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Two decades of measuring environmental attitudes: A comparative analysis of 33 countries☆

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ABSTRACT

This paper analyzes the development of environmental concern by using the three waves of the environmental modules of the International Social Survey Programme. First, we discuss the measurement of environmental concern and construct a ranking of countries according to the new 2010 results. Second, we analyze the determinants of environmental concern by employing multilevel models that take individual as well as context effects into account. Third, we explore the longitudinal aspect of the data at the macro level in order to uncover the causal relation between countries' wealth and environmental concern. The results show that environmental concern is closely correlated with the wealth of the nations. However, environmental concern decreased in almost all nations slightly during the last two decades. The decline was lower in countries with improving economic conditions suggesting that economic growth helps to maintain higher levels of environmental concern.

1. Introduction

The International Social Survey Programme (ISSP) conducted the third module on environmental attitudes between 2010 and 2012. The new database contains 33 countries (final release) and allows analysis of environmental concern over the last two decades for 15 nations, and for the last 10 years for another 9 countries. The surveys are based on random samples of citizens in the participating nations and can be used to construct a ranking with respect to a country's mean environmental concern.

In addition to describing the development of environmental concern, we present multilevel analyses of its determinants. So far, the literature has identified a set of social demographic characteristics that are linked to individuals' environmental concern (Van Liere and Dunlap, 1980; Stern and Dietz, 1994; Greenbaum, 1995; Dietz et al., 1998; Diekmann and Preisendörfer, 1998; Kemmelmeier et al., 2002; Marquart-Pyatt, 2008). Among these characteristics are individuals' age, education, sex, and income. The literature has also shown that some basic value orientations, particularly Inglehart's postmaterialism index (Inglehart, 1990, 1995, 1997) and levels of trust (Meyer and Liebe, 2010), are closely associated with environmental attitudes. Therefore, we will retest these findings with the new data.

In addition to individual variables, the research has also identified a set of macro variables that are linked to levels of environmental concern (Franzen and Meyer, 2010; Franzen and Vogl, in press). Hence, we investigate whether environmental quality, urbanization, population density, and some economic indicators are related to environmental concern. Particularly, much debate has been devoted to the hypothesis that more affluent countries display higher levels of concern (Brechin and Kempton, 1994; Brechin and Bhandari, 2011; Diekmann and Franzen, 1999; Dunlap and York, 2008; Franzen, 2003; Gelissen, 2007). The new data allow us to extend the past discussion in two ways: first, the ISSP includes more countries than before, which makes the test of the affluence hypothesis more powerful. Second, we can also use the longitudinal data structure on the country level to conduct panel analysis, which is more powerful in uncovering the causal structure than simple cross sectional analysis.

The paper is organized in four sections. In Section 2 we discuss our measurement of environmental concern. We look in detail how the different components of it changed in the USA, Japan, and Germany. The section also describes the results of the surveys of all 33 countries and presents the ranking. In Section 3, we formulate the individual as well as the macro level hypotheses about the causes of environmental concern and present the results of a multilevel analysis, which takes the country characteristics and the individual characteristics into consideration. Moreover, we analyze the data's panel structure on the macro level to investigate whether the observed changes in environmental concern are related to changes in countries' wealth. Section 4 sums up the most important findings and discusses the results.

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2. The measurement of environmental concern

Environmental concern is usually defined as an individual's insight that humans endanger the natural environment combined with the willingness to protect nature (Franzen and Meyer, 2010; Dunlap and Jones, 2002). The definition consists of two components, the cognitive component of having the rational insight and the conative component of being willing to do something about it. In environmental sociology, the emotional reaction to environmental problems is often additionally taken into consideration as a third component (Maloney and Ward, 1973; Maloney et al., 1975). In this conceptualization, individuals react in three distinct ways to environmental problems: having rational insight into the problem, being willing to act, and being emotionally affected by environmental degradation. The ISSP contains a number of questions in which respondents can indicate their agreement or disagreement on a five point Likert-scale ranging from strongly agree to strongly disagree (or very willing to very unwilling). Table 1 displays a selection of statements that contain the different components and that have been used in previous research (Franzen and Meyer, 2010). An explorative factor analysis with varimax rotation indicates that the nine items fall into two dimensions. The first four items clearly refer to the conative component while the second dimension contains the other five items, which refer to the cognitive aspect (items 5, 8, and 9) or more to an affective reaction (items 6 and 7). However, results of the factor analysis suggest that the more emotionally formulated items basically measure the same concept as the cognitive statements. These two factors are extracted in all three waves of the ISSP environmental module in 1993, 2000, and 2010. The Cronbach's alpha coefficient of an additive scale of the nine items results in values of 0.73 and 0.76 for the USA indicating a sufficient reliability of the scale. The coefficients are a little lower in Japan and Germany (see Table 1).

For descriptive purposes, we collapsed the highest and second highest categories (strong and fairly strong agreement or very and fairly willing) and display the proportion of respondents who agree or disagree with a given statement in the three largest economies included in the ISSP. Inspection of Table 1 reveals that the attitudes towards the environment did not change very much in the USA over the last 20 years. For instance, in 2010 46 percent of the American population was very willing or fairly willing to pay much higher prices in order to protect the environment. This is a decrease of six percentage points as compared to 1993 but not different from 2000. The proportion agreeing to cut their standard of living or to pay higher taxes is somewhat lower. The willingness to pay higher taxes dropped by 8 percentage points in 2010 as compared to 1993 but there has been no change since 2000. In addition, the willingness to cut the standard of living is fairly stable and even increased slightly. The other five items measure pro-environmental attitudes in terms of disagreement. With regard to these items, the results are stable or slightly decreasing. In order to get a better picture of the average change we added all nine items into a scale (from 9 to 45) and standardized it to vary between 0 and 100. The average for the United States is 54.7 in 1993, 52.6 in 2000 and 50.3 in 2010.

If we compare the proportion of respondents agreeing with the statements to answers in Japan or Germany it becomes obvious that the three countries do not greatly differ in terms of pro-environmental attitudes. Thus, in Japan and Germany the proportion agreeing to pay higher prices is 40 percent and 38 percent in 2010, respectively, and thus lower than in the United States. However, comparing the average of all nine items reveals that Japan (52.9) and Germany (51.9) are similar with respect to environmental concern and only slightly above the average observed for the United States. As in the United States, the index dropped in Japan and Germany as well over the last two decades. The sharpest reduction can be observed in Japan. Notice, however, that the ISSP was completed in all thee countries before the nuclear catastrophe in Fukushima and that attitudes might have changed afterwards, particularly in Japan.

Next, we compute the environmental concern for all 33 countries that provided data for the ISSP 2010 or the years before. As Table 2 shows, environmental attitudes differ strongly between countries. Switzerland is leading the ranking with a value of 60.2, followed by Canada (56.5), and Denmark (55.3). At the bottom of the ranking are countries like the Philippines (39.3), Bulgaria (38.7), and South Africa (38.5). By and large the ranking of countries is relatively stable. Countries that were at the top of the ranking in 1993 and 2000 also rank high in 2010. However, environmental concern decreased almost in all countries either compared to 2000 or 1993. Chile is the only exception to this rule where environmental attitudes increased from 45.4 to 50.6. Notice also that all of the changes are statistically significant, either as compared to 1993 or 2000. Thus, the 2010 ISSP indicates that environmental concern is decreasing worldwide. This trend is already observable for the first decade and continues in the second decade. Fig. 1 shows the trend in concern for OECD countries and non-OECD countries in the ISSP.

Table 1
Environmental concern in USA, Japan, and Germany (percentage agreement/disagreement).

Question	USA			Japan			Germany		
	1993	2000	2010	1993	2000	2010	1993	2000	2010
1) I do what is right for the environment, even when it costs more money or takes more time (% very and fairly willing).	57	51	54	59	53	40	60	54	52
2) How willing would you be to accept cuts in your standard of living in order to protect the environment? (% very and fairly willing).	34	29	36	44	41	28	52	40	41
3) How willing would you be to pay much higher prices in order to protect the environment? (% very and fairly willing).	52	45	46	53	53	40	46	34	38
4) How willing would you be to pay much higher taxes in order to protect the environment? (% very and fairly willing).	40	32	32	44	37	23	31	19	23
5) Modern science will solve our environmental problems with little change to our way of living (% strong and fairly strong disagreement).	59	48	48	75	76	65	43	45	44
6) People worry too much about human progress harming the environment (% strong and fairly strong disagreement).	50	49	41	48	51	41	57	48	47
7) We worry too much about the future of the environment and not enough about prices and jobs (% strong and fairly strong disagreement).	44	44	39	47	47	35	50	50	51
8) It is just too difficult for someone like me to do much about the environment (% strong and fairly strong disagreement).	60	51	54	56	56	50	54	55	48
9) In order to protect the environment the country needs economic growth (% strong and fairly strong disagreement).	26	25	20	17	18	7	31	28	28
Cronbach's alpha.	0.76	0.74	0.73	0.71	0.68	0.72	0.75	0.67	0.70

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Table 2
Mean environmental concern per country and year.

Country	1993		2000		2010	
	N	Concern	*N*	Concern	*N*	Concern
Switzerland (CHE)	3019	63.2	1006	61.0[a]	1212	60.2[b]
Canada (CAN)	1467	59.8	1115	55.9	985	56.5[b]
Denmark (DNK)			1069	57.9	1305	55.3[c]
Finland (FIN)			1528	57.0	1211	54.8[c]
Sweden (SWE)			1067	54.9	1181	54.1
South Korea (KOR)					1576	53.9
Japan (JPN)	1305	58.5	1180	59.3	1307	52.9[b,c]
Taiwan (TWN)					2209	52.6
Norway (NOR)	1414	58.0	1452	54.4[a]	1382	52.1[b,c]
Germany (DEU)	2106	56.3	1501	51.6[a]	1407	51.9[b]
New Zealand (NZL)	1271	57.7	1112	54.7[a]	1172	51.7[b,c]
Austria (AUT)			1011	54.8	1019	50.8[c]
France (FRA)					2253	50.8
Australia (AUS)	1779	57.1			1946	50.7[b]
Chile (CHL)			1503	45.4	1436	50.6[c]
Spain (ESP)	1208	52.6	958	52.6	2560	50.4[b,c]
United States (USA)	1557	54.7	1276	52.6[a]	1430	50.3[b,c]
Slovenia (SVN)	1032	52.0	1077	52.0	1082	50.0[b,c]
Belgium (BEL)					1142	49.4
Israel (ISR)	1198	51.7	1205	49.0[a]	1216	47.4[b,c]
Great Britain (GBR)	1261	53.9	972	52.5	928	46.6[b,c]
Mexico (MEX)			1262	48.7	1637	46.4[c]
Slovak Republic (SVK)					1159	45.5
Argentina (ARG)					1130	44.8
Turkey (TUR)					1665	44.1
Czech Republic (CZE)	1005	45.6	1244	44.7	1428	42.9[b,c]
Croatia (HRV)					1210	42.0
Russia (RUS)	1931	48.5	1705	44.0[a]	1619	41.4[b,c]
Lithuania (LTU)					1023	40.4
Latvia (LVA)			1000	42.3	1000	39.8[c]
Philippines (PHL)	1200	43.1	1200	42.9	1200	39.3[b,c]
Bulgaria (BGR)	1183	42.0	1013	38.7[a]	1003	38.7[b]
South Africa (ZAF)					3112	38.5
Netherlands (NLD)	1852	60.2	1609	58.0[a]		
Italy (ITA)	1000	55.2				
Poland (POL)	1641	48.3				
Ireland (IRL)	957	46.7	1232	52.3[a]		
Hungary (HUN)	1167	40.7				
Portugal (PRT)			1000	38.5		

Note: second, fourth, and sixth column report the number of cases per country in the dataset. We report the standardized mean (between 0 and 100) of environmental concern.
[a] Significant difference between 1993 and 2000.
[b] Significant difference between 1993 and 2010.
[c] Significant difference between 2000 and 2010.

Why this observed decline occurs, is hard to say, particularly since it contrasts sharply with global environmental indicators like CO_2 emissions that are responsible for global warming and have been the focus of environmental summits since Rio de Janeiro in 1992 or of the reports by the IPCC (see Fig. 1). Thus, one of the most sincere global environmental threats increased in intensity and is far from being resolved. One possible explanation for the diverging trends is fatigue combined with the economic crisis that started in the United States in 2008. However, before analyzing the trend in more detail, we investigate the individual and national differences in environmental concern.

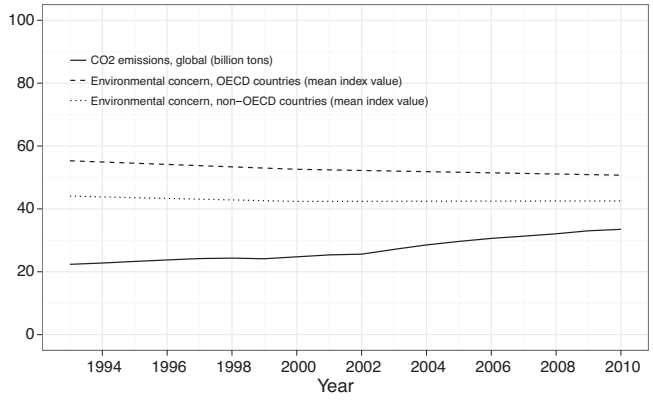

Fig. 1. CO_2 emissions and environmental concern.

3. The determinants of environmental concern

The individual differences within a country are much larger than the between country differences. For instance, in the US sample environmental concern ranges from 5.5 to 100 and has a standard deviation of 15.3 (the values for the other countries are similar). On the macro level the means vary from 38.5 to 60.2 and the standard deviation is 5.8. On the individual level, environmental concern depends on a number of respondents' socio-demographic characteristics such as gender, age, education, and income. Past research has often found that women are more concerned than men due to different socialization and social roles (see Blocker and Eckberg, 1997; Bord and O'Connor, 1997; Davidson and Freudenburg, 1996; McCright, 2010; Wilson et al., 1996; Zelezny et al., 2000). Younger individuals are supposed to show more concern than older ones since they grew up in times when the issue received increasing attention in the media. Also, education should generally increase respondents' knowledge about environmental problems and should thereby also increase concern. Moreover,

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more affluent individuals should be more concerned about environmental problems than the less affluent. This is due to two mechanisms. On one hand, wealthier individuals have less economic problems to worry about and are therefore freer to turn to other concerns. On the other hand, individuals with higher incomes generally consume more private goods and demand more public goods. Their willingness (and ability) to pay for better public goods is higher. Previous research has confirmed an individual income effect (e.g. Franzen and Meyer, 2010; Franzen and Vogl, in press; Gelissen, 2007; Kemmelmeier et al., 2002).

In addition to socio-demographic variables, value orientations and political attitudes are also linked to environmental concern. Inglehart's postmaterialism hypothesis is most often discussed in the literature. Inglehart (1990, 1995, 1997) suggests that societies undergo a "silent revolution" by developing economically. Generations that are socialized in times of economic deprivation value materialistic values (e.g. economic growth, price stability) as opposed to generations that are raised during times of economic prosperity who put more emphasis on postmaterial values (freedom and self-realization). Postmaterial values should be positively linked to environmental concern since economic prosperity is no longer the priority.

In most Western democracies, conservative political parties represent the interests of business and industries stronger than the middle or liberal political spectrum. This is definitely true for the Republican Party in the US (e.g. Brulle et al., 2012; McCright and Dunlap, 2011) but also for the conservative parties in Germany or Japan. Therefore, individuals with a stronger affiliation to the right of the political spectrum are expected to have lower environmental concerns. Additionally, individuals differ greatly in the levels of trust they have towards other people, institutions, and the government in general. Previous research has demonstrated that trusting others elicits more concern for public goods (e.g. Meyer and Liebe, 2010). General trust in other people enhances the belief that others are also cooperating in providing and maintaining public goods. Hence, we expect that trust is associated with a stronger willingness to contribute to environmental protection. Following this line of reasoning, trust in governmental institutions might also influence individuals' environmental concern. However, the direction of this effect is unclear. On one hand, providing public goods is the responsibility of governments. Lack of trust in the government could therefore increase the individuals' concerns that environmental problems are not properly taken care of. On the other hand, individuals are less willing to contribute to the provision of public goods when they believe that others, in this case government officials, are not doing their share either.

We test the hypothesized socio-demographic effects and the effects of the value and political orientations by regressing the environmental index on these variables. First, we test the hypotheses by using only the national sample of the 2010 ISSP for the USA. Second, we take all available data of the 31 countries into consideration (relevant data is missing for Taiwan and Israel) to examine cross-national differences via multilevel models. Model 1 in Table 3 displays the effects for the USA. Measurement of gender and age are straightforward and need no further comment (see Appendix A for descriptive information on variables). The results show that both variables are not significantly related to environmental concern in the USA sample. Education is measured by the highest schooling degree of respondents. In the United States, the variable has five categories (less than high school, high school, junior college, bachelors, and graduate degree). The results clearly show that environmental concern is positively associated with education. For the United States sample, the difference is mainly between those having no or only high school degrees and respondents with junior college degrees, bachelor degrees, or degrees from graduate school. The fact that environmental concern does not increase continuously with higher education as expected might be due to the American educational system, where quality differences within degree type (e.g. BA) can be larger than the differences between degree types (junior college, BA degree, or graduate school).

As expected, income determines environmental concern as well. We calculated individuals' equivalent income by dividing the sum of household members' income by the square root of the number of individuals living in that household. The measure accounts for the standard of living of every household member instead of only taking income earners into consideration. The regression coefficient measures the effect of every additional $1000 increase per year. Hence, an increase of $10,000 per year has

Table 3
Determinants of environmental concern.

	Model 1 USA	Model 2 all data	Model 3 all data (income imputed)
Individual-level variables			
Sex (1 = female)	1.31	1.25***	1.39***
	(1.02)	(0.18)	(0.16)
Age in years (18–80)	−0.049	0.18***	0.16***
	(0.032)	(0.035)	(0.030)
Squared age in years (18–80)		−0.0019***	−0.0017***
		(0.00037)	(0.00031)
Intermediate secondary	1.26	1.49***	1.80***
	(1.67)	(0.32)	(0.28)
Secondary degree	8.28***	3.58***	3.83***
	(2.26)	(0.31)	(0.27)
University degree incomplete	7.48***	5.90***	6.04***
	(2.00)	(0.35)	(0.31)
University degree	7.40**	8.85***	9.09***
	(2.34)	(0.35)	(0.30)
Relative income within country[a]	0.065***	0.83***	0.84***
	(0.019)	(0.094)	(0.092)
Postmaterialism	1.44	2.59***	2.57***
	(0.84)	(0.16)	(0.14)
Party affiliation	−3.66***	−1.85***	−1.79***
	(0.66)	(0.11)	(0.10)
General trust in people	2.01***	1.45***	1.40***
	(0.41)	(0.080)	(0.071)
General trust in government	0.45	0.26**	0.13
	(0.48)	(0.089)	(0.078)
Country-level variables			
GDP (PPP) in 1000		0.28***	0.27***
		(0.076)	(0.073)
Proportion urban population		0.048	0.043
		(0.063)	(0.060)
Population density		0.0079	0.0081
		(0.0055)	(0.0052)
Environmental Performance		0.13	0.13
Index		(0.095)	(0.091)
Constant	49.0***	18.8*	19.8**
	(3.32)	(7.99)	(7.63)
Standard deviation			
Country level		3.65***	3.50***
Individual level		13.4***	13.4***
Intraclass correlation (ICC)			
Null model		0.16	0.15
Model with covariates		0.069	0.064
Explained variance			
Country level		0.64	0.64
Individual level		0.12	0.11
Adj. R^2	0.15		
Number of countries	1	31	31
Number of observations	872	21646	27460

Note: standard errors in parentheses. In Model 1 the educational degrees are high school, junior college, bachelor degree, and graduate school.
[a] Absolute income for Model 1.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

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about the same effect as increasing education from high school to some college degree.

Next, we turn to the effects of values and political opinions. First, postmaterial value orientations are not related to environmental concern in the United States (see Appendix A for information on measurement). Second, party affiliation matters. In the United States, the variable is measured in five categories (Democrat, independent close Democrat, independent, independent close Republican, Republican) and has a nominal or ordinal scale. We recoded the variable into three categories (Democrat, independent, Republican) and tested via dummy variables the difference between Democrats and Republicans as compared to the middle categories. Republicans' environmental concern is 7.0 units lower than that of independents or Democrats and the difference is highly statistically significant. This finding is in line with other studies, particularly with McCright and Dunlap (2011) who find that conservative white males have a strong tendency to deny climate change and the human impact on it. The results do not differ greatly if party affiliation is treated continuously assuming interval scaling (from liberal to conservative). Since the continuous interpretation allows for better international comparison we display the continuous effect in Table 3.

Trust in other people is measured in the ISSP by one item: "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?" The question provides five answer categories from "you cannot be too careful" to "most people can be trusted." As hypothesized, general trust in other people is strongly associated with environmental concern (see Table 3, Model 1). However, general trust in the government, measured by the item „most of the time we can trust people in government to do what is right" has no significant effects.

Next, we repeat the analysis using the data for all 31 countries contained in the final release version of the ISSP 2010. In addition to the individual variables the data allow us to take into account differences between countries. Since we have a two-level model structure (individual effects and country specific effects) hierarchical linear regression analysis is a suitable statistical tool, which allows the simultaneous estimation of micro and macro effects (Gelman and Hill, 2007; Snijders and Bosker, 1999; Rabe-Hesketh and Skrondal, 2008). We apply a varying-intercept model and estimate coefficients via the maximum likelihood method using the statistical software Stata 11.2. Environmental concern Y_{ij} depends on the characteristics (x_1 through x_{12}) of the individuals (i to n) as denoted by Eq. (1). The country-specific characteristics (z_1 through z_4) are incorporated by varying the intercept β_{0j} depending on the macro level variables of j to k countries. This is formulated in Eq. (2):

$$Y_{ij} = \beta_{0j} + \beta_1 x_{1ij} + \cdots + \beta_{12} x_{12ij} + \varepsilon_{ij} \quad (1)$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01} z_{1j} + \cdots + \gamma_{04} z_{4j} + \zeta_j \quad (2)$$

In principle, the model could be extended in order to consider cross-level interaction effects so that the slope of the individual effects may depend on context effects (varying slope model). However, our main focus is the estimation of the macro level effects on environmental concern and not the potential slope variations of individual effects. Furthermore, investigating cross-level effects requires well-founded theoretical hypotheses. Otherwise, the number of all empirically possible cross-level effects is too large and the selection arbitrary. Therefore, we restrict ourselves to the varying-intercept model.

Model 2 of Table 3 displays the result of the hierarchical model specified in Eqs. (1) and (2). On the individual level most results repeat the findings of the USA of Model 1. Most importantly, education and income are on average positively linked to environmental concern in all countries considered. The size of the educational effect increases for every higher educational degree obtained by respondents. In contrast to the United States sample we z-transformed the income variable to make it comparable across countries. Hence, the variable measures the income position of respondents relative to the country's mean. The results show that environmental concern increases with the z-value, i.e. the household's income position.

Moreover the results show that women have a slightly higher environmental concern than men. Age is positively linked to environmental concern. The sign of the squared age effect indicates that the effect is concave, i.e. environmental concern increases first and drops later on with increasing age. Most of the variables measuring values or political affiliation have the same signs as in the United States sample. Thus, party affiliation as well as trust in other people matters across countries. Furthermore, the effect of postmaterialism is statistically significant in the international sample.

On the macro level, we take four variables into account, the purchasing power adjusted GDP per capita (PPP), the percent of a country's population living in a city, population density and the Environmental Performance Index (EPI). The results with respect to GDP are very clear: the wealth of a country has over and above the individual income position a positive effect on individuals' environmental concern. This macro effect is caused by two mechanisms: On one side, individuals' standard of living does not only depend on the household income but also on the quality of public goods provided by the countries. Richer countries provide on average more and better quality public goods. This provision contributes to individuals' wealth in addition to their personal incomes. On the other hand, measuring income is an incomplete and less than optimal measure of personal wealth. It does not take inherited wealth or other property into account. Furthermore, individuals tend to underreport personal incomes in surveys. Hence, the GDP effect could also catch some of the measurement error of the personal income variable. The strong association of GDP and environmental concern is depicted in Fig. 2.

The other three macro-variables are included in the model to take objective environmental quality into consideration. Environmental quality is often a bigger problem in cities than in the less densely populated countryside. Furthermore, we incorporate the well-established EPI-index as a direct measure of environmental quality. However, our results suggest that environmental quality does not matter for individuals' environmental concern, since none of the three variables is statistically significantly related to it.

We conducted a number of robustness checks with the models displayed in Table 3. First, Models 1 and 2 of Table 3 show that about one third of all cases are lost due to missing data. Missing responses to the income question are the main cause of this

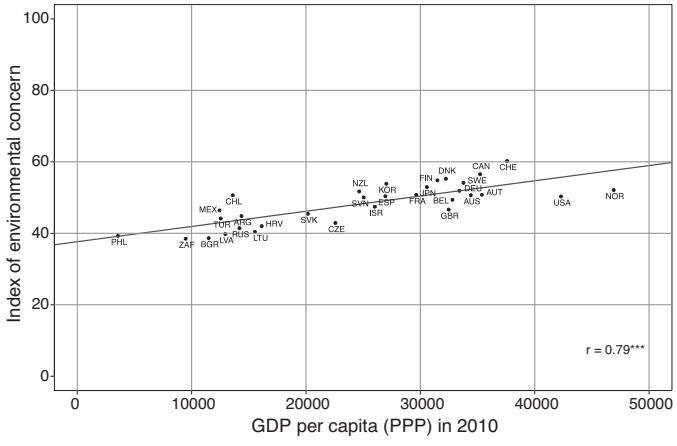

Fig. 2. The bivariate correlation between GDP and environmental concern.

reduction. Therefore, we imputed the income variable by assigning the mean country's income to all otherwise missing observations. The results of this estimation are displayed in Model 3 and demonstrate that the results do not depend on the imputation of the income variable. Second, the macro-level effects are based on a relatively low number of 31 countries. This makes the analysis potentially dependent on single influential country observations. Therefore, we checked the robustness of the models by re-estimating it 31 times and always dropping one of the 31 countries. Our estimations remain robust, which suggests that the results do not depend on a single country. Third, we included further macro variables such as the International Transparency Index (measuring corruption) or the Gini-index (measuring income inequality) into the model. None of these checks produced substantial changes in our results. The Transparency Index is highly correlated with GDP. However, in most analyses the GDP effect remains statistically significant despite problems of multicollinearity. In comparison, the effect of the Transparency Index is less robust. Thus, the effect of the Transparency Index is mainly driven by the GDP effect since, statistically, both variables measure the same effect.

Furthermore, we checked whether the results presented in Table 3 depend on our definition of environmental concern. The factor analysis reported suggests that the index consists of two components, the willingness to pay items (items one to four in Table 1) and the items measuring cognitive insight or emotional concern (items five to nine in Table 1). Therefore, we split the environmental concern index into two dependent variables and recalculated the models in Table 3 using only an index of items five to nine. The results (not shown here, but available upon request) remain basically unchanged. Particularly, the individual income effect, as well as the country level GDP effect, remains unchanged when we regress only the reduced index (items five to nine) on the covariates displayed in Table 3.

In sum, the results of the estimations presented in Table 3 suggest that environmental concern depends on several individual characteristics as well as on countries' wealth. On the individual level, education, income, political affiliation, sex, age, postmaterialism, and trust determine environmental concern. Thus, the analysis of the ISSP 2010 confirms previous findings (Franzen and Meyer, 2010; Franzen and Vogl, in press). However, the results also show that the models explain only 15 percent of the variance in the US sample and about 10 percent of the individual variance in the international sample. Thus, environmental attitudes are partly explained by socio-demographic variables and by some basic values. Yet, a very large part of the variation on the individual level remains unexplained. On the macro level, 64 percent of the variance is explained by GDP per capita. Therefore, the wealth effect displayed in Fig. 2 is strong and very reliable. We did not find any other macro variable that is reliably associated with environmental concern. Hence, the wealth effect explains a large part of the cross-national differences in environmental concern.

However, we cannot explain why environmental concern decreased during the last 20 or 10 years in most countries. While the decrease is small, wealth in most countries increased during the same time period. For instance, the US economy (GDP per capita) grew from 1993 to 2000 in real terms by 22 percent and from 2000 to 2010 by another 6.9 percent despite the banking crisis in 2008. Japan's wealth grew by 13 percent and Germany's by 24 percent between 1993 and 2010. The average real growth in GDP per capita for all countries in the ISSP was 20 percent from 1993 to 2000 and 2.5 percent from 2000 to 2010. Thus, overall wealth increased in most countries even though economic growth was negative in some years and on average weak in the last decade.

Since we have 15 countries with three and 10 countries with two measurements of environmental concern (together 65 observations) the data can be used to analyze the relationship between wealth and environmental concern using an unbalanced pooled panel OLS-regression (e.g. Wooldridge, 2003). We estimate a fixed effects model (difference-in-difference estimation) where the difference in environmental concern of countries is regressed on the difference in GDP per capita. The general within difference model can be written as,

$$Y_{it} - \bar{Y}_i = \beta_1 (x_{it} - \bar{x}_i) + \varepsilon_{it} - \bar{\varepsilon}_i \quad (3)$$

The fixed effects model has the advantage of taking only the within country variation into account. Any unobserved between country differences, therefore, cannot bias the estimation anymore. Under the assumption that x_{it} and ε_{it} are not correlated (strict exogeneity) a fixed effects model is the best statistical tool to estimate the unbiased causal effect of x on Y. The assumption is violated if there are measurement errors in x_{it}, unaccounted period effects (external shocks), or omitted variables that are correlated with Y and x. Thus, we have to assume that our GDP data are reliable and that the regression includes all relevant variables. Period effects can be accounted for by including time dummy variables into Eq. (3). In our case we account for period effects by including two time variables (one dummy for $T = 2000$ and another for $T = 2010$) into Eq. (3).

Table 4
Fixed effects panel-regression (unbalanced).

	Environmental concern per country
Log GDP per capita (PPP)	6.91***
	(2.66)
Periode effects	
2000	−3.16***
	(0.71)
2010	−6.43***
	(1.05)
R^2 within	0.65
Number of countries	25
Number of observations	65

Note: standard errors in parentheses.
*** $p < 0.001$.

First, the results show (Table 4) that environmental concern decreased during the period from 1993 to 2000 by 3 points on average and from 1993 to 2010 by 6.4 points. Second, controlling for this time trend, GDP per capita has a positive effect on environmental concern, suggesting that the negative trend in environmental concern was weaker in countries with larger increases in GDP. Since we took the natural logarithm of GDP per capital (for ease of interpretation) the results suggest that environmental concern increases by about 7 points for every percent increase of GDP. The panel regression explains 65 percent of the variation within countries. Overall, the result of the fixed effects panel regression mirrors the result we obtained with the multilevel model.

4. Conclusion and discussion

The multilevel analysis of the 2010 ISSP final release reveals that inhabitants' environmental concern in the 31 countries considered depends on individuals' socio-demographic characteristics such as age, gender, education, and income. Additionally, environmental concern depends on general trust in others, party affiliation, and postmaterial values. However, a country's wealth as measured by GDP per capita matters as well. Respondents in more wealthy nations tend to have higher environmental concern. Hence, the new analysis confirms former findings obtained with the ISSP 1993 or 2000 data (Franzen and Meyer, 2010; Franzen and Vogl, in press).

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We also explore the panel structure of the data on the macro level. 15 of the 33 countries participated in all three ISSP modules (in 1993, 2000 and 2010), and another 10 countries participated twice (either in 1993 and 2000 or in 2000 and 2010). Therefore, our panel data contains 65 observations. The results of the fixed effects panel regression show that GDP has a positive effect on respondents' environmental concern and reconfirms the finding obtained with the cross-sectional data. Overall, environmental concern decreased slightly in almost all countries (the exception is Chile). However, the decrease was weaker in countries that experienced larger increases in GDP since 1993. This finding is compatible with results obtained from time series analysis of public attitudes towards climate change in the United States. Brulle et al. (2012) find that concerns about climate change peaked in 2007 in the United States and then decreased to levels observed in 2002. According to the authors, the controversy of political elites, particularly the skepticism regarding climate change by Republican leaders, contributed most strongly to the decrease. They also find that the increasing unemployment rate and the weakening economy in the United States after the 2008 financial crisis pulled attention away from environmental concerns.

The fact that environmental concern decreased during the last two decades in most ISSP countries is of course bad news for the prospect of conserving the planet. It suggests that governments willing to implement measures for environmental protection will find it increasingly difficult to receive public support. It might also mean that individuals may exert less personal effort in daily life in order to protect the environment. We cannot explain this general decrease with our data. It contrasts sharply with increasing CO_2 emissions, the increasing attention scientists (e.g. the IPCC) have devoted to environmental problems, and with media coverage of it. One explanation could be public fatigue with a problem that has been on the agenda for a long time. Another explanation is that climate change skeptics, reports of scientific misconduct, inaccuracies, and exaggerations have introduced more confusion into the public debate. Furthermore, the banking crisis that started in 2008 and the debt crisis that followed has increased the concern over future economic perspectives pulling attention away from environmental issues. The data are not alarming yet, but the results suggest that effort is needed to keep public concern for the environment high. Most determinants of environmental concern, such as GDP per capita, are not easily subject to manipulation. Therefore, our research cannot produce practical policy solutions. The most direct way to keep environmental concern up seems to be through increased access to education. Educational attainment has the strongest effect on environmental concern. Perhaps by incorporating more lectures about environmental dangers and threats into schools' curricula, environmental concern could increase. The analysis of Brulle et al. (2012) also suggests that the political elite influences public attitudes more than scientific reports or general mass media coverage. Hence, the chances that the public will accept governmental action towards sustainable development are greater if political elites are unified around the cause.

Appendix A. Data description

	Min.	Max.	Mean	Sd	Description	Data source
Sex	0	1	0.51		0 = male, 1 = female.	ISSP (2010)
Age	18	80	46.94	15.84	Age in years.	ISSP (2010)
Postmaterialism	0	2	0.81	0.61	Number of postmaterialistic goals a country should have from a list of four.* 0 = none, 1 = one, 2 = two.	ISSP (2010)
Education	0	4			Education is classified into 5 categories: 0 = primary education and no formal education, 1 = intermediate secondary education, 2 = secondary education, 3 = university incomplete, 4 = university education.	ISSP (2010)
Relative houshold income	−2.15	28.94	0.07	1.03	Household income divided by the square root of the number of persons living in the household, *z*-transformed.	ISSP (2010)
Party affiliation	1	5	2.98	0.83	1 = far left, 2 = left, 3 = center/no preference, 4 = right, 5 = far right.	ISSP (2010)
Trust in people	1	5	2.76	1.28	5 point Likert scale from: 1 = you can't be too careful,..., 5 = most people can be trusted.	ISSP (2010)
Trust in government	1	5	2.72	1.11	5 point Likert scale to the question: "Most of the time we can trust people in government to do what is right": 1 = disagree strongly, 2 = disagree, 3 = neither agree or disagree, 4 = agree, 5 = strongly agree.	ISSP (2010)
Country-level variables						
GDP per capita (PPP) in $1000	3.56	46.91	24.99	11.11	Per capita GDP 2010 converted to measure the purchasing power in each country in 1000 2005 international US$.	Word Bank: World Development Indicators (WDI) & Global Development Finance (GDF)
Population density	3.75	508.86	128.25	138.22	Number of inhabitants per square kilometer of country's land area 2010.	Word Bank: WDI & GDF
Proportion urban population	48.00	97.40	76.05	10.65	Proportion of population living in areas classified as urban according to the criteria used by each country.	Word Bank: WDI & GDF
Environmental Performance Index (EPI)	50.79	89.09	68.58	8.97	Environmental Performance Index 2010. Weighted indicators for environmental quality and sustainability.	Yale Center for Environmental Law and Policy, Center for International Earth Science Information Network

Note: *the four goals mentioned are freedom of speech, democratic participation, fight rising prices, and maintain order in the nation.

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