The relationship between national development and the effect of school and student characteristics on educational achievement. A cross-country exploration.

Abstract

Since the publication of two controversial studies in the 80's, in which Heyneman and Loxley suggested that the level of economic development of a country had an effect on the degree to which school and student factors influence educational achievement, numerous works have further investigated the so-called Heyneman-Loxley (HL) effect. Roughly, these works can be organized into two streams, one that defends the prevalence of the HL effect in the current macro-socioeconomic context and a second one that denies it. The debate is far from over and no overwhelming evidence has been provided from any research stream. By carrying out Multi-level regression analysis this paper assess the effects of country development and inequality on learning in reading, using data from PIRLS 2006. The results suggest the existence of an ameliorating effect of higher levels of country development on learning through two different ways: 1) directly, on the mean results of countries; 2) indirectly, by reducing the inequality associated to schools' socioeconomic status, the rural sector, and school's resources. The findings also confirm the dominance of socioeconomic variables over organizational or institutional ones in explaining student achievement differences, at least at the aggregate level of analysis. These results add to the production of knowledge for the design of context-specific policies by increasing our understanding on how broader socio-economic and political constraints on schools affect their performance.

Introduction

The relationships between education and economic development have been intensively studied in cross-national comparative research. At risk of oversimplify, it can be said that there is a consistent relationship at the country-level between educational opportunities (i.e.: coverage rates; mean years of schooling) and economic growth and development (Quote); or even that the raising of educational levels is necessary to sustain and promote the economic development of a country (Quote). These conclusions made social scientists and policy makers slouch towards education systems, as they were considered to be the most suitable *institutions* for the production of the skills, and even values and attitudes required for development.

In most developed and developing countries, the expansion of educational systems over the last century has been the result of a combination of sustained efforts by the state, and demands from different groups of society. This process of educational growth can be easily verified in most countries around the world, although with great differences in the rates of inclusion of social strata, institutional features, and equality of opportunities. Even when universal coverage rates (especially at the primary and secondary levels), were the most evident results, soon it was obvious that mass access to education was not enough for countries to compete internationally in a globalized, knowledge-based economy. Raising the quality of educational outcomes was also emerged as a necessary feature (Hanushek & Woessmann, 2007).

The expansion of the coverage rates of education systems around the world and the focus on its quality motivated the production of a host of studies identifying and analyzing those factors associated to educational outcomes (commonly measured as the students' scores in standardized tests). One of the first and most influential results of these studies pointed out that student background and socioeconomic status were much more important in determining educational outcomes than were school-related factors (Coleman et al., 1966; Peaker, 1971).

A plethora of studies confirming the results of the so-called Coleman and Plowden Reports (i.e. Coleman et al., 1966; Peaker, 1971) turned these findings in one of the most persistent generalizations in the studies carried out in this line of inquiry (Heyneman, 2004). However, a great majority of these works were based on analysis of data form a few developed

countries. Taking this fact into consideration, Heyneman and Loxley (1983) contradicted these previously widely-accepted results by carrying out a study using data from a sample of countries from Asia, Africa, Latin America and the Middle East. Their results suggested that the level of economic development of a country (measured as the Gross Domestic Product - GDP) had an effect on the degree to which school and student background influence educational achievement. Roughly, they found that the lower the GDP of a nation, the more influence schools seemed to have on educational outcomes. At that time, this finding was thought to represent good news (Fernandez and Blanco 2004), because it seemed to indicate that schools could make a bigger difference in developing countries. The opportunity for raising educational quality seemed to be clear.

Since then, numerous works have further investigated the interactions among school characteristics, students' background and levels of national economic development (see for example Fuller, B. 1986; Riddell, A. 1989; Baker et al, 2002; Hanushek, E. and Luque, J., 2003). Roughly, these works can be organized into two streams, one that defends the prevalence of the effect of the level of economic development of countries on the extent to which school and students' background factors influence achievement, and a second one that denies it. The debate is far from over and no overwhelming evidence has been provided from any research stream. It can be also questioned whether these differences in the size of school effects can be interpreted as good news or, conversely, they show the great impact of socioeconomic differences at the school level.

This work contributes to the debate by doing a cross-country exploration of the relationship between national development and the effect of school and family background characteristics on educational achievement. In this way, the general objective is to test for the existence of inequity patterns at the country and school levels regarding student achievement in PIRLS 2006.

As mentioned before, the countries included in the sample and the data analyzed comes from the IEA's study PIRLS 2006. Different specifications of three-level Hierarchal Linear Regression Models are used to explore the relationship between national levels of development (measured through the Index of Human Development 2006) and the relevant variables at the school level, as well as between school characteristics and student socioeconomic status.

To accomplish this objective, the paper is composed by five sections apart from this introduction. In section two, in order to frame the contribution of this work, a brief summary of the state of the debate about the size and consistency of the school and family background effects on educational achievement across different countries is presented. Section three focuses on the specific research questions and hypotheses to be tested. Section four describes the datasets, variables and methods used for the analysis. The following two sections of the paper correspond to the presentation of results and their discussion in terms of their contribution to the debate. Finally, some concluding ideas from both the theoretical and policy points of view are drawn.

School and family background effects on educational achievement across nations. The Heyneman-Loxley effect

The debate fueled by the results of the so-called Coleman Report (Coleman, et al., 1966) in the USA regarding the relative importance of school and family background factors on students achievement motivated the emergence of a host of studies replicating this analysis with data from different countries. Most of these replications confirmed the results of Coleman and colleagues (i.e. the influence of family background is more important than school characteristics in explaining the variance on educational achievement). However, in a comparison of the factors associated to academic achievement in Uganda and other more industrialized societies, Heyneman (1976) found contradictory evidence. The results for the Uganda case and the fact that most of the empirical evidence confirming the Coleman Report conclusions steamed, so far, from studies carried out in developed countries, lead the author to consider the possibility that the relative influence of school and family background on academic achievement would vary across countries; and further, that this variation would be related to the countries level of economic development.

At the beginning of the 80s Heyneman, this time with Loxley, published two significant papers in which, by using data from countries with a range of national average income, they confirmed the hypothesis derived from the analysis of the Uganda's education system (Heyneman & Loxley, 1982; 1983). That is, on the one hand, that the relative influence of school characteristics and family background on educational achievement varied across countries; and on the other, that this variation seemed to be conditioned by the level of economic development of the countries. These findings set up the bases for the

establishment of a prolific branch of comparative education, which results encouraged the policies of production of human capital as instruments for the development of the poorest countries (Heyneman S. P., 2004).

In the discussion of their results Heyneman and Loxley offer five possible explanations for the correlations identified. The first three strictly refer to methodological shortcomings that could cast doubts on the validity of the findings, while the last two are related to the social mechanisms that would generate the observed results. The present work is restricted to the scrutiny of the last two as they are particularly relevant to its objectives.

The first of these explanations refers that in less-developed nations schooling is a scarce good, and that this scarcity, in combination with the individual social trajectories induced by a labour market highly segregated into a formal-urban and an agricultural-informal sectors, increases the social value assigned to it regardless of family background. That is, in a labour market with these characteristics, higher probabilities of social mobility would be associated to the formal urban sector, which in turn would have higher entry requirements related to schooling than to socioeconomic status, for example. Therefore, whenever students have access to schooling and regardless of their family background, would be motivated to make larger efforts to attain achievement.

The second explanation refers to the ability of wealthier countries to provide higher levels of school resources throughout their education systems. This would result in less differentiated levels of resources for *all* schools and, in turn, in higher minimum levels of school quality for *all* children. In less-wealthy nations, due to the existence of higher levels of economic inequality and therefore stronger associations between families' SES and school resources, the differences in the level of resources across schools would be significantly higher.

However, the social scenario in which Heyneman and Loxley obtained their results has gone through major changes in the last three decades. The logic of educational growth as a project funded by nation-states has been widely spread around the world (Heyneman S. P., 2004). As a consequence, a clear long-term trend in expansion of mass education can be observed in both developed and developing countries. Enrollment rates and public

expenditure in education have been consistently growing across both groups of nations (Baker & Holsinger, 1996).

Consequently, the HL effect would be expected to decrease because of the reduction of the extreme scarcity of schooling in developing countries. Additionally, the observed long-term expansion of educational expenditure and the consequent increase of the minimum levels of schools resources across less-developed nations, if widespread, would also lead to a decline in the HL effect (Baker, Goesling, & LeTendre, 2002, p. 297).

Although we recognize that the consequences of the expansion of education systems around the world could contribute to lessen the HL effect to some extent, our position supports the hypothesis of the resilience of the HL effect in the current macro social context. At least three reasons could be argued for this.

The first one is that even though it is clear that there has been an expansion of education systems in most developing countries, developed countries are clearly ahead in this trend (Tsang, 1995). In fact, the overall levels of expenditure and enrolment among wealthier countries continues to be considerably larger compared with the developing ones is also well documented (Baker, Goesling, & LeTendre, 2002).

Second, even though educational expansion policies have been good at raising school enrollment levels, the expansion of the education systems has not been homogeneous with respect to their results; social inequities within the educational systems have prevailed. Research carried out in several countries of Latin America, for example, shows that when large sectors of the most marginalized population (that accounts for most of the increment in the coverage rate, especially in developing countries) were incorporated into education systems, the inequalities in educational achievement became more intense and more evident (Fernández, 2003; Muñoz-Izquierdo & Villarreal, 2005; Sandoval-Hernandez, 2007). That is, schooling might have been expanded to reach large proportions of the population, but *quality* schooling is still a scarce good in developing countries. In developing countries school results seem to be highly dependent on their students' background characteristics.

A third reason to hypothesize the prevalence of the HL effect concerns the increase of minimal levels of school resources in developing countries derived from the expansion of educational expenditure. That is, even when it is clear that there has been a generalized increase in the level of school resources, this trend has not favored all schools equally. Differences in the level of school resources are still evident, as the expansion of public mass education, at least in Latin America, has systematically favored urban and medium class sectors (e.g. more and better resourced schools –in terms of physical and human resources). Under these circumstances, the difference between rural and urban sectors, and between schools' SES become decisive. This would contribute to increase the effect of schools on educational achievement.

Whereas Heyneman and Loxley's main arguments to explain the relationship between development and school effects were the scarcity of educational opportunities in developing countries and its consequent increase of the motivation to do well in school; our hypothesis are based on the notion that, in developing countries, social inequality is reproduced more effectively within the educational systems. From this perspective, the HL effect should not be interpreted as evidence of larger margins for schools to influence educational outcomes in developing countries, but rather as the opposite. The larger size of the school effects in such countries should be attributed to the effect of schools SES, and not to schools' organizational or pedagogical characteristics.

Research questions / Objectives

Drawing along these lines, the main objectives of this work are: first, to test for the existence of a direct relationship between development, economic inequality, and learning results at the national level; and second, to explore how different levels of national development and economic inequality influence the school and family background effects on student performance.

For the first objective it is expected to corroborate the existence of the HL effect using more recent and varied data than previous studies. Concerning the second objective, it is expected that greater differences in school effects would be associated with greater differences in the social composition of schools, thus giving partial support to our main thesis.

The existence of a significant relationship between the level of national development and academic achievement would imply that there are factors at the national level which have an effect on the academic performance of students, even after controlling for individual socioeconomic characteristics and school quality. These factors could be represented by the public resources offered by the nation-state to its citizens, at least by those that could affect directly or indirectly the educational achievement of the population (e.g. access to different options of formal and informal education, availability of life-long learning alternatives, availability of public libraries, access to health services, mass media communications, etc.). Economic inequality, in turn, could have a direct effect on learning if lower levels of national development are coupled with the institutionalization of socio-politic dynamics that negatively affect the quality of schooling (e.g. corruption, corporatism, lack of accountability, etc.).

It is further assumed that higher levels in the provision of these resources and a more homogeneous distribution of them (conditions frequently found in developed countries) would contribute to ameliorate the differences in academic performance associated to the variation in the socioeconomic composition of schools (SES mean). Conversely, in less-developed societies, the opposite conditions imply that the principal or unique mean to access education (especially for those students coming from lower socioeconomic strata) is school. Therefore, the variance in student performance between schools would be more important in developing countries than in the developed ones. Moreover, higher levels of inequality would be associated to highly segmented education systems, in which inequalities in the allocation of school resources (e.g. material inputs, quality of teaching stock, effective teaching and school management practices) are not adequately compensated by public policies or publicly available resources.

In brief, schools in developing, unequal countries would be assumed to reproduce the pre-existent social inequalities, trend that would be reinforced by the absence of effective public policy interventions or publicly available resources to reverse it. Thus, in less-developed countries, the differences between schools, both academic and socioeconomic, would explain greater proportions of the variation in student achievement than in the more developed ones. Conversely, higher levels of national development would contribute to reduce the associations between socioeconomic school composition, school resources, and achievement.

Data, Variables and Methods

Data

This study relies on data from the Progress in International Reading Literacy Study (PIRLS), a testing and data collection program conducted by the International Association for the Evaluation of Educational Achievement (IEA) in 2006. The main objective of this initiative is to help countries make informed decisions about reading education, by providing internationally comparative data about students' reading achievement in primary school (the fourth grade in most participating countries). PIRLS in 2006 was implemented in 40 countries, including Belgium with 2 educational systems and Canada with 5 provinces, making a total of 45 participants in total (Mullis, Martin, Kennedy, & Foy, 2007, p. 18)[1]. Due to missing values limitations, the data from Luxembourg were not included in the analysis; therefore the sample considered in this work is composed by 44 of the 45 participants. The final database used for the analysis includes information on more than 210,000 students and 7440 schools.

Dependent variable

In the 2006 PIRLS International Report (Mullis, Martin, Kennedy, & Foy, 2007, p. 308) achievement scales were produced for each of the two reading purposes (reading for literary experience and reading for information) and for two processes of comprehension (retrieving and straightforward inferencing, and interpreting, integrating, and evaluating), that are considered in the test, as well as for reading overall. The dependent variable used for our analysis corresponds to the last one.

Student reading achievement was summarized using item response theory (IRT) modeling techniques that produce a score by averaging the responses of each student to the items that he/she took in a way that takes into account the difficulty and discriminating power of each item. Two features of IRT modeling are especially relevant for a survey like PIRLS, on the one hand, it allows for the estimation of a student's score in a test even if he or she did

[1] The full list of participants in PIRLS 2006 is: Bulgaria, Canada (Ontario), Canada (Quebec), England, France, Germany, Hong Kong SAR, Hungary, Iceland, Islamic Rep. of Iran, Israel, Italy, Latvia, Lithuania, Rep. of Macedonia, Rep. of Moldova, Morocco, Netherlands, New Zealand, Norway, Romania, Russian Federation, Scotland, Singapore, Slovak Republic, Slovenia, Sweden and United States.

not answered all the items in the test; and on the other, it provides a common scale on which performance can be compared across countries (Foy, Galia, & Li, 2007).

To provide student scores PIRLS uses the achievement distribution to impute the achievement of each student conditional on his or her item responses and background characteristics. To quantify any error in the imputation process, PIRLS datasets report five plausible values for each student, implying that any calculation has to be done five times. The average of the results of these five analyses is then taken as the best estimate of the statistic in question, and the difference between them reflects the imputation error (Mullis, Martin, Kennedy, & Foy, 2007, p. 308).

Finally, it is also relevant to mention that the PIRLS mean achievement scale across those countries was set at 500 units and the standard deviation at 100. Additionally, since the countries varied in size, each country was weighted to contribute equally to the mean and standard deviation of the scale.

Independent variables

The information collected by PIRLS 2006 also includes a wide range of background information about students' home and school experiences in learning to read. Students' parents, teachers, and head-teachers, as well as the students themselves answered questionnaires covering various aspects of home literacy support, school environment, and classroom instruction. A full list of the variables used in this work, including main descriptive statistics, can be consulted in Appendix A.

Several procedures were used to construct the variables for the analysis. Some of them are factor indexes that comprise information from simpler variables, while the rest are dummy variables. Three different datasets were defined: one at the student-level, one at the school-level, and the other at the country level. The database at the student-level includes information about the student socio-economical status (SES), sex, school's perceived climate, homework, reading practices and dispositions, the use of computers, internet, and TV. At the school level, the database included information on school mean socioeconomic status, location (urban/rural setting), resources (library, number of books, lack of material and

human resources), time devoted to teaching, emphasis on reading, climate, coordination among teachers, and participation of families in meetings. At the country-level, the variables used were Human Development Index for 2006 and Gini index for the same year.

Methods

Hierarchal linear modeling (HLM) constitutes the main analysis technique used in the analysis of the data. The decision of using HLM was made considering several criteria. The first one can be described as empirical, theoretical and technical isomorphism (Cortes & Ruvalcaba, 1993). That is to say that the structure of the empirical data and the theories available to explain the hypothesis to be tested represent a good match with the analysis technique to be used. As it is known, educational data is characterized for having a multilevel structure, where student attainment is conditioned by individual characteristics, by school characteristics that are common to all students in the same institution, and for characteristics of the education system that are common to all schools and students (Bryk y Raudenbush 1992). Therefore, in the educational research context, HLM allows for more robust estimations and more rigorous hypothesis testing than those derived from Ordinary Least Squares regression.

Another reason is that HLM are especially appropriate for the central objectives of this work: on the one hand, they allow for the estimation of the effect of aggregate nation-level variables (e.g. Index of Human Development, Gini Index) on school-level effects on educational achievement; on the other hand, they allow for the estimation of interaction effects between variables at different levels (e.g. the interaction between IHD and school SES). In theoretical terms, this allows to test if development and equality at the country level affect the reproduction of inequalities at the school level.

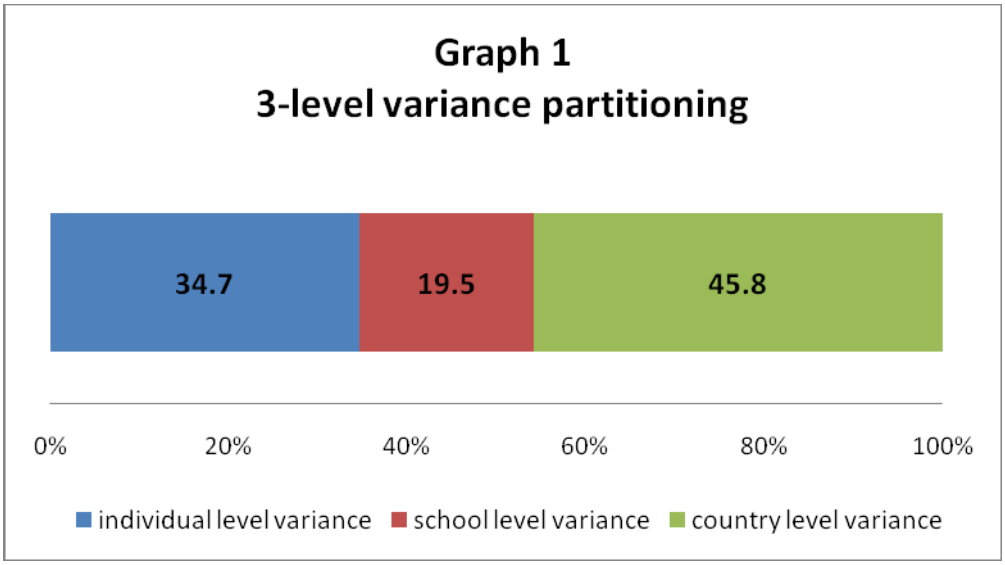
As suggested by Bryk & Raudenbush (1992), models were specified in stages of increasing complexity, from “null” models to “means-and-slopes-as-outcomes” models. The first stage of the analysis consisted then in specifying a “null” model with no explanatory variables. This model provided an estimate of two intra class correlation (ICC): the proportion of variance in learning between schools and between countries. In the second, third, and fourth stages, fixed effect models were estimated respectively at the students, schools, and country levels. The fifth stage included theoretically relevant random effects for selected variables at the student level (namely, student SES) and, in the following stage, their interactions with school-

level variables. The seventh model included random effects for variables at the school level, and the last model specified their interactions with country-level variables. Additionally, in order to do an exploratory analysis of the relationship between national development and the levels of intra-school variance, bi-variated correlation tests were used.

Results

Variance partition

As mentioned above, the first step in the HLM strategy was the estimation of the partition of total variance in student achievement into the three levels considered in the analysis (i.e. student, school and country levels). The objective is to estimate the extent to which the differences in student academic performance are explained by differences between students, between schools and between countries.



The graph 1 shows that there are important differences in the proportions of the variance explained by each level. The greatest proportion corresponds to the differences between countries (almost one half), followed by the differences between individuals (34.7%), and the differences between schools (19.5%).

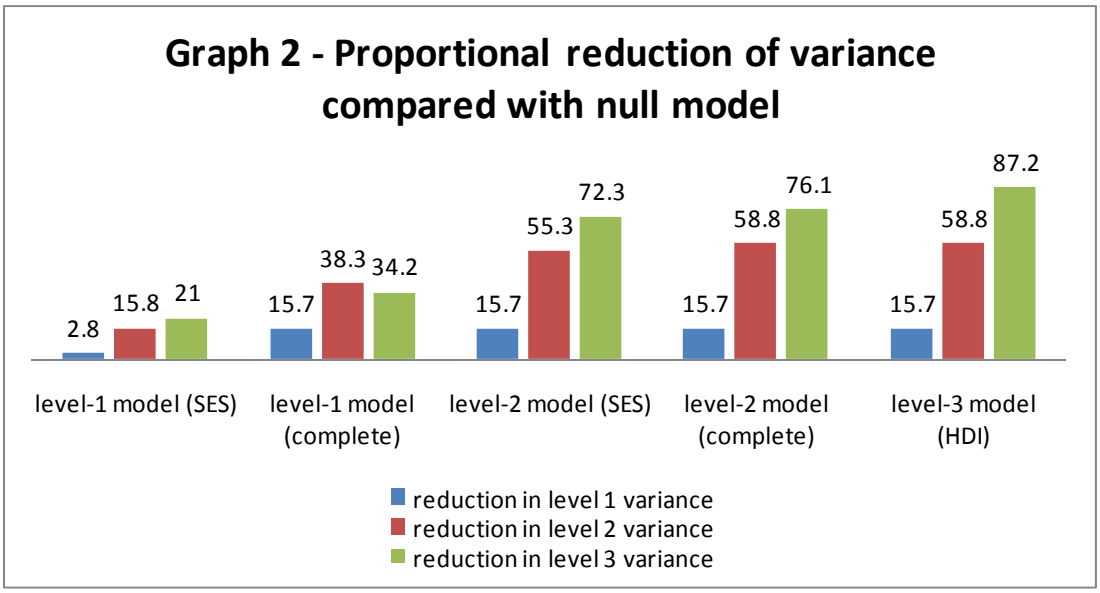
According to these first results, it might be thought that the differences associated to education systems across countries can be crucial in explaining the variation of academic results, and therefore that there is an significant opportunity for the design and application of high-impact policies at the nation level. However, in the next paragraphs it will be made clear that this is a far too optimistic conclusion.

Percentage of variance explained by different models

As previously mentioned, the strategy of analysis followed in this work consisted in the progressive estimation of models including variables from the three levels of analysis. As explicative variables from each are included in the model, the amount of variance –in the three levels– is significantly reduced in comparison to the null model. Even when in theory it would be expected that the inclusion of an independent variable in a model produced a reduction of the variance only in the level to which it belongs, this is not the case for the data analyzed in here (see graph 2). The reason is that neither student characteristics homogeneously distributed between schools, neither school characteristics are homogeneously distributed between countries.

Along these lines, graph 2, show results for five different models. In the first model the only explanatory variable is socioeconomic level (SES) at the student level. As it can be observed, this variable only explains 2.8% of the variance at the student level, but explains almost 16% of the school level and 21% of the country level variance.

In the second model (complete model at the student level), the inclusion of student dispositions, perceptions and practices as explanatory variables explains 15.7% of the variance at the same level, while the variance between both, schools and countries is reduced in more than a third.



In the third model, the school average of the students` SES is added as the only explanatory variable at the school level. As it can be observed in graph 2, the reduction of the variance in this level reaches 55%, while at the country level it exceeds 75%.

Because of its relevance for the objectives of this work, special attention has to be paid to the last result. Thus, it is important to point out that the large proportion of the variance attributed to the country level in the null model, has been reduced in around 75% before including any variable of this level into the model. That would imply the greatest proportion of what, in principle, could be considered as “country effect” is actually a compositional effect of the unequal distribution of student and school characteristics. However, it is also important to consider that it is still possible that this unequal distribution of student and school characteristics obey to societal or institutional features at the national level.

Finally, when the only explanatory variable at the country level is the Human Development Index (HDI), the variance at this level represents just the 13% of the original one. Even though this result is not as optimistic as the one reported from the null model, this can still be considered as a good margin for the action of educational policies at the national level.

The structure of the factors associated to student reading achievement

Next, we analyze the results of the regression model for the total sample (Table 1). First, we briefly present the results for the student level, and the analysis of the results at the school and country level.

Student level

As it has been said, at the individual level, the model explains just the 15.7% of the total variance. This is not an odd result when information regarding some important variables is not available (e.g. cognitive skills). Three groups of variables were tested in this model: student characteristic variables (SES and gender); variables related to the practices and dispositions of students towards reading; and variables regarding the characteristics of the schools. The results are showed in the last rows of table 1.

Table 1

Regression coefficients for the final model

Country level	
HDI 2006	0.221***
School level	
Mean SES	0.224***
Rural	- 0.081***
HDI 2006	0.079***
Reading 1st grade	0.034*
Library	0.055**
Less 200 books	- 0.019
HDI 2006	0.038**
Families	0.058**
Individual level	
SES	0.119***
Mean SES	0.038**
Disciplinary problems	- 0.030**
Like reading	0.230***
Does not read	- 0.085***
Magazines	- 0.027***
Novels	0.046**
Watching TV	- 0.069***
Internet	- 0.110***
Reading by him/herself	0.101***
Library use	0.043*
Negative climate	- 0.040**
Reading homework	0.052*
Intercept	*-0.162***

Source: Own calculations bases on PIRLS 2006, total sample except for Luxemburg
(***) *p<0.001*; (**) *p<0.01*; (*) *p<0.05*
Standard errors of the coefficients in brackets

The variables that showed a positive association with student performance are: student SES (SES), if the student reported to like reading (like reading), how often the student read novels or books (novels), if the school carries out reading-alone practices (reading by him/herself), and to a lesser extent, the frequency of use of the school library (library), and the frequency of reading homework (reading homework). In turn, the variables that observed a negative association are: if the student declared not to read (does not read), how often the student read comics and magazines (magazines), how often the student watches TV (watching TV), how often the student uses internet (internet), and the perception of a negative school climate (negative climate). Most of these coefficients report the expected directions in their association with the dependent variable: a greater subjective disposition towards reading,

and frequent reading practices are associated to higher reading achievement, both when promoted by school and when they represent students' initiative.

It is important to point out that the students' practices and dispositions, as a group of variables, explain the greatest amount of the total variance, approximately 2/3 of the total explained variance. In contrast, the student SES explains just the 3% of the level 1 variance.

Three coefficients are especially important because of their possible policy and theory implications. The first one is the positive effect that frequent reading activities in class would have on reading achievement. At least at this early schooling level, reading-oriented activities seem to have an effect on educational attainment. In the second place, attention is drawn to the fact that the frequency of reading magazines and of the use of Internet has a negative coefficient. Contrary to the commonly held belief in the positive effects of exposition to texts in different formats, our results suggest that prolonged exposition to texts in a non-traditional format would have a negative association to academic attainment.

Finally, we would like to mention the variables that did not fit in the model, but that because of their role in the theory were initially considered. The index of out-of-school reading practices (readpr), the index of quality of peer relationships (climate), parental support for reading homework (help), and the use of computers at home (computer 1 and computer 2) did not showed a significant association to student outcomes. Because of space restrictions it is not possible to explain these results here.

School level model

The school model presents a complex structure because of the interactions with the country individual SES. Six variables showed significant coefficients in the expected direction, but their weight in the global explanation is considerably different.

At the outcast, the factor that demonstrates the strongest effect on educational achievement is average school SES (mean SES). The fact that the average school SES reported larger effect size than the individual SES has been well documented in the literature. From our

point of view there are at least three non-excluding explanations for this association. Deciding between these hypotheses goes beyond the objectives of this work, yet they might represent one of the most interesting avenues for the study of how educational inequalities are produced between education systems.

The first hypothesis holds that as the average family SES is higher in a community, its probability of attracting the resources needed for their schools to offer quality education is also higher. The wealthier families are able to get more economical resources for their schools, as they have greater capacity to exert politic pressure; they live in nice areas, because high quality teachers have more chances to choose the school they want to work in, their schools also end up having the best teachers. These differences are not only evident in the dichotomy private/public, but also within the public sector. In this fashion, the schools that have the intake with the higher SES would also be higher levels of educational resources.

The second hypothesis posits that the school SES is an indicator of the cultural, economic and social capital of the students' families, as well as an indicator of the value families assign to education. Therefore, higher levels of school SES would be associated to higher probabilities of the existence of norms, values and role models adapted to the demands of formal education. In this way, family and territorial networks would act as a mechanism to foster the gains of the available educational resources and, thus academic achievement. In this manner, students' practices and dispositions would be conditioned by an educational *ethos* more or less common to all students in the school. Furthermore, it would also be more probable to find linguistic codes and rules of production of symbols more adequate to the pedagogic discourse of formal education.

Finally, the third hypothesis involves the teachers' expectations regarding students' academic attainment. In this case, the effect of SES on achievement would be explained by the fact that teachers build their expectations and set their teaching goals based on their evaluation of the students' average *educability*. This evaluation would be influenced by social prejudices and stigmas, but also by the teachers' experience, for whom it is more difficult to educate low than high SES students. Therefore, teachers facing low SES students would lower their expectations, motivation and goals, affecting in this way the academic performance of all their students.

The rest of the school factors with significant coefficients do not add much to the explanation of the global model, nevertheless it is important to mention them. Schools located in rural areas (rural) and school libraries with less than 200 books (less 200 books) are negatively associated to achievement. In turn, the level of reading skills of the students in grade one, as judged by the head teacher; if the school has a library and the index of parents' participation in school activities, is positively associated to student achievement.

What is important to point out here, is that in comparison to the variance reduction associated to the school SES, the percentage of explained variance added by the five variables fitted into the model is rather low. This finding suggest that, at least when a large number of countries is included into the analysis, the results tend to confirm the classic finding of Coleman: once it has been controlled for the socioeconomic factors at the individual and school levels, schools have a relatively small margin to influence on student attainment. It seems that, as it was claimed by Basil Bernstein four decades ago, school cannot compensate for society.

However, it is important to draw attention to the fact that two school factors were found to significantly modify the effect of student SES on achievement. That is to say, that these two factors are associated to changes in the reproduction of social inequality at the student level[2]. The first one is the school SES that, in line with what has been found in other research works, increases the effect of the student SES. That is, the slope of the individual SES tends to become steeper as the school SES is higher. Although, all students in a school seem to benefit from a high school SES, students with high SES take more advantage of these favorable conditions. This finding adds to the hypothesis that students benefit of high levels of school SES in a differentiated way depending on their own social, economic and cultural capitals.

The other significant school factor is the index of disciplinary problems (disciplinary problems). Even though this index did not show a direct effect on the student attainment, it did have an effect through its negative association with the student SES slope. Although we do not have a sound explanation for this finding, it might be thought that students with higher

[2] As it can be seen in graph 3, the level of statistical explanation reached by this random effect is relatively low (15%), yet significant.

SES are more affected by the reduction of effective teaching time due disciplinary problems in classroom. As it can be observed, not all the *equity* effects favor school outcomes.

Before discussing the results of the model at the national level, it is necessary to mention the variables that did not show significant effects at this level. Any of the following variables showed significant effects on the student achievement: teaching hours per year (hclass), school emphasis on teaching reading (schread), the indexes of resource shortages – technological, infrastructure and trained teachers (lackict, lackinfr and lackteach), two indexes of school climate (climate and clidis), grequency of teachers coordinators meetings (coord1 and coord2), and the time used by the head teacher in pedagogical issues (timeped). In summary, neither the factors related to school management nor school climate showed significant effects in the global model.

Country level model

The last part of the analysis consisted in fitting the model at the country level to test two main hypotheses. The first one was that the country levels of economic equity and well-being have positive and significant effects on student attainment; and second, that these variables influence student attainment through their interaction with school effects. In general terms, it is postulated that as the levels of well-being and equity are higher, the inequalities associated to school factors reduce[3].

Bi-variated correlations between national development and school differentiation

A first basic way to approximate this phenomenon consists in analyzing the correlation between country HDI and the level of intra-school variance. In an exploratory fashion, we used one-way analysis of variance (ANOVA) to estimate the between schools variance in reading achievement for each country. The same procedure was followed to estimate the between school variance in the students' SES, the results of this analysis were used as a variable at the country level to approximate the social segmentation in schools.

[3] In other words, the second hypothesis implies that the interaction coefficients between country level and school level variables will have the opposite sign of the school variable coefficients, thus compensating their differentiating effect.

Table 2

Bivariate Correlations between HDI_2006 and relative variance components at the school level

	HDI_2006	% Variance in reading test at school level	% Variance in student SES at school level
HDI_2006	1	**-.62***	**-.57***
% Variance in reading test at school level		1	**.73***

Source: Own calculations based on PIRLS 2006, total sample except for Luxemburg

Table 2 presents the bi-variated correlations between the variables described above. As it can be seen, there are high negative correlations between IDH and the percentages of the variance at the school level, both in reading and in student SES. This provides empirical evidence to support the hypothesis that the higher the level of development of a country, the lower the social differences between its schools and the lower the relative difference of their results. That is, a high national economic development is associated with low levels of socio-academic differentiation between schools.

It is also interesting to point at the fact that there is a strong association between the social segmentation indicator and the school level of variance in reading achievement. As it was established in the previous section, this might be explained by the strong effect that the school socio-economic context exert on student achievement. According to these results, schools in less-developed countries are considerably segmented in social and academic terms. This finding may suggest that school factors and school socio-economic context were able to explain greater percentages of the variance as the level of development of a country is lower. However, because of restrictions of space, it is not possible to test such hypothesis in this work.

Coefficients in the country level model

Similarly than the preliminary correlation analysis, the results of the regression model provide evidence to support, at least partially, the hypothesis set for this work. As it was established in the hypotheses, the IDH shows a positive association with the national average of achievement. As it was explained in the previous section, this finding might be explained

through the strong effect that school SES has on student achievement. Although in previous stages of the modeling strategy the country variance had been reduced in 76%, when the IDH is fitted into the model, the percentage of explained variance increase by 11 percent points, reaching a total of 87%. It is important to mention that even though there is still a considerably percentage of the variance that remains unexplained at the country level, it is a percentage rather small.

According to the literature, this remaining variance could be explained by institutional characteristics of the education systems and / or their policies; however we do not have robust enough variables to measure these factors. In any case, it is our intuition that most of these institutional characteristics would not show statistically significant effects. Drawing on a sociological perspective centered on the persistence of social inequalities, we suggest that the most important effects of national characteristics on educational achievement obey to the social structure and the type of well-fare regime operating in each country.

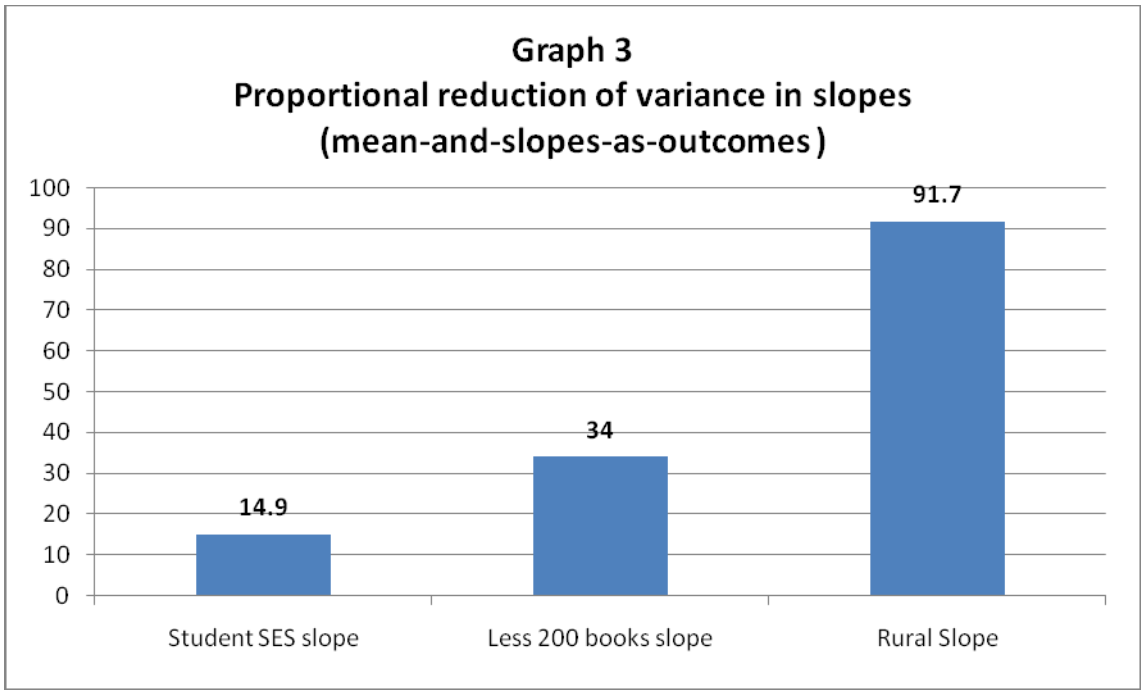
Next, we present the results for the interaction models between school factors and country level characteristics. In the first model, only the interaction between school SES and HDI was fitted. As predicted by our hypothesis the coefficient was negative, suggesting that the HDI could compensate for the effects of social differentiation between schools. However its level of significance was p=0.088. Interesting results emerged when the interactions with the remaining coefficients were introduced into the model: the interaction coefficients showed to be significant for the *rural* and *less than 200 books* variables. Additionally, the interaction between IHD and school SES became clearly non-significant (p>0.4)[4].

The negative effect showed by the variable *rural* in the last model remains significant, but the introduction of HDI into the model explains 92% of its original variance (this can be observed in graph 3). That would mean that the level of national development manages to effectively explain the differences between rural and urban sectors, being higher when lower is the level of development.

[4] The interaction coefficient between HDI and *level of reading skills* (Reading 1st grade) was not significant either.

In turn, a similar trend is observed with the negative effect of the lack of books in school: the interaction with the HDI shows a positive and significant coefficient. This would indicate that the negative slope is dimmed as the level of country development is higher. In this case, the percentage of the variance explained for this variable by the IDH is 34% (graph 3); and its coefficient that in a previous model (not shown here) was positive and significant, is not significant anymore. In other words, it can be claimed that the negative effect associated to the lack of resources is only evident when it interacts with country level of development (i.e. the availability of public extra-school resources in society).

In substantive terms, these results suggest that the level of development of the countries contributes to ameliorate the educational inequalities associated to school social segregation, though in an indirect way. The higher the level of national well-being, the strongest its moderation of the negative effects associated to rural settings and lack of school resources (observed through the provision of school books).



Source: Own calculations based on PIRLS 2006, total sample except for Luxemburg

Discussion

This presentation attempted to assess the impact of country development and economic inequality on the reading learning of a large sample of primary students from more than 40 countries. Our main hypothesis states that there are both direct and indirect effects of development and inequality. Development affects learning directly by providing students and families with a set of resources which are helpful for developing learning abilities, despite the quality of formal education received by each student. To the extent that these resources are more or less publicly available, development would also affect learning indirectly, by reducing the effects of inequalities in school SES and resources. Economic inequality affects learning directly by allowing the institutionalization of socio-political dynamics within the educational systems that lower educational quality (e.g.: corruption, particularistic behavior, political use of educational policies). The indirect effects of inequality are produced through the strong effects that social segregation of schools exerts on learning, affecting school resources, teachers' expectations, and so forth.

The results support, at least partially, some of these statements. Firstly, we found strong, negative correlations between HDI, social segregation and academic differentiation among schools, thus giving partial support to the Heyneman-Loxley findings (but not necessarily supporting their explanations for those findings). Secondly, a positive and statistically significant association between HDI and national mean score on the reading test was found.

Thirdly, we found that the negative school-level associations between rural schools, few books at school, and learning, are significantly smoothed by countries' development. In conclusion, countries' development appears to have significant direct and indirect effects on learning, increasing mean scores and reducing inequalities related to school resources. Inequality, on the other hand, does not show any kind of effects (at least when measured using the Gini index).

We have also corroborated some of the previous findings of educational research on learning inequalities. Specifically, the relative strength of SES effects at the school level, compared with the strictly organizational school effects, was corroborated. Another interesting finding is the small amount of variance remaining at the country level after controlling for the effects of development. Although these are very general results and more detailed, country-specific analysis must be carried on, they are important because they seem to corroborate Basil

Bernsteins' statement: education cannot compensate for society. School resources, educational policies and reforms, do not seem to have a decisive impact on educational results, particularly under high levels of poverty and inequality. It seems almost impossible to raise the quality of education significantly without sustained levels of economic growth and equality of opportunity.

The results presented here are far from definitive. It could be questioned, for example, if measures such as HDI and the Gini index are the most appropriate to measure development and inequality. In addition, we do not have direct measures of the availability of extra-scholar educational resources, or systematic measures for educational policies. Also, educational institutions are not considered in our analysis, while other studies have shown that they might have an impact on learning. Variables at the individual and school level could also be questioned, either because of the way they are constructed (SES index does not take into account parent's educational level), or because they are missing from the database (for example, if the school belongs to the private or the public sector).

As we mentioned at the beginning, the findings presented here are just the first steps of a research program that needs to advance in at least two tracks. Firstly, data from different sources and different years should be analyzed (PISA, TIMSS, SERCE, etc.), to reach more robust conclusions. Secondly, it is necessary to carry on separate national-level analysis to compare "what works" at the school level in each country, how student and school-SES inequalities impact on achievement, how much variance can those factors account for, and how do these results relate with more precise measures of national development, equality, resources, an institutions.

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Appendix A

Descriptive Statistics for student-level variables

	Minimum	Maximum	Mean	Std. Deviation
GIRL (female student)	.00	1.00	.4942	.49997
SES (index of student socio-economic status)	-2.19018	1.25262	.0000000	1.00000000
READPR (index of reading practices outside the school)	-2.44746	1.72072	.0000000	1.00000000
MAGAZINES (index of frequency reading comics, magazines, and newspapers)	-2.31238	2.85133	.0000000	1.00000000
READING BY HIM/HERSELF (student reads by him/herself in class very every day or almost)	.00	1.00	.6664	.47148
CLIMATE (index of school climate perceived by the student: care, respect, help among students, safeness, teachers care)	-3.98758	1.35362	.0000000	1.00000000
NEGATIVE CLIMATE (index of bullying and stealing at school)	-1.21110	2.10770	.0000000	1.00000000
READING HOMEWORK (student is assigned homework that implies reading at least once a week)	.00	1.00	.7853	.41060
NOVELS (student reads novels or books with histories at least once a week)	.00	1.00	.6355	.48130
LIBRARY (student uses school library at least once a week)	.00	1.00	.6915	.46186
LIKES READING (student disagrees with the statement “I only read if I have to”)	.00	1.00	.4838	.49974
HELP (student receives help from parents to do reading-relate homework)	.00	1.00	.3648	.48136
WATCHING TV (student watches TV 3 or more hours a day)	.00	1.00	.2880	.45283
DOES NOT READ (student declares not reading)	.00	1.00	.2535	.43504
COMPUTER1 (student uses computer at home every day)	.00	1.00	.2709	.44441
COMPUTER2 (student uses computer at home once a week)	.00	1.00	.3865	.48695
INTERNET (index of frequency in the use of internet)	-1.10715	2.41854	.0000000	1.00000000

Descriptive Statistics for school-level variables

	Minimum	Maximum	Mean	Std. Deviation
MEANSES (mean index of student SES)	-2.61119	1.86320	.0000000	1.00000000
RURAL (school located in a rural area)	.00	1.00	.5830	.49306
HCLASS (hours of schooling in a year)	-2.25781	4.18219	.0000000	1.00000000
SCHREAD (school emphasis in reading)	-1.64162	1.38555	.0000000	1.00000000
LIBRARY (school has a library)	.00	1.00	.7992	.40062
LESS 200 BOOKS (school library has less than 200 books)	.00	1.00	.4326	.49544
LACKTEACH (school's capacity to teach hindered by lack of qualified teachers)	.00	1.00	.4125	.49229
LACKICT (index of lack of technology resources for teaching)	-1.51195	2.35788	.0000000	1.00000000
LACKINFR (index of lack of infrastructure and teaching resources)	-1.75224	2.03768	.0000000	1.00000000
READING 1ST GRADE (index of reading ability of the evaluated students when they entered school)	-1.06484	1.85305	.0000000	1.00000000
COORD1 (teachers meet two or three times a week to work on pedagogical issues)	.00	1.00	.1317	.33821
COORD2 (teachers meet once a week to work on pedagogical issues)	.00	1.00	.3668	.48192
TIMEPED (% of school principal's time dedicated to pedagogical or instructional issues)	-1.34999	5.81003	.0000000	1.00000000
FAMILIES(50% or more parents participate in meetings with teachers)	.00	1.00	.6079	.48823
CLIMATE (school climate: students desire to do well, students regard for welfare, parent support, respect for school property, teachers expectations and satisfaction)	-2.45290	4.03866	.0000000	1.00000000
CLIDIS (school disciplinary climate: drug abuse, theft, vandalism, physical conflicts…)	-1.14093	2.29984	.0000000	1.00000000