6 ***	23.6	17.4 ***	22.3	16.8 **	5.8 ***	-15.1 ***	46.3 ***	0.01 **	0.98
4d	% *GHG*/	0.75 ***	-14.6 ***	28.3 ***	41.9 ***	12.9 ***	16.3 ***	83.8 ***	23.4 ***	17.4 ***	20.0 ***	15.4 ***	5.9 ***	-16.9 ***	43.1 ***	0.02	0.98
4e	% *GHG*/	1.41 ***	-13.0 ***	2.1 ***	38.40 ***	13.6 ***	25.7 ***	109.7 ***	23.5 ***	17.0 ***	22.0 ***	15.8 ***	5.1 **	-14.8 ***	46.7 ***	0.02 ***	0.98

Tab. C.2: Regression coefficients β_i^* for the HES data set x_i^*, obtained from regressions $GHG^* = f(\beta_i^*, x_i^*)$, according to Equations 3 and 4. ***Empl* and *pop* are excluded from the variable set.** *** significantly different from zero at the 99% level of confidence, ** 95%, * 90%, grey font: significance below 90%. Units of coefficients can be read from column 2 and row 2. For example the unit of the coefficient for equation 3d and the variable *size* is change in emissions per unit change in the number of household members. Grey background indicates a percentage change in the explanatory variable. For example the unit of the coefficient for equation 4d and the variable *inc* is the percentage change in emissions per percentage change in per-capita income.

Equation		*age*	*size*	*inc*	*pop*	*ten*	*born*	*car*	*NSW*	*Vic*	*Qld*	*WA*	*SA*	*Tas*	*NT*	β_0	R^2
	Units	/year	/member	/AU$1k	/('000/km^2)	/index point	/%	/vehicle	/move	/move	/move	/move	/move	/move	/move		
1a	*SWB* points/	0.08 ***	1.22 ***	0.057 ***	-0.27 ***	2.55 ***	-1.4 ***	-1.41 ***	-0.2	0.6 ***	0.8 ***	-0.2	0.5 **	-0.2	2.0 ***	57.3 ***	0.026
1b	*SWB* points/	2.91 ***	1.08 ***	0.054 ***	-0.27 ***	2.66 ***	-1.4 ***	-1.36 ***	-0.2	0.6 ***	0.7 ***	-0.2	0.5 ***	-0.2	2.0 ***	50.1 ***	0.023
1c	*SWB* points/	0.09 ***	3.59 ***	0.059 ***	-0.24 ***	2.43 ***	-1.4 ***	-0.80 ***	-0.2	0.6 ***	0.8 ***	-0.2	0.5 **	-0.1	2.1 ***	57.1 ***	0.030
1d	*SWB* points/	0.09 ***	1.45 ***	2.46 ***	-0.33 ***	2.50 ***	-1.5 ***	-1.82 **	0.0	0.8 ***	0.9 ***	-0.1	0.7 **	0.0	1.9 ***	50.8 ***	0.028
1e	*SWB* points/	0.08 ***	1.25 ***	0.058 ***	-0.22 ***	2.60 ***	-1.2 ***	-1.36 ***	-0.2	0.8 ***	0.9 ***	0.0	0.6 ***	-0.1	2.1 ***	56.3 ***	0.027
2a	% *SWB*/	0.12 ***	2.05 ***	0.09 ***	-0.28 ***	4.15 ***	-1.9 ***	-1.22 **	-0.5 *	0.7 **	1.1 ***	-0.2	0.6 **	-0.1	3.5 ***	4.0 ***	0.023
2b	% *SWB*/	3.94 ***	1.83 ***	0.09 ***	-0.28 ***	4.33 ***	-1.9 ***	-1.13 ***	-0.5	0.7 ***	1.1 ***	-0.3	0.6 ***	-0.1	3.4 ***	3.9 ***	0.020
2c	% *SWB*/	0.13 ***	5.98 ***	0.09 ***	-0.22 ***	3.94 ***	-2.0 ***	-0.20 **	-0.5 *	0.7 **	1.1 ***	-0.3	0.6 **	0.0	3.5 ***	4.0 ***	0.026
2d	% *SWB*/	0.13 ***	2.42 ***	3.94 ***	-0.38 ***	4.06 ***	-2.1 ***	-1.88	-0.2	1.0 **	1.3 ***	0.0	0.9 **	0.3	3.2 ***	3.9 ***	0.025
2e	% *SWB*/	0.12 ***	2.08 ***	0.09 ***	-0.25 ***	4.18 ***	-1.6 ***	-1.31 **	-0.5 *	0.9 ***	1.2 ***	0.0	0.8 ***	0.1	3.5 ***	4.0 ***	0.023

Tab. C.3: Regression coefficients β_i for the AUWS data set x_i, obtained from regressions $SWB = f(\beta_i, x_i)$ according to Equations 1 and 2. ***Empl* and *qual* are excluded from the variable set.** *** significantly different from zero at the 99% level of confidence, ** 95%, * 90%, grey font: significance below 90%. Units of coefficients can be read from column 2 and row 2. For example the unit of the coefficient for equation 1d and the variable *size* is change in *SWB* points per unit change in the number of household members. Grey background indicates a percentage change in the explanatory variable. For example the unit of the coefficient for equation 2d and the variable *inc* is the percentage change in *SWB* points per percentage change in per-capita income.

Equation		*age*	*size*	*inc*	*Pop*	*ten*	*born*	*car*	*NSW*	*Vic*	*Qld*	*WA*	*SA*	*Tas*	*NT*	β_0	R^2
	Units	/year	/member	/AU$1k	/('000/km^2)	/index point	/%	/vehicle	/move	/move	/move	/move	/move	/move	/move		
3a	t CO_2-e/	0.14 ***	-2.2 ***	0.38 ***	0.86 ***	1.0 ***	0.0	10.6 ***	-0.3	0.2	-0.9 **	-1.5 ***	-3.1 ***	-4.9 ***	2.5 ***	0.2	0.74
3b	t CO_2-e/	2.94	-2.2 ***	0.37 ***	0.84 ***	0.8 ***	-2.5	4.2 ***	-0.7	0.3	-1.3 ***	-1.4 ***	-2.9 ***	-5.1 ***	1.3 ***	0.0	0.74
3c	t CO_2-e/	0.12 ***	-5.9 ***	0.37 ***	0.88 ***	1.1 ***	-0.2 **	10.7 *	-0.3 *	0.3	-0.9 ***	-1.4 ***	-3.1 ***	-4.9 ***	2.5 ***	0.1	0.74
3d	t CO_2-e/	0.03 ***	-2.5 ***	4.70 ***	1.17 ***	1.0 ***	-1.4	9.3 ***	-0.6	-0.2	-1.6 **	-2.1 ***	-3.6 ***	-5.6 ***	2.0 ***	0.2	0.72
3e	t CO_2-e/	0.24 ***	-2.3 ***	0.39 ***	-0.03	0.7 ***	5.4 ***	5.6 ***	-0.6	0.3	-1.4 ***	-2.0 ***	-3.4 ***	-4.8 ***	1.8 ***	0.3 **	0.73
4a	% *GHG*/	2.77 ***	-13.1 ***	2.3 ***	3.5 ***	12.4 ***	84.3 ***	173.3 ***	2.8 *	-5.1 ***	1.0	-11.1 ***	-24.2 ***	-30.4 ***	39.0 ***	0.02 ***	0.98
4b	% *GHG*/	71.11 ***	-13.3 ***	2.2 ***	2.5 ***	7.2 ***	24.1 ***	-13.2 ***	-11.5	-5.8 ***	-12.3 *	-10.1 ***	-22.5 ***	-38.6 ***	8.1 ***	-0.02 ***	0.98
4c	% *GHG*/	2.65 ***	-33.0 ***	2.3 ***	3.8 ***	12.6 ***	81.0 ***	172.8 *	3.0 ***	-4.7 ***	1.3 ***	-10.1 ***	-23.5 ***	-30.8 ***	38.8 ***	0.01 ***	0.98
4d	% *GHG*/	2.03 ***	-14.7 ***	31.3 ***	5.1 ***	11.8 ***	72.9 ***	158.0 ***	1.1 *	-6.9 ***	-2.8	-13.7 ***	-25.9 ***	-34.4 ***	35.0 ***	0.02	0.97
4e	% *GHG*/	3.04 ***	-13.4 ***	2.4 ***	-2.28 ***	10.1 ***	147.3 ***	151.0 ***	-2.6 *	-7.2 ***	-6.9 ***	-23.1 ***	-30.7 ***	-30.4 ***	27.7 ***	0.01 **	0.98

Tab. C.4: Regression coefficients β_i^* for the HES data set x_i^*, obtained from regressions $GHG^* = f(\beta_i^*, x_i^*)$, according to Equations 3 and 4. ***Empl* and *qual* are excluded from the variable set.** *** significantly different from zero at the 99% level of confidence, ** 95%, * 90%, grey font: significance below 90%. Units of coefficients can be read from column 2 and row 2. For example the unit of the coefficient for equation 3d and the variable *size* is change in emissions per unit change in the number of household members. Grey background indicates a percentage change in the explanatory variable. For example the unit of the coefficient for equation 4d and the variable *inc* is the percentage change in emissions per percentage change in per-capita income.

Equation		*age*	*size*	*inc*	*pop*	*qual*	*ten*	*car*	*NSW*	*Vic*	*Qld*	*WA*	*SA*	*Tas*	*NT*	β_0	R^2
	Units	/year	/member	/AU$1k	/('000/km^2)	/index point	/%	/vehicle	/move	/move	/move	/move	/move	/move	/move		
1a	*SWB* points/	0.08 ***	1.23 ***	0.056 ***	-0.44 ***	0.56 ***	2.5 ***	-1.23 ***	0.1	0.8 ***	1.0 ***	-0.1	0.7 ***	0.1	2.2 ***	56.0 ***	0.026
1b	*SWB* points/	2.89 ***	1.09 ***	0.052 ***	-0.44 ***	0.55 ***	2.6 ***	-1.17 ***	0.1	0.8 ***	1.0 ***	-0.1	0.7 ***	0.1	2.1 ***	48.8 ***	0.023
1c	*SWB* points/	0.09 ***	3.59 ***	0.057 ***	-0.40 ***	0.52 ***	2.4 ***	-0.60 ***	0.1	0.8 ***	1.0 ***	-0.2	0.7 ***	0.1	2.2 ***	55.8 ***	0.030
1d	*SWB* points/	0.09 ***	1.45 ***	2.39 ***	-0.47 ***	0.37 ***	2.5 ***	-1.57 *	0.1	0.9 ***	1.1 ***	-0.1	0.8 ***	0.2	1.9 ***	49.9 ***	0.028
1e	*SWB* points/	0.08 ***	1.28 ***	0.056 ***	-0.30 ***	0.56 ***	2.6 ***	-0.92 ***	0.0	0.9 ***	1.2 ***	0.1	0.9 ***	0.3	2.3 ***	54.3 ***	0.027
2a	% *SWB*/	0.12 ***	2.06 ***	0.09 ***	-0.53 ***	0.86 ***	4.1 ***	-0.98 *	-0.1	1.0 ***	1.5 ***	-0.1	1.0 ***	0.4	3.7 ***	4.0 ***	0.023
2b	% *SWB*/	3.93 ***	1.84 ***	0.08 ***	-0.53 ***	0.85 ***	4.2 ***	-0.89 ***	-0.1	1.0 ***	1.4 ***	-0.1	1.0 ***	0.3	3.6 ***	3.9 ***	0.020
2c	% *SWB*/	0.13 ***	5.98 ***	0.09 ***	-0.47 ***	0.79 ***	3.9 ***	0.07	-0.1	1.0 ***	1.5 ***	-0.2	1.0 ***	0.4	3.7 ***	4.0 ***	0.026
2d	% *SWB*/	0.13 ***	2.42 ***	3.84 ***	-0.57 ***	0.55 ***	4.0 ***	-1.54	0.0	1.2 ***	1.6 ***	0.0	1.2 ***	0.6	3.3 ***	3.9 ***	0.025
2e	% *SWB*/	0.12 ***	2.11 ***	0.09 ***	-0.37 ***	0.88 ***	4.2 ***	-0.69	-0.1	1.2 ***	1.7 ***	0.2	1.3 ***	0.6	3.8 ***	4.0 ***	0.023

Tab. C.5: Regression coefficients β_i for the AUWS data set x_i, obtained from regressions $SWB = f(\beta_i, x_i)$ according to Equations 1 and 2. ***Empl* and *born* are excluded from the variable set.** *** significantly different from zero at the 99% level of confidence, ** 95%, * 90%, grey font: significance below 90%. Units of coefficients can be read from column 2 and row 2. For example the unit of the coefficient for equation 1d and the variable *size* is change in *SWB* points per unit change in the number of household members. Grey background indicates a percentage change in the explanatory variable. For example the unit of the coefficient for equation 2d and the variable *inc* is the percentage change in *SWB* points per percentage change in per-capita income.

Equation		*age*	*size*	*inc*	*pop*	*qual*	*ten*	*car*	*NSW*	*Vic*	*Qld*	*WA*	*SA*	*Tas*	*NT*	β_0	R^2
	Units	/year	/member	/AU$1k	/('000/km^2)	/index point	/%	/vehicle	/move	/move	/move	/move	/move	/move	/move		
3a	t CO_2-e/	0.06	-2.3 ***	0.36 ***	0.07	3.3 ***	0.9 ***	3.7 *	1.3 ***	2.0 ***	0.8	0.4	-0.8	-3.3 ***	2.9 ***	0.4 **	0.74
3b	t CO_2-e/	0.40	-2.3 ***	0.36 ***	0.09	3.2 ***	0.9 ***	4.7	1.4 **	2.1 ***	0.9	0.5	-0.6 *	-3.2 ***	2.9 ***	0.3 **	0.74
3c	t CO_2-e/	0.04	-6.1 ***	0.35 ***	0.10	3.2 ***	1.0 ***	4.0 **	1.3 ***	2.0 ***	0.8 *	0.5	-0.8	-3.4 ***	2.9 ***	0.2 **	0.75
3d	t CO_2-e/	-0.06	-2.6 ***	4.39 ***	0.21	3.6 ***	0.8 ***	2.1 **	1.0 ***	1.7 ***	0.2 *	-0.1	-1.0	-3.9 ***	2.4 ***	0.4	0.72
3e	t CO_2-e/	0.04	-2.3 ***	0.36 ***	-0.12 ***	4.0 ***	0.9 ***	1.7	1.4 ***	2.4 ***	0.8 *	0.4	-0.5	-3.2 ***	2.5 ***	0.3	0.74
4a	% *GHG*/	1.39 ***	-12.9 ***	2.1 ***	-2.9 ***	50.3 ***	13.8 ***	69.0 ***	29.7 ***	25.0 ***	27.2 ***	24.8 ***	13.8 ***	-10.9 ***	47.5 ***	0.02 ***	0.98
4b	% *GHG*/	57.31 ***	-13.3 ***	2.1 ***	-1.4 ***	26.1 ***	8.5 ***	-39.1 ***	3.9 ***	9.2 ***	2.9 ***	7.4 ***	-4.0 ***	-27.2 ***	17.4 ***	-0.01 ***	0.98
4c	% *GHG*/	1.30 ***	-32.5 ***	2.1 ***	-2.7 ***	49.4 ***	13.9 ***	70.3 ***	29.3 **	24.8 ***	27.1 *	25.0 ***	13.8 **	-11.5 ***	47.1 ***	0.01 **	0.98
4d	% *GHG*/	0.74 ***	-14.5 ***	28.3 ***	-2.1 ***	49.9 ***	13.0 ***	56.0 ***	27.6 ***	22.8 ***	23.5 ***	21.4 ***	11.7 ***	-14.2 ***	43.6 ***	0.02	0.98
4e	% *GHG*/	1.14 ***	-12.6 ***	2.1 ***	-1.09 ***	48.8 ***	14.3 ***	81.9 ***	27.8 ***	23.2 ***	24.4 ***	20.4 ***	10.9 ***	-12.4 ***	44.3 ***	0.01	0.98

Tab. C.6: Regression coefficients β_i^* for the HES data set x_i^*, obtained from regressions $GHG^* = f(\beta_i^*, x_i^*)$, according to Equations 4 and 5. ***Empl* and *born* are excluded from the variable set.** *** significantly different from zero at the 99% level of confidence, ** 95%, * 90%, grey font: significance below 90%. Units of coefficients can be read from column 2 and row 2. For example the unit of the coefficient for equation 3d and the variable *size* is change in emissions per unit change in the number of household members. Grey background indicates a percentage change in the explanatory variable. For example the unit of the coefficient for equation 4d and the variable *inc* is the percentage change in emissions per percentage change in per-capita income.

Appendix D: Robustness and quality tests

Excluding Census data from the AUWS data set, and running a regression on 2,681 AUWS samples only, made no difference to the sign and significance of regression coefficients, except for the car ownership variable, where it caused a profound change. Whilst the regression coefficient for emissions does not change significantly, the regression coefficient for well-being changes sign, and stays significant at the 99%-confidence level. This result is interesting in the sense that car ownership decreases well-being when measured as "general car ownership in the area of residence", but increases well-being when measured as "car ownership in the household". In principle, we cannot rule out cross-variable influence with age since in the reduced AUWS sample per-capita car ownership is weakly and positively correlated (ρ = 0.12) with age. However, household size is now much more strongly and negatively correlated with per-capita car ownership (ρ = –0.53, in larger households people appear to share cars), and this correlation should push the car ownership regression coefficient into negative ranges. Hence, we may have detected some kind of double-standard attitude, even if only a subconscious one, that rules cars as beneficial when owned within the household, but as detrimental when owned outside the household.

The main difference between the regression specifications in Equations 1-4 and their interpretations lies in their behaviour for samples with characteristics at or beyond the boundary of the sample population. This is evident especially for the emissions regressions, where specifications 3 and 4 often do not agree with each other. For example in Equations 3a, 3b, 3c and 3e, we postulate that emissions grow linearly with income, no matter how high this income. In Equations 4a, 4b, 4c and 4e, this relationship is even exponential, thus making emissions even more sensitive to income. The log-taking of income in Equations 3d (logarithmic growth of emissions with income) and 4d (power relationship) has the effect of saturating emissions at higher incomes.

Equation	R^2 *SWB*	R^2 *GHG*	minimum t CO_2-e	median t CO_2-e	maximum t CO_2-e	σ t CO_2-e
1/3a	0.03	0.74	-20.5	19.5	388.8	9.9
1/3b	0.02	0.74	-20.5	18.5	382.6	9.8
1/3c	0.03	0.75	-7.4	19.0	383.9	9.9
1/3d	0.03	0.72	-31.5	18.2	42.3	5.1
1/3e	0.03	0.74	-21.5	19.8	401.4	10.2
2/4a	0.02	0.98	1.1	24.2	2.1E+11	4.3E+8
2/4b	0.02	0.98	1.9	21.5	5.4E+10	1.7E+8
2/4c	0.03	0.98	1.8	23.5	1.6E+11	3.4E+8
2/4d	0.02	0.97	0.6	21.7	289.9	11.3
2/4e	0.02	0.98	1.1	24.0	4.2E+11	8.1E+8

Tab. D.1: Quality assessment of regressions: Determination coefficients R^2, minimum, median, maximum, and standard deviation σ of emissions $GHG = f(\beta_i^*, x_i)$ estimated for the AUWS sample.

This is evident from the minima and maxima, and the standard deviation σ of emissions estimated for the AUWS sample, as recorded in Tab. D.1. In cases where we did not take the logarithm of income, emissions can grow out of bounds for some outlier samples with very high income. For the linear specifications, some

emissions can even become negative, which does not make sense. Nevertheless, the medians of all specifications agree reasonably well, hovering between 18 and 24 t CO_2-e.[4]

Whilst greenhouse gases can be explained well by the suite of 15 explanatory variables (R^2 around 0.7), the AUWS appears to be also dependent on factors outside our multiple regression, which is why the R^2 is low between 0.02 and 0.03 (see the large scatter in Fig. 2, left). We believe that this is largely due to the psychological effect called SWB homeostasis, which effectively protects individuals' mental state from adverse events, and thus buffers the effect of lifestyle changes on personal well-being.

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[4] This value is lower than results reported elsewhere (Lenzen 1998; Lenzen *et al.* 2004), because in this work we have excluded emissions embodied in imports, and emissions in government consumption and capital infrastructure. This was done because first, the HES does not distinguish imported and domestically produced products, and second, because emissions caused by government consumption and production of capital goods are usually allocated to households on a per-capita basis, thus adding no insights to the role of socio-economic-demographic characteristics.