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# Influence of family wealth on student reading performance in PISA

## Influencia de la riqueza familiar en el rendimiento lector del alumnado en PISA

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### **Abstract**

The aim of the present research study was to determine the relative impact of family wealth on reading performance in PISA in a sample of Latin American countries (Brazil, Chile, Uruguay, Argentina, Mexico, Peru, Costa Rica, Dominican Republic and Colombia) and northern European countries (Finland, Iceland, Norway and Sweden). The study of the influence of family wealth on reading performance is addressed in a general way by analyzing the presence of available resources and articles in the student's home (Homepos) and their possible impact on reading performance. Subsequently, we examined the relationship between students' reading performance and more specific socioeconomic variables, namely, family wealth (Wealth) and the number of ICT resources available (IctRes). Multi-group regression analysis was used to verify similarity of magnitude in the relationship between wealth indicators and reading performance among the different countries in this study. Overall, the results reveal a consistently stronger relationship between the wealth variables and reading performance in the case of Latin American countries. In addition, analysis of the non-standardized regression coefficients allows clustering the different countries according to the points of increased reading performance

that result from an increase in the wealth indicators. The distinction between the Latin American group and the northern European group is more clearly seen in the variables Wealth and IctRes than in the variable Homepos.

*Key words:* PISA, reading performance, family wealth, Latin America, northern Europe.

### **Resumen**

Este artículo presenta una investigación cuyo principal objetivo es determinar la incidencia de la riqueza familiar en el rendimiento lector en PISA de forma comparada en una muestra de países latinoamericanos (Brasil, Chile, Uruguay, Argentina (BA), México, Perú, Costa Rica, República Dominicana y Colombia) y del norte de Europa (Finlandia, Islandia, Noruega y Suecia). El estudio de la influencia de la riqueza familiar sobre el rendimiento lector se aborda de forma general analizando la relación de todos los recursos y artículos disponibles en el hogar de cada estudiante (variable Homepos) y su posible incidencia en el rendimiento lector. Subsiguientemente se estima la relación existente entre el rendimiento lector y variables socioeconómicas más específicas referidas; por un lado, a la riqueza familiar (variable Wealth) y, por otro, al número de recursos de las tecnologías de la información y de la comunicación (variable IctRes). Se ha empleado el análisis de regresión multigrupo que permite comprobar la similitud de la magnitud de la relación entre las variables indicadoras de la riqueza y el rendimiento lector entre los distintos países de este estudio. Los resultados muestran que, de forma general, la relación entre las variables relacionadas con la riqueza y el rendimiento lector es siempre mayor en el caso de los países latinoamericanos. Adicionalmente, el análisis de los coeficientes de regresión no estandarizados permitió identificar distintos grupos de países en función del incremento en puntos de rendimiento lector que supone el aumento en los indicadores de riqueza. La agrupación de países latinoamericanos, por un lado, y del norte de Europa, por otro, se aprecia con mayor nitidez en las variables Wealth y Ictres que en la variable Homepos.

*Palabras clave:* PISA, rendimiento lector, riqueza familiar, Latinoamérica, norte de Europa.

## **Introduction**

Educational systems are a means of regularizing the sociocultural (Bernstein, 1989; Bourdieu & Passeron, 2001) and economic (Goldthorpe, 2000) differences in a population. Each country, within the different types of welfare state regimes, takes different measures to help establish

equal opportunity (Rodríguez, 2004); educational systems are among the public institutions that seek to improve living conditions and promote equal opportunity (Barr, 1998, 2001).

Notwithstanding, an increasing number of studies (Unesco, 2015) point to additional factors, beyond the educational system, that account for between-country differences in matters such as school failure, dropout, level of basic competencies, and so on. For example, educational disparity improves when there is a clear decrease in social inequalities (Shavit & Blossfeld, 1993), as in Sweden. In order to explain these differences, one takes into account other aspects, under the categories of social, cultural and technological factors. Thus, analyzing the impact of socioeducational factors on students' academic performance is one way to look for solutions that may improve academic outcomes and the quality of educational systems. Understanding the impact of these factors and their proper interpretation can help guide macro- and micro-educational policies and help us understand why they succeed or fail, and thus be able to improve teaching-learning processes, and by extension, the quality of education that students receive. The impact of factors on students' reading comprehension has been widely investigated (Carlisle, Correnti, Phelps, & Zeng, 2009), and even more so since reading became the object of international macro-studies like PISA and PIRLS (Mullis, Kennedy, Martin, & Sainsbury, 2006; OCDE, 2010, 2013). These international macro-assessments analyze the possible factors that influence students' reading performance by examining characteristics of (1) individual students and their families, (2) teachers and schools, and (3) educational systems.

Analysis of educational systems and schools directly affects educational policy, and consequently, a number of different variables are included, with significant between-country variation. By contrast, the individual characteristics of each student, as well as their family environment or gender, are independent from educational systems. Analyzing and understanding their effect may have significant impact in improving reading performance, and it may be possible to extrapolate the results to other educational systems (Foorman & Moats, 2004). We must keep in mind that reading, and a critical understanding of what one reads, is a cross-cutting competency that can significantly affect students' academic, social and vocational future (Coulombe, Tremblay, & Marchand, 2004; Vázquez-Cano, 2017).

This study seeks to ascertain, within the context of the PISA study (OECD, in press), the impact of family wealth on students' reading performance, and how it differs between two large blocks of countries, northern Europe and Latin America. Establishing these comparisons can help us identify whether family wealth influences reading performance in very different sociocultural and geographic settings, regardless of the educational system, and be able to decide on measures that promote reading development.

## Reading literacy and PISA

Reading literacy is the ability to deal with information that is codified in printed texts (Perfetti & Marron, 1998), it is the skill of reading, writing, comprehending, interpreting and discussing different texts in multiple contexts (International Reading Association, 2012). It is therefore essential to students' academic performance in different subjects that together make up their pre-university development (Holloway, 1999). How we conceive and comprehend reading literacy has varied over the past decades, in line with the sociocultural and technological changes of the information and communication society. In this sense, reading literacy is associated with lifelong development, and is no longer considered to be an ability acquired in early years and perfected in adolescence. On the contrary, reading literacy must continue throughout one's lifetime, allowing the individual to adapt to the different formats, forms of interaction and physical or virtual media that provide access to reading and to texts. Today more than ever, reading is not only an individual process, but a collective process that requires metacognitive processes that undergo continuous restructuring (Bruner, 1990; Schiefele, Schaffner, Möller, & Wigfield, 2012), especially due to the continuous changes in information access that technologies of information and communication bring about (Leu, 2007).

Consequently, we have shifted from the passive reader who only received information from printed texts in the 20th century, to an active reader who has access to unlimited digital and printed material, requiring new cognitive strategies, and who moreover is able to produce content in response to the texts he or she reads (Dole, 2004; OECD, 2010). When reading, the individual creates meaning in response to the text being read, relying on his or her sociocultural and linguistic knowledge to do



so. In this process, the reader must draw on different, diverse discourse strategies and on comprehension and decodification skills, which will enable him or her to grasp the meaning and intention of the texts, often from interpreting discontinuous or fragmentary text, as when reading micro-blogging or social networks (Vázquez-Cano, Mengual-Andrés, & Roig-Vila, 2015).

The determination of reading literacy in international macro-studies is carried out from a linguistic and social perspective. PIRLS defines reading competence of students in fourth grade as: “the ability to understand and use those written language forms required by society and/or valued by the individual” (Mullis et al., 2006, p. 3). Young readers can construct meaning from very different types of texts. They read to learn, to participate in reading communities inside and outside of school, and for pleasure. In this line of thinking, PISA defines reading literacy for fifteen-year-olds as: “an individual’s capacity to understand, use, reflect on and engage with written texts, in order to achieve one’s goals, to develop one’s knowledge and potential, and to participate in society” (OECD, 2014, p. 2; OECD, 2016).

The PISA 2015 study assesses students’ reading literacy, keeping in mind that it constitutes a point of reference and a fundamental requirement for these students’ future success (Britt, Goldman, & Rouet, 2012; Murnane, Sawhill, & Snow, 2012). In fact, adequate reading literacy is needed for the person to actively participate in their community and in their own personal life. Similarly, it becomes an asset for the economy and for the social progress of nations, given that citizens with solid literacy competencies contribute to the general development of the country in all its facets, including but not limited to the social, cultural, economic, and scientific (Coulombe, Tremblay, & Marchand, 2004).

Assessment of reading literacy in PISA is addressed from a multidimensional perspective, where multiple variables and factors converge. The test is thus designed to take into consideration three large areas: situation, text and aspect. For situation, the base document is the “Common European Framework of Reference” (CEFR), developed by the Council of Europe (1996), where four possible situations are proposed, and a certain percentage of items are associated with each: personal (30%), public (30%), educational (25%) and work-related (15%). The PISA reading scale is also divided into literacy levels, which differentiate and describe what the student is normally expected to carry out, associating

tasks with different levels of difficulty (OECD, 2009; 2015). Reading literacy in PISA is structured into 7 levels ranging from 1 (262 points) to 6 (698 points).

## Family wealth and its influence on reading literacy

In research from recent years, possessions within the home has been taken as an indicator of family wealth (Spiezia, 2010; Traynor & Raykov, 2013). Although students' socioeconomic context and their schools may have an impact on academic performance, a low level socioeconomic context does not necessarily imply that academic outcomes are lower than average (OECD, 2010). Furthermore, possible influence from the socioeconomic context may be neutralized by the positive influence of the academic context of schools (Marks, 2010). A family's possessions within the home are considered to represent a more reliable measure of wealth than other macroeconomic indicators.

Research from the late 20th century approached the family environment from the ecological perspective (Bronfenbrenner, 1979). This theory considers that a child's learning is affected by factors of family wealth and interaction, along with diverse contextual factors (Bronfenbrenner & Morris, 1998). The home, as the child's primary context, offers the first moment of access to reading, in a primary interaction process called the "approximation process". The approximation process is complemented by the child's outside relationships and socioeducational context, referred to as the "family niche" (Super & Harkness, 1986). This niche is made up of the surrounding culture, the context of family interactions, the spatial context, and the possessions that are available in the home. This make-up affects the beginning and later development of knowledge and of reading (Beals & DeTemple, 1993). The impact of the family has been considered a powerful conditioning factor in students' academic performance (Bronfenbrenner, 1994; Harkness, Super, Barry, Zeitlin, & Jennipher, 2009, p. 34). Context has been shown to be an influential factor in improving reading literacy in developed countries (Farver, Xu, Eppe, & Lonigan, 2006).

Similarly, studies that analyze the influence of the family environment in developing countries and with minority populations have also produced positive results (Aram & Levin, 2002; Ngorosho, 2011). Knowing that the

reading process is acquired through a visual perception process, where orthographic decodification is fundamental (Gough, Juel & Griffin, 1992), it is considered foundational that the child be exposed to reading materials where he or she visualizes and approaches the concept of reading (Farver et al., 2013; Justice & Sofka, 2013). The school and home contexts are highly significant in the acquisition and perfection of reading literacy, and positive interrelations seem to support better outcomes in development of reading literacy (Bronfenbrenner, 1994; Epstein, 2001). Although the school is considered to be the context with the greatest impact on developing reading skills, the role of the home has also been highlighted in the initial stages of acquiring reading and writing (Evans, Shaw, & Bell, 2000).

The first manifestations of reading take place at home (Neuman & Dickinson, 2002), and the family later complements the school's work in the area of reading, as well as its social, affective and academic experiences (Farver, et al., 2006; Klauđa & Wigfield, 2012). The home becomes a context of "emergent literacy" (Sulzby & Teale, 1991), this is the space where the child begins his or her reading development. Later on, both the possessions and the relationships found in the home and in the environment influence the development of reading (Roth, Speece, & Cooper, 2002). For this reason, homes where reading is formally promoted, but above all informally encouraged, have a positive influence on the development of reading literacy among children and adolescents (Kirby & Hogan, 2008; Reese & Gallimore, 2000). By contrast, in homes with lower economic income, lower parental education, and fewer possessions, students' level of reading literacy and academic development is reduced (McLoyd, 1998; Farver, et al., 2006).

Likewise, students from families with a low wealth index may suffer from low self-esteem and a disadvantaged environment, affecting their academic development (Blacksher, 2002). The scientific literature has shown that family wealth may be considered a predictive variable of academic performance. Low family wealth may be responsible for less parental involvement in the children's teaching-learning processes (Zhao, Valcke, Desoete, & Verhaaeghe, 2011). Studies carried out between 1918 and 1975 show a mean correlation as high as 0.34 (Sirin, 2005), although this incidence varies substantially from one country to another (Zhao et al., 2011). In PISA 2009 (OECD, 2010), which preferentially measured students' reading performance, countries with greater wealth obtained



better reading scores, despite numerous exceptions. As we can observe, the research studies show that family context and family wealth have a significant impact on scholastic achievement, as a general rule, although the exceptions and disparities are many (Breen & Jonsson, 2005).

Similarly, we have seen that academic performance not only depends on the school, but also on the socioeconomic context of the student (OECD, 2005). The effect of this socioeconomic context on students' academic performance has been a controversial aspect, with divergent results appearing in the late 20th century and the first years of the 21st century (Tomul & Celik, 2009). Results from PISA 2015 show that all Latin American countries fall below the OECD average for reading (<493 points). The vast majority of northern European countries, however, place above this level. In addition, the evolution of reading performance in PISA results over the years 2000-2012 shows that northern European countries have maintained their results in reading, while Latin American countries have risen slightly. Indication of the influence of family wealth on reading results is very divergent among OECD countries, and a clear pattern of influence cannot be identified in PISA assessments since the year 2000 (OECD, 2014).

In PISA 2015, family wealth was measured using the variable Homepos, which grouped 13 items into the ST011 variable, to which 3 more items specific to each country were added, in order to contextualize family wealth. Additionally, the items from variables ST012 and ST013 were included, referring to possessions and books in the student's home. These variables are structured into four categories in the questionnaire: a) possessions related to family wealth (Wealth), b) cultural possessions (CultPos), c) educational resources at home (Hedres), and d) possessions in the home related to information and communication technologies (IctRes).

## Methodology

The main objective of this study was to determine the relative impact and possible significance of family wealth in students' reading performance, comparing two different socioeducational, cultural and economic contexts (Latin American and northern European countries). Four variables were to be considered: a) possessions relating to family wealth (Wealth), b) cultural possessions (CultPos), c) educational resources at home

(Hedres), and d) household possessions relating to information and communication technologies (IctRes). For this purpose, we began with the following hypothesis: “the possession of resources and articles in the student’s home (Homepos) along with the level of family wealth (Wealth) and the number of resources related to information and communication technologies (IctRes) will have a more pronounced impact on the reading performance of students from Latin American countries”.

## Sample

The sample used for this study was constructed from PISA 2015 data (OECD, in press-a, -b), using data from the student questionnaire. Specifically, this study used data for northern European countries (Finland, Sweden, Iceland and Norway) and Latin American countries (Brazil, Chile, Uruguay, Argentina [Buenos Aires], Mexico, Peru, Costa Rica, Dominican Republic and Colombia). Composition of the final sample, according to country, can be seen in Table I.

TABLE I. Final sample composition.

<b>Countries</b>	<b>n</b>	<b>Percentage</b>
<b>Brazil</b>	46282	23.5
<b>Chile</b>	7053	3.6
<b>Colombia</b>	23590	12.0
<b>Costa Rica</b>	13732	7.0
<b>Dominican Republic</b>	9480	4.8
<b>Finland</b>	17646	9.0
<b>Iceland</b>	6742	3.4
<b>Mexico</b>	15136	7.7
<b>Norway</b>	10912	5.5
<b>Peru</b>	13942	7.1
<b>Sweden</b>	10916	5.5
<b>Uruguay</b>	18186	9.2
<b>Argentina (B.A.)</b>	3314	1.7
<b>Total</b>	196931	100.0

The persons who participated in this study may be considered representative of 15-year-old students that are enrolled in school in each country. Each of the participating countries guaranteed the representativeness of its respective samples using specific strata (for an in-depth report on the sampling and final selection process, see OECD, in press-b).

## Variables

The reading performance variable was calculated using the average of 10 possible values for each student's reading performance. This variable reflects the degree to which students are able to use their reading ability to understand and interpret different types of written materials, so that we may determine what level of reading performance they use in meeting their goals, participating in society, and developing their own knowledge and potential (OECD, in press-a). Reliability of the average score for each country, as measured by Cronbach's alpha, was over .98 in all cases (psychometric properties of the reading performance test can be found in OECD, in press-b). In addition, variables related to wealth in the home were established. The composition of each variable can be seen in Table II (the procedure for calculating total score, and psychometric properties, can be found in OECD, in press-b).

The Homepos variable is an abstract indicator of all the available resources and articles that exist in each student's home. It is composed of indicators related to family wealth (Wealth), cultural possessions (CultPos), educational resources (HedRes) and ICT resources (IctRes). The "Wealth" variable is used as an indirect indicator of mean family wealth, based on assets available in the student's home. The "IctRes" variable indicates the number of Information and Communication Technology (ICT) resources. The last two indicators were used to determine specifically whether a family's economic capacity exercises differential influence on students' reading performance. The "CultPos" and "HedRes" variables were excluded from the analysis, having been considered less specifically related to family wealth (i.e. the economic capacity needed to acquire any of the resources in the "Wealth" and "IctRes" variables is necessarily greater in any country than that required for resources reflected in the "CultPos" and "HedRes" variables).

**TABLE II.** Composition of the variables used in this research study.

ID	Item	Items used to measure the index		
		Homepos	Wealth	IctRes
ST011Q01TA	Desk for study	X		
ST011Q02TA	Own bedroom	X	X	
ST011Q03TA	Quiet place to study	X		
ST011Q04TA	A computer for doing school assignments	X		
ST011Q05TA	Educational Software	X		X
ST011Q06TA	Internet connection	X	X	X
ST011Q07TA	Classical literature (e.g. Shakespeare)	X		
ST011Q08TA	Poetry books	X		
ST011Q09TA	Works of art (e.g. paintings)	X		
ST011Q10TA	Books to help with school assignments	X		
ST011Q11TA	Technical reference books	X		
ST011Q12TA	A dictionary	X		
ST011Q16NA	Books about art, music or design	X		
ST011Q17TA	Item 1 of country-specific wealth	X	X	
ST011Q18TA	Item 2 of country-specific wealth	X	X	
ST011Q19TA	Item 3 of country-specific wealth	X	X	
ST012Q01TA	Televisions	X	X	
ST012Q02TA	Cars	X	X	
ST012Q03TA	Rooms with a bath or shower	X	X	
ST012Q05NA	Cell phone with Internet access (e.g. smartphone)	X	X	X
ST012Q06NA	Computers (tabletop or laptop computers)	X	X	X
ST012Q07NA	Tablet (e.g. iPad®, BlackBerry®, PlayBook™)	X	X	X
ST012Q08NA	E-reading devices (e.g. Kindle™, Kobo, Bookeen)	X	X	X
ST012Q09NA	Musical instruments (e.g. guitar, piano)	X		
ST013Q01TA	How many books are in your house?	X		

## Procedure

The data collection procedure is described in detail in OECD (in press-b). The relationship between reading literacy and each of the home wealth indicators was analyzed using linear regressions for each of the

countries. This type of analysis, within the framework of multi-group analyses, makes possible a statistical comparison of the magnitude of the relationship between the two types of variables in all the countries included in this study. In addition, this type of multi-group analysis is highly useful for discovering whether there are between-country similarities in the magnitude of the relationships between the study variables. In this way, countries can be grouped together where the magnitude of the relationship between reading performance and home wealth indicators is similar.

First, all the descriptive statistics for each variable were calculated according to country. An ANOVA with post hoc comparisons and Bonferroni correction was carried out in order to determine whether there were statistically significant differences in the means of variables related to wealth, as a function of country. Next, correlations were calculated between all the variables related to wealth, as a function of country. Finally, multi-group simple regression analysis was used to verify the predictive capacity of scores related to home wealth on reading performance scores in each country. The original structure of these analyses suggested a simple regression analysis with the “Homepos” variable and a multiple regression analysis using the variables “Wealth” and “IctRes”; however, given the high collinearity of these last two variables, we decided on univariate analyses exclusively. Missing cases were treated using the Full Information Maximum Likelihood procedure.

Comparison of the moderating effect of “country” on relations between home wealth variables and reading performance was performed by contrasting an unconstrained model of the regression coefficients with increasingly restrictive nested models (i.e., with a greater level of regression coefficients fixed as equal between different countries). Two criteria were followed in advancing toward the more restrictive models: similarity between non-standardized regression coefficients and a group distinction between northern European and Latin American countries. The unconstrained models were identified as “Homepos-Free”, “Wealth-Free”, “IctRes-Free”. The models with maximum invariance between countries were identified as: “Homepos-Invariant”, “Wealth-Invariant”, “IctRes-Invariant”. Estimation of 95% confidence intervals was carried out by applying the delta method (Raykov & Marcoulides, 2004).

Model fit was verified using the Comparative Fit Index (CFI) and the Chi-square test. CFI values greater than .95 are indicators of good fit



(Hu & Bentler, 1999). Following the recommendations of Cheung and Rensvold (2002), neither statistically significant nor practical differences were considered to exist when CFI differences between models were less than .01. All analyses were carried out with MPlus v7.0 (Muthén & Muthén, 1998-2011).

## Results

Descriptive statistics of all wealth-related variables can be seen in Table III. With regard to our study objective, a simple analysis of the descriptive statistics seems to reveal, grosso modo, the influence of type of country (i.e. Latin American vs. northern Europe) on the distribution of each variable. In addition to greater maximum and average scores on all variables in northern European countries, one can also note the effect that type of country exercises on the different dispersion of variables. In general, northern European countries show greater dispersion in reading performance scores, and lesser dispersion in variables related to wealth. Generally speaking, the three variables related to wealth showed statistically significant differences according to country: Homepos  $F(12, 191985) = 7770.60, p < .001$ , Wealth  $F(12, 190891) = 7326.99, p < .001$ , IctRes  $F(12, 189438) = 7415.22, p < .001$ . Post hoc comparisons confirmed that the differences between all countries in all the variables were statistically significant ( $p < .01$ ), except in the “Homepos” variable between Argentina (B.A.) and Chile ( $p = .109$ ).

Correlations of all wealth-related variables can be seen in Table IV. These correlations reveal a strong collinearity between the variable pairs “Homepos-Wealth” and “Wealth-IctRes”. This collinearity is a direct result of the content shared by the three variables (see Table II), making it unadvisable to use multivariate analyses to show us the joint, partial relationships of each variable to reading performance. Nonetheless, we considered it appropriate to establish the specific, separate relationship of each of these variables to reading performance, given that they each reflect different levels of specificity with regard to family wealth.

TABLE III. Descriptive statistics, by country, of the study variables.

Country	Variable	n	Minimum	Maximum	Mean (SD)
Brazil	Homepos	43552	-8.97	5.45	-1.32 (1.10)
	IctRes	42268	-3.38	3.50	-1.15 (0.96)
	Wealth	43064	-7.01	4.09	-1.22 (1.09)
	Rdg Performance	46275	86.92	711.10	404.69 (88.81)
Chile	Homepos	6994	-8.79	5.47	-0.37 (1.14)
	IctRes	6986	-3.27	3.50	-0.46 (1.02)
	Wealth	6989	-6.96	4.19	-0.38 (1.11)
	Rdg Performance	7053	185.75	712.37	475.69 (83.57)
Colombia	Homepos	23134	-9.01	3.66	-1.38 (1.26)
	IctRes	23006	-3.38	3.50	-1.09 (1.14)
	Wealth	23072	-7.18	4.10	-1.36 (1.29)
	Rdg Performance	23590	131.80	693.91	436.11 (82.31)
Costa Rica	Homepos	13452	-6.70	5.26	-1.23 (1.15)
	IctRes	13384	-3.27	3.50	-0.90 (1.00)
	Wealth	13424	-6.94	4.10	-1.16 (1.13)
	Rdg Performance	13732	180.01	701.28	427.07 (72.46)
Dominican Re- public	Homepos	9390	-9.10	3.57	-1.58 (1.21)
	IctRes	8944	-3.38	3.50	-1.39 (1.09)
	Wealth	9204	-6.98	4.09	-1.57 (1.27)
	Rdg Performance	9478	101.06	632.71	362.48 (78.79)
Finland	Homepos	17466	-8.75	5.17	0.13 (0.71)
	IctRes	17451	-3.27	3.50	0.11 (0.73)
	Wealth	17457	-6.98	4.13	0.17 (0.73)
	Rdg Performance	17644	79.53	749.22	527.85 (87.58)
Iceland	Homepos	6578	-5.70	5.42	0.51 (0.71)
	IctRes	6572	-3.27	3.50	0.39 (0.79)
	Wealth	6574	-3.26	4.08	0.28 (0.67)
	Rdg Performance	6742	134.44	781.04	482.6 (92.81)
Mexico	Homepos	15024	-8.94	4.18	-1.52 (1.30)
	IctRes	14948	-3.38	3.50	-1.34 (1.15)
	Wealth	14986	-6.95	4.11	-1.42 (1.37)
	Rdg Performance	15136	178.73	675.23	429.21 (71.4)

Norway	Homepos	10638	-8.75	5.14	0.63 (0.80)
	IctRes	10604	-3.27	3.50	0.61 (0.83)
	Wealth	10616	-6.98	4.09	0.60 (0.80)
	Rdg Performance	10912	54.31	807.14	513.36 (92.21)
Peru	Homepos	13886	-9.48	5.26	-1.71 (1.33)
	IctRes	13756	-3.38	3.50	-1.61 (1.17)
	Wealth	13788	-6.97	4.09	-1.90 (1.42)
	Rdg Performance	13939	131.59	661.20	398.94 (83.96)
Sweden	Homepos	10756	-8.75	5.40	0.42 (0.90)
	IctRes	10718	-3.27	3.50	0.50 (0.96)
	Wealth	10736	-7.00	4.44	0.49 (0.90)
	Rdg Performance	10915	149.73	758.09	500.02 (94.97)
Uruguay	Homepos	17898	-8.86	5.28	-0.80 (1.01)
	IctRes	17598	-3.38	3.51	-0.67 (0.94)
	Wealth	17772	-7.07	4.19	-0.81 (0.97)
	Rdg Performance	18186	161.40	724.98	438.39 (91.17)
Argentina	Homepos	3230	-4.01	3.11	-0.45 (0.99)
	IctRes	3216	-3.27	3.50	-0.33 (0.86)
	Wealth	3222	-3.85	4.28	-0.48 (0.96)
	Rdg Performance	3314	203.72	674.14	472.36 (82.13)

The standardized and non-standardized regression coefficients and the confidence intervals (95%) of all the models can be seen in charts I, II and III. In addition, the values of the standardized regression coefficients of the invariant models can be seen in Table IV.

**TABLE IV.** Correlations between the independent variables and regression coefficients of the invariant models, according to country.

Country		Wealth	IctRes	Reading	R <sup>2</sup>	Country		Wealth	IctRes	Reading	R <sup>2</sup>
Brazil	Homepos	0.91	0.29	.33 (.33:.33)	.11	Mexico	Homepos	0.91	0.36	.36 (.35:.37)	.13
	n	42268	40218	43545			n	14948	14832	15024	
	Wealth		0.91	.33 (.32:.33)	.11		Wealth		0.91	.31 (.30:.32)	.10
	n		42268	43057			n		14948	14986	
	IctRes			.32 (.31:.32)	.10		IctRes			.33 (.32:.34)	.11
	n			42261			n			14948	
Chile	Homepos	0.90	0.37	.45 (.44:.46)	.20	Norway	Homepos	0.80	0.24	.23 (.24:.23)	.05
	n	6986	6957	6994			n	10604	10452	10638	
	Wealth		0.90	.36 (.35:.36)	.13		Wealth		0.80	.00 (-.01:.01)	.00
	n		6986	6989			n		10604	10616	
	IctRes			.36 (.35:.36)	.13		IctRes			.02 (.01:.03)	.00
	n			6986			n			10604	
Colombia	Homepos	0.92	0.34	.41 (.42:.40)	.17	Peru	Homepos	0.90	0.25	.52 (.51:.53)	.27
	n	23006	22828	23134			n	13756	13686	13883	
	Wealth		0.92	.41 (.41:.42)	.17		Wealth		0.90	.47 (.46:.47)	.22
	n		23006	23072			n		13756	13785	
	IctRes			.40 (.39:.40)	.16		IctRes			.51 (.50:.52)	.26
	n			23006			n			13754	
Costa Rica	Homepos	0.90	0.42	.42 (.42:.43)	.18	Sweden	Homepos	0.81	0.23	.25 (.25:.26)	.06
	n	13384	13212	13452			n	10718	10382	10755	
	Wealth		0.90	.41 (.41:.42)	.17		Wealth		0.81	.00 (-.01:.01)	.00
	n		13384	13424			n		10718	10735	
	IctRes			.40 (.39:.41)	.16		IctRes			.02 (.01:.031)	.00
	n			13384			n			10717	
Dom. Rep.	Homepos	0.90	0.33	.31 (.30:.32)	.10	Uruguay	Homepos	0.90	0.39	.37 (.36:.37)	.13
	n	8944	8536	9388			n	17598	16374	17898	
	Wealth		0.90	.34 (.33:.36)	.12		Wealth		0.90	.29 (.29:.28)	.08
	n		8944	9202			n		17598	17772	
	IctRes			.39 (.38:.40)	.15		IctRes			.30 (.30:.31)	.10
	n			8942			n			17598	

<b>Finland</b>	<b>Homepos</b>	0.83	0.20	.22 (.22:.21)	.05	<b>Argentina</b>	<b>Homepos</b>	0.88	0.34	.40 (.39:.41)	.16
	<b>n</b>	17451	17298	17464			<b>n</b>	3216	3194	3230	
	<b>Wealth</b>		0.83	.00 (.01:-.01)	.00		<b>Wealth</b>		0.88	.32 (.31:.32)	.10
	<b>n</b>		17451	17455			<b>n</b>		3216	3222	
	<b>IctRes</b>			.02 (.02:.01)	.00		<b>IctRes</b>			.31 (.30:.31)	.10
	<b>n</b>			17449			<b>n</b>			3216	
<b>Iceland</b>	<b>Homepos</b>	0.72	0.20	.20 (.21:.20)	.04						
	<b>n</b>	6572	6546	6578							
	<b>Wealth</b>		0.72	-.14 (-.12:-.16)	.02						
	<b>n</b>		6572	6574							
	<b>IctRes</b>			.02 (.02:.01)	.00						
	<b>n</b>			6572							

Note. All correlations were statistically significant,  $p < .001$

Initial and final model fit is shown in Table V.

TABLE V. Regression model fit.

<b>Independent Variable</b>	<b>Model</b>	$\chi^2$	$\Delta\chi^2$	<b>df</b>	$\Delta$ <b>df</b>	<b>CFI</b>	$\Delta$ <b>CFI</b>
<b>Homepos</b>	<b>Homepos-Free</b>	0.001		0		1.000	
	<b>Homepos-Invariant</b>	130.331	130.330	10	10	.995	.005
<b>Wealth</b>	<b>Wealth-Free</b>	0.008		0		1.000	
	<b>Wealth-Invariant</b>	180.349	180.341	8	8	.992	.008
<b>IctRes</b>	<b>IctRes-Free</b>	0.001		0		1.000	
	<b>IctRes-Invariant</b>	158.285	158.285	9	9	.993	.007

Note.  $\chi^2$  = Chi-square test;  $\Delta\chi^2$  = differences in Chi-square; df = degrees of freedom;  $\Delta$ df = differences in degrees of freedom; CFI = comparative fit index;  $\Delta$ CFI = differences in comparative fit index.



CHART I. Regression coefficients for the Homepos variable.

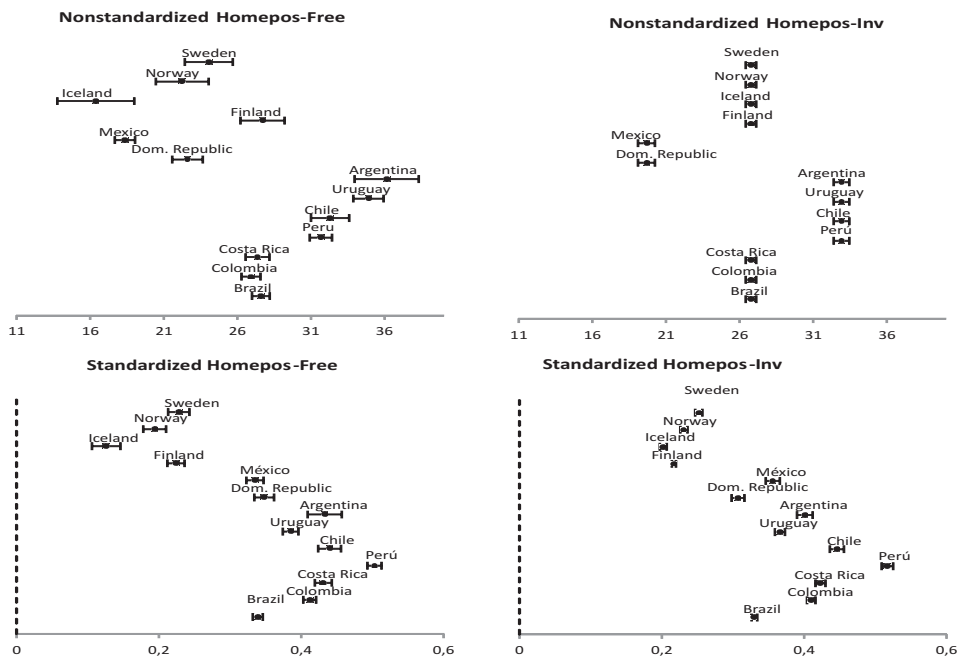


CHART II. Regression coefficients for the Wealth variable.

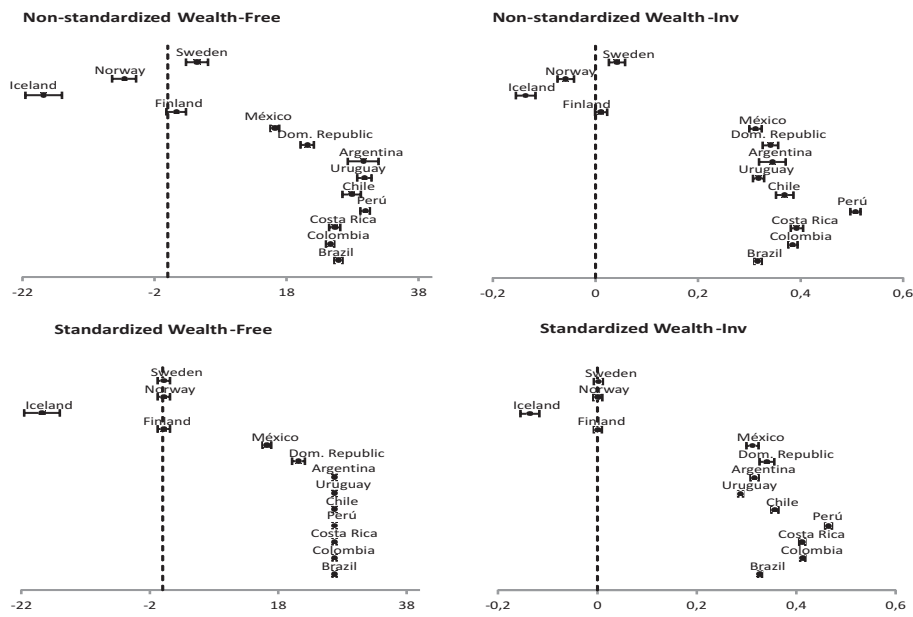
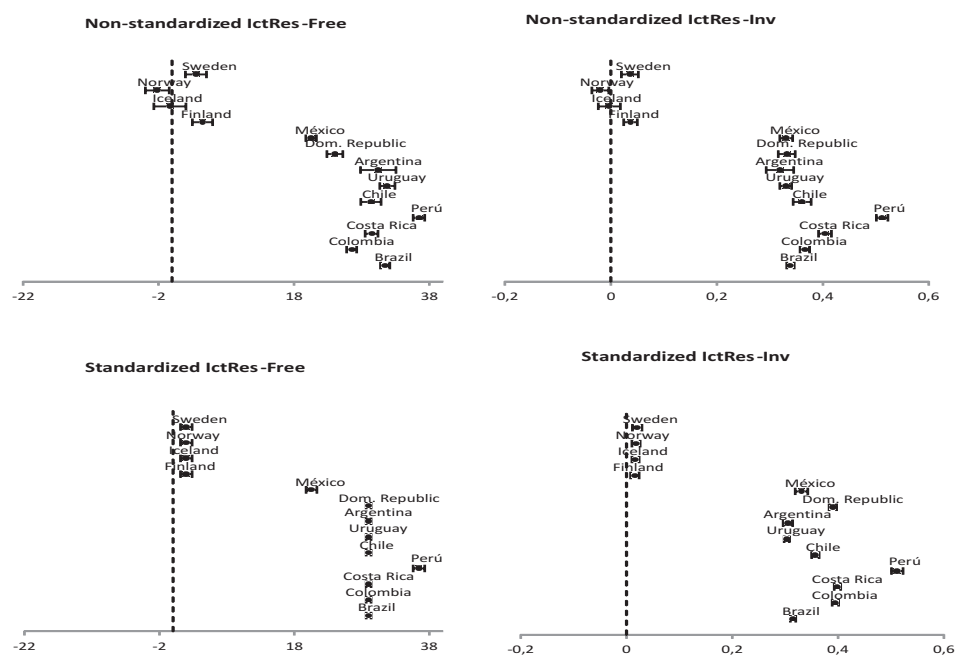


CHART III. Regression coefficients for the IctRes variable.



## Comparison with results obtained on former PISA reports

A low impact of the “Wealth” variable had been found previously in comparative studies of European countries, and family context was not shown to be a highly significant variable in the educational performance of students in northern Europe (Ammermüller, 2004). Groupings indicate similarities in the non-standardized regression coefficients among the group’s member countries, in other words, increasing the independent variables by one unit leads to exactly the same increase in reading performance within each group. However, the lesser dispersion of the home wealth variables and the greater dispersion in reading performance in northern European countries translates generally to lower standardized regression coefficients (i.e., correlation) than those of Latin American countries. These results are partially confirmed in PISA 2009 (OECD, 2010), where countries like Chile, Argentina and Uruguay, along with Bulgaria and Turkey, whose reading results are lower than average, the impact of variables associated with family wealth were substantially more significant.

The effect of socioeconomic variables and family wealth on students' academic performance has been shown to be very uneven among OECD member countries (2005); for example, in earlier studies, the impact in Germany accounted for 23% of the student's scholastic performance, while in Japan it was only 12% (Wößmann, 2004; OECD, 2005). Similarly, differences in reading performance attributed to the school's socioeconomic context did not exceed 30% in Nordic countries, while in the remaining OECD countries we find 57% (OECD, 2010). In Latin American countries, mainly Chile, Mexico, Peru, Colombia and Argentina, between-school differences are much greater and produce greater variability and impact on reading results (OECD, 2010).

## Discussion

This study began with the hypothesis that possession of resources and articles available in the student's home (Homepos variable), along with the level of family wealth (Wealth variable) and the number of ICT resources available to the student (IctRes), would have a more pronounced impact on reading performance in students from Latin American countries. Results confirm this initial hypothesis. The process of comparing regression coefficients between the different countries showed that, overall, variables related to home wealth in countries from northern Europe have less of an effect (and a similar effect) on reading performance than what is seen in Latin American countries.

Regression of reading performance on the Homepos variable revealed three groups of countries as a function of nonstandardized regression coefficients. In order from greatest to least influence of the Homepos variable, the groups are: 1) Argentina, Uruguay, Chile and Peru; 2) Sweden, Norway, Iceland, Finland, Costa Rica, Colombia and Brazil; 3) Mexico and Dominican Republic. These results also confirm those found in PISA 2009 (OECD, 2010: p. 44) where Peru, Uruguay and Chile had higher values than the other countries in influence of the variables "cultural possessions and books at home" and "educational resources at home" on student reading performance. Likewise, possessions in the family home demonstrated a moderate mean relationship ( $\beta = .30$ ,  $R^2 = .09$ ) on reading results in PIRLS 2006 (Brese & Mirazchiyski, 2010). In PISA 2006, the Homepos variable had a correlation index of .28 with

reading results, with an 8% explained variance (Brese & Mirazchiyski, 2010). Moreover, in earlier comparative studies (2000-2003) of the impact of Homepos, under the name of “possessions in the home”, the variable proved to have the greatest predictive power on reading performance in United States, Korea and Germany (Schulz, 2005).

With respect to the nonstandardized influence of the Wealth variable, five groups were found (from greatest to least influence): 1) Argentina, Uruguay, Chile, Peru, Costa Rica, Colombia and Brazil; 2) Dominican Republic; 3) Mexico; 4) Sweden, Norway and Finland; 5) Iceland. Finally, regarding the IctRes variable, four groups were found as a function of their nonstandardized influence on reading performance: 1) Peru; 2) Argentina, Uruguay, Chile, Costa Rica, Colombia, Brazil and Dominican Republic; 3) Mexico; 4) Sweden, Norway, Iceland, Finland.

Taken together, the results of this study justify the claim that the influence of variables related to family wealth on reading performance is systematically greater in Latin American countries than in northern European countries.

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