Más allá de los logros cognitivos: la actitud hacia la escuela y sus determinantes en España según PISA 2009

Beyond cognitive-skills: the attitude towards school and its determinants in Spain with PISA 2009[1]

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Resumen

Los procesos educativos pueden generar tanto resultados *cognitivos* —conocimiento y aptitudes—, como *no-cognitivos* —expectativas, valores y actitudes—. Estos últimos, han sido con frecuencia relegados en la literatura de la Economía de la Educación. Sin embargo, su relevancia en el desarrollo de las trayectorias académicas y laborales, así como en el bienestar personal y social, ha sido ampliamente documentada. El primer paso para proponer medidas que promuevan la generación de habilidades no-cognitivas, es conocer sus determinantes. Por lo tanto, este trabajo tiene como objetivo realizar una contribución en la comprensión de los mismos para el caso de España. En particular, se enfoca a la actitud hacia la escuela —la percepción personal de la utilidad y los beneficios de asistir al colegio— de los alumnos de 15 años. Con este propósito se estima un modelo de regresión multinivel bivariado, empleando datos del Programa para la Evaluación Internacional de Alumnos (PISA, por sus siglas en inglés) del año 2009. El análisis busca explicar simultáneamente a la actitud hacia la escuela y a los puntajes en las pruebas de aprendizaje, identificando el efecto relativo de los atributos personales, familiares, y escolares. Los resultados sugieren que los factores que influyen en ambos tipos de logros pueden diferir. El nivel socioeconómico de los padres o de los compañeros, por ejemplo, de gran incidencia en los resultados de las pruebas, parece no influir en la actitud hacia la escuela. En la determinación de esta última, la historia académica previa y las variables que indican la posesión en el hogar de recursos educativos, culturales y específicos para la resolución de las tareas escolares, resultan ser las más significativas. Entre los factores escolares, aparece como relevante el clima socio-afectivo, reflejado en la calidad de las relaciones entre alumnos y profesores.

Palabras clave: logros no-cognitivos, actitud, PISA 2009, España, modelos multinivel multivariados.

Abstract

Educational processes can provide both cognitive —knowledge and abilities— and non-cognitive —expectations or attitudes— outcomes. Despite the relevance of the latter, they have frequently been neglected in the Economics of Education literature. The aim of this paper is to contribute to the study of non-cognitive results, by means of the analysis of their determinants; in particular, this study analyses the determinants of the attitude towards school of 15-year-old Spanish students. A bivariate multilevel model is estimated, which simultaneously explains non-cognitive and cognitive achievements, using data from PISA 2009. Results suggest that the determinants of both types of skills may differ. Indeed, home educational resources, academic history, and teacher-student relationships are more influential than socioeconomic status or possession of material resources in explaining students' motivation.

Keywords: non-cognitive skills, attitude, PISA 2009, Spain, multivariate multilevel models.

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Introduction

Even though there is consensus surrounding the multidimensional character of educational achievements, the economic literature has concentrated almost exclusively on the study of the determinants and effects of cognitive skills acquisition. Thus, other educational outputs linked to motivational aspects and personality traits, that can be equally relevant to personal and social development, have been relegated (Carneiro, Crawford and Goodman, 2007; Heckman and Rubinstein, 2001).

This is mainly due to the difficulty in reaching a consensus regarding a definition of the skills that form part of the human capital, without belonging to the cognitive dimension. According to the Royal Spanish Academy, the word *cognitive* means "relative to knowledge". Therefore, these kinds of achievements are linked to students' knowledge, while values, attitudes and habits would be non-cognitive skills.

As stated by Heckman and Rubinstein (2001) or Levin (2012), the lack of trustworthy methods to measure these characteristics has constituted another limitation for the research. However, in the last few years several empirical studies provide evidence in favor of the economic and social relevance of non-cognitive factors (Brunello and Schlotter, 2011; Holmlund and Silva, 2009). According to this literature, their influence is seen in the educational and work careers, in cultural and citizenship participation, and even in risk behavior. Moreover, it is suggested that these competencies would not be innate and permanent traits, but they would respond to the circumstances faced by individuals, and could be boosted in early educational interventions (Heckman, Stixrud and Urzua, 2006; Heckman et al., 2010; Skinner and Pitzer, 2012). The first step in the process to improve non-cognitive skills is to know their determinants. Therefore, this work pretends to make a contribution to the comprehension of the same for the Spanish case.

Among the diverse non-cognitive factors, here we study the *attitude towards school* in particular. The perception of the usefulness of attending school may indicate the predisposition of the student towards studying, his degree of responsibility, his valuing of knowledge, and his expectations regarding his future educational career. All of these are attributes that can have an independent explanation, even if they are closely related to the cognitive dimension.

In line with the literature on Economics of Education in Spain —see Cordero, Crespo and Pedraja (2013) for more detail—, the working hypothesis defends that the main determinants of *attitude towards school* are individual and family factors, the influence of schools being relatively minor. At the same time, it postulates that the school variables that positively affect the attitude towards school are those linked to the social-affective environment in which students cohabit.

The data used to contrast this hypothesis, corresponds to the Programme for International Student Assessment (PISA) 2009, elaborated by the Organization for Economic Co-operation and Development (OECD). The chosen methodology attempts to capture the hierarchical structure of educational data and, at the same time, avoid possible estimation biases due to the double causality existing between non-cognitive and cognitive skills (Brunello and Schlotter, 2011). Accordingly, a three-level bivariate regression model is applied, in which both the attitude towards school and the test results are taken into account.

The paper is structured in the following way: in the next section the non-cognitive achievement literature is revised, deepening on conceptualization and the justification of its relevance. In addition, the main available results are summarized. In the third section the

methodology is detailed; in the fourth, the data and variables are described; in the fifth the results obtained are exposed; and finally, the sixth section gathers the conclusions of the analysis.

Evidence and substantiation

Non-cognitive achievements in the literature

In spite of its marginal place in the economic literature, the formation of non-cognitive skills has been discussed in the academic environment since the middle of last century. For instance, Bloom (1956) classifies educational objectives in three main domains: cognitive, psychomotor, and affective. The last one includes the targets expressed in interests, attitudes and appreciations, and their development at school would imply that students respond positively to what is learned (Krathwohl, Bloom and Masia, 1964).

Dreeben (1968) argues that what is learned at school is not limited to what is taught, nor can it be visualized exclusively through learning tests; but school is designed to transmit behavior, values, and capacity for both commitment and adaptation. As a consequence, educational results are multiple and exceed the development of cognitive competencies.

In the literature there is a great variety of examples of non-cognitive skills: discipline, self-confidence, commitment, tenacity, perseverance, assistance, sociability, autonomy, expectations about the future, etc. (Brunello and Schlotter, 2011; Cervini, 2003; Heckman and Rubinstein, 2001). These kinds of competencies are being increasingly weighed in the explanation of economic and social well-being. Next, some examples of such studies and their general conclusions are presented.

In their research of 2011, Brunello and Schlotter revised the empirical evidence regarding the effects of non-cognitive attributes and concluded that: (i) they affect the assessment of cognitive competencies positively—which is supported by the works of Valle, González, Barca and Núñez (1996) and Holmlund and Silva (2009)—; (ii) they promote the permanence and completion at different levels; and (iii) their contribution to success in the labor market and future income is greater than or equal to that of cognitive skills.

With regard to the last point, Levin (2012) argues that a broad definition of human capital must include not only knowledge but also inter and intra-personal competencies, attitudes, values, and habits. This explains the modest association regularly observed between *performance* in learning tests and future income or labor productivity.

Together with his colleagues, James Heckman is the academic that has worked the most to understand the role non-cognitive skills play in both educational and economic results (Levin, 2012). His studies in the US demonstrate that they are just as important as cognitive achievements for productivity at work, school graduation, future income and personal well-being. In Heckman and Rubinstein (2001) and Heckman, et al. (2006), the authors find that non-cognitive competencies can be developed in schools, and they have and incidence not only on the education and work careers but also on several risk behaviors, related to health and criminality. This is supported by Carneiro et al. (2007) and the meta-analysis of Durlak, Weissberg, Dymnicki, Taylor and Schellinger (2011).

To sum up, these skills are valuable in themselves, exceeding the effect they may have on school achievements and work performance, and are essential for success in the life of individuals (Heckman and Rubinstein, 2001). Fortunately, everything seems to indicate that these attributes are malleable, and are affected by contextual factors like the actions and characteristics of both families and schools (Heckman, 2000; Dreeben, 1968).

Attitude towards school

As was previously mentioned in this paper, non-cognitive achievement is related to *attitudes*, which according to the Royal Spanish Academy are mood dispositions. Noro (2004) indicates that they are not innate but arise from the interaction between the individual and the environment —friends, family, school, society—.

In this sense, Skinner and Pitzer (2012) refer to the malleable state of the academic attitude, which is related to effort, determination, perseverance, enthusiasm, concentration, and predisposition towards schoolwork. They indicate that determinants of attitude are personal as well as social, and therefore, they comprise the quality of interactions with parents, teachers and classmates. For instance, it is possible that the children who are most committed and with a positive attitude towards school join groups of children with a similar attitude, and receive greater support and attention from parents and teachers, thus reinforcing their positive self-perception. In the same way, they defend that this favorable attitude contributes to permanence and good performance at school; and protects children from risks such as delinquency, unsafe sexual attitude, or the consumption of alcohol and drugs.

Similar assertions can be found in Baker, Sigmon and Nugent (2001); Martínez-Ferrer, Murgui, Musitu and Monreal (2008); Schunk and Mullen (2013); and Valeski and Stipek (2001). Their works mention that a positive attitude towards school may be linked to better levels of emotional well being, lower absenteeism and school abandonment, as well as minor violence problems, both within school and outside of it.

Determinants of educational achievements

Since the Report by Coleman (Coleman et al., 1966), the international literature has attempted to identify the incidence of different personal, family, and school factors on school performance. Mainly, the latter has been measured through scores obtained in standardized testing —see Calero and Escardíbul, 2007; Formichella, 2011; or Formichella and Krüger, 2013; for a detailed revision—.

In the specific case of Spain, there is abundant research dealing with this objective. As an example, the works of Calero and Escardíbul (2007); Escardíbul (2008); Calero, Choi y Waisgrais (2010); and Choi and Calero (2013) can be mentioned. Cordero et al. (2013), conduct a revision of empirical studies that use data provided by PISA, from which they extract some general conclusions: i) greater inequalities are observed among students within schools than among educational centers; ii) the most relevant school factor is the socioeconomic and cultural environment in the centers; iii) the students' characteristics that seem to have greater impact are related to the socioeconomic context, especially the parents' educational level, although the immigration status and the history of repetition also have an incidence.

Now, those works that attempt to explain non-cognitive results differ in the choice of concepts and the indicators used, which makes their conclusions difficult to compare or generalize. Some of these available antecedents are described briefly below.

Battistich, Solomon, Kim, Watson and Schaps (1995) analyze the determinants of both cognitive and non-cognitive results in a group of schools in the US, using multilevel and hierarchical models. They consider factors such as liking school, motivation and academic self-esteem, educational aspirations, etc. Among their main results, they find that the students' "sense of

community" —if they feel taken care of and at ease at school— is positively related to the attitudinal variables; while living in poverty would deteriorate such results.

The non-cognitive variable studied by García and Méndez (2011) for Italian students, is the students' expectation about completing the tertiary level. They conclude that some individual attributes such as being a woman, a greater occupational hierarchy of the father, and higher spending on educational resources in the home, are positively associated with the expected schooling. They also find an impact on some school characteristics: negative for the percentage of students repeating and private ownership, and positive for peer expectations and the proportion of foreign students.

Both Cervini (2003) for the Argentine case, and Opdenakker and Van Damme (2000) for that of Belgium, analyze the determinants of a number of cognitive and non-cognitive results —among them, interest in learning, academic self-concept and educational aspiration— estimating several multilevel models. They find that personal, family and school factors have a different incidence on cognitive as well as non-cognitive results. The role of the school in the explanation of academic performance appears to be more relevant than in the conformation of attitudes, on which the family context would have greater weight.

Lastly, it is worth mentioning that the works of Cervini and Dari (2009) and Cervini (2010) are similar to this study in their methodology: the estimation of multilevel bivariate models.

Methodology

The educational data provided by PISA are collected by means of a two-stage sampling system in response to the hierarchical structure they present: the students (lower level) are grouped in schools (higher level). In this case, the specialized literature recommends carrying out a multilevel regression analysis (Calero et al., 2010; Formichella, 2011; Hox, 2002).

The multilevel method implies estimating a regression line for each higher level unit, and enables studying the effects of variables of different hierarchies simultaneously. In the same way, it considers the existence of a greater correlation between the variables of those units belonging to the same group, thus obtaining more efficient estimations (Cervini, 2012; Hox, 2002; Levacic and Vignoles, 2002; OECD, 2009). Moreover, it is possible to decompose the variance of the dependent variable on the different levels of aggregation, in order to assess the relative weight of the attributes at each level. Thus, this estimation technique enables us to observe the decomposition of the variation in attitude "among students within schools" and "among schools".

Although the central variable is the *attitude towards school*, if an estimation of the same were carried out independently there could exist a bias, due to its interaction with cognitive achievements. Therefore, the use of a more sophisticated multilevel model is recommended: the multivariate multilevel model.

These models enable us to calculate the determinants of all the response variables simultaneously, since each is part of a unique equation system. This facilitates the estimation of correlations between the dependent variables and of these with each one of the regressors at each nesting level (Cervini and Dari, 2009). Furthermore, the advantage of doing it simultaneously is that reliability of the statistical significance *tests* increases, which is observed in the reduction of standard errors. This fact is most relevant when the dependent variables are strongly correlated, which is very frequent in the educational results corresponding to the same individual (Snijders and Bosker, 1999).

The final estimated model has two response variables: students' *attitude towards school (ATSCHL)*, and the *average grade* on the tests *(GRADE)*. Thus, each observation unit has two values that form the lowest hierarchy level (level 1). Both are nested within the student (level 2), which is included in the school (level 3). Therefore, technically, level 1 exists exclusively to define the bivariate structure (Rasbash, Steele, Browne and Goldstein, 2012).

The specification of the final model was carried out in the conventional form (Bryk and Raudenbush, 1992; Hox, 2002), starting from a null model (without explanatory variables) to evaluate the variance decomposition of the dependent variables between the proposed levels; explanatory variables of different levels and types of effects were then added, until we arrive at the final model, which is formally expressed in the following way (Equation 1):

$$Y_{hij} = \beta_{0j}\omega_{1hij} + \sum_{p=1}^{P} \beta_{p0}\omega_{1hij}X_{p_{ij}} + \sum_{q=1}^{Q} \beta_{qj}\omega_{1hij}Z_{q_{ij}} + e_{1ij}\omega_{1hij}$$
$$+\alpha_{0j}\omega_{2hij} + \sum_{p=1}^{P} \alpha_{p0}\omega_{2hij}X_{p_{ij}} + \sum_{q=1}^{Q} \alpha_{qj}\omega_{2hij}Z_{q_{ij}} + e_{2ij}\omega_{2hij} \quad (1)$$

Where:

- Y_{hij} is the expected educational result of student *i* at school *j*. Sub-index *h* indicates what response variable is present in the estimation, 1 (*ATSCHL*) or 2 (*GRADE*).
- $\omega_{1hij} = \begin{cases} 1 \text{ if } h = 1 \\ 0 \text{ if } h = 2 \end{cases}$
- $\omega_{2hij} = 1 - \omega_{1ijk}$
- β_{0j} (α_{0j}): it is the intercept of the regression line for school *j*.
- $X_{p_{ij}}$: set of *P* independent variables at level 2 with fixed effects.
- β_{p0} (α_{q0}): it is the coefficient that accompanies the explanatory variables *X*, therefore, it does not vary between centers.
- $Z_{q_{ij}}$: set of *Q* independent variables at level 2 with random effects.
- $\beta_{qj}(\alpha_{qj})$: it is the coefficient that accompanies the explanatory variables *Z*, therefore, it varies between centers.
- $e_{1ij}(e_{2ij})$: it is the random deviation of student *i* with regard to the school average (within each center *j*). This error is supposed to be normally distributed with zero mean and constant variance. Such variance, denominated σ_{e1}^2 (σ_{e2}^2), represents the variation in *attitude (grade)* which is verified within schools.

The intercept β_{0j} (α_{0j}) incorporates level 3 as indicated in Equations 2 y 3:

$$\beta_{0j} = \beta_{00} + \sum_{n=1}^{N} \beta_{0n}S_{n_j} + r_{10j} \quad (2)$$

$$\alpha_{0j} = \alpha_{00} + \sum_{n=1}^{N} \alpha_{0n}S_{n_j} + r_{20j} \quad (3)$$

Where:

- $\beta_{00}(\alpha_{00})$ is the global average value of outcomes: the average of all the schools when the explained variable is *ATSCHL* (*GRADE*).
- S_{n_j}: set of *N* independent variables of school level.
- $\beta_{0n}(\alpha_{0n})$: it is the coefficient that accompanies the set of S explanatory variables.

- r_{10j} (r_{20j}): it is the random deviation of school *j* with regard to the global average. This error is supposed to be normally distributed with zero mean and constant variance. Such variance, called σ^2_{r1} (σ^2_{r2}), represents the variation in *attitude (grade)* verified between schools.

Meanwhile, level 2 variable coefficients with random effects $\beta_{qj}(\alpha_{qj})$, are conformed by a fixed and a random part, as observed in Equations 4 and 5:

$$\beta_{qj} = \beta_{q0} + r_{1qj} \quad (4)$$

$$\alpha_{qj} = \alpha_{q0} + r_{2qj} \quad (5)$$

Where:

- $\beta_{q0}(\alpha_{q0})$ is the average effect of variable Z for all schools.
- r_{1qj} (r_{2qj}) is the deviation of school *j* with regard to such average effect.

In addition to the regression coefficients, what interests us is the decomposition of the variance between the different levels. We compute the "*intraclass correlation coefficient*" of the null model ($\rho = \sigma^2_r / (\sigma^2_r + \sigma^2_e)$), an indicator that represents the proportion of results variance explained by differences among schools[5]. In the same way, the final model residual variance is analyzed in relation to the null model. It gives an idea of the explanatory capacity of the model. The calculation of the same is the following: $1 - (\sigma^2_r + \sigma^2_e)_{final\,model} / (\sigma^2_r + \sigma^2_e)_{null\,model}$, and can be carried out both globally as well as for each level. Lastly, the *deviance* or likelihood-ratio, can be estimated by means of the Maximum Likelihood procedure. The better the adjustment of the model, the lower the value of the same (Cervini, 2012; Hox, 2002).

Data and variables

The study employs the PISA 2009 dataset corresponding to Spain, and the sample consists of 24,478 students and 889 schools. The program assesses 15-year-old students' learning. At this age students are about to finish mandatory schooling. During this round, reading comprehension is studied in depth, keeping Mathematics and Science as supplementary. In addition to the results obtained on the tests, PISA provides information about the students' individual and socio-familiar characteristics, as well as of the educational centers. The variables used, together with their basic descriptors, are presented in Table 1 and are the following:

Dependent Variables (Level 1)

Non-cognitive achievements: attitude towards school index (ATSCHL)

This index is an approximation to the perception that 15-year-old students have of the usefulness and benefits of school (OECD, 2010). It is a composite index published in the PISA report based on the opinion of students regarding: i) school preparation for adult life; ii) usefulness of schools; iii) contribution of schools when making appropriate decisions; and iv) usefulness of school to find work.

Cognitive achievements: mean grade on Reading, Science and Mathematics tests (GRADE)

[5] If that value were zero, it would not make sense to propose a multilevel model.

It is the average Reading, Science and Mathematics standardized tests scores[6]. Its role is to control the possible correlation between cognitive and non-cognitive results when calculating the determinants of the latter.

Explanatory variables at the student level (Level 2)

Students' personal characteristics

Female: takes value 1 for the feminine sex.

Age: it is calculated as the difference between the year and month of the test, and the year and month of the student's birth.

Native student: takes value 1 if the student is native Spanish.

Mother tongue: takes value 1 if the student has done the *test in* his/her mother tongue.

Prior academic career: indicated by two variables: i) *Attended Preschool*: takes value 1 if the student attended children's education for two or more years; ii) *Repeating student*: takes value 1 if the student has repeated a grade at primary or secondary school.

Home and school contextual characteristics

Nuclear family structure: takes value 1 if the student's family is nuclear and 0 in the opposite case (single parent, stepfamily, etc.).

Secondary education parents: takes value 1 if the parents' education level is Baccalaureate or the formative levels (middle or superior grade).

Tertiary education parents: takes value 1 if the highest educational level of the parents is the university level.

Mother works full-time: takes value 1 if the mother works full-time. Only the mother's activity level is considered because, theoretically, it is the main agent of socialization, responsible for the transmission of education (Berger and Luckmann, 1984).

Parents' occupational status (*HISEI*): it is a composite index elaborated by PISA that represents the highest occupational status ofparents, and reflects the attributes of the occupations which translated into income.

Home cultural possessions index (CULTPOSS): it is a composite index that represents the presence of classic literature, works of art or poetry books.

Resources related to school activities[7]:

- *Employment of ICT in school tasks index (HOMSCH)*: it is a composite index that represents the frequency in the use of information and communication technologies for studying.
- *Home educational resources index (HEDRES)*: it is a composite index that makes reference to the availability of space and materials favorable to studying.

Explanatory variables at the school level (Level 3)

[6] PISA outcomes are reported as a set of five "plausible values" (PV) which represent student proficiencies. When the sample contains more than 6400 observations, there is no significant difference between employing only one plausible value or all five of them, in the estimation of the mean and the standard error, or in the probability of committing a type I error (OCDE, 2009). Thus, we have chosen to average the PV1 values for all three competencies to calculate the GRADE variable.

[7] These are the only two variables included with random effects.

Average socioeconomic level: it reflects the social composition of the student population, and it is formed as the average of the students' Economic, Social and Cultural Status Index (ESCS). This indicator summarizes the information about the parents' occupational status, their educational level, and home material and cultural possessions (OECD, 2010).

Internet Access (COMPWEB): it is defined as the proportion of computers for educational purposes connected to Internet at the establishment.

Average quality of student-teacher relationship (Average relationship): it is formed as the average of the school's *STUDREL* index. The latter refers to the students' perception of the attitude and treatment on the part of the teachers. The greater the value, the better the relationship is perceived.

Average disciplinary climate in the classroom (Average climate): it is the average of the school's *DISCLIMA* index. It indicates the students' perception of the order and organization existing in the classroom during language lessons. The greater the value, the better the perceived disciplinary climate.

Private: takes value 1 if the school is private (whether it receives any State subsidy or not) and 0 if the school is public.

TABLE I.
Description of used variables

VARIABLES		**CUALITATIVE**	**CUANTITATIVE**
		Percentage of students	**Mean and Standard Deviation**
Individual level	Attitude towards school		0.11 (1.00)
	Average grade		492.51 (83.39)
	Female	49.24	
	Age		15.82 (0.28)
	Native student	90.75	
	Mother tongue	84.51	
	Attended Preschool	93.96	
	Repeating student	19.40	
Family level	Nuclear family	85.30	
	Mother works full-time	47.87	
	Parents with secondary-education	27.14	
	Parents with tertiary-education	48.85	
	Parents' occupational status		46.59 (17.20)
	Home educational resources		-0.12 (0.89)
	Home cultural possessions		0.20 (0.86)
	Use of ICT		-0.02 (0.95)
School level	Private	39.55	
	Internet access		0.98 (0.09)
	Average socioeconomic level		-0.25 (0.55)
	Average relation		-0.04 (0.33)
	Average disciplinary climate		0.07 (0.44)

Source: Own elaboration based on the PISA 2009 (OCDE) data set.

Results

The software *Stata 12* together with the computational program *MLwIN* was used for the estimation of the models, as stated in Leckie and Charlton (2012). Thus, the coefficients that accompany the explanatory variables were estimated simultaneously through iterative methods that maximize the function of maximum likelihood.

The observations were weighed by the final weights per student (*W_FSTUWT*) as well as per school (*W_FSCHWT*), provided by the PISA program. These weights attempt to compensate the

possible biases arising from the sampling methods or from the non-response on the part of the school and students, and their use enables us to derive appropriate estimations of population values (OECD, 2010).

On Tables II and III presented below, we can observe the main results obtained with the null and final models.

Starting from the decomposition of the variance in the null model (see Table II), we can see that the total variance in *ATSCHL* is explained mostly by the differences among students within schools (92.6%), being the variance due to differences among centers much lower (7.4%). This preponderance is also verified for the cognitive results, since 78.3% of the variance in the *GRADE* is explained by the differences among students. Thus, it is observed that the relative role that personal and family differences fulfill is greater in the case of the non-cognitive result studied here, which is coherent with the conclusions of Cervini (2003) and Opdenakker and Van Damme (2000).

Although in the case of the *ATSCHL* variable the difference between the centers is relatively low —with an *intraclass correlation coefficient* of 7.4%—, it is statistically significant. In the same way, the *intraclass correlation coefficient* for the *GRADE* is equal to 21.7% and the variance between schools is also significant. Therefore, it is convenient to estimate a multilevel model.

TABLE II.
Multilevel Regression. Random Effects: Variance of constants

	ATSCHL		**GRADE**	
	Null model	**Final model**	**Null model**	**Final Model**
Variance between schools**: $\sigma_{u_0}^2$	0.075 (7.4%)	0.038	1482.043 (21.7%)	520.915
Variance between students**: σ_e^2	0.938 (92.6%)	0.848	5344.501 (78.3%)	3372.990
Total variance: σ_{total}^2	1.013	0.887	6826.544	3893.905
Percentage of the residual variance that is explained by the variables over the null model: school level		48.9		64.8
Percentage of the residual variance that is explained by the variables over the null model: students level		9.5		36.9
Percentage of the residual variance that is explained by the variables over the null model: total		12.4		42.9

Source: Own elaboration based on the PISA 2009 (OCDE) dataset. Note: **Significant at the 0.05 level.

In the same way, since covariances between the dependent variables are statistically significant at the student level (see Table III), the use of multivariate models is pertinent, as they take into account the correlation between dependent variables in the simultaneous estimations.

TABLE III.
Multilevel Regression. Random Effects: Covariances of the constant and deviance statistic

	NULL MODEL	**FINAL MODEL**
Cov (*ATSCHL, NOTA*) School level	0.473	0.269
Cov (*ATSCHL, NOTA*) Student level**	6.572	1.678
Deviance	350167.72	248060.91

Source: Own elaboration based on the PISA 2009 (OCDE) dataset. Note: **Significant at the 0.05 level.

The analysis of the Final Model on Table IV enables us to know which factors present a significant association with the 15-year-old students' valuing of school, and to compare them with the determinants of the cognitive results represented by the *GRADE.*

It can be observed that, among personal characteristics, being a woman is positively associated with the school attitude, whereas, on average, women have worse grades. In the same

way, having attended two or more years at the preschool level also affects positively the non-cognitive result, even though it is not significant when explaining academic performance.

Meanwhile, having repeated at least a grade significantly reduces not only the *ATSCHL* value but also the grade on *tests.* This can be reflected on the impact of repeating itself — experience that could generate a demotivation, a feeling of failure or detachment, by interrupting the school career continuity and separating the student from his group of peers— or it can be capturing the effect of personal and family variables that have an incidence on academic performance and attitude at the same time.

Regarding family factors, results suggest that the parents' occupational status is not relevant for determining *ATSCHL*, but their educational level is. However, the effect is not the expected one: the parents' higher education decreases their children's valuing of school. On the contrary, the effect on performance is positive. Even though this result deserves further investigation, the following hypothesis is posed: parents that have not had access to higher education value more the fact that their children can study, transferring them such enthusiasm; at the same time, they possess fewer competencies to help their children on their student path, in comparison with the more educated parents.

Also, it is observed that having educational elements, as well as materials and an appropriate place for studying, and having access to works of art or literature, are positively associated with the attitude towards school. It is probable that, to a great extent, these factors are reflected in the family attitude —the role given to education at home, and the effort parents make to guarantee that their children have the necessary resources, regardless of their income —.

These results coincide with those referred to in the *GRADE* with the exception that in this case the parents' occupational status is significant. In the same way, having computer resources to carry out school tasks has a positive incidence on motivation as well as on academic results.

As regards family structure, we find that belonging to a nuclear family allows us to expect greater valuing of school. Probably, this is due to the fact that the presence of disruptive episodes in the dynamic family, such as a separation, may affect the educational process and interest for the same (Björklund and Chadwick, 2003). However, this variable is not significant in order to explain performance.

In the case of school factors, the level of material resources and the socioeconomic profile of the group of peers do not seem to have a relevant impact on the determination of a positive attitude towards school. On the contrary, the socioeconomic composition of student population influences cognitive results significantly.

Students' perception of their teachers' attitude does have an incidence on the *ATSCHL* index. Thus, when on average students consider that their relationship with teachers is positive, and that they worry about their learning and well being, they value school more.

Lastly, it is worth pointing out that the type of management of centers does not present a significant association with the student's interest in school or with their academic performance.

TABLE IV.
Multilevel Regression. Coefficients of the Fixed-part

EXPLANATORY VARIABLES		**DEPENDENT VARIABLES**	
		Attitude towards school	**Average grade**
Constant		0.513	353.368***
Individual level	Female	0.144***	-9.438***
	Age	-0.020	7.713***
	Native student	-0.090	20.85***

	Mother tongue	0.043*	5.011**
	Attended Preschool	0.142***	6.395
	Repeating student	-0.156***	-79.103***
Familiar level	Nuclear family	0.051**	1.147
	Mother works full-time	-0.028*	1.898**
	Parents with secondary-education	-0.046**	3.152**
	Parents with tertiary-education	-0.089***	3.059**
	Parents' occupational status	-0.000	0.4619***
	Home educational resources	0.113***	3.784***
	Home cultural possessions	0.062***	11.275***
	Use of ICT	0.084***	-8.348***
School level	Private	-0.018	-2.549
	Internet access	-0.143	-3.845
	Average socioeconomic level	-0.013	19.877***
	Average relation	0.528***	-11.665***
	Average disciplinary climate	0.030	14.815***

Source: Own elaboration based on the PISA 2009 (OCDE) dataset. Note: ***Significant at level 0.01; **Significant at level 0.05; *Significant at level 0.01.

With respect to the relative magnitude of the effects mentioned, in order to analyze it the coefficients of the explanatory variables that ended up being statistically significant were standardized, so that they were more easily compared (Table V).

TABLE V.
Standardized coefficients of the variables at the student level with respect to the dependent ATSCHL

EXPLANATORY VARIABLES	STANDARIZED COEFFICIENTS
Female	1.355
Attended Preschool	1.334
Repeating student	-1.459
Nuclear family	0.483
Parents with secondary education	-0.432
Parents with tertiary education	-0.831
Home educational resources	0.954
Home cultural possessions	0.502
Use of ICT	0.753
Average relationship	1.633

Source: Own elaboration based on the PISA 2009 (OCDE) dataset.

It can be observed that among the individual variables, having repeated presents a greater impact on the attitude towards school, decreasing the *ATSCHL* index value by 1.5 standard deviations (SD). Being a woman, on the other hand, increases the attitude towards school by 1.35 SD. In the same way, having attended the preschool level increases the index by 1.33 SD, and belonging to a nuclear family by 0.5 SD. The effect of parents' secondary and tertiary education is minor and negative.

Regarding the variables related to home resources, an increment of one SD of *educational resources, cultural possessions, or employment of the ICT,* is associated with an increment of 0.9; 0.5 and 0.7 SD of the *ATSCHL* variable, respectively.

The only variable at school level that was statistically significant was the index that reflects the average quality of the relationship between students and teachers: if it increases in one SD, the *attitude towards school* improves in 1.6 SD.

As regards the incorporated variables with random effects, for the *home educational resources* the random effects were not significant; although they were in the case of technological resources aimed at school tasks. This means that the use of ICT—or the family attitude towards education that it may be capturing— does not have the same effect on the student attitude in all the centers and schools seem to have a role as mediators, modifying the students' initial situation to a certain extent.

Finally, Table II shows that the final model proposed enabled us to reduce the non-explained variance of the variable of interest by 9.5% for the student level and by 48.9% for the school level. In sum, a 12.4% of the total inequalities in *Attitude towards school* was explained. This percentage is consistent with the literature on the topic (Cervini, 2003). Lastly, it is worth mentioning that the statistical *deviance* decreases.

Conclusions

Non-cognitive skills have an incidence on the possibility that people perform more fully in the personal-affective, family, work, and civil spheres. Thus, the development of these skills is closely related to the promotion of individual and social well-being. Throughout this work we have studied the determinants of non-cognitive educational results represented by the variable defined as *Attitude towards school.* The hypothesis has been that the variables that influence the most on it correspond to both the individual and family levels and that, among school variables, the most influential are linked to their socio-affective climate. Thus, the evidence is in favor of the hypothesis.

The results show that the greater proportion of the variance is explained by the students' level, and that the only variables that are statistically significant at level 2 are factors that refer to the atmosphere students breathe at school. Therefore, a better school climate affects students' attitude *positively.*

Among the individual variables that are statistically significant, the role of those that indicate the possession of educational and cultural resources, as well as those specific ones for carrying out school tasks is highlighted. These variables would evince a double effect. On the one hand, it would seem that if students have the necessary resources to carry out the educational activity, their attitude towards school improves. On the other hand, the fact that a home has the educational resources implies that in the expenditure decisions of such home the purchase of this type of resources has been valued; this reflects the positive attitude of adults in the home towards education, which may influence the students positively.

For these reasons, if policy makers wished to improve non-cognitive results they would have to put an emphasis on policies that exceed the educational sphere. However, this does not mean that nothing can be done from schools, since the model also shows that the inclusion of random effects in the variable that reflects the use of ICT for studying has been significant. Thus, the fact that the centers differ in their capacity to compensate for the inequalities of origin is highlighted.

Given that some schools have a better performance than others when equating initial differences, there is room for seeking improvements in educational policies that attempt to match the results of different institutions.

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