

Pitfalls of International Comparative Research: Taking Acquiescence into Account

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Summary

Acquiescence can be the source of a serious response bias in international comparative research. We demonstrate this by referring to an example taken from environmental sociology. The effect of wealth on individuals' willingness to pay for environmental protection is controversially discussed in the literature. Studies analyzing the International Social Survey Programme (ISSP) report that individuals in wealthier nations are more concerned about the environment, while studies using the World Values Survey (WVS) or the European Values Study (EVS) come up with the opposite finding. The puzzle is resolved when the different levels of acquiescence are taken into consideration. As it turns out, respondents in poorer nations in Asia and Eastern Europe have higher levels of acquiescence than respondents in richer Western nations. Thus, acquiescence conceals the wealth effect of studies analyzing the WVS or EVS and the issue is resolved when acquiescence is properly controlled for in multivariate statistical models.

1 Introduction

Acquiescence or the tendency to agree to survey questions regardless of their content can be a serious source of bias in survey research. If not taken into account, acquiescence can considerably distort results and conclusions of survey research and it may even reverse findings. It can cause biases in national surveys but the problem can be much more severe in international comparative research. In principle, the problem of acquiescence is well known and subject of almost every standard methodological textbook (e.g. Diekmann 2010; Schaeffer/Presser 2003; Schnell et al. 2005; Schuman/Presser 1996). Its existence has also been demonstrated by many methodological studies (e.g. Grimm/Church 1999; van Soest/Hurd 2008). However, it has rarely left the methodological laboratory and is mostly ignored when it comes to analyzing large international survey programs such as the International Social Survey Programme (ISSP) or the World Values Survey (WVS).

In the following we demonstrate that acquiescence biases the results of international comparative surveys. Our example is taken from an issue in environmental sociology: Researches using the World Values Survey (WVS) or the European Values Study (EVS) usually come up with the finding that environmental concern is higher in poor nations as compared to wealthy nations (e.g. Dunlap/York 2008; Gelissen 2007). However, analyses with the International Social Survey Programme (ISSP) find consistently the opposite, namely that wealth is positively related to the concern for the natural state of the environment (Franzen/Meyer 2010). So far acquiescence has not been taken into account

in this debate, which we will do in this contribution. We measure acquiescence separately in each of the three surveys and demonstrate the reliability and consistency of the measure. We then analyze the three surveys and show that the findings obtained from the WVS and the EVS are seriously affected by acquiescence.

The remainder of the article is organized into four sections. The next section summarizes the results of international comparative research on environmental concern. It shortly demonstrates the opposing findings and discusses some possible causes. Section three is concerned with the measurement of environmental concern and presents the results obtained by analyzing the three surveys separately. These results mainly reproduce the different findings and the puzzle existing in the literature. Section four is concerned with the measurement of acquiescence in the three surveys. Since the surveys deal partly with different issues the measure of acquiescence differs too. We therefore spent some effort in testing the reliability of the acquiescence measure and demonstrate how the correlations between countries' wealth and the willingness to pay for environmental preservation are affected by it. Furthermore, the section presents results of various linear hierarchical models explaining the willingness to pay. Particularly we compare models that take only data from the WVS and EVS into account with those including also the ISSP data. Moreover, we introduce various controls for acquiescence and show how the findings are affected by it. We also analyze the determinants of acquiescence and show that the wealth of nations is an important factor. Finally, the results are summarized and discussed in the conclusion.

2 Environmental concern in international comparative research

Following microeconomic theory, individuals' and countries' wealth should be positively related to environmental concern and particularly to the willingness to pay for environmental protection (Diekmann/Franzen 1999; Franzen 2003). An increase of income allows individuals to spend more money on private as well as on public goods (including the environment). Thus, individuals' willingness (not the actual amount spent) to pay for environmental protection should be a positive function of income.¹ This theoretical expectation receives strong support from empirical analyses of the ISSP 1993 and 2000 (Franzen/Meyer 2004, 2010). The authors find positive effects of gross national product (GNP) as well as relative income effects on the respondents' level of environmental concern.

Dunlap and York (2008) analyzed the three waves of the WVS conducted in 1990-1993, 1995-1998 and 1999-2001. The authors report for all three waves negative correlations between the average reported environmental concern and the GNP of countries. The authors argue that inhabitants of poorer countries report a higher willingness to pay for two reasons: On the one side inhabitants of poorer nations are exposed to more severe local environmental problems inducing higher general awareness. On the other side environmental concern has diffused globally leveling away differences due to national wealth.

Gelissen (2007) combined data from the WVS 1999-2001 with data of the EVS 1999 and conducted a multilevel analysis based on the combined data. His results also show a negative correlation of countries' wealth with environmental concern. However, he finds

¹ See Franzen and Vogl (2011) for a more detailed discussion of this argument.

a positive correlation between countries' economic growth during the last decade and citizens' willingness to pay. Thus, overall all three analyses using the ISSP, the WVS, and the EVS reach contradictory or at least mixed results.

In principle, these differences of results can have three different causes. First of all the ISSP, WVS, and EVS do not contain random samples of countries but consist of different opportunity samples of countries. The ISSP 2000 contains mainly countries from the OECD and rarely poorer nations from Asia or South America. In 2000 the only Asian countries in the ISSP were Japan and the Philippines, and it contained only two Latin American countries, namely Mexico and Chile. The proportion of countries from Africa and Asia is much higher in the WVS, and the EVS contains only European countries. Thus, the differences of the results may be due to the samples of countries in the respective survey programs.

Second, the differences in results could stem from differences in the way the country specific samples were constructed. The participating countries of the ISSP as well as of the WVS and the EVS agreed to conduct the surveys according to similar standards. Thus, all countries are required to use random samples of the adult population. Within a given survey program they have to use the same questionnaire with the same question wording and conduct the interviews either by means of written or oral questioning. However, in some of the countries those methodological standards are hard to fulfill and national reports on surveying methods indicate that certain institutions deviate from the agreements. For instance, not all countries followed the approved standards of drawing random samples. It must also be considered that it is difficult to conduct random sampling in countries in which a large part of the population is not officially listed or where large proportions do not have a permanent residential address. Even if random samples were realized, the response rates in the national surveys strongly depend on the resources invested in conducting the survey.

Third, the measurement of environmental concern differs between the ISSP, the WVS, and the EVS. Since these differences are considerable, a more detailed discussion will follow in the next section. Taking all three aspects into consideration would go beyond the scope of this study. Instead we concentrate on the different selection of countries contained in the ISSP, the WVS, and the EVS, and on the different measurements of environmental concern. Both aspects are related to acquiescence. In the next section, we will first discuss the different measurements of environmental concern in the ISSP, WVS, and EVS, and replicate the results reported in the literature analyzing the three surveys separately.

3 The measurement of environmental concern

The ISSP was concerned with environmental attitudes in 1993 and 2000. The WVS was conducted during 1990-1993, 1995-1998, 1999-2001, and 2005-2008, and the EVS in 1999 and 2008. Thus, a comparison among the three surveys can best be accomplished for the ISSP in 2000, the WVS 1999-2001, and the EVS 1999. The WVS and the EVS contain both two identical items each with four answer categories that measure individuals' willingness to pay for environmental protection (see Table 1 for exact question wording). Both items were analyzed by Dunlap and York (2008), and by Gelissen (2007). The ISSP 2000 contains two similar but not identical items. The first item differs slightly from the formulation in the WVS or EVS. In the latter surveys respondents are asked whether they would give "a part of their income" in order to protect the environ-

Table 1 Items for measuring environmental concern in the ISSP 2000, WVS 1999-2001 and EVS 1999

	Question Wording	Answer Categories
Item 1: WVS/ EVS	I would give part of my income if I were certain that the money would be used to prevent environmental pollution.	(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree
Item 2: WVS/ EVS	I would agree to an increase in taxes if the extra money were used to prevent environmental pollution.	(1) Strongly agree (2) Agree (3) Disagree (4) Strongly disagree
Item 1: ISSP	How willing would you be to pay much higher prices in order to protect the environment?	(1) Very willing (2) Fairly willing (3) Neither willing nor unwilling (4) Fairly unwilling (5) Very unwilling
Item 2: ISSP	How willing would you be to pay much higher taxes in order to protect the environment?	(1) Very willing (2) Fairly willing (3) Neither willing nor unwilling (4) Fairly unwilling (5) Very unwilling

ment. The ISSP asked how willing respondents are “to pay much higher prices” in order to protect the environment. The formulation “much higher prices” appears to be more substantial in the amount asked than the expression “part of income” and could deter more respondents from agreeing with the statement as compared with the WVS and EVS. The second item asked in a similar way, how willing respondents would be to pay higher taxes in order to protect the environment. Despite these considerations the two items correlate in each survey. In the ISSP the smallest correlation can be observed in Japan (0.53) and the highest in Bulgaria (0.82). In the WVS the two items correlate lowest in Peru (0.33) and highest in Uganda (0.86), and in the EVS the correlations vary between 0.40 in Iceland to 0.75 in Great Britain. Moreover, an explorative factor analysis (using varimax rotation) provides a one-dimensional solution in each country, suggesting that the two items measure the same construct.

More problematic than the differences in the wording of the questions is probably the different number of answer categories. The ISSP uses five answering categories and both the WVS and the EVS four point scales. Having more answer categories should reduce the proportion of those agreeing with a statement since respondents can disperse more over all available categories, in particular to the middle category.

Table 2 lists the proportion of respondents agreeing with both statements (strongly agree and agree) according to the ISSP, WVS and the EVS surveys. It is noticeable that agreement rates are much higher in the WVS and EVS as compared with the ISSP. For the WVS, agreement ranges from 41 % in Moldova to 90 % in Vietnam. In the EVS the lowest agreement is observed in Lithuania with 23 % and is highest in Sweden with 77 %. In the ISSP, agreement ranges from 12 % in Finland to 38 % in Japan. The averages of the three surveys are 60 % (WVS), 50 % (EVS) and 27 % (ISSP) respectively. The difference becomes also very vivid when we compare the value for Spain which is the only

Table 2 The willingness to pay for the environment in countries of the ISSP, WVS, and EVS

ISSP 2000				WVS 1999-2001				EVS 1999			
Nr.	Country	N	agreement in %	N	agreement in %	N	agreement in %	N	agreement in %	GDP per capita (PPP)	
1	Albania			939	63.37 %					3864	
2	Argentina			1252	46.33 %					9189	
3	Austria	997	21.16 %					1493	39.12 %	28632	
4	Bangladesh			1394	76.47 %					840	
5	Belarus							930	48.82 %	5071	
6	Belgium							1887	47.43 %	26795	
7	Bosnia and H.			1170	70.77 %			1170	70.77 %	4353	
8	Bulgaria	946	18.29 %					944	49.36 %	6200	
9	Canada	1091	25.48 %	1911	60.49 %					28910	
10	Chile	1437	31.32 %	1181	65.37 %					9479	
11	China			907	72.22 %					2372	
12	Croatia							983	63.48 %	10972	
13	Czech Republic	1212	17.66 %					1874	64.94 %	15008	
14	Denmark	1047	28.75 %					1000	68.40 %	28325	
15	Estonia							953	33.68 %	9894	
16	Finland	1437	12.25 %					1013	51.04 %	24476	
17	France							1591	39.03 %	25938	
18	Germany West	947	21.75 %					1015	27.09 %	26281	
19	Great Britain	956	32.11 %					940	49.68 %	25673	
20	Greece							1128	67.82 %	18644	
21	Hungary							982	36.56 %	12057	
22	Iceland							959	58.39 %	26890	
23	India			1498	56.14 %					1446	
24	Ireland	1192	34.82 %					988	40.59 %	28768	
25	Israel	1204	30.98 %							20985	
26	Italy							1951	44.95 %	24431	
27	Japan	1166	38.16 %							25274	
28	Kyrgyz Rep.			1214	59.64 %					1335	
29	Latvia			1042	61.90 %					7670	
30	Lithuania	976	17.62 %					971	46.65 %	8417	
31	Luxembourg							939	22.90 %	55151	
32	Macedonia			1003	68.10 %			1172	55.89 %	6170	

Table 2 The willingness to pay for the environment in countries of the ISSP, WVS, and EVS (*Continued*)

Nr.	Country	ISSP 2000		WVS 1999-2001		EVS 1999		GDP per capita (PPP)
		N	agreement in %	N	agreement in %	N	agreement in %	
33	Malta	1249	32.83 %	1453	62.84 %	992	49.09 %	18190
34	Mexico			921	40.50 %			10647
35	Moldova							1472
36	Netherlands	1583	37.59 %			1002	56.79 %	29663
37	New Zealand	1092	31.87 %					19333
38	Norway	1431	24.25 %					38988
39	Peru			1476	62.20 %			5055
40	Philippines	1170	28.29 %	1194	65.75 %			2333
41	Poland					1053	50.71 %	10281
42	Portugal	929	18.62 %			961	45.27 %	17680
43	Romania					992	46.88 %	6181
44	Russia	1641	29.37 %			2328	53.09 %	7628
45	Serbia			1112	74.01 %			5685
46	Singapore			1497	46.16 %			32787
47	Slovak Rep.					1288	41.77 %	11229
48	Slovenia					979	63.02 %	17429
49	South Africa	1036	32.34 %					6552
50	South Korea			2804	42.76 %			16456
51	Spain	917	23.56 %	1138	55.89 %	1154	48.18 %	22296
52	Sweden	1019	20.22 %	1155	52.38 %	1012	77.17 %	26336
53	Switzerland	975	35.28 %					31001
54	Tanzania			1146	78.10 %			778
55	Turkey					1166	59.86 %	8150
56	Uganda			994	44.16 %			690
57	Ukraine					1110	52.79 %	3317
58	USA	1184	33.36 %	1196	61.71 %			34776
59	Vietnam			961	90.22 %			1420
60	Zimbabwe			955	48.59 %			247

Note: The table reports the sample size (N) and the proportion of respondents who agree (strongly agree or agree, and very willing or fairly willing) to both items. The last column depicts the purchasing power adjusted gross national product per capita.

country that is contained in all three surveys: The ISSP reports 24 % agreement in Spain, the EVS 48 % and the WVS even 52 %.

Comparing the seven countries that are listed in the WVS and the ISSP (Canada, Chile, Japan, Mexico, Philippines, Spain, USA), the average difference in the agreement rate is 31 percentage points. This comparison demonstrates that small changes in the wording of questions or the number of answer categories can have considerable consequences. Based on these findings we standardize the answer scales by using their complete information, instead of only the proportion agreeing. We did this by treating them as interval scales and recoding them in such a way that higher values indicate stronger agreement. Furthermore, we divided the sum of the values obtained from both items by the sum of the answer categories available. Thus, the new scale is standardized between 0 and 1 where 1 indicates the highest willingness to pay and zero the lowest. On average the countries in the ISSP reach a value of 0.44, the countries in the WVS a value of 0.58, and the ones in the EVS a value of 0.51. Next, we calculated the bivariate correlation between the measured willingness to pay and the purchasing power adjusted gross national product (PPP) of the countries for every survey separately (see Figure 1 where the index displayed on the y-axis is multiplied by 100).

Using data of the ISSP we find a positive correlation of 0.54 which is statistically significant ($p=0.005$). An analysis of the EVS data results in a correlation of -0.04 ($p=0.85$), and the analysis of the WVS generates a non-significant negative correlation of -0.28 ($p=0.177$). These results replicate former findings using the ISSP (Franzen 2003, Franzen/Meyer 2010) and the WVS (Dunlap/York 2008). Dunlap and York report a negative correlation of -0.32 using data from the WVS and EVS, the same measurement of environmental concern, and taking the natural logarithm of the countries' GDP per capita. In our case taking the natural logarithm of the adjusted GDP per capita does not change any of the reported results. Also, using the Spearman rang correlation instead of

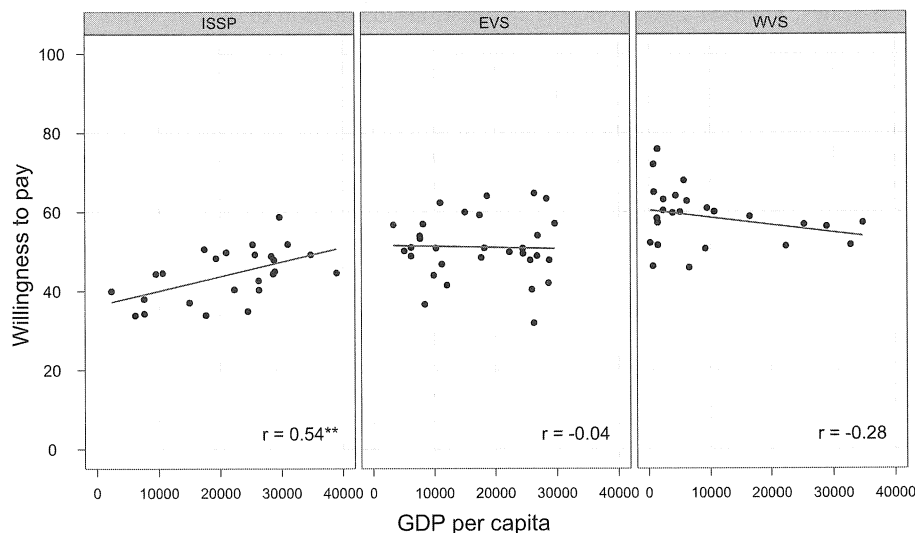


Figure 1 The correlation between wealth and environmental concern for the ISSP, EVS, and WVS

the Pearson correlation does not lead to any substantial differences in the reported correlation or significance levels. Thus, an analysis of the three international surveys results in the paradoxical finding that the ISSP data produce a positive correlation, analysis of the EVS shows no association and an analysis of the WVS produces a negative correlation. Hence, curiously, the three surveys generate all possible options.

A possible solution of the puzzle is the combination of the three data sets. However, the higher levels of agreement in the WVS and EVS as compared to the ISSP which are due to differing methodology are an obvious problem when pooling the data. In addition, cross-cultural research has often pointed out that some countries (presumably Non-Western countries) have generally higher levels of acquiescence. Within national studies (e.g. Ross/Mirowsky 1984) it is often found that individuals with low socio-economic status (SES) acquiesce more than respondents with higher education or income. In cross-cultural studies it is additionally argued that cultures can vary with respect to individualism versus collectivism. Collectivistic cultures are supposed to be more group-oriented and to encourage acquiescence more than individualistic cultures (vgl. Bosau 2009; Hofstede 2001; Marin et al. 1992; Smith/Fischer 2008; van de Vijver/Leung 1997). Since the ISSP contains more OECD or developed countries than the WVS or the EVS, which includes many Eastern European nations, cultural differences might also explain some of the variation of acquiescence.

4 Taking acquiescence into consideration

In order to pool and compare the data we first calculated a measure of acquiescence for every respondent in every country. We follow the standard procedure as suggested in the literature of cross-cultural research (e.g. Hofstede 1980; Matsumoto/Yoo 2006; Smith 2004) and selected as many conceptually unrelated items as possible from the surveys' questionnaires which respondents had been asked to agree or disagree on 4 or 5 point Likert-scales. The ISSP 2000 contains 28 questions in addition to the two items measuring the willingness to pay, which are not included for measuring acquiescence. All agreeing answers (agree or strongly agree) were summed up for each respondent and divided by the total number of items considered. This way the measure of acquiescence ranges from 0 to 1 for every respondent and can be interpreted as the proportion of items agreed when multiplied by 100. A value of zero denotes a respondent who never agreed to a statement, irrespective of the content or formulation of the item or its coding. A value of 1 denotes the other extreme, i.e. a respondent who agreed to every statement. The average of all respondents in a given country denotes the degree of acquiescence in that country.

The WVS 1999-2001 contains 24 items of which 14 use a four point answering scale and the rest a five point answering scale. Finally, the EVS 1999 has 34 items (of which 15 have four answer categories) suitable for the calculation of the tendency of agreement. Table 3 depicts the results of the measure of acquiescence for the 60 countries contained in the three surveys programs. In the ISSP, New Zealand and Japan have the lowest acquiescence of 0.37, and Portugal is the country with the highest value of 0.65. The average agreement in the ISSP is 0.46. In the WVS, measurement of acquiescence results in an average of 0.60. The lowest value is found for the USA with a value of 0.47, and the highest value in the Philippines with a value of 0.71. Among the European nations in the EVS the Netherlands show the lowest acquiescence with a value of 0.45, and respondents from Romania the highest (0.71) with an average of 0.59. Thus, these differences

Table 3 The measurement of acquiescence

Country	ISSP		WVS		EVS	
	2000	1999-2006	1999-2001	2005-2008	1999	2008
Albania			0.64			
Argentina			0.60	0.65		
Austria	0.45	0.56			0.47	0.60
Bangladesh			0.64			
Belarus					0.63	0.61
Belgium					0.58	0.60
Bosnia and H.			0.59			
Bulgaria	0.53	0.57			0.63	0.67
Canada	0.40	0.50	0.51			
Chile	0.56	0.59	0.57	0.65		
China			0.66	0.74		
Croatia					0.59	
Czech Republic	0.46	0.50			0.61	0.59
Denmark	0.44	0.52			0.51	0.54
Estonia					0.60	0.59
Finland	0.38	0.49			0.53	0.51
France					0.61	0.64
Germany	0.43	0.53			0.50	0.58
Great Britain	0.41	0.50			0.48	
Greece					0.59	0.67
Hungary					0.63	0.64
Iceland					0.49	
India			0.65	0.72		
Ireland	0.44	0.54			0.49	0.56
Israel	0.49	0.54				
Italy					0.61	
Japan	0.37	0.45	0.50	0.62		
Kyrgyz Republic			0.65			
Latvia	0.46	0.51			0.68	0.62
Lithuania					0.65	0.59
Luxembourg					0.57	0.61
Macedonia			0.60			
Malta					0.61	0.63
Mexico	0.59	0.57	0.62	0.66		
Moldova			0.63	0.60		
Netherlands	0.41	0.43			0.45	0.50
New Zealand	0.37	0.48				
Norway	0.38	0.47				
Peru			0.63	0.62		
Philippines	0.52	0.56	0.71			
Poland					0.70	0.58
Portugal	0.65	0.60			0.62	0.65
Romania					0.71	0.64
Russia	0.50	0.56			0.65	0.66
Serbia			0.61	0.59		
Singapore			0.62			
Slovak Republic					0.61	0.58
Slovenia	0.53	0.56			0.61	0.63
South Africa			0.59	0.67		
South Korea			0.57	0.65		

Table 3 The measurement of acquiescence (*Continued*)

Country	ISSP		WVS		EVS	
	2000	1999-2006	1999-2001	2005-2008	1999	2008
Spain	0.52	0.56	0.50	0.60	0.54	0.63
Sweden	0.40	0.46			0.52	
Switzerland	0.42	0.52				
Tanzania			0.62			
Turkey					0.68	
Uganda			0.61			
Ukraine					0.66	0.69
USA	0.38	0.51	0.47	0.54		
Vietnam			0.66	0.71		
Zimbabwe			0.61			
Correlations r		0.85 ***		0.71 **		0.60**

Note: Acquiescence was calculated for each individual in every country by dividing the number of respondents' positive answers (strongly agree or agree) by the number of all relevant attitude statements (excluding the willingness to pay items) in the surveys. We took only those respondents into consideration who answered at least 50 % of the rating questions used to construct the measure. All attitude items in the ISSP have 5 answer categories, the WVS and EVS have both 4 and 5 answer categories. Alternatively, we also measured acquiescence in the WVS and EVS by only taking the items with 5 attitude items into account. However, this variation does not affect the measure of acquiescence or any of the results reported in Table 4.

reflect rather closely the differences observed with respect to the willingness to pay among the three surveys.

Next, we wondered whether our measure of acquiescence per country depends on a specific survey or whether the results are reliable if the measure is calculated from different waves of the surveys. The ISSP is conducted almost every year in most countries. We picked the surveys from 1999 to 2006 (excluding 2000), calculated the average acquiescence from those years and compared it to our measure obtained with the data from the ISSP 2000.² As it turns out the correlation of the measure of acquiescence in 2000 is highly correlated ($r = 0.85$) with the average of the years 1999 to 2006 suggesting high reliability irrespective of the special topic of the surveys. The WVS was repeated in 2005-2008 and contains 21 suitable items. The correlation between acquiescence measured in 1999-2001 and 2005-2008 is 0.71 suggesting high reliability as well. The EVS was repeated in 2008 with overall 30 attitude items. Here the correlation of the acquiescence between the two surveys results in a correlation of 0.60, which is still a fair value. Thus, overall our measure of acquiescence is rather reliable at the country level and does not depend much on the survey years or the specific topic of the surveys.

In order to take the level of acquiescence into consideration we weighted the standardized index of a country's willingness to pay with the reverse value of the coefficient of acquiescence. For example the USA has an average value of environmental concern of 0.33 in the ISSP. However, only a certain proportion of this value is due to the "true" willingness to pay while another part results from the general tendency to agree. Therefore we took the reverse of the coefficient of acquiescence ($1 - 0.38 = 0.62$) and weighted

² The number of suitable attitude items contained in the ISSP from 1999 to 2006 varies between 8 and 30.

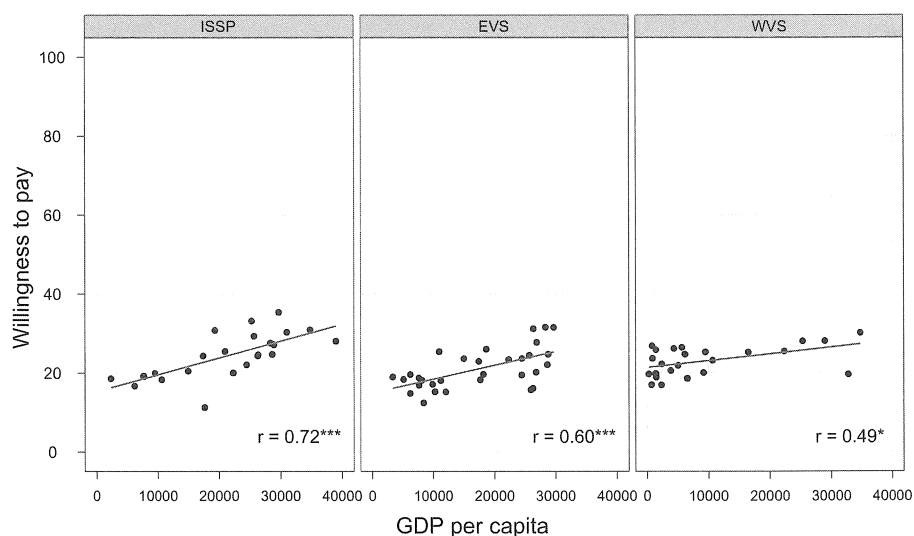


Figure 2 Correlations between wealth and weighted environmental concern for the ISSP, EVS, and WVS

(multiplied) the original scale by it. Thus, for the USA this weighting results in a value of 0.21.³ The correlation of the weighted willingness to pay with countries' wealth (purchasing power adjusted gross national product per capita) for each survey is displayed in Figure 2.

Hence taking acquiescence into consideration increases the strength of the positive association for the ISSP and turns the zero association in the EVS and the negative correlation for the WVS into clearly positive and statistically significant correlations. Also, combining all 60 countries from the ISSP, WVS, and the EVS results in a statistically significant correlation of $r = 0.49$.⁴ The correlation using all countries is depicted in Figure 3.

The data sets of the 60 countries do not only contain information about environmental concern but also some socio-demographic characteristics of the respondents. In addition, more statistical information about the countries' characteristics is available from the United Nations Development Program or the European Commission. Hence, the data available can be analyzed by multilevel analysis (Snijders/Bosker 1999; Rabe-Hesketh/Skrondal 2008). At the individual level (level 1) theoretical considerations led us to expect that respondents' income, education, and age should affect environmental concern. The wealth effect should not only affect environmental concern at the macro

³ Alternatively, the weighting can also be accomplished by multiplying the willingness to pay by the inverse of the acquiescence value. For the USA this procedure would result in $0.33/0.38 = 0.87$. This weighting expresses the willingness to pay in relation to the general acquiescence. Values above 1 mean that the willingness is higher than the „standard“ level of acquiescence. Both weighting methods lead to the same result when correlating the weighted willingness to pay with the adjusted GDP.

⁴ We took the average of a country's willingness to pay and acquiescence in case it was contained in more than one survey.

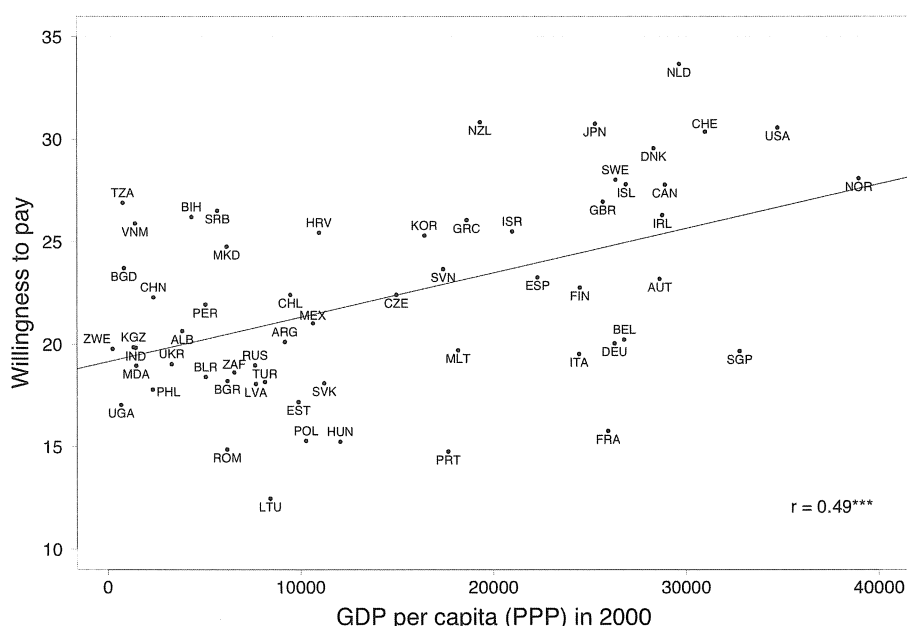


Figure 3 The correlation between environmental concern and wealth in the 60 countries from the ISSP, WVS, and EVS⁵

level of countries as demonstrated in Figure 3. It should as well explain the inter-individual difference within countries.

In the analyses that follow we calculate individuals' household equivalence income by dividing the income of the households by the square root of the number of individuals living together in one household. This procedure has the advantage that we measure the standard of living more accurately than taking only personal incomes that some earners share with family members. Taking the household income also allows measuring the standard of living of respondents who are not active on the labor market or have no personal income. Instead of trying to adjust this equivalent income by the purchasing power, we conducted a z-standardization with the income variable and measure for every respondent the standardized difference from the country's average income. Thereby we measure the income position of a respondent relative to the average income of the country in which he/she lives.

Moreover, environmental concern should also depend on the level of education. Respondents with a higher education are better informed about the state of the environment which should also increase their concern and understanding about environmental protection. People with little information and knowledge about the state of the planet cannot be concerned about it. Furthermore, older people should have lower concern for the environment than younger people. This could be due to a cohort effect rather than to the

⁵ Since Luxembourg is an outlier with respect to GNP per capita it is excluded from Figure 2. This exclusion affects the results only marginally. The correlation including Luxembourg is 0.46.

effect of aging itself. Younger cohorts were more exposed to environmental concern by public discussions, political debates and media reports than older cohorts. Accordingly, younger generations should be more sensitive to environmental issues. Literature also discusses the effect of gender on environmental concern (see Blocker/Eckberg 1997; Wilson et al. 1996). Some studies find higher concern among women than men.

Also at the macro level certain characteristics of countries could influence environmental concern. Besides the level of wealth itself the distribution thereof has to be taken into consideration. A high level of inequality could direct public attention and politics more towards economic issues and redistribution. These goals could be in competition with environmental issues. To test this hypothesis we calculated the Gini-coefficient from the income data of the surveys. We expect that the Gini-coefficient is negatively correlated with the willingness to pay for a better environment.

Environmental concern could also be affected by environmental quality. We therefore included the environmental sustainability index 2001, which was compiled by the Yale Center of Environmental Law and Policy (YCELP), the Center for International Earth Science Information Network of the Columbia University (CIESIN), the World Economic Forum (WEF) and the European Commission. The index consists of different subscales from which we took a country's index of air and water quality as well as the index of biodiversity and soil erosion. If a country has a low local environmental quality it should sensitize respondents and increase the willingness to pay to improve environmental quality.

In most countries environmental quality is not evenly distributed but is worse in urban areas than in the more sparsely populated countryside. Generally, heavily populated regions are supposed to have a poorer quality of air and water. Therefore, we also included the population density of a country as well as the proportion of the population living in cities. The denser the population and the higher the proportion of respondents living in an urban area, the worse the objectively and subjectively perceived environmental quality should be. Thus, higher population density as well as a higher proportion of inhabitants living in cities should increase the willingness to pay for environmental protection.⁶

We apply a varying-intercept multilevel model to the data and estimate coefficients via the maximum likelihood method. Level one of our analysis takes the variables of individuals (x) into account and level two the country-specific characteristics (z). On the one side the willingness to pay Y_{ij} depends on the characteristics of the i to n individuals. On the other side we consider the country-specific characteristics by varying the slope of the constant β_{0j} due to the macro level variables z of the j to k countries:

$$Y_{ij} = \beta_{0j} + \beta_1 x_{1ij} + \dots + \beta_7 x_{7ij} + \epsilon_{ij}$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01} z_{1j} + \dots + \gamma_{07} z_{7j} + \zeta_j$$

The estimation results of the specified models are presented in Table 4. Overall, we report five different models of regressing the willingness to pay on the individual and country specific variables. The first model takes only the 49 countries of the WVS and EVS into account. It is therefore basically a replication of Dunlap and York (2008) using multilevel analysis instead of simple correlations. Model 2 controls for acquiescence by introducing the individual specific variable as an independent variable into the regression

⁶ A detailed description of every variable is contained in Table A of the appendix.

equation. In models 3 and 4 we repeat both analyses by combining all three data sets. Finally, in Model 5 we alternatively control for acquiescence by weighting the dependent variable.

A first test of whether multilevel analysis is useful is to estimate the intraclass correlation coefficient (ICC) of the null model. The ICC coefficients of the various models show values between 0.08 and 0.12 indicating that only a small proportion (8 % to 12 %) of the overall variance is due to the macro level variation. However, multilevel modeling is still applicable. In the first four models the dependent variable is the standardized scale of respondents' willingness to pay multiplied by 100 (values between 0 and 100).

The first model takes only the 49 countries contained in the WVS and EVS into consideration. Some smaller countries (Bosnia, Kyrgyz Republic, Luxembourg, Macedonia, Malta, Serbia, and Tanzania) have missing data on important variables and drop out of the analysis. As can be seen all individual variables have the expected effect and these effects change rather little between models 1 through 5. Thus, individuals' education and relative income position are positively related to the willingness to pay. Age has a negative effect and respondents' sex is positively related to environmental concern. At the macro level our main interest is the effect of purchasing power adjusted GDP (PPP) on individuals' willingness to pay. The result in model 1 shows that GDP is negatively (but statistically insignificantly) associated with the willingness to pay. Thus, the multilevel analysis basically replicates the bivariate correlation presented in Figure 1. Additionally, the model takes also the proportion living in urban areas, population density, environmental quality and income inequality (as measured by the Gini-coefficient) into account. None of these macro variables is significantly related to the willingness to pay (as this is the case in further models).

Next, Model 2 controls for acquiescence by introducing the individually measured variable as a control into the multi-level regression model. First, acquiescence is statistically significantly related to the willingness to pay ($\beta = 0.17$, $p = 0.000$). Second, taking acquiescence into account changes the direction of the effect of GDP which is now positively related to the willingness to pay, although statistically not significant. In Model 3 the analysis is extended by incorporating all three data sets. This increases the number of individual observations from 49,780 to 70,905. However, the combination of the three data sets increases the number of countries only by 4 (from 49 to 53) since many countries (20) are contained in more than one data set. In model 3 the effect of GDP increases in size ($\beta = 0.19$) but is still statistically insignificant. However, taking acquiescence in Model 4 again into account not only increases the positive effect of GDP but it also makes the effect statistically significant. The effect of GDP ($\beta = 0.26$) has a p-value of 0.055 and is just short of the conventional 5 % significance level. Finally, in Model 5 we use an alternative approach to control for acquiescence. We subtracted each individual's acquiescence value from 1 and multiplied it by the individual's willingness to pay. This weighting procedure is analogous to the one applied to country averages in Figure 3. In Model 5 the positive effect of GDP on the willingness to pay is stronger ($\beta = 0.37$) and statistically highly significant ($p = 0.000$). The model explains 46 % of the variance observed at the macro level and 7 % of the variance observed at the micro level, it therefore, indicates the best fit as compared to models 1 through 4.⁷

⁷ The results are not affected if we use an alternative weighting procedure and multiply the willingness to pay by the inverse of acquiescence.

Table 4 Multilevel analyses of environmental concern and acquiescence

	Model 1 WtP: WVS/EVS	Model 2 WtP: WVS/EVS	Model 3 WtP: WVS/EVS/ISSP	Model 4 WtP: WVS/EVS/ISSP	Model 5 weighted WtP	Model 6 Acquiescence
<i>Individual-level variables</i>						
Sex (1=female)	0.452* (0.217)	0.504* (0.216)	0.149 (0.188)	0.258 (0.187)	0.538*** (0.101)	-0.746*** (0.105)
Age in years (18-80)	-0.0509*** (0.00744)	-0.0753*** (0.00751)	-0.0371*** (0.00638)	-0.060*** (0.00644)	-0.0897*** (0.00342)	0.157*** (0.00356)
Secondary education	3.459*** (0.303)	3.792*** (0.302)	3.858*** (0.257)	4.224*** (0.256)	2.968*** (0.137)	-2.513*** (0.143)
High school degree	5.449*** (0.310)	6.053*** (0.310)	5.879*** (0.277)	6.447*** (0.277)	4.641*** (0.148)	-3.892*** (0.154)
University degree	8.341*** (0.390)	9.295*** (0.391)	9.415*** (0.326)	10.25*** (0.328)	7.613*** (0.175)	-5.718*** (0.182)
Relative income within country	0.812*** (0.114)	0.928*** (0.114)	1.216*** (0.100)	1.335*** (0.100)	0.998*** (0.0538)	-0.820*** (0.0559)
Acquiescence		0.170*** (0.00828)		0.146*** (0.00672)		
Dataset WVS			11.83*** (0.411)	10.51*** (0.414)	0.546* (0.221)	8.980*** (0.228)
Dataset EVS			10.44*** (0.320)	8.938*** (0.326)	-0.158 (0.172)	10.33*** (0.178)
<i>Country-level variables</i>						
GDP (PPP) in 1000	-0.0172 (0.158)	0.0852 (0.160)	0.186 (0.134)	0.261+ (0.136)	0.368*** (0.0739)	-0.586*** (0.0627)
Proportion urban pop.	-0.0836 (0.0750)	-0.0907 (0.0757)	-0.101 (0.0635)	-0.103 (0.0646)	-0.0394 (0.0351)	0.0117 (0.0357)
Population density	0.213 (1.431)	-0.155 (1.444)	-0.473 (1.261)	-0.795 (1.285)	-1.363 (0.698)	2.638*** (0.670)
Environmental quality	-1.125 (2.779)	-0.701 (2.805)	-2.816 (2.401)	-2.370 (2.446)	0.289 (1.329)	
Gini-Coefficient	1.955 (10.70)	3.023 (10.80)	-0.830 (9.525)	-0.671 (9.702)	2.335 (5.270)	

Table 4 Multilevel analyses of environmental concern and acquiescence (*Continue*)

	Model 1 WtP: WVS/EVS	Model 2 WtP: WVS/EVS	Model 3 WtP: WVS/EVS/ISSP	Model 4 WtP: WVS/EVS/ISSP	Model 5 weighted WtP	Model 6 Acquiescence
Constant	57.48*** (6.508)	46.69*** (6.590)	45.74*** (5.685)	38.09*** (5.802)	19.04*** (3.146)	52.88*** (1.977)
Standard deviation country level	7.536***	7.608***	6.667***	6.795***	3.691***	3.765***
individual level	24.00***	23.90***	24.83***	24.74***	13.30***	13.84***
Intraclass correlation (ICC)						
null model	0.0983	0.0983	0.076	0.076	0.118	0.264
model with covariates	0.0897	0.0920	0.067	0.070	0.072	0.069
Explained variance						
country level	0.113	0.096	0.161	0.128	0.462	0.818
individual level	0.019	0.027	0.050	0.056	0.066	0.115
Number of countries	49	49	53	53	53	53
Number of observations	49,780	49,780	70,905	70,905	70,905	70,905

Note: Reported are the unstandardized regression coefficients. Numbers in parentheses denote the standard errors of the coefficients. + < p = 0.10, * = p < 0.05, ** = p < 0.01, *** = p < 0.001.

Finally, we analyze the determinants of acquiescence. Literature has often suggested that older people as well as respondents with lower SES have a higher tendency to acquiesce (e.g. Ross/Mirowsky 1984). This expectation is confirmed in model 6 of Table 4, which shows a positive effect for age, increasingly negative effects for the different educational degrees and a statistically significant negative effect for income. Furthermore, our results also indicate that females have a lower tendency to acquiesce. On the macro level the wealth of nations is negatively related to acquiescence. Furthermore, the results also indicate that population density is positively related to acquiescence. This latter finding might be explained by the fact that population density is often high in developing countries. Thus, this variable might be associated with aspects of countries' modernization. Finally, the two survey dummies indicate that acquiescence is higher in the WVS and the EVS than in the ISSP. The ICC of the null model indicates that 26 % of the total variance of acquiescence is due to differences between countries. Model 6 explains 82 % of this macro variance and 12 % of the individual variance.

Overall, the results depicted in Table 4 suggest that the negative association between wealth and acquiescence (model 4 and 5) on the one hand and the positive association between acquiescence and the willingness to pay (model 6) on the other hand is responsible for the suppression of the effect of wealth on the willingness to pay if acquiescence is not controlled for. In that case the regression analysis does not distinguish between the effect of wealth and the effect of acquiescence on environmental concern and both effects cancel each other out. Next to wealth, acquiescence depends also on population density. Hence, it seems that poor countries with high population density are most sensible to acquiescence.

5 Conclusions and Discussion

This study analyzes the question why different studies scrutinizing the determinants of environmental concern in cross-cultural perspective come to different conclusions. Studies that are based on data from the ISSP support the wealth effect (Diekmann/Franzen 1999; Franzen 2003; Franzen/Meyer 2010). However, Dunlap and York (2008) as well as Gelissen (2007) argued that environmental concern is stronger in poorer nations and that empirical investigations based on the WVS and the EVS refute the wealth effect. In this contribution we measure environmental concern by two items which ask respondents whether they would be willing to pay higher prices and higher taxes in order to improve the environment. These two items are contained in an almost identical way in all three surveys and therefore the items allow a comparison of the three surveys. We first analyze the three data sets separately and replicate former findings. Thus, the analysis of the ISSP results in a positive correlation between countries' wealth and inhabitants' environmental concern. Analysis of the WVS results in a negative association between wealth and environmental concern, and the EVS shows a correlation of zero. However, the three data sets differ strongly with respect to respondents' level of their willingness to pay. It is comparatively high in the WVS and the EVS and relatively low in the ISSP. On the one side this difference is due to a slight variation in the answering scales of the surveys (four-point versus five-point agreement scales). On the other side there are also large differences between the samples of countries in each survey. We therefore calculated the general tendency of respondents to agree to all kinds of different items contained in the surveys. If this general acquiescence is taken into consideration, the analysis of the pooled data of 60 countries shows a positive and statistically significant

correlation between the countries' wealth and their environmental concern. This fundamental result is robust when we apply multilevel analysis to the data and take further individual and country level effects into consideration. On the individual level respondents' relative income position, their education and age affect the willingness to pay. At the macro level the willingness to pay is also determined by the wealth of nations but not by environmental quality, population density or the inequality of the income distribution. Thus, our analyses of the pooled data from the ISSP, WVS, and EVS support the wealth hypothesis and refute the conclusions of Dunlap and York (2008).

The puzzle of the contradicting findings is resolved when the countries' acquiescence is corroborated into the analysis. Respondents in poorer nations in Asia and Eastern Europe have a stronger tendency to agree to survey questions. This tendency of general agreement can also be observed in industrialized countries, however, to a lesser extend. The level of acquiescence we measured may be due to different causes: On the one side it is related to using four or five point Likert-scales. On the other side, our findings suggest that acquiescence depends also on the wealth of nations. Moreover, there might be cultural effects such as differences in individualistic or collectivistic orientations. Unfortunately, the data we use do not contain proper measures to investigate this third possibility.

Finally, one note of caution is appropriate. Even though we analyze answers of participants from 60 countries, these countries are not a random sample of all countries but an opportunity sample. It will therefore be left to further research to show whether the results remain robust if more countries participate in the WVS or the ISSP.

Appendix

Table A Description of variables

Variable	Min.	Max.	Description	Data Source	Reference
<i>Individuals variables</i>					
Sex	0	1	0 = male, 1 = female	ISSP, WVS, EVS	
Age	18	80	Age in years	ISSP, WVS, EVS	
Education	1	4	Four categories: 1 = No or primary education 2 = Secondary education, 3 = High school or equivalent 4 = University education	ISSP, WVS, EVS	
Relative household income	-1.98	13.62	Household income divided by the square root of the number of persons living in the household, z-transformed.	ISSP, WVS, EVS	
Acquiescence	0	100	Proportion of items respondents strongly agree or agree in relation to all statements with 4 or 5 point answer categories multiplied by 100.	ISSP, WVS, EVS	
<i>Country Variables</i>					
GDP per capita (PPP)	0.25	38.99	GDP per capita in 2000 converted to measure the purchasing power in each country in US\$ 1000.	International Monetary Fund (IMF) World Economic Outlook Database, April 2009	http://www.imf.org/external/pubs/ft/weo/index.aspx (09/01/2009)
Population density	0.003	5.88	Thousand inhabitants per square kilometer.	United Nations: World Population Prospects	http://data.un.org/Data.aspx?q=population+density&d=PopDiv&f=variableID%3a14 (09/01/2009)

Table A Description of variables (*Continue*)

Variable	Min.	Max.	Description	Data Source	Reference
Proportion urban population	12	100	Proportion of population living in areas classified as urban according to the criteria used by each country.	UN-DATA, WHO-Data	http://data.un.org/Data.aspx?q=urban+population&d=WHO&f=inID%3aSDEC06 (09/01/2009)
Environmental quality	-0.81	1.36	Part of the Environmental Sustainability Index 2001 measures the condition of the environment in the following sectors: air quality, water quality, amount of water, biodiversity and terrestrial systems. Mean of these five sectors. Before added, the items for the individual sectors are z-transformed.	YCELP, CIESIN, WEF and the Joint Research Centre of the European Commission	http://sedac.ciesin.columbia.edu/es/esl/archive.html (09/01/2009)
Gini-coefficient	0.21	0.69	Measures income inequality 0 = equal distribution, 1 = maximally unequal distribution.	Own calculations with ISSP, WVS and EVS data	

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