The influence of the family, the school, and the group on the environmental attitudes of European students

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Abstract:

The attitudes of young people arise from an intense interaction with their social groups of reference, and in this work we examine the extent to which this background conditions the individual environmental attitudes of the young. Using data provided by the PISA 2006 survey {{290 OECD 2007; 359 OECD 2007}} for the European Union, we test for the influence of the family, the characteristics of the school, and the social interactions or school peer group on attitudes toward the environment. The existence of social interactions, as well as the important role of family characteristics and school activities, are confirmed. The results allow us to emphasise the importance of the social context of the adolescent, and the need to take this into account as a channel that amplifies the influence of specific environmental education strategies.

Keywords: peer effects; environmental attitudes; PISA, school

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Introduction

Global environmental problems, such as climate change, sustainable water management, energy resources, and pollution, have become more complex and require society's attention {{335 Awan, Usama 2013}}. The increasing level of awareness and knowledge of the environment has led countries and international bodies to include sustainable development strategies as matters of international political concern {{273 Coertjens,L. 2010}}.

In this context, there exists a broad consensus on the responsibility of society for its younger members, both as important players in the modern world and, especially, as the leading generation for future development {{371 United Nations 2004}}, and a general agreement that education is a crucial contributory factor in the formation of responsible individuals who will be vitally concerned with sustainable development {{358 UNCED 1992}}.

In this regard, United Nations Agenda 21 highlights the critical role of education in the promotion of sustainable development, considering both formal and non-formal education as "indispensable to changing people's attitudes so that they have the capacity to assess and address their sustainable development concerns" {{358 UNCED 1992}}. As a further step in promoting education as a key instrument for sustainable development, the United Nations General Assembly declared the Decade of Education for Sustainable Development (ESD) for the period 2005-2014, with the objective of promoting environmental education around the world and using education as a tool for shaping a

more sustainable future {{372 United Nations 2002}}.

The European Union has played an active role in promoting these initiatives. The definition of an "EU Sustainable Development Strategy (SDS)" in 2001 {{369 European Council 2001}}, further updated in 2006 and 2009, and the Fifth Ministerial "Environment for Europe" Conference in Kiev, in 2003, promoting a strategy of sustainable development through all educational systems, are good examples of this commitment.

Since education is recognized as a determining factor in the acquisition of environmental attitudes {{345 Heberlein, Thomas A 2012; 324 Levine,D.S. 2012}}it is relevant to investigate the role that the educational and relational surroundings of adolescents (family, peer-group, school, city…) have on individual attitudes to sustainable development. As *{{373 Meinhold, J.L. 2005}} recognizes, attitudes that adolescents have about the environment will affect future decisions concerning natural resources and how they will be used and sustained. Thus, the study of factors affecting the environmental attitudes of the young becomes important, even more so since the youth of today are the decision-makers of tomorrow {{321 Boeve-de Pauw,J. 2010}}.

This research highlights how individual, family, and school characteristics are determining variables in the environmental attitudes of European youth. More importantly, our work attempts to include social interactions, or peer-group effects, as an explicative factor of the environmental attitudes of students; this is to say, to investigate whether the environmental attitudes of school-mates influence individuals. Our rationale for this is threefold: First, since social research suggests that it is necessary to change attitudes about the environment before expecting a change in environmental behaviour {{321 Boeve-de Pauw,J. 2010; 370 Stagner, Rachel Miriam 2013}}, so does it make sense to study the factors affecting these attitudes and their relationship with the social

context of the adolescent.

Second, expanding the context, the strong evidence on peer effects found in the literature for a wide range of adolescent studies (alcohol consumption, schooling, and sexuality, among others) leads us to test the existence of these effects in the field of environmental attitudes. Finally, the existence of these effects is important for policy design, since social interactions can act as "social multipliers". In that case, as {{117 Lundborg,Petter 2006}} states, if there exists a social multiplier effect, even small interventions may have large individual effects. This information helps in the evaluation of strategies followed by schools - and countries - in the promotion of the environmental education of students, which, as has been noted before, is a key element in the promotion of sustainable development.

The purpose of this study is exploratory, since we attempt to empirically test whether individual, family, and school variables have a significant effect in forming the environmental attitudes of students, and whether the peer influence found in other studies regarding adolescents is also supported in environmental attitudes.

The rest of the paper is structured as follows. We continue with a theoretical outline, where we survey the existing literature on attitudes, environmental attitudes, and social interactions. This will lead to the formulation of the main research questions addressed in this paper. There follows a section describing our methodology, and the analysis, presentation, and discussion of our main results. The paper closes with a review of our main conclusions.

Background

Attitudes and environmental attitudes

Both the Theory of Reasoned Action and Learning (TRAL) {{340 Fishbein, Martin 1975; 341 Ajzen, Icek 1980}} and the Theory of Planned Behavior (TPB) {{333 Ajzen, Icek

1985; 331 Ajzen, Icek 1991}} highlight the role of attitudes in the formation of behaviours, supporting the idea that changing the attitudes of individuals in a certain domain is a prerequisite to changing the behavior towards this domain. Attitudes have been, and remain, a crucial concept in social psychological theory, and the Fishbein/Ajzen model is commonly used to explain causal relationships between attitudes and behaviours.

Environmental attitudes emerge within the new environmental paradigm, against the dominant social one {{350 Oskamp, Stuart 2005}} and can be defined as a psychological tendency expressed by evaluating perceptions of (or beliefs regarding) the natural environment, including factors affecting its quality, with some degree of favour or disfavour {{351 Milfont, Taciano L 2009}}. Some authors distinguish between different types of environmental attitudes, oriented around three sets of valued objects: self, others, and the biosphere, interpreted within social-cognitive theory, and they suggest that the attitudes an individual develops are based on the degree to which they perceive an interconnection between themselves and others (altruistic) or between themselves and nature (biospheric) {{352 Schultz,Wesley P 2001}}.

Although the link between attitudes and behaviours has sometimes been questioned in the literature {{346 Heimlich, Joe E 2008}}, numerous authors claim that environmental attitudes are powerful predictors of ecological behaviours {{348 Kaiser, Florian G 1999; 349 Kaiser, Florian G 2007; 353 Stern, Paul C 1995; 324 Levine,D.S. 2012}} *among others). Other authors, such as *{{337 Bamberg, Sebastian 2003}} show that there exists a causal role of environmental attitudes as an important indirect determinant of environmental behaviours, following from the generation of a specific cognition of the situation.

The meta-analysis by *{{336 Bamberg, Sebastian 2007}} of the psycho-social determinants of pro-environmental behaviour shows that such behaviour is an amalgam of self-interest and pro-social motives, so it is important to recognize that contextual and relational factors, such as education, family, and peers, have a significant influence in the shaping of adolescent environmental attitudes {{326 Steg,L. 2009}}. Articles such as *{{287 Tilbury,D. 1994}}, *{{272 Chapman,David 2001}} and more recently, *{{279 Torgler,B. 2007}}, *{{273 Coertjens,L. 2010}}, and * {{338 Boeve-de Pauw, Jelle 2011}} make significant contributions to the study of the development of environmental attitudes among adolescents, on the basis of a range of family, socio-economic, and school factors".

Social interactions

It is well-established in the psychological, sociological, and economic literature that the family plays a significant role in emotional and behavioural development during childhood, but environmental attitudes can change throughout life, especially in adolescence, via socialization among other relevant agents, such as peer groups in school. For example, *{{284 Noller,P. 1991}}, *{{274 Dekovic,M. 2004}}, and *{{285 Moschis,G.P. 1985}} point out that the relationships established in the family help teenagers to acquire certain attitudes, for example, moderating the effects of mass-media exposure. However, as * {{274 Dekovic,M. 2004}} noted, as children approach adolescence, they spend more and more time with their peers, who become the most important reference group during those years. Modern sociological theory shows how individuals are influenced by others and, as * {{342 Giddens, Anthony 2013}} suggests, individual identity is constructed by the influence of others, there is permanent tension between the individual and society, and most attitudes and behaviours are the result of an interaction of the self with others, especially in adolescence.

Strong evidence of peer effects has been found in a wide range of adolescent issues, such as alcohol consumption and truancy {{36 Duarte,R. 2011}}, obesity {{124 Trogdon,Justin G. 2008}}; schooling {{63 Mora,Toni 2011}}, and sexuality {{113 Ali,Mir M. 2011}}.

However, the empirical estimation of true peer effects is not a simple matter. The statistical approach to estimating social interactions took an important step forward with the work of *{{142 Manski,CF 1993}}, who distinguishes three types of effects: endogenous, exogenous or contextual, and correlated effects. The endogenous effect, also known as the peer effect, appears when the propensity to participate in a behaviour depends on the prevalence of this behaviour in the group. The contextual effects appear when the propensity to participate in a certain behaviour varies with the exogenous characteristics of the group. (Endogenous and contextual effects are also known as social effects or social interactions). Correlated effects emerge because individuals in the same group tend to have similar behaviours due to the sorting problem, that is to say, similar individuals tend to make similar choices. As * {{142 Manski,CF 1993}} has shown, there is no clear way to distinguish between peer effects and contextual effects, and the estimates reflect a combination of both social effects. As a result, most research has assumed that there are no contextual effects, and has interpreted the estimated combined effects as peer effects {{117 Lundborg,Petter 2006; 63 Mora,Toni 2011; 36 Duarte,R. 2011}}. This is also assumed in our study.

Recent works, such as * {{321 Boeve-de Pauw,J. 2010}} and * {{273 Coertjens,L. 2010}} have also analysed the role of a range of individual and contextual variables in the environmental attitudes of students. Our work builds on this literature, extending the analysis to the explicit consideration of group effects and school characteristics. More specifically, our paper attempts to assess the extent to which the closer background of

European students (educational, socio-economic, family, and peer-group) conditions their individual pro-environmental attitudes. We are also interested in evaluating the role played by the information provided through formal education channels (schools).

Research questions

In order to frame the analysis, the main research questions of our work can be formulated as follows:

1. What individual variables explain students' environmental attitudes?
2. Are the family and socio-economic characteristics relevant in explaining student attitudes toward the environment? If so, which ones?
3. Are social interactions or peer effects relevant in explaining these attitudes?
4. Do school characteristics and information provided at school explain variations in student's environmental attitudes? Which variables are most important?
5. Can other explicative variables at the country level (representative of a more generational country attitude) be useful in explaining differences in environmental attitudes?
6. Are the patterns of influence of all these variables above different depending on gender? If so, which ones and how?

Methods

Empirically, our analysis is based on the data provided by the *Programme for International Student Assessment, PISA 2006* coordinated by the Organization for Economic Cooperation and Development {{290 OECD 2007}}, the only wave where a set of questions regarding environmental attitudes are included. (Although the PISA survey has been conducted regularly since 2000, it is only in the wave corresponding to the year 2006 that these questions appear).

We use data corresponding to the current EU28, with the exception of Cyprus and Malta (not included in PISA 2006). This survey contains detailed information about the socio-economic and family characteristics of students aged 15. Additionally, data on the performance and characteristics of schools can be linked to student characteristics. The survey also provides information about students' environmental attitudes, as well as information about the environmental issues provided by schools. According to the PISA 2006 Technical Report (OECD 2009, p. 64 and ss.), the sampling design was a two-stage stratified sample design.

The first-stage sampling units consisted of individual schools with 15-year-old students. The schools were sampled systematically from a comprehensive national list of all eligible schools, with probabilities proportional to a measure of size. In each country, at least 150 schools were selected, or all the eligible schools if there were fewer than 150 schools in a participating country. Within each participating school, a predetermined number of students, usually 35, were randomly selected. In the case of schools with fewer than the predetermined number of students, all students were selected. Finally, a minimum response rate of 80% of selected students in participating schools was required. The final PISA 2006 European subsample for the selected countries consists of 172,066 students from 6,432 schools.

In the general context of an educational production function {{276 Hanushek,E.A. 1986}}, individual attitudes towards the environment of student *i* living in country *c*, attending school *s* and belonging to grade *g* can be represented as depending on individual and family characteristics (X_{icsg}), the average attitudes of his/her school-grade group (G_{icsg}), a group of school characteristics (S_{cs}), and country characteristics (C_c). Assuming a linear relationship:

$$Y_{icsg} = f\left(X_{icsg}, G_{icsg}, S_{cs}, C_c\right) + u_{icsg} = f\left(Z\right) + u_{icsg} = Z\beta + u_{icsg}$$

where the vector Z includes all the explanatory variables, $Z\beta$ is the product with the coefficient vector β, equivalent to the usual linear combination of the individual explanatory variables, and u_{icsg} represents an error term.

With respect to the variables included in the model, the dependent variable (Y_{icsg}) is an individual environmental attitudes index (EAI), built on the basis of the level of agreement given by the student to seven statements (Student Questionnaire for PISA 2006, page 21, Q26), that appears in Table 1.

With respect to the explanatory variables, and beginning with the individual and family characteristics of the adolescent, X_{icsg}, the following are considered: *Gender* (1=male, 0=female), *Born1991* (1=if born in 1991, 0=if born in 1990), *Immigrate-first generation* (1=born in the country of assessment but whose parent(s) were born in another country, 0=otherwise), *Immigrate* (1=non-native, 0=otherwise), *SocioEconomicIndex* (an index provided by PISA 2006 based on education, occupational status, and number of possessions in the family home), *StudiesMother1* (1=mother has primary education level or lower, 0=otherwise; used as reference category), *StudiesMother2* (1=mother has secondary education, 0=otherwise), *StudiesMother3* (1=mother has post-secondary non-tertiary education, 0=otherwise), and *StudiesMother4* (1=mother has tertiary education, 0=otherwise). Corresponding variables and codes have been applied for the father, giving us a total of eight educational variables, four for each parent. These eight variables have been computed categorizing the variables *StudiesMother* and *StudiesFather* that range from 1 to 4. An additional set of variables deals with books in the home: *BooksHome1* (1=the student has between 0 and 10 books at home, 0=otherwise; reference category), *BooksHome2* (1=the student has between 11 and 25 books at home, 0=otherwise), *BooksHome3* (1=the student has between 26 and 100 books at home, 0=otherwise), *BooksHome4* (1=the student has between 101 and 200 books at home, 0=otherwise),

BooksHome5 (1=the student has between 201 and 500 books at home, 0=otherwise), and *BooksHome6* (1=the student has more than 500 books at home, 0=otherwise).

Regarding the school context of the individual, an average of the EAI from his/her school-grade, G_{icsg}, has been defined to capture the association with the school-grade group's environmental attitudes. This group variable is computed, for each adolescent, as the average of the EAI for the individual's mates in the school-grade sample. Given that the student spends a large amount of time at school, group variables defined in this context can be proxies for the reference group of the student. Since the PISA 2006 survey does not provide class identifiers, the group variable has been built by considering the students attending the same school and grade. This group has also been used in the analysis of peer group effects on academic achievement {{356 Schneeweis,N. 2007}}.

With regard to school characteristics, three dichotomous variables are considered to take into account the ownership of the school: *Private* (1=the school is private, 0=otherwise; reference category), *PrivateDependent* (1=the school is private/government-dependent, 0=otherwise), and *Public* (1=the school is public, 0=otherwise). To address the influence of informative campaigns at the school level, four dichotomous variables have been introduced: *InfoSchoolAir* (1=school is the main source of information about Air pollution, 0=otherwise), *InfoSchoolForest* (1=school is the main source of information about clearing of forests and other land uses, 0=otherwise), *InfoSchoolWater* (1=school is the main source of information about water shortages, 0=otherwise), and *InfoSchoolNuclear* (1=school is the main source of information about nuclear waste, 0=otherwise). The variable *TeacherStudentRatio* (the teacher-student ratio at school) has been also included. Finally, the city size where the school is located has been taken into account with five dichotomous variables: *City1* (1=the city has less than 3,000 inhabitants, 0=otherwise; reference category), *City2* (1=the city has between 3,001 and

15,000 inhabitants, 0=otherwise), *City3* (1=the city has between 15,001 and 100,000 inhabitants, 0=otherwise), *City4* (1=the city has between 100,001 and 1,000,000 inhabitants, 0=otherwise), and *City5* (1=the city has more than 1,000,000 inhabitants, 0=otherwise).

At the country level, a variable has been created taking as value for each individual the national average of the EAI, in an attempt to capture a homogeneous effect of national differences on the environmental attitudes of students. It could reflect the influence on the individual attitudes of a wide range of national factors, such as national policies on education for sustainable development, national policies towards the environment, national income levels, national life expectancy, national literacy, national environmental endowments, and national environmental quality {{321 Boeve-de Pauw,J. 2010}}. Finally, we have included dummy variables corresponding to the countries, given that their omission could attribute some specific national effects to other exogenous variables. This allows us to have differential effects across countries.

Analysis

In the estimation of these peer effects, two main statistical concerns must be dealt with: the possible endogeneity of the peer group variable, mainly due to what *{{142 Manski,CF 1993}} calls the reflection problem, that is to say, the group behaviour influences the behaviour of their members, but at the same time each of the members influences the behaviour of the group, and the sorting problem, which is the selection of groups by choices based on socio-economic or environmental characteristics. These problems yield biased estimates of peer group influences {{151 Gaviria,A. 2001}}.

In other words, the empirical estimation of social interactions must take into account the fact that the group-effect variable, G_{icsg}, could be partially endogenous. In order to deal with the possible endogeneity problem of the variable measuring the average attitudes of

the school-grade group, we estimate the model by two-stage least squares (2SLS). Given that 2SLS provides consistent estimates of the equation of interest in the presence of an endogenous regressor {{344 Greene, William H 2003; 151 Gaviria,A. 2001}}, this approach could be more plausible than the more traditional hierarchical linear model approach[1].

In the first stage, the group effect variable is regressed on the exogenous variables and certain instruments. In the second stage, the predicted values of the peer or group effect variable from the first stage replace the original peer variable. We cannot use the standard errors estimated in the second stage, as they ignore the fact that the predicted peer variable has been estimated. However, standard econometric software (STATA) provides the corrected standard errors. In order to account for the clustering of adolescents within school and grades, we report robust standard errors that deal with the non-independence of data from individuals within the same school and grade.

We have used as instruments the school-grade average, after excluding individual *i*, of the following variables: *InfoSchoolNuclear*, *StudiesMother* and *StudiesFather*. In order to have confidence in the instruments used, we have implemented two tests. First, we have checked the joint significance of the instruments in the first stage, and the three instruments are jointly significant (LR=1,865.64). Second, we have tested the validity of instruments using the * {{140 Wooldridge, J.M. 2002}} approach. These statistics follow, under the null of validity of the instruments, a Chi-squared distribution with three degrees of freedom (the number of instruments). In our case, this is 0.351 and so we cannot reject the validity of the instruments.

[1] Nevertheless, a hierarchical linear model including two random intercepts, at the school and country levels, has also been estimated {{368 Rabe-Hesketh,Sophia 2005}}. The estimated coefficients and significance levels are very similar and are available upon request.

Results

The frequencies corresponding to the questions about environmental attitudes are reported in Table 1, while the average of the EAI is presented for the whole sample, and for the different countries, in Table 2. As can be seen, the average value of the EAI is 15.269, which reflects a moderate positive pro-environmental attitude (note that the index ranges from 0 to 21). The average is higher for females than for males, with this pattern being observed for all countries except Croatia, Romania, and Slovakia. By country, the highest values of the index, on average, are found for Portugal, Spain, France, and Hungary (index above 16), while the lowest correspond to the Netherlands, Latvia, and Sweden (index under 14). Finland and Sweden show the greatest distance between male and female EAI.

Table 2 also shows Cronbach's alpha in the EU28 countries. The dependent variable has an acceptable reliability. Cronbach's alpha for the EU28 is 0.760 and, at the country level, ranges from 0.637 in Latvia to 0.834 in Finland. Other available psychometric properties and models (RMSA, RMR, CFI and NNFI) regarding these environmental aspects have been incorporated from PISA 2006 Technical Report (OECD 2009, p. 328 to 331). The parameters confirm a satisfactory performance across countries and for the whole sample.

(Insert Table 1)

(Insert Table 2)

Table 3 contains the estimation of the parameters of the model for the entire sample, reported in column 1, and for boys and girls reported in columns 2 and 3, respectively.

We report the estimates for the model selected after sequentially excluding the non-significant variables with the stepwise algorithm incorporated in the STATA software. The criterion for excluding variables of the regression has been p-value>0.1 and the criterion for reincorporating variables has been $p \leq 0.05$. Implementing this procedure has

eliminated the following variables, in this order: StudiesMother4, Immigrate, InfoSchoolNuclear, StudiesFather3, StudiesMother2, and StudiesFather4. No variables were re-incorporated at any stage of the procedure.

Turning to the results, our first research question is: What individual variables explain students' environmental attitudes? Beginning with the estimations for the full sample, and looking at individual characteristics, we observe that girls tend to be more pro-environment-oriented than boys, as shown in the sign and significance of the gender variable. Thus, the coefficient of the variable *Gender* is significantly negative. All things being equal, EAI reported by boys is 1.42% (0.216/15.269*100) lower than that reported by girls.

Although variability in age is very low in the survey (only some months), the results show that the youngest students (those born in 1991, against the majority, born in 1990) tend to be less environmentally-oriented, although this coefficient is only significant at the 95% confidence level. Also with this level of significance, the results indicate that, in the selected sample, the first-generation immigrant students, that is, those born in the country whose parents are immigrant, have a slightly higher pro-environmental orientation.

(Insert Table 3)

The second research question refers to the relevance of family and socio-economic characteristics in explaining student attitudes toward the environment. As can be seen, a positive and significant relationship between the socio-economic index and the attitude towards environmental problems can be identified. While the level of studies of the parents offers mixed results (being significant the tertiary level of the mother at 95% and the secondary level of the father at 99%), the number of books at home, which has been sometimes used as an indicator of literacy at home, is clearly significant and the coefficients corresponding to these variables are also important in size. Moreover, we

observe that the impact is monotonically greater as the number of books increase, indicating that a student living in a home with more than 500 books (variable *Bookshome6*) reports a value of the dependent variable around 10.3% (1.578/15.269*100) higher than a similar student from a family with less than 11 books at home (variable *Bookshome1*).

An important question to be addressed when we move from the family to the school environment is the existence (or not) of significant social effects at the school level, which is the object of our third research question. Clearly, our results indicate that the environmental attitudes of students are significant and positively associated with the average environmental attitudes of their school-grade peers. Thus, a unitary increment in the average of the EAI of the group is associated with an increase of the individual EAI of 0.394 units.

Our fourth research question is, Do school characteristics and information provided at school explain variations in student's environmental attitudes? Which variables are relevant?

Our results suggest that the interesting variables at the school level are those regarding the information received at school about various environmental issues. Our results provide evidence that the information provided at school about air pollution, forest depletion, and water shortages increase the dependent variable by 0.103, 0.227 and 0.071 points, respectively, those being the three variables that are statistically significant at the 99% level. Moreover, there are differences in environmental attitudes among students from different types of school. Thus, relative to private independent schools, the students in private/government-dependent schools show a more pro-environmental attitude, reporting about 0.138 points more in the dependent variable, and more so in state schools, where students reported 0.196 points more in the dependent variable (EAI), with both

variables being significant (the first at the 95% level).

The variable measuring the teacher-student ratio is significant at the 95% level, and the effect is positive, although reduced in size. The size of the city where the school is located is also included as an explicative factor. All the variables regarding this issue show significance at the 99% confidence level (except citysize2, at the 95% confidence level). The sign of the corresponding coefficient is always negative, and its size increases with city size. All other things constant, students in large cities (citysize5, with more than 1 million inhabitants) show an index of environmental attitudes 1.1% lower (0.173/15.269*100) than those studying in small towns (citysize1, the omitted category, less than 3,000 inhabitants). In other words, those more closely involved in the rural and natural environment seem to have a more pro-environment attitude.

In order to address the fifth research question, we have included in the model certain explicative variables at the country level. More specifically, we include the country average of the EAI for adolescents. The effect of this variable is positive and statistically significant at the 99% confidence level. In consequence, the higher the value of the country average EIA, the higher the level of the individual index. More specifically, the value of the coefficient is 0.706, which means that, all other things being equal, students living in a country with a 1-point higher average pro-environmental attitude show an individual EAI 4.6% higher. Finally, to control for the heterogeneous effects of cross-country differences, fixed-effects variables at the country level have been introduced.

Our final research question regards the potential different patterns of influence of the variables depending on gender. To address this question, once the main results have been presented for the whole sample, we look for specific gender-differential effects. We run the estimations for the two separated subsamples, which have a similar share in the total sample (49.8% girls and 50.2% boys). Most of the main results presented above are

confirmed for the subsamples, although some interesting differences are found.

The first difference between gender groups concerns immigrant status. As can be seen, while the first-generation immigrant condition has no significant effect on environmental attitudes for females, this condition is statistically significant for males, with a coefficient of 0.349.

The variables regarding socio-economic status, and the number of books at home, are significant for both subsamples. The influence of the socio-economic index is greater for girls than for boys, while we find no clear pattern of differential influence for the books variable. Regarding the influence of the group on individual attitudes, the effect of this variable on the girls' subsample is notably greater, more than double that of the boys. More specifically, the coefficient of this variable is 0.580 for girls and 0.236 for boys, implying that girls are significantly more affected by their peer group attitudes than boys. Girls' attitudes towards the environment also appear to be more affected by school characteristics than those of the boys; the school type results, for instance, are significant for girls but not for boys. The city size offers a consistent pattern (negative and increasing in size coefficient) but with mixed results regarding significance, with the effect of greater size being significant at the 99% level for the female subsample and at the 95% level for the male subsample.

One particularly interesting result is the differential effect of the country average EAI in both subsamples. In this case, although the variable is positive and significant for both sub-samples, the effect is notably larger for the male sub-sample (the value of the coefficient is 0.925 for boys and 0.502 for girls). Relative to the influence of the peer-group variable, we could say that girls are more influenced by the closer context, while boys seem to be more sensitive to the changes in the broader generational context.

Discussion

In this paper, we have examined the potential influence of individual, family, and school characteristics in explaining the environmental attitudes of European students, also testing for the existence of social effects. The results have produced interesting insights regarding individual, family, and school variables, with most of these being consistent with the existing literature. We have seen that gender is correlated with student environmental attitudes, with girls being more pro-environment than boys, a result confirmed by earlier studies {{334 Arnocky, Steven 2010; 321 Boeve-de Pauw,J. 2010; 273 Coertjens,L. 2010; 354 Zelezny, Lynnette C 2000}}. The general result has been explained by * {{334 Arnocky, Steven 2010}} who finds that pro-environmental gender differences are fully mediated by differences in emotional empathy.

Regarding immigrant status, the results are inconclusive. Our estimations show that, for the sample considered, first-generation immigrant students (i.e. those who were born in the country, of parents born elsewhere) have a slightly higher pro-environment orientation. However, the immigration category is not significant (and it is not included in the final model). Moreover, our results suggest that, while the status of first-generation immigrant is significant for the male sub-sample in explaining environmental attitudes, it is not a relevant factor for the female sub-sample. Although not directly comparable, other studies, such as * {{357 Klineberg,Stephen L. 1998}}, report influences of race or ethnicity on environmental concerns, also with varying results, while * {{370 Stagner, Rachel Miriam 2013}} found no significant differences between gender and ethnic groups in attitudes towards the environment for a group of adolescents. We conclude that further research on these kinds of variable is needed.

We have also found evidence of a positive relationship between socio-economic status and pro-environment attitudes, as well as between our measurement of cultural possessions (number of books at home) and environmental attitudes. The number of

books at home has been considered, in different contexts, as a good proxy for the "scholarly status at home" or "home literacy environments" {{283 Evans,M.D.R. 2005; 275 Fuchs,T. 2007}}. This result is also found in prior studies {{321 Boeve-de Pauw,J. 2010; 273 Coertjens,L. 2010}}. *{{275 Fuchs,T. 2007}} found a positive and significant link between the number of books at home and other educational outcomes, such as student performance in reading, science, and math. 'Post-materialism' has been alluded to in the literature to explain this type of result. According to * {{347 Inglehart, Ronald 1995}} and * {{321 Boeve-de Pauw,J. 2010}}, the priority levels for post-materialistic goals, such as environmentalism, increase with prosperity.

Since the family is the first socialization circle for the adolescents, parental guidance and reinforcement can be a significant mediating factor for external information, as is also found for other attitudes and behaviours {{178 Austin,E.W. 2003; 274 Dekovic,M. 2004}}. In this regard, the family should be considered a target group in the development of environmental education objectives.

Notably, our estimations support the hypothesis of the existence of group-effects or social effects on environmental attitudes. * {{142 Manski,CF 1993}} has shown that the estimated coefficient reflects a combination of both social effects: peer and contextual. As a result, most studies have assumed that there are no contextual effects, and have interpreted the combined effects as peer effects {{117 Lundborg,Petter 2006; 63 Mora,Toni 2011; 36 Duarte,R. 2011}}. Although this assumption can be very restrictive, we follow this practice in order to maintain the same terminology, while realising that, in this context, 'peer effects' means both peer and contextual effects.

Clearly, our results indicate that the effect of school-grade peers is positive, significant, and important in size, meaning that the environmental attitudes of a particular student are reinforced by the attitudes of school-grade peers. In other words, if a random student is

assigned to a different school and grade, where the mean of the EAI in the peer group is 1 point higher, the reported index of environmental attitudes would increase, all other things being equal, by 0.394 units, which is 2.58% with respect to the mean of the dependent variable (0.394/15.269*100). These quantitative results should be interpreted with caution, due to the reciprocal nature of social interactions, to the proper nature of the social effects, which as * {{142 Manski,CF 1993}} noted, cannot be fully isolated, and to the fact that we are computing the peer group at the school-grade level.

As far as we know, no prior studies have estimated the size and significance of social interactions on environmental attitudes. However, we do find some references regarding other adolescent topics using a similar approach. More specifically, using the same estimation method (2SLS),*{{154 Ali,M.M. 2009}} found significant coefficients that vary from 0.360 to 0.531 for the peer effect on smoking. Similarly, *{{291 Duarte,R. 2014}} reported a significant coefficient of 0.362 for peer effects on alcohol-impaired driving. Thus, our estimated coefficient (0.394 for the whole sample, 0.580 for girls and 0.236 for boys) are quite similar to those found in the analysis of other adolescent issues. The empirical evidence of the existence of social effects tells us about "social multipliers", meaning that the effects of changes in the exogenous variables may be greater than those implied by the estimated coefficients. This is because an exogenous change (e.g., the case of a targeted informative campaign at school), will yield two effects. The first will be a direct effect, from the impact of the campaign on individual attitudes to environmental problems. However, an indirect effect will also appear, due to a change in peer attitudes, and it is reasonable to consider that the change in the peer effect variable will reinforce the direct effect. Consequently, just as peer effects may serve to amplify the effects of intervention policies {{117 Lundborg,Petter 2006}}, our results also

suggest that the study and identification of the adolescent's reference groups constitutes a challenge to design more effective environmental education policies.

In this regard, the research comes from a quantitative point of view, in the evaluation of social influences on the formation of the environmental attitudes of adolescents. However, given the very different ways in which the influence of peers can be exerted, it would be very interesting to broaden the analysis to qualitative methods, and different data, in an attempt to understand how peer effects actually function from the perspective of the student.

The differential magnitude of social interaction by gender has been reported in the literature on other topics {{292 Brown, B.B. 1986}}. One possible explanation is that girls, in most social contexts, use more forms of communication than boys {{293 Brinzendine,L. 2006}} and, consequently, may share more conversations about environmental issues than boys. Similarly, * {{334 Arnocky, Steven 2010}} explains that empathy, a key factor in environmental attitudes, is expressed more often by women than by men.

It would be of interest to policy makers to focus on the results of the information provided by schools to raise awareness of environmental problems among their students. All in all, our results are consistent with the existing literature on education regarding such environmental issues as energy-savings and carbon-emissions reduction, and a range of studies have found positive effects on student knowledge, attitudes, and behavior regarding these topics {{299 Uitto,Anna 2011; 298 Lee,Lung-Sheng 2013; 301 Shephard,Kerry 2014}}. Similarly, the teacher/student ratio, the school type, and the size of the city are statistically significant, indicating that school characteristics as well as proximity to rural and natural environments may also influence the formation of environmental attitudes.

Our results show a relationship between individual attitudes and the generational country average of the EAI, implying that cross-country differences (which may be due to educational contexts, national policies towards the environment, and/or differential implementation of environmental subjects in formal and informal education, among others) have significant influence on students. This is reflected in the correlation between environmental attitudes at the individual and national levels. A discussion of several country-level factors on environmental attitudes can be seen in * {{321 Boeve-de Pauw,J. 2010}}.

In summary, our findings suggest that the environmental attitudes of adolescents result from a complex interplay of many social factors: family background, school characteristics, school programs, and social interactions with peers. A number of implications for policy can be drawn from these findings. First, given that providing information at schools on environmental topics (e.g. air pollution, forest depletion, etc.) increases the pro-environmental attitudes among adolescents, educational authorities should maintain, expand, and improve such informative campaigns. Moreover, it is important to consider the adolescents' interests and ideas, to create processes of reflection and participation around environmental attitudes, with the goal of building a more sustainable society.

Second, given the complex process pointed out above, it appears that no simple strategy can be entirely effective in promoting and encouraging pro-environmental attitudes. In light of this, school campaigns should be integrated with a more general community effort in order to improve the results that guide environmental attitude construction. Interventions directed at adolescents can benefit from including teachers and parents as campaign targets. Evidence exists of intergenerational transmission effects of environmental attitudes, and it has been found that communication on environmental

issues, within the family, is indeed an important socializing factor that influences adolescents' environmental attitudes {{374 Meeusen,C. 2014}}.

Third, we have seen that some groups of adolescents report lower environmental attitude indices than others. Our results suggest that males in general, those who have lower socio-economic status, and those who live in larger cities report less positive pro-environmental attitudes. Consequently, policy makers should consider these groups as important targets when designing policy programs. Finally, and most importantly, authorities, when evaluating the costs and benefits of a particular policy intervention, should keep in mind that, in addition to the initial impact of the intervention on adolescent attitudes, there would be an additional and indirect impact due to peer effects.

The findings from this study should be considered in light of several limitations that come mainly from using cross-sectional data. Longitudinal data could control for unobserved heterogeneity. Other limitations arise from the lack of certain crucial information about adolescents, such as political orientation, personality type, etc. In this regard, future research should include more explanatory variables at the individual level, such as political preferences, religion, and so on. Another important finding to explore further is the effectiveness of informative campaigns at school. It would be interesting to analyze which kinds of campaign are more successful in obtaining better results. Finally, more evidence of the presence of peer effects in environmental attitudes is needed, and more analysis with alternative research designs and data sets may provide more definitive evidence on this issue. In this context, richer data sets and qualitative methods can help in understanding how the influence of peer attitudes actually takes effect, and in identifying the factors that explain differences across genders.

Conclusions

In this paper, we have analysed the role of individual, family, and school factors in the

environmental attitudes of European students. A special effort has been made to discuss, and test for, the influence of social interactions or peer effects in the environmental attitudes of students. Overall, our findings in this work are consistent with the existing literature, and we have found positive and significant peer effects for environmental attitudes.

The existence of these effects provides evidence of "social multipliers", that is, the effects of changes in the exogenous variables may be greater than those implied by the estimated coefficients. This result is of great significance for policy makers, as peer effects may serve to amplify the effects of intervention policies. Additionally, we estimate differential effects by gender and our results show that social interactions or peer effects are slightly greater for girls than for boys. Similarly, we have found that girls have stronger pro-environmental attitudes than boys.

School variables also suggest interesting results, with potential policy implications of their own. Our results show that information campaigns at school about air pollution, forest depletion, and water shortages improve the environmental attitudes of students. Additionally, other school factors, such as the teacher-student ratio, and proximity to rural and natural environments, can mediate the construction of these attitudes.

This research highlights the importance of the social context of the adolescent and the need to take into account the school and the student reference groups as channels that amplify the influence of specific environmental education strategies.

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Table 1. Environmental attitudes among European students.

Frequencies (%)	Strongly Agree	Agree	Disagree	Strongly Disagree
a) It is important to carry out regular checks on the emissions from cars as a condition of their use	43.76	47.14	7.02	2.08
b) It disturbs me when energy is wasted through the unnecessary use of electrical appliances	23.11	45.42	25.40	6.07
c) I am in favour of having laws that regulate factory emissions, even if this would increase the price of products	26.44	44.26	23.66	5.65
d) To reduce waste, the use of plastic packaging should be kept to a minimum	30.90	48.63	17.01	3.43
e) Industries should be required to prove that they safely dispose of dangerous waste materials	50.99	40.69	6.51	1.81
f) I am in favour of having laws that protect the habitats of endangered species	49.95	40.97	7.03	2.04
g) Electricity should be produced from renewable resources as much as possible, even if this increases the cost	35.27	44.63	16.08	4.02

Notes: The responses given by the students have been codified as follows: 0 if strongly disagree, 1 if disagree, 2 if agree, and 3 if strongly agree. The EAI is the sum of the points obtained in all the responses, ranking from 0 (if the student strongly disagrees with all the sentences) to 21 (if he/she strongly agrees with all the sentences).

Table 2. Mean of the environmental attitudes index by country and gender, and psychometric properties.

Sample	Cronbach's alpha	Total sample	Girls	Boys	Equal means by gender[a]	RMSEA[b]	RMR[b]	CFI[b]	NNFI[b]
All	0.760	15.269	15.446	15.094	<0.001				
Austria	0.757	15.213	15.470	14.957	<0.001	0,043	0,03	0,9	0,9
Belgium	0.770	15.203	15.403	15.018	<0.001	0,049	0,032	0,86	0,87
Bulgaria	0.713	15.416	15.551	15.288	0.005	--	--	--	--
Croatia	0.686	15.377	15.330	15.424	0.240	--	--	--	--
Czech Republic	0.722	14.374	14.425	14.328	0.241	0,051	0,3	0,86	0,86
Denmark	0.791	14.360	14.833	13.865	<0.001	0,046	0		
Estonia	0.719	14.719	14.927	14.519	0.041	0,046	0,033	0,9	0,9
Finland	0.834	14.774	15.702	13.822	<0.001	0,049	0,033	0,91	0,91
France	0.761	16.220	16.295	16.142	0.120	0,044	0,03	0,9	0,91
Germany	0.759	14.837	14.967	14.709	0.021	0,055	0,036	0,85	0,85
Greece	0.715	15.900	16.104	15.692	<0.001	0,045	0,031	0,89	0,89
Hungary	0.737	16.093	16.205	15.985	0.019	0,041	0,025	0,9	0,9
Ireland	0.753	15.286	15.595	14.969	<0.001	0,046	0,032	0,91	0,92
Italy	0.716	15.620	15.790	15.450	<0.001	0,055	0,032	0,83	0,83
Latvia	0.637	13.884	13.947	13.816	0.123	--	--	--	--
Lithuania	0.706	15.158	15.272	15.044	0.010	--	--	--	--
Luxembourg	0.802	15.413	15.647	15.183	<0.001	0,047	0,036	0,92	0,92
The Netherlands	0.759	13.458	13.461	13.456	0.954	0,05	0,03	0,87	0,87
Poland	0.784	15.884	16.066	15.694	<0.001	0,051	0,028	0,89	0,89
Portugal	0.764	17.054	17.126	16.973	0.047	0,049	0,022	0,91	0,91
Romania	0.702	14.903	14.844	14.957	0.215	--	--	--	--
Slovakia	0.701	14.391	14.111	14.665	<0.001	0,05	0,032	0,88	0,88
Slovenia	0.777	15.707	15.949	15.491	<0.001	--	--	--	--
Spain	0.751	16.307	16.470	16.143	<0.001	0,041	0,022	0,93	0,93
Sweden	0.825	13.977	14.510	13.467	<0.001	0,047	0,036	0,92	0,92
United Kingdom	0,805	14,32	14,459	14,178	<0.001	0,049	0,029	0,92	0,92

[a] P-value (H_0: Equal means by gender)
ANOVA F statistic (H_0: Equal means across countries) = 421.84, P-value <0.001)
[b] No available data in OECD (2009)
Source: OECD (2009) and own elaboration.

Table 3: 2SLS regressions of environmental attitudes

	2SLS (All)		*2SLS (Girls)*		*2SLS (Boys)*	
	Coefficient		**Coefficient**		**Coefficient**	
Gender	-0.216	***	-		-	
	(-12.703)		-		-	
Born1991	-0.115	**	-0.133	*	-0.083	
	(-1.961)		(-1.711)		(-0.957)	
Immigrate-first generation	0.140	**	-0.060		0.349	***
	(2.559)		(-0.813)		(4.407)	
SocioEconomicIndex	0.105	***	0.109	***	0.095	***
	(7.980)		(6.301)		(4.776)	
StudiesMother3	-0.042	**	-0.035		-0.042	
	(-2.244)		(-1.431)		(-1.544)	
StudiesFather2	-0.093	***	-0.122	***	-0.064	**
	(-4.304)		(-4.236))		(-1.998)	
BooksHome2	0.470	***	0.380	***	0.560	***
	(11.929)		(6.848)		(10.142)	
BooksHome3	0.799	***	0.764	***	0.851	***
	(21.376)		(14.706)		(16.125)	
BooksHome4	1.055	***	1.050	***	1.065	***
	(25.811)		(18.431)		(18.377)	
BooksHome5	1.366	***	1.399	***	1.323	***
	(30.761)		(22.892)		(20.771)	
BooksHome6	1.578	***	1.748	***	1.400	***
	(30.583)		(25.029)		(18.734)	
School-Grade Peer	0.394	***	0.580	***	0.236	***
	(10.747)		(12.684)		(4.137)	
InfoSchoolAir	0.103	***	0.032		0.155	***
	(4.403)		(0.979)		(4.668)	
InfoSchoolForest	0.227	***	0.239	***	0.218	***
	(10.970)		(8.522)		(7.141)	
InfoSchoolWater	0.071	***	0.052	**	0.091	***
	(3.584)		(1.974)		(3.118)	
PrivateDependent	0.138	**	0.201	***	0.090	
	(2.320)		(2.863)		(0.917)	
Public	0.196	***	0.283	***	0.133	
	(3.425)		(4.189)		(1.413)	
TeacherStudentRatio	0.006	**	0.004		0.009	**
	(2.152)		(1.523)		(1.974)	
City2	-0.079	**	-0.030		-0.128	**

	(-2.327)		(-0.752)		(-2.383)	
City3	-0.093	***	-0.084	**	-0.102	*
	(-2.763)		(-2.085)		(-1.947)	
City4	-0.130	***	-0.178	***	-0.090	
	(-3.698)		(-4.231)		(-1.637)	
City5	-0.173	***	-0.167	***	-0.184	**
	(-3.755)		(-3.095)		(-2.517)	
CountryEnvironmentalAttitudes	0.706	***	0.502	***	0.925	***
	(13.363)		(8.390)		(10.312)	
R-Squared	0.104		0.122		0.89	
Nº observations	134,152		66,820		67,332	

Note: t-ratios in brackets calculated with the STATA robust option, *** significant at 1%, ** significant at 5%, * significant at 10%. Country dummies not reported.
Instruments used are the school-grade average, after excluding individual *i*, of the following variables: *InfoNuclear*, *StudiesFather* and *StudiesMother*.