

Resilient and low performer students: Personal and family determinants in European countries

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Abstract

Background: Students' academic achievement depends on their personal, family and sociocultural characteristics. This study aims to identify the personal and family factors of European students who do not perform as expected, whether by surpassing expectations (resilient) or by failing to meet them (low performers). **Method:** The sample was composed of 117,539 fourth grade students who completed the Progress in International Reading Literacy Study (PIRLS) test, from 23 European Union countries. Academic performance was evaluated via a reading comprehension test. For each country, two binary logistic regression models were used, one for resilient students and the other for low performers. Variables related to the students and their families were used as predictor variables. **Results:** Significant differences were found between European countries in terms of the proportion of resilient and low performing students. The two variables with the most predictive power were student confidence with reading, and having done early literacy activities. **Conclusions:** Students' personal characteristics and family conditions are instrumental in students being considered resilient or low performers.

Keywords: Resilience, academic low performing, reading comprehension, PIRLS.

Resumen

Estudiantes resilientes y de bajo rendimiento: determinantes personales y familiares en países europeos. Antecedentes: el rendimiento académico de los estudiantes depende de sus características personales, familiares y socioculturales. El presente trabajo trata de identificar los factores personales y familiares de los estudiantes europeos que no obtienen el rendimiento esperado, bien sea porque superan las expectativas previas (resilientes), o porque rinden por debajo de lo esperado (low performers). **Método:** la muestra está formada por 117.539 estudiantes de cuarto grado que realizaron la prueba de Progress in International Reading Literacy Study (PIRLS), pertenecientes a 23 países de la Unión Europea. El rendimiento académico se evaluó mediante una prueba de comprensión lectora. Para cada país se utilizaron dos modelos de regresión logística binaria, uno para los alumnos resilientes y otro para los low performers. Como variables predictoras se utilizaron variables asociadas al alumno y a su familia. **Resultados:** se han obtenido diferencias importantes entre los países europeos en relación a la proporción de alumnos resilientes y low performers. La confianza de los estudiantes en la lectura y el haber realizado actividades de alfabetización temprana son las dos variables con mayor poder predictivo. **Conclusiones:** las características personales del alumnado y sus condiciones familiares son determinantes para que los estudiantes sean considerados resilientes y low performers.

Palabras clave: resiliencia, bajo rendimiento académico, comprensión lectora, PIRLS.

A deep understanding of what personal, social and family factors most affect academic performance is particularly important in improving student achievement and reducing academic failure (Barragán et al., 2016; Berliner, 2009; Carrillo, Civiés, Blanch, Longás, & Riera, 2018; Henderson & Milstein, 2003; Jensen, 2013; Stockton, 2011). In this context, *resilient* students are those who achieve academic success despite adverse socioeconomic conditions, and *low performers* are those whose performance is worse than expected (García-Crespo, Galián, Fernández-Alonso, & Muñiz, 2019; Organisation for Economic Co-operation and Development

(OECD), 2011; Servicio de Evaluación Educativa, 2017). Identifying the variables that promote resilience and reduce the proportion of low performers is fundamental in being able to help students and improve how education systems work. Choi and Calero (2013) indicated that students' capacity for resilience comes from the interaction between personal, family and school variables. Erberber, Stephens, Mamedova, Ferguson and Kroeger (2015), using results in science and mathematics from the TIMSS 2011, found that the factors that most affect student resilience were individual, such as the students' own expectations, whether they liked mathematics, or whether they were bullied at school, along with school-related factors, such as expectations of student performance, percentage of students with low socioeconomic levels, the school's interest in academic success, school safety and discipline, and the amount of academic resources. In general, most researchers have indicated that student's personal characteristics are the most significant. Martin and Marsh (2003) highlighted qualities such as self-confidence, the feeling of

freedom and low anxiety accompanied by persistence and tenacity. Veas, López-López, Gilar, Miñano and Castejón (2017) had similar findings, and Jacob (2002) highlighted the capacity for attention, persistence, eagerness to learn and ability to work independently. González-Arratia and Valdez (2007) focused on a student's ability to maintain positive thinking about their vision of the future, which gives them more confidence in themselves, maintaining their ideals, and having autonomy and self-control. Kobasa, Maddi and Kahn (1982) underlined the importance of personal fortitude, Castejón, Gilar, Miñano and Veas (2016) highlighted that the difference lies in the student's intrinsic motivation, and Anwar, Shamim-ur-Rasool and Haq (2012) stated that creativity is decisive. Family can also be instrumental in achieving good results, as an association has been found with the academic expectations parents have for their children (Martín-Lagos, 2018). Fernández-Alonso, Álvarez-Díaz, Woitschach, Suárez-Álvarez and Cuesta (2017) proposed that students who presented a more distant or indirect profile of family involvement tended to have better results than students from more controlling homes. For Waxman, Huang and Padron (1997), the characteristics that make a student resilient were enthusiasm for and dedication to reading and homework, the students' academic objectives, their academic self-concept, and not repeating a school year. More specifically, what really marked the difference between good and poor student achievement was their motivation for reading, which also influenced their self-concept and general motivation (Vaknin-Nusbaum, Nevo, Brande, & Gambrell, 2017). Along similar lines, García-Crespo et al (2019) demonstrated that students' confidence with reading and a favorable school climate made it much more likely for a student to be resilient, but not the extent nor what values make a student a low performer. Identifying the variables associated with students getting lower than expected results is extremely important in order to reduce academic failure and improve education systems (Rodríguez-Rodríguez & Guzmán, 2019; Valle, Regueiro, Rodríguez et al., 2015).

Within this context, the objective of this research is to thoroughly analyze which personal and family variables are determinant when it comes to identifying resilient students and low performers. This general objective includes three specific objectives. First, examine whether the frequency of resilient students and low performers are homogeneously distributed in the 23 European Union countries that participated in the PIRLS-2016 test. This analysis will allow us to understand the behavior of European educational systems, and identify those that foster resilience and minimize low performers. Second, identify which personal and family variables are most significant in explaining resilient and low performing conditions, and check their invariance in relation to European Union countries. The third objective is to see what values of the variables identified as being significant make a student stop being a low performer and become resilient. Apart from the intrinsic scientific interest in these objectives, achieving them would have implications in application, which would on the one hand help students, increasing the proportion of resilient students compared to low performers, and on the other hand, improve how education systems work, making them more effective.

Method

Participants

The sample was composed of 117,539 students at 4,324 schools in 23 European Union countries (table 1).

Table 1
Sample description

Country	Number of students	Number of schools
Austria	4360	150
Belgium (Flemish)	5198	148
Belgium (French)	4623	158
Bulgaria	4281	153
Czech Republic	5537	157
Denmark	3508	185
England	5095	170
Finland	4896	151
France	4767	163
Germany	3959	208
Hungary	4623	149
Ireland	4607	148
Italy	3940	149
Latvia	4157	150
Lithuania	4317	195
Malta	3647	95
Netherlands	4206	132
North Ireland	3693	134
Poland	4413	148
Portugal	4642	218
Slovak Republic	5451	220
Slovenia	4499	160
Spain	14595	629
Sweden	4525	154
Total	117539	4324

The sampling was two-stage, sequential stratified by clusters, which is what is used in the PIRLS-2016 test. Each country determined which strata best represented the object population of the study, students who had had four years of compulsory schooling (4th grade). The two-stage model selected schools in the first stage, with a probability proportional to size. In the second stage, classes within the school were selected to participate. In this study, we used 24 samples, corresponding to the 23 European Union participants in PIRLS-2016, as Belgium included two samples, one Flemish-speaking and one French-speaking. Data from England could not be analyzed as they do not provide data from family questionnaires, which prevented us from creating an indicator of student socioeconomic level, something which is fundamental in this study to identify resilient students and low performers.

Instruments

Reading Comprehension test. In PIRLS, Reading aims and reading comprehension processes are evaluated (Mullis & Martin, 2015). To that end test booklets were created following the theoretical framework designed by the TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College, and IEA. Creating the test booklets begins with selection of the readings, from which the items are created. There are six literary readings and six informative readings with which 16 models of test booklets are constructed using an incomplete partially balanced design (Fernández-Alonso & Muñiz, 2011). Each student is assigned one test booklet comprising one literary text and one informative text, and the student must answer an average of 17 items per text. Some of the items are dichotomous, others partial credit, with three or four categories. Item Response Theory (IRT) models were used to assign scores to each scale with a mean of 500 and standard deviation 100, through five plausible values (Martin, Mullis, & Hooper, 2017). This process gives better population parameters than maximum likelihood procedures or *a posteriori* Bayesian methods (von Davier, González, & Mislevy, 2009). The psychometric properties of the test may be found in Martin, Mullis, & Hooper (2017).

Index of Economic, Social and Cultural Status (ESCS). This index was created from four variables included in the student and home context questionnaires: a) *Home possessions*, which has a value of 0 to 4 depending on whether the student responds that they have a computer or tablet, study desk, their own room, and internet connection, b) *books at home*, with five categories depending on the number of books, c) *parents' highest education level*, with five values based on the level of education that the students' parents have completed, d) *parents' highest occupation level*, with six categories: 0 (never had paid work), 1 (unskilled laborer), 2 (skilled worker), 3 (clerical), 4 (small business owner), and 5 (professional).

The ESCS index was obtained via Principal Component Analysis of the four variables, which explain 50.88% of the total variance, meaning it may be considered essentially unidimensional (Suárez-Álvarez et al., 2018; Villegas et al., 2018). According to this index, a student is resilient if they have an ESCS index below the first quartile in their country, and their performance in PIRLS 2016 is above the third quartile, once the individual ESCS is discounted. If their performance is below the first quartile of European Union achievement we can say that the student is an academic low performer.

Predictor variables of academic achievement. Ten variables were considered as predictor variables of academic achievement, eight student variables and two related to the family.

Student variables:

- *Gender*: female and male
- *Student attended preschool*, with two categories: 1 year or less, and two or more years
- *Students' sense of school belonging*, students were asked how much they agreed with five statements about their attitude toward school, 1 (I like being in school), 2 (I feel safe when I am at school), 3 (I feel like I belong at this school), 4 (Teachers at my school are fair to me), and 5 (I am proud to go to this school)

- *Students engaged in reading lessons*, students were scored according to their level of agreement with nine statements related to their reading commitment.
- *Students like reading*, students were scored on this scale according to their level of agreement with eight statements and how often they did two reading activities outside of school
- *Students confident in reading*, students were scored according to their degree of agreement with six statements: 1 (I usually do well in reading), 2 (Reading is easy for me), 3 (I have trouble reading stories with difficult words), 4 (Reading is harder for me than for many or my classmates), 5 (Reading is harder for me than any other subject), and 6 (I am just not good at reading).
- *Early preschool literacy activities*, students were scored according to their parents' frequency of doing the nine activities: 1 (Read books), 2 (Tell stories), 3 (Sing songs), 4 (Play with alphabet toys, e.g., blocks with letters of the alphabet), 5 (Talk about things you had done...).
- *Early literacy tasks*, students were scored according to their parents' responses to how well their children could do the six tasks: 1 (Recognize most of the letters of the alphabet), 2 (Read some words), 3 (Read sentences), 4 (Read a story), 5 (Write letters of the alphabet), and 6 (Write some words).

Family variables:

- *Parents' perceptions of child's school*. Students were scored on this scale according to their parents' responses to six statements about the school: 1 (My child's school does a good job including me in my child's education), 2 (My child's school provides a safe environment), 3 (My child's school cares about my child's progress in school), 4 (My child's school does a good job informing me of their progress), 5 (My child's school promotes high academic standards), and 6 (My child's school does a good job in helping them become better in reading).
- *Parents like reading*. Students were scored on this scale according to their parents' responses to eight statements about reading, as well as how often they read for enjoyment.

Using IRT partial credit scaling, the variables were transformed to a scale with a central point of 10, corresponding to the mean of all the countries that completed the PIRLS test. The scale units were chosen so that two points in the score on the scale would correspond to the logit standard deviation in all countries (Martin, Mullis, & Hooper, 2017; Mullis, Martin, Foy, & Hooper, 2017). For the statistical analyses, all variables were normalized with a mean of 0 and standard deviation of 1 for all European Union countries participating in the study.

Procedure

The application of the PIRLS 2016 test followed the standards of the International Association for the Evaluation of Educational Achievement (IEA). The application was as follows: two 40-minute sessions with a 30 minute break and a student context questionnaire. (Martin, Mullis, & Hooper, 2017). It also included a home questionnaire (Learning to Read Survey), a teacher questionnaire and a school questionnaire.

Data analysis

In order to ensure the accuracy of the estimations of the combined distributions of populations or subpopulations, the PIRLS test uses plausible values, combining IRT models with latent regression techniques. The plausible values are not used to estimate individual student achievement, although the relative uncertainty is conserved. Therefore additional analytical procedures are needed to estimate student scores. In order to make estimations that are consistent with the population statistics, the context questionnaires must be considered (Martin, Mullis, & Hooper, 2017). To avoid bias and to be consistent with the above, PIRLS uses the student and class context variables to conserve the variability of the data. This variability is essential to be able to apply the models used in our study. The analysis procedures derived from the general classical linear model assume that cases are selected through simple random sampling. However, large-scale educational evaluations do not usually comply with the assumption of independence of the collected data (Iníguez-Berrozpe, & Marcaletti, 2018). As previously stated, PIRLS 2016 used a complex sample design (two-stage stratified sequential sampling by clusters), where the observations are not independent, as the students (stage 2) within a single class or school (stage 1) are more similar to each other than to students in other schools (De la Cruz, 2008). In nested designs, each level of the hierarchy has a different variability and the errors are not independent, but classical general linear models do not address this interdependence of cases and so results from them will most likely exhibit bias.

All models were made with IEA's IDBAnalyzer© software which allows analysis using plausible and replica values. The reason for using replica values is determined by the correct calculation of the standard errors of estimation, the sampling method used brings with it a variability that is not found in simple random sampling, called sampling variability (Martin, Mullis, & Hooper, 2016). The most common procedure for calculating sampling variability in designs such as PIRLS is through a resampling scheme with balanced repetition and Jackknife technique (Johnson & Rust, 1992; Wolter, 1985). PIRLS uses a variation of Jackknife called Jackknife repeated replication (JRR) to estimate sampling variance. JRR is an easy to calculate method that gives unbiased estimations of sampling variances for the sampling errors of the means, totals and percentages. Because PIRLS uses probabilistic sampling of schools and students, any calculation must be weighted in accordance with the probabilities of selection, in this way each student will be appropriately represented depending on the probability of being selected in the sample. The variable SCHWGT was taken from the PIRLS 2016 database, which gives the student sampling weight, and will serve as the weighting for the student. There are a large number of methods for recovering missing data (Fernández-Alonso, Suárez-Álvarez, & Muñiz, 2012), and in this case we used the regression procedure implemented by the Missing Value Analysis module in SPSS, taking the class the student belongs to as the segmentation. In order to check whether levels of resilient and low performing students are distributed homogeneously throughout the European Union countries (the first objective), the ESCS of the students must be estimated. As already indicated in the *measurement instruments* section, the ESCS was obtained via a PCA of the four variables collected in the student and family questionnaires. Pearson correlations were calculated

between the variables making up the ESCS, along with the weights of each variable in the extracted Principal Component.

In order to achieve the second objective, we used binary logistical regression for both the analysis of resilience and low performing students. The criterion variable was student academic achievement in reading comprehension in the PIRLS test, dichotomized in terms of resilience (resilient - not resilient) and low performing (low performer – not low performer). The predictor variables were all those related to the student and family described in the corresponding section.

The following indicators were used for the analysis of the statistical model used, along with its goodness of fit: Cox and Snell's R^2 (CSR) and Nagelkerke's R^2 (NKR), which indicate the part of the variance in the criterion variable explained by the predictor variable, b) β and its sign. Positive values of β indicate direct, positive impact of the predictor variable on the criterion variable, negative values indicate an opposite impact, c) the Odds ratio = e^β , which allows us to compare the odds of different values of a predictor variable, indicating the magnitude of the impact, with a value of 1 indicating that β has no impact. The further from 1, in either direction, the greater the impact, albeit direct or indirect (García-Crespo et al, 2019), d) significance of β , variables were selected that were significant at 5% and 10%.

Results

Index of Economic, Social and Cultural Status

Table 2 gives the Pearson correlations between the variables used to construct the ESCS.

The loadings for each of the four variables in the Principal Component extracted are 0.134 for home possessions, 0.541 for books at home, 0.709 for parents' highest education level and 0.652 for parents' highest occupation level, which explains 50.88% of the total variance (table 3). The principal component was normalized with a mean of 0 and standard deviation 1 for the combined 23 samples from the European Union.

Resilient and low performers in European Union countries

The results relating to the first research objective are presented in table 4, showing the ESCS and the percentages of academically resilient students and low performers by country, together with the standard errors of the estimated parameters.

Poland (42.22%) and Italy (40.53%) had the highest proportions of resilient students, while French-speaking Belgium (5.96%) and Malta (6.45%) had the lowest. There is a large difference in the numbers of resilient students between countries. When it

	1	2	3	4
Home possessions (1)				
Books at home (2)	0.133***			
Parents' highest education level (3)	0.172***	0.468***		
Parents' highest occupation level (4)	0.167***	0.395***	0.575***	
*** p < 0,01				

comes to low performers, Malta (59.24%) and French-speaking Belgium (47.60%) had the highest proportion, while Italy (14.05%) and Poland (14.52%) had the lowest. Table 5 gives the values of

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of variance	Cumulative %	Total	% of Variance	Cumulative %
ESCS	2.036	50.888	50.888	2.036	50.888	50.888
2	0.928	23.201	74.089			
3	0.622	15.548	89.637			
4	0.415	10.363	100.000			

Extraction Method: Principal Component Analysis

Cox and Snell's R^2 (CSR) and Nagelkerke's R^2 (NKR) for each regression.

Taking the criterion variable low performer, the regression explaining most variance was for Lithuania (20%, 31%), which is very similar to Malta (19%, 25%) and Denmark (19%, 27%). The regression with least variance explained was for Germany (5%, 8%), which is about the same as for Austria (7%, 14%). Taking the dependent variable resilient, the regression with best fit was for Ireland (20%, 26%), which is about the same as for Poland (16%, 21%) and Lithuania (15%, 23%), while the regressions with worst fit were for Belgium (Fl.) (5%, 9%), Belgium (Fr.) (6%, 16%) and Bulgaria (6%, 9%).

Table 6 presents the data to identify which individual and family variables are most important for explaining the conditions of resilience and low performing (second objective), and to assess what values of those variables identified as important make a student move from being a low performer to being resilient (third

Country	ESCS	ESCS s.e.	Low performer percentage	Low performer percentage s.e.	Resilient percentage	Resilient percentage s.e.
Austria	0.09	0.03	26.28	2.09	16.43	1.80
Belgium (Flemish)	0.25	0.03	28.00	2.08	12.80	1.25
Belgium (French)	0.11	0.03	47.60	2.38	5.96	0.77
Bulgaria	-0.24	0.06	27.66	2.91	27.48	3.40
Czech Republic	0.09	0.03	20.99	2.32	22.88	1.81
Denmark	0.65	0.03	28.68	1.67	17.45	1.56
Finland	0.49	0.02	15.35	1.41	32.76	1.95
France	0.01	0.03	38.73	1.94	11.88	1.21
Germany	0.01	0.04	32.59	3.05	20.00	1.86
Hungary	0.00	0.06	23.24	2.27	25.33	2.15
Ireland	0.23	0.03	17.88	1.68	36.23	1.90
Italy	-0.45	0.04	14.05	1.80	40.57	1.88
Latvia	0.30	0.03	16.39	1.70	27.18	1.77
Lithuania	0.11	0.03	21.97	2.22	23.14	1.76
Malta	-0.10	0.01	59.24	1.53	6.45	0.77
Netherlands	0.45	0.03	22.01	2.20	19.23	1.85
Northern Ireland	0.34	0.03	20.75	1.42	36.90	2.03
Poland	-0.04	0.03	14.52	1.66	42.22	2.20
Portugal	-0.20	0.03	20.76	1.66	24.95	1.80
Slovak Republic	-0.16	0.04	34.99	3.42	18.92	1.71
Slovenia	0.16	0.03	27.20	2.16	22.09	1.90
Spain	-0.02	0.03	22.24	1.33	20.93	1.10
Sweden	0.66	0.03	27.29	1.78	18.80	1.61

s.e.: Standard error

Table 5
Variance explained by the regressions

Low performers				Country	Resilients			
CSR	NKR	CSR.se	NKR.se		CSR	NKR	CSR.se	NKR.se
0.07	0.11	0.02	0.02	Austria	0.09	0.15	0.02	0.03
0.10	0.14	0.02	0.02	Belgium (Flemish)	0.05	0.09	0.02	0.03
0.13	0.18	0.03	0.04	Belgium (French)	0.06	0.16	0.02	0.04
0.10	0.14	0.03	0.04	Bulgaria	0.06	0.09	0.02	0.03
0.09	0.15	0.03	0.04	Czech Republic	0.09	0.14	0.02	0.02
0.19	0.27	0.02	0.03	Denmark	0.10	0.17	0.02	0.03
0.11	0.20	0.02	0.03	Finland	0.15	0.21	0.02	0.03
0.12	0.16	0.02	0.03	France	0.07	0.13	0.02	0.03
0.05	0.08	0.02	0.03	Germany	0.07	0.11	0.02	0.03
0.11	0.17	0.03	0.04	Hungary	0.11	0.17	0.02	0.03
0.12	0.20	0.02	0.04	Ireland	0.20	0.26	0.02	0.03
0.09	0.17	0.02	0.03	Italy	0.08	0.11	0.02	0.03
0.15	0.25	0.02	0.04	Latvia	0.12	0.18	0.02	0.04
0.20	0.31	0.03	0.04	Lithuania	0.15	0.23	0.03	0.04
0.19	0.25	0.02	0.03	Malta	0.07	0.17	0.02	0.04
0.09	0.14	0.03	0.04	Netherlands	0.13	0.21	0.03	0.04
0.14	0.24	0.03	0.05	Poland	0.16	0.21	0.03	0.04
0.13	0.21	0.02	0.04	Portugal	0.10	0.15	0.02	0.03
0.17	0.24	0.04	0.06	Slovak Republic	0.09	0.14	0.02	0.03
0.16	0.23	0.03	0.04	Slovenia	0.12	0.19	0.03	0.04
0.11	0.18	0.02	0.03	Spain	0.08	0.12	0.01	0.02
0.10	0.15	0.02	0.03	Sweden	0.10	0.16	0.02	0.04

CSR: Cox & Snell R²; NKR: Nagelkerke R²; se: Standard error

objective). Table 6 gathers together the regression parameters for each country or region, for each dependent variable, which are: the coefficients (β), the odds ratio ($\text{Exp}\beta=e^\beta$), the standard error of both ($\beta.se$ y $\text{Exp}\beta.se$) and the significance of the coefficients ($\beta.sig$). Setting the level of significance at 95%, variables are statistically significant for the model when $0 \leq \beta.sig \leq 0.05$. In Table 6 they are identified with **. Setting the level of significance at 90%, variables are statistically significant for the model when $0.05 \leq \beta.sig \leq 0.10$. In Table 6 they are identified with *. In addition, predictor variables with a negative effect are given in dark grey, variables with a positive effect are marked in light grey.

Discussion

With respect to the first objective, the proportions of low performer and resilient students have been estimated and exhibit significant differences between EU countries or regions. Resilient students vary from 6% in French-speaking Belgium to 42% in

Poland, and low performers vary from 14% in Italy to almost 60% in Malta. In terms of the second objective, it is clear that the effect of the predictor variables on the condition of being resilient or a low performer differs markedly from country to country. This may possibly be due to social and cultural differences, or the different educational systems in each country (Mullis, Martin, Goh, & Prendergast, 2017; OECD, 2018).

Table 7 gives a graphical indication of the effect of the predictor variables on the condition of low performing or resilience. It indicates whether the predictor variable has a positive impact (increases the probability) using $\uparrow\uparrow$ if it is statistically significant at 95% and \uparrow if it is statistically significant at 90%. If the variable has a negative effect (reduces the probability), that is indicated by $\downarrow\downarrow$ if it is significant at 95%, or \downarrow if it is significant at 90%. It is worth noting that students having confidence reading is statistically significant in every country for classifying students as resilient or low performers, except in Germany. A student with confidence in reading increases the likelihood of them being resilient by

Table 6
Summary of results of binary logistic analysis for the European Union countries

Low				Resilient					
B	Expβ	β.se	Expβ.se	Country	Variable	β	Expβ	β.se	Expβ.se
-0.25**	0.78	0.10	0.08	Austria	Students sense of school belonging				
0.25**	1.29	0.10	0.13		Students like reading				
-0.57**	0.57	0.10	0.06		Students confident in reading	0.84**	2.31	0.10	0.24
-0.15*	0.86	0.08	0.07		Parents like reading				
-0.32*	0.73	0.16	0.12		Gender(f)				
0.42**	1.53	0.20	0.31		Student attended preschool(1y or less)				
-0.23**	0.79	0.12	0.09	Belgium(Fl.)	Students sense of school belonging				
-0.65**	0.52	0.09	0.05		Students confident in reading	0.48**	1.62	0.11	0.19
0.34**	1.41	0.08	0.11		Early literacy tasks				
-0.33**	0.72	0.15	0.11		Gender(f)	0.57**	1.77	0.24	0.42
0.41*	1.51	0.22	0.34		Student attended preschool(1y or less)	-0.76**	0.47	0.38	0.18
				Belgium(Fr.)	Students like reading	0.38**	1.47	0.18	0.27
-0.80**	0.45	0.12	0.05		Students confident in reading	0.59**	1.81	0.17	0.31
-0.17*	0.84	0.10	0.08		Early literacy tasks				
					Parents like reading	0.31**	1.36	0.16	0.21
-0.44**	0.65	0.13	0.09		Gender(f)				
					Student attended preschool(1y or less)	-18.72**	0.00	0.29	0.00
-0.37**	0.69	0.13	0.09	Bulgaria	Students engaged in reading lessons	0.28**	1.32	0.12	0.17
0.25**	1.28	0.12	0.16		Students like reading	-0.26**	0.77	0.09	0.07
-0.51**	0.60	0.11	0.06		Students confident in reading	0.44**	1.56	0.12	0.18
					Gender(f)	0.37*	1.45	0.21	0.30
-0.29**	0.75	0.13	0.10	Czech Republic	Students sense of school belonging	0.27**	1.30	0.13	0.17
					Students engaged in reading lessons	-0.36**	0.70	0.11	0.07
-0.61**	0.55	0.12	0.06		Students confident in reading	0.64**	1.89	0.10	0.18
					Early literacy tasks	0.16*	1.18	0.10	0.12
-0.29**	0.75	0.10	0.08		Parents like reading	0.25**	1.29	0.09	0.12
-0.30*	0.74	0.16	0.12		Gender(f)				
0.99**	2.70	0.45	1.16		Student attended preschool(1y or less)	-0.91**	0.40	0.32	0.13
-0.27**	0.76	0.13	0.10	Denmark	Students sense of school belonging	0.26**	1.29	0.12	0.16
0.36**	1.43	0.17	0.24		Students engaged in reading lessons				
-1.03**	0.36	0.14	0.05		Students confident in reading	0.76**	2.14	0.11	0.24
-0.55**	0.58	0.14	0.08		Early literacy tasks	0.27**	1.31	0.13	0.17
1.11**	3.05	0.50	1.54		Student attended preschool(1y or less)	-1.67*	0.19	1.01	0.16

Table 6
Summary of results of binary logistic analysis for the European Union countries

Low				Resilient					
B	Expβ	β.se	Expβ.se	Country	Variable	β	Expβ	β.se	Expβ.se
-0.53**	0.59	0.16	0.09	Finland	Students sense of school belonging				
0.58**	1.79	0.18	0.33		Students engaged in reading lessons				
					Like reading	0.25*	1.28	0.14	0.18
-0.81**	0.44	0.14	0.06		Students confident in reading	0.63**	1.88	0.08	0.16
					Early literacy activities before school	-0.15*	0.86	0.09	0.08
-0.48**	0.62	0.10	0.06		Early literacy tasks	0.54**	1.71	0.07	0.12
-0.40**	0.67	0.21	0.14		Gender(f)				
				France	Students like reading	-0.20*	0.82	0.12	0.10
-0.65**	0.52	0.11	0.06		Students confident in reading	0.63**	1.88	0.10	0.18
-0.44**	0.64	0.12	0.08		Early literacy tasks	0.54**	1.72	0.15	0.25
-0.53**	0.59	0.17	0.10		Gender(f)	0.48*	1.62	0.26	0.42
-0.20*	0.82	0.12	0.10	Germany	Students sense of school belonging				
					Students engaged in reading lessons	-0.23**	0.79	0.11	0.09
					Students like reading	0.24*	1.27	0.14	0.17
					Students confident in reading	0.41**	1.51	0.11	0.17
-0.18*	0.83	0.11	0.09		Early literacy activities before school				
					Parents like reading	0.26**	1.30	0.12	0.16
0.50**	1.65	0.19	0.32		Student attended preschool(1y or less)	-0.35*	0.71	0.20	0.14
				Hungary	Students sense of school belonging	0.31**	1.36	0.13	0.18
-0.22*	0.80	0.13	0.10		Students engaged in reading lessons				
-0.96**	0.38	0.15	0.06		Students confident in reading	0.82**	2.26	0.12	0.27
0.21**	1.24	0.11	0.13		Parents perceptions of child school				
					Gender(f)	0.35**	1.42	0.17	0.24
0.91*	2.49	0.52	1.28		Student attended preschool(1y or less)				
				Ireland	Students sense of school belonging	0.32**	1.38	0.12	0.16
					Students engaged in reading lessons	-0.31**	0.74	0.12	0.09
-0.60**	0.55	0.19	0.10		Students confident in reading	0.57**	1.78	0.09	0.15
-0.70**	0.50	0.13	0.06		Early literacy tasks	0.62**	1.86	0.12	0.22
0.26*	1.29	0.15	0.19		Parents perceptions of child school				

Table 6
Summary of results of binary logistic analysis for the European Union countries

Low				Resilient					
B	Expβ	β.se	Expβ.se	Country	Variable	β	Expβ	β.se	Expβ.se
				Italy	Students sense of school belonging	0.16*	1.17	0.09	0.11
0.33**	1.39	0.13	0.19		Students like Reading	-0.26**	0.77	0.10	0.08
-1.00**	0.37	0.14	0.05		Students confident in reading	0.62**	1.86	0.10	0.19
-0.41**	0.66	0.12	0.08		Parents perceptions of child school	0.14*	1.15	0.08	0.09
-0.27**	0.76	0.14	0.11		Parents like reading				
-0.47**	0.63	0.22	0.14		Gender(f)				
-0.63**	0.53	0.20	0.10						
				Latvia	Students sense of school belonging				
0.40**	1.49	0.17	0.25		Students engaged in reading lessons	-0.32*	0.72	0.17	0.12
0.57**	1.77	0.18	0.32		Students like reading				
-1.10**	0.33	0.25	0.08		Students confident in reading	0.76**	2.14	0.14	0.29
-0.63**	0.53	0.17	0.09		Early literacy tasks	0.41**	1.51	0.13	0.19
-0.73**	0.48	0.22	0.10		Gender(f)	0.54**	1.71	0.21	0.36
-0.22*	0.80	0.13	0.11						
				Lithuania	Students engaged in reading lessons				
					Students like reading	-0.32**	0.73	0.15	0.11
-1.03**	0.36	0.17	0.06		Students confident in reading	0.69**	2.00	0.15	0.29
-0.84**	0.43	0.24	0.10		Early literacy tasks	0.69**	1.99	0.17	0.33
0.32*	1.38	0.17	0.23		Parents perceptions of child school				
					Gender(f)	0.38*	1.47	0.21	0.30
0.80**	2.24	0.27	0.60		Student attended preschool(1y or less)	-0.40**	0.67	0.20	0.13
				Malta	Students confident in reading	0.87**	2.38	0.13	0.30
-0.88**	0.41	0.10	0.04		Early literacy tasks				
-0.38**	0.69	0.10	0.07		Parents perceptions of child school				
-0.25**	0.78	0.13	0.10		Gender(f)				
-0.45**	0.64	0.19	0.12						
				Netherlands	Students sense of school belonging	0.29**	1.34	0.11	0.15
0.36*	1.43	0.21	0.30		Students engaged in reading lessons	-0.46**	0.63	0.17	0.11
					Students like reading	0.45**	1.57	0.16	0.25
-0.57**	0.57	0.12	0.07		Students confident in reading	0.54**	1.72	0.10	0.17
-0.37**	0.69	0.19	0.13		Early literacy tasks	0.28*	1.32	0.15	0.20
					Parents like reading	0.27*	1.31	0.16	0.20

Table 6
Summary of results of binary logistic analysis for the European Union countries

Low				Country	Variable	Resilient			
B	Expβ	β.se	Expβ.se			β	Expβ	β.se	Expβ.se
0.32*	1.38	0.18	0.24	Poland	Students sense of school belonging				
-0.38*	0.69	0.20	0.14		Students engaged in reading lessons				
0.43**	1.54	0.20	0.31		Students like reading	-0.28**	0.76	0.12	0.09
-0.65**	0.52	0.17	0.09		Students confident in reading	0.61**	1.83	0.10	0.18
					Early literacy activities before school	-0.24**	0.78	0.10	0.08
-0.83**	0.44	0.12	0.05		Early literacy tasks	0.53**	1.70	0.16	0.27
-0.28*	0.76	0.16	0.12		Parents perceptions of child school				
					Parents like reading	0.24**	1.27	0.12	0.15
					Gender(f)	0.54**	1.72	0.16	0.28
0.42**	1.52	0.12	0.18		Portugal	Students like reading	-0.32**	0.72	0.10
-1.24**	0.29	0.17	0.05	Students confident in reading		0.83**	2.30	0.11	0.24
-0.32**	0.73	0.11	0.08	Early literacy tasks					
-0.62**	0.54	0.10	0.05	Slovak Republic	Students confident in reading	0.55**	1.73	0.12	0.21
-0.18*	0.84	0.09	0.08		Early literacy activities before school				
-0.31**	0.73	0.10	0.08		Parents like reading	0.26**	1.29	0.11	0.14
0.56*	1.75	0.30	0.53		Student attended preschool(1y or less)	-0.78**	0.46	0.21	0.09
0.47**	1.60	0.12	0.20	Slovenia	Students engaged in reading lessons	-0.59**	0.56	0.16	0.09
-0.27*	0.76	0.14	0.11		Students like reading				
-0.81**	0.45	0.12	0.06		Students confident in reading	0.68**	1.98	0.11	0.22
-0.29*	0.75	0.16	0.12		Early literacy tasks				
0.37**	1.45	0.13	0.19		Parents perceptions of child school	-0.20*	0.82	0.11	0.09
-0.48**	0.62	0.13	0.08		Parents like reading				
-0.31*	0.74	0.18	0.13		Gender(f)	0.59**	1.80	0.22	0.40
				Spain	Students sense of school belonging	0.18**	1.20	0.08	0.09
					Students like reading	-0.12*	0.89	0.06	0.06
-0.83**	0.44	0.11	0.05		Students confident in reading	0.61**	1.85	0.08	0.14
-0.23**	0.79	0.10	0.08		Early literacy activities before school	0.19**	1.21	0.08	0.10
-0.46**	0.63	0.09	0.06		Early literacy tasks	0.32**	1.38	0.08	0.11
0.21**	1.23	0.07	0.08		Parents like reading				

Table 6
Summary of results of binary logistic analysis for the European Union countries

Low				Country	Variable	Resilient			
B	Expβ	β.se	Expβ.se			β	Expβ	β.se	Expβ.se
0.24**	1.28	0.11	0.14	Sweden	Students engaged in reading lessons	-0.39**	0.68	0.15	0.10
-0.58**	0.56	0.12	0.07		Students confident in reading	0.59**	1.80	0.13	0.24
					Early literacy activities before school	-0.21**	0.81	0.10	0.08
-0.53**	0.59	0.13	0.07		Early literacy tasks	0.54**	1.72	0.14	0.24
					Student attended preschool(1y or less)	-0.88**	0.42	0.37	0.15

** 0 ≤ β.sig ≤ 0.05; * 0.05 ≤ β.sig ≤ 0.10

	Positive impact
	Negative impact

Table 7
Effect of the variables on the probability of being low performer or resilient

Country	Students sense of school belonging		Students engaged in reading lessons		Students like reading		Students confident in reading		Early literacy activities before school		Early literacy tasks		Parents perceptions of child school		Parents like reading		Gender (f)		Student attended preschool(1y or less)	
	↓	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓	↑	↓	↑
Austria	↓				↑		↓	↑							↓				↑	
Belgium (Fl.)	↓						↓	↑			↑						↓	↑	↑	↓
Belgium (Fr.)					↑	↓	↑				↓				↑	↓				↓
Bulgaria			↓	↑	↑	↓	↓	↑										↑		
Czech Rep.	↓	↑		↓			↓	↑			↑				↓	↑	↓	↑	↑	↓
Denmark	↓	↑	↑				↓	↑			↓	↑							↑	↓
Finland	↓		↑			↑	↓	↑		↓	↓	↑					↓			
France						↓	↓	↑			↓	↑					↓	↑		
Germany	↓			↓		↑		↑			↓					↑			↑	↓
Hungary		↑	↓				↓	↑					↑					↑	↑	
Ireland		↑		↓			↓	↑			↓	↑	↑							
Italy		↑			↑	↓	↓	↑					↓	↑	↓		↓			
Latvia	↓		↑	↓	↑		↓	↑			↓	↑					↓	↑		
Lithuania			↓			↓	↓	↑			↓	↑	↑				↑	↑		↓
Malta							↓	↑			↓		↓				↓			
Netherlands		↑	↑	↓		↑	↓	↑			↓	↑				↑				
Poland	↑		↓		↑	↓	↓	↑		↓	↓	↑	↓			↑		↑		
Portugal					↑	↓	↓	↑			↓									
Slovak Rep.							↓	↑		↓				↓	↑				↑	↓
Slovenia			↑	↓	↓		↓	↑			↓		↑	↓	↓		↓	↑		
Spain		↑				↓	↓	↑	↓	↑	↓	↑			↑					
Sweden			↑	↓			↓	↑		↓	↓	↑								↓

Low performer

Resilient

at least 50 percentage points, as is the case for Germany, but it could increase by up to 140 points, as happens with Malta. This same variable also has a statistically significant effect in terms of low performing, Bulgarian students with a high value in this index are 40 percentage points less likely to be low performers. The greatest reduction is for Portugal, where the probability of being a low performer is as much as 70 percentage points lower. This is in line with Jacob (2002) and Waxman, Huang and Padrón (1997), who stated that resilient students have more faith in their possibilities and are more consistent in their tasks. Having had early pre-school literacy activities, parents liking Reading, and parents' perceptions of the child's school exhibit no significant effects, on either resilience or low performing, or show effects only in a few countries. This contrasts with research from Martín-Lagos (2018), who underlined the importance of motivation in the home. This study, in line with the OECD (2018) indicating the positive effects of having done early literacy tasks, also found a positive effect, both increasing the likelihood of being resilient (11 countries), and reducing the likelihood of being a low performer (14 countries). The increased probability of being resilient ranged from the 18 additional percentage points in the Czech Republic, statistically significant at 90%, to the 99 additional percentage points for Lithuania. The reduction in the likelihood of being low performers ranged from 16 percentage points for French-speaking Belgium to 57 percentage points for Lithuanian students. The OECD (2018) noted that attending preschool is beneficial to students' later academic performance, and in line with that, our study found that attending a year or less of preschool had a statistically significant impact on future resilience in 8 countries, it also had a significant impact on low performing in 8 countries. More specifically, attending a year or less of preschool practically prevents students from being resilient in French-speaking Belgium, and reduces the likelihood by at least 33 percentage points in the case of Lithuania. The effect of attend a year or less of preschool triples the likelihood of being a low performer in Denmark and increases the probability by 51 percentage points in Flemish-speaking Belgium. *Gender* has an impact on resilience in 8 countries, and being a low performer in 10 countries. Being a girl increases the likelihood of being resilient by between 40 and 80 percentage points for students in those countries where the effect is statistically significant, and reduces the probability of being a low performer by between 26 and 52 percentage points. The results of the variable *students engaged in reading* are difficult to explain because the effect goes in one direction or the other depending on the country. It is, therefore, a variable about which we do not have sufficient information and would be a target for subsequent

research. Students' sense of school belonging, on the other hand, is also statistically significant in a good number of countries, which indicates that a good school climate encourages resilience and reduces low performing. The increase or decrease in likelihood in either direction varies between 20 and 50 percentage points.

In relation to the third objective, we have confirmed that when the effect is statistically significant in one direction in the coefficient of a variable in one of the regressions (low performer or resilient dependent variable), in the other regression it may have a statistically significant effect in the opposite direction or not have any effect. The contextual variable which stands out most in this sense is students' confidence in reading; the higher the value for this index, the greater the likelihood of being resilient and the lower the likelihood of being a low performer. Taking France as an example, high values almost double the probability of being resilient and halve the probability of being a low performer. Analyzing the gender variable, we see that the results in those countries where the effect is statistically significant are similar to reading confidence, although this variable opens up three types of analysis. If we take the example of Flemish-speaking Belgium, being a girl increases the probability of resilience by 77 percentage points and reduces that of being a low performer by 38 points. However, if we look at Finland, being a girl does not increase the likelihood of resilience, but it does decrease the likelihood of being a low performer by 33 percentage points. And thirdly, in Poland, being a girl increases the probability of resilience by 72 percentage points but has no significant effect on reducing the probability of being a low performer. All of this indicates that investing in educational policies aimed at increasing student reading confidence will improve rates of resilience and reduce low performing. Policies aimed at preschool schooling will have the same impact, as will encourage early literacy tasks. All of that should help compensate academically for a disadvantaged socioeconomic situation at the beginning. Reducing the gender gap is also an important task, as well as making educational surroundings friendly, that students can identify with.

All of the results in this research are limited by the nature of the PIRLS study, which lacks student variables such as cognitive capacity and other non-cognitive skills that may have an impact on resilience or low-performing (Santos, Ferraces, Godas, & Lorenzo, 2018). Consequently it is not certain that these results can be generalized to other competencies or other times.

Acknowledgments

This research was funded by the Ministry of Economy, Industry and Competitiveness of Spain, Reference PSI2017-85724-P.

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