Impact of home factors on students' reading achievements

Aistė ELIJIO (VU)

e-mail: aistuciuke@hotmail.com

Abstract. On the basis of PIRLS 2001 data, we consider the impact of factors characterizing the home situation of students to their reading literacy achievements. The data was analyzed for three groups of countries: Eastern Europe, "Northern", and English-speaking countries. Parents' education, home educational resources, and early home literacy activities have a similar influence in all these groups of countries, while the financial well-being of the family and the type of location of a school have rather different influences in the groups.

Keywords: reading literacy achievements, home situation, complex sample design.

Introduction

PIRLS (Progress in International Reading Literacy Study) is an international study of the students' reading achievements and the factors that contribute to those achievements. The survey population is 9-10 year old students from 35 countries. In Lithuania pupils were only from schools with Lithuanian as the language of instruction. Students' reading comprehension achievements were measured using the variety of test booklets. The IRT (Item Response Theory) scaling methodology was then used to generate student scores for analysis and reporting. The PIRLS scale score average across countries was set to 500 and the standard deviation to 100. Data on the possible factors was collected using Students, Parents (Home), Teachers, and School questionnaires.

In this article, students' achievements are analysed in the light of some factors that relate to their home situation: parents' education, home educational resources, early home literacy activities, financial well-being of the family, and school location.

The countries analysed in this article can be grouped into the following three categories:

1. Eastern Europe countries: Lithuania, Latvia, Czech Republic, Slovakia, Slovenia, Hungary, Moldova, Macedonia, Romania, and Russia.
2. English-speaking countries: England, Scotland, New Zealand, Canada.
3. "Northern" countries: Sweden, Norway, Iceland.

Impact of complex sample design for analysis

The survey used complex sample design that included stratification, SYS PPS sample of schools, and then selection of one or two classes from the selected schools, with all students from selected classes participating. In this analysis, the complex design is

taken into account by using sampling weights that allow obtaining unbiased estimates of such parameters as means and proportions.

Initial weights for each student (students within the same classroom have the same sampling weights) are calculated using the formula: $W_i = \frac{1}{p_i} \cdot \frac{n}{n_p} \cdot \frac{C_i}{c_i} \cdot \frac{k_i}{k_{pi}}$, where p_i denotes the school selection probability, $n-$ total sample size of schools, n_p- total number of schools that participated, C_i- number of classes in the school, c_i- number of classes selected, k_i- number of selected students in class, $k_{pi}-$ number of students that participated, respectively.

The sum of these weights within a sample provides an estimate of the size of the population. However, when doing cross-country analyses, these weights would not treat countries of different size equally and would give inflated results in significance tests. Therefore, transformation of weights is done using the following formula: $w_i = W_i \cdot \frac{M}{\sum W_i}$, where M denotes student sample size.

The transformation of the weights is different within each country, but in the end the sum of the new weights w_i over all schools within each country adds up to the sample size of that country. As the weight variable w_i is proportional to the original weights W_i, the same population estimates for means and proportions are obtained.

Both sorts of the sampling weights are used in the international analysis (more detailed explanation is available in [2], weights referred to as TOTWGT and HOUWGT respectively).

All calculations were done using SPSS statistical package with the data weighted by the transformed weight variable w_i.

Parents' education

The parents' education variable was aggregated into the following three categories: lower than secondary (includes those who have not attended school, had primary or
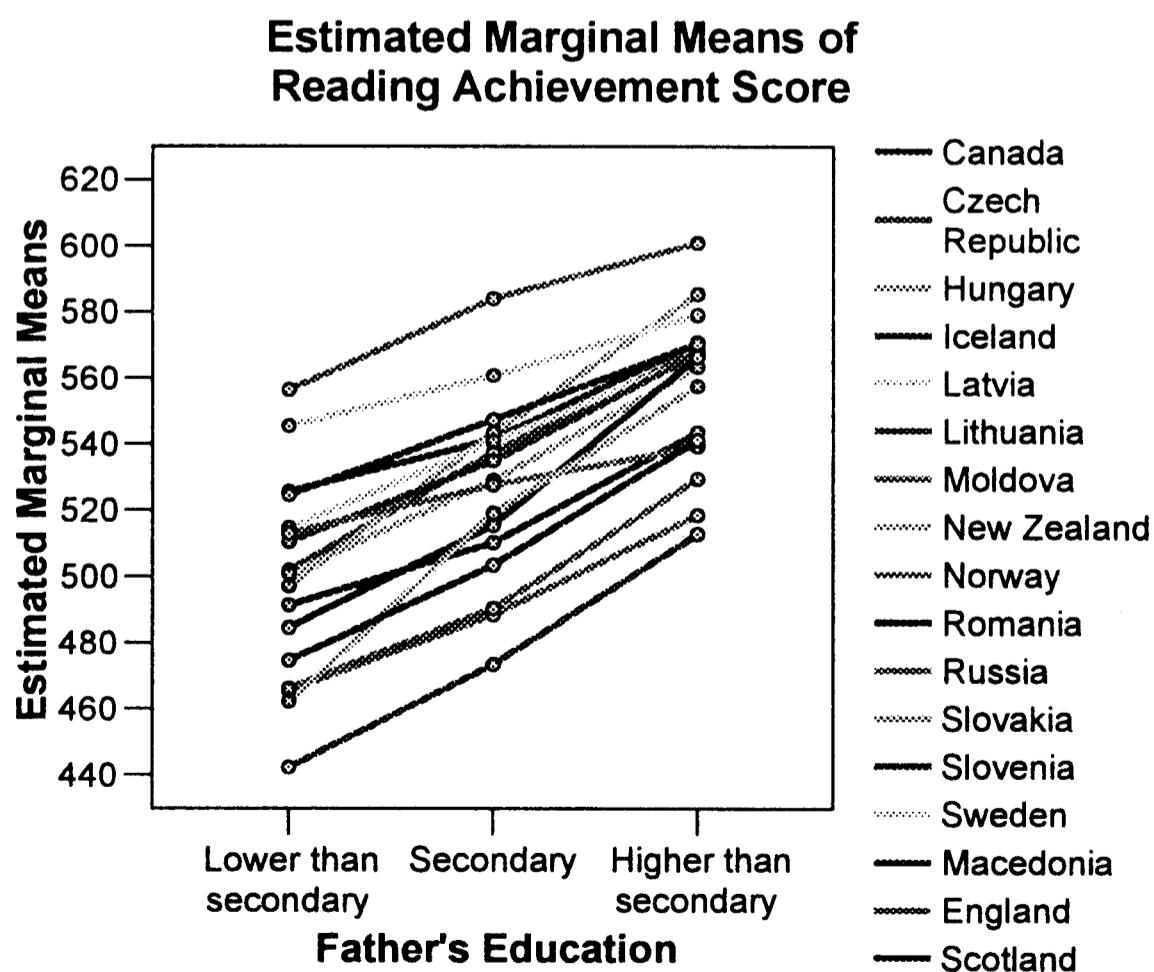

Fig. 1. Relationship between father's education and student's reading achievements.

Table 1. Estimated marginal means of reading achievement score

Countries	Number of books at home				
	0-10 Books	11-25 Books	26-100 Books	101-200 Books	> 200 books
Canada	519	530	548	559	575
Czech Republic	489	506	526	546	565
Hungary	483	495	531	542	572
Iceland	487	479	498	517	533
Latvia	516	528	535	551	563
Lithuania	498	520	546	559	571
Moldova	462	485	508	539	542
New Zealand	484	509	528	548	568
Norway	443	462	481	497	524
Romania	482	494	519	546	564
Russia	511	511	527	542	549
Slovakia	465	488	518	539	543
Slovenia	465	482	505	516	534
Sweden	512	526	554	562	580
Macedonia	409	429	478	494	490
England	533	539	557	582	602
Scotland	505	519	535	557	579

basic education); secondary (general or vocational) and higher than secondary (college or university).

χ^2 criterion in all countries shows a statistically significant relationship between the education of parents and students reading achievements (χ^2 from 43 to 667, $p = 0.000$ in all cases).

In both father's and mother's cases one can see a virtually linear trend: the higher the education, the higher the average achievement of students.

The difference in average achievements between categories is about 30 scale points.

Home educational resources

The strongest relationship was seen between the amount of books at home and students' reading achievements. χ^2 in all countries shows a statistically significant relationship between the number of books at home and reading achievements: χ^2 is between 137 and 678, $p = 0.000$ in all cases. In almost all countries there is a linear trend. The differences (at least between some further categories) are statistically significant.

Early home literacy activities (EHLA)

Survey investigated how frequently prior to child entering primary school, someone at home engaged with him/her in the following activities: reading books, telling stories, playing with alphabet toys, playing word games, or reading aloud signs and labels. The index of responses is calculated, and correlation with the students reading achievement

scores is studied. Then the index is aggregated into three categories (high, medium and low), χ^2 is analysed and ANOVA used.

The coefficient of Pearson correlation between the EHLA index and students reading achievement score is approximately 0.2 (in various countries from 0.117 to 0.283), correlation is statistically significant ($p < 0.01$).

χ^2 in all countries shows a statistically significant relationship between the aggregated EHLA index and reading achievement score: in Scotland $\chi^2 = 18.6$, $p = 0.017$, in other countries, χ^2 is between 42 and 192, $p = 0.000$.

ANOVA shows statistically significant differences ($p < 0.05$) between the reading achievements of students with high and low EHLA indices in all countries. In many countries there are also statistically significant differences between the intermediate categories (except Canada, Latvia, Hungary, Russia, and Scotland).

Financial well-being of the family

Financial well-being of the family is seen as a factor that could impact students' achievements. However, it is a challenging question to clarify. In most of the countries the question about the actual income of the family was not administered. Parents were only asked how well-off did the family feel in relation to other families. The analysis was done on the basis of that financial self-conception. Parents had to indicate whether they regard their financial well-being compared to other families to be very well-off, somewhat well-off, average, not very well-off, or not at all well-off. The responses were aggregated into the following three categories: higher than average, average, and lower than average.

In all countries except Russia χ^2 criterion shows a statistically significant relation between the relative financial well-being and students' reading achievements ($p < 0.01$). In Russia, the results showed no difference between the average achievements of students from relatively different well-off families.

ANOVA shows a similar tendency in most countries: the richer parents feel, the better average reading achievement of the children.

Moreover, the difference between the students from the average and lower than average financial families was larger than the one between the higher than average and average well-off families. However, there were several exceptions: Macedonia, Moldova, and Lithuania.

It is worthwhile to compare the responses to the question itself which reveal some trends how parents from different countries view their financial well-being.

Parents from the English speaking countries were most hesitant to answer this question. A large proportion of them did not answer it. Most of the remaining answers are in the "average" category, then "higher than average", and, finally, "lower than average".

Equal numbers of parents from the "Northern" countries answered that they were average well-off and higher than average. Only a small percentage of them indicated being "lower than average" or did not answer the question.

The Eastern Europe countries, however, show different tendency. The absolute majority of the parents answered that they were "average" or "less than average" well-off. Only a very small percentage said that they were "better than average" well-off.
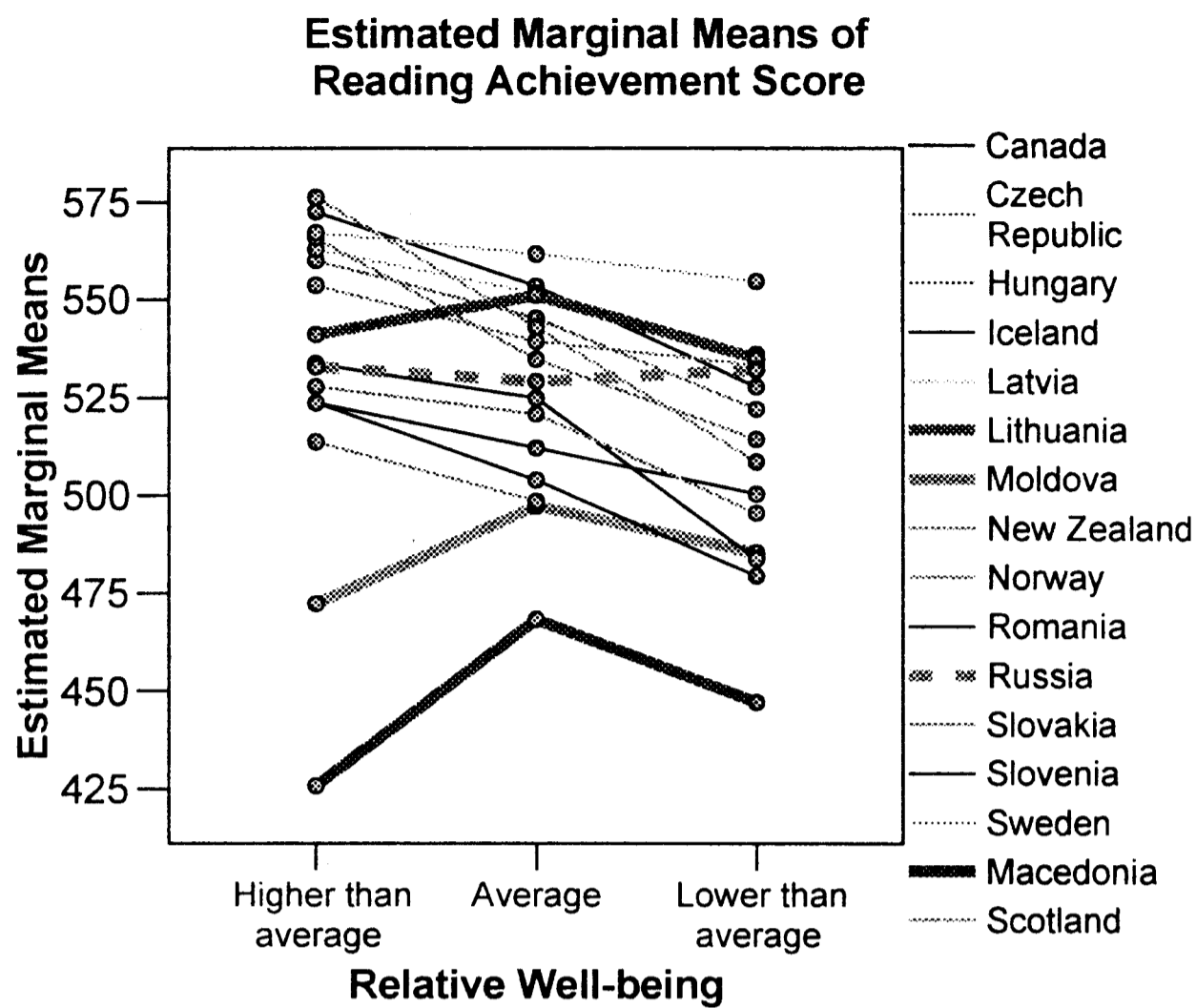
Estimated Marginal Means of Reading Achievement Score

Fig. 2. Relationship between relative well-being ot the family and student's reading achievements.

Lithuania, Russia, and Moldova have the lowest percentage of the families that regard themselves "better than average".

School locality

Although the school locality variable is not directly related to the home factors, however, it was assumed that it also indirectly indicates the locality of students' home as well as possibly related social factors. The analysis showed clear and strong differences between the tendencies in different blocks of countries:

1. In Eastern Europe countries (except Czech Republic and Slovenia), the average reading achievement of students from city/town schools are higher than the average reading achievement of students from the country-side; the difference is statistically significant.
2. In "Northern" countries, there is no statistically significant difference between the average achievements of students from city/town and village schools.
3. In English speaking countries, the average reading achievement of students from village schools are statistically significantly higher than the ones from city/town schools.

It was thought that in the Eastern Europe countries (including Lithuania), the social situation of children in villages might be very different from the one in cities/towns. For example, maybe number of books, parents' education, early home literacy activities, or financial well-being of the family are different there, and those factors influence students' achievements more than the school location itself. However, multiple ANOVA showed that school location behaves as an independent variable. Other analysed factors behave in similar way in both cities/towns and villages, but in villages the achievements are lower by about 30 scale points.

References

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REZIUMĖ

A. Elijio. Namų aplinkos įtaka mokinių skaitymo gebėjimams

Straipsnyje, remiantis tarptautinio skaitymo gebėjimų tyrimo PIRLS 2001 duomenimis, nagrinėjama įvairių faktorių, apibūdinančių moksleivių namų aplinką, įtaka jų skaitymo pasiekimams. Rezultatai stebimi trijose šalių grupėse: Rytų Europos, „Šiaurės" ir anglosaksiškose. Nors tėvų išsilavinimo, edukacinių resursų ir ankstyvosios skaitymo veiklos namuose faktoriai panašiai veikia visose nagrinėtose šalių grupėse, finansinio šeimos gerbūvio ir vietovės, kurioje yra mokykla, veiksniai veikia skirtingai.