

SOCIAL CAPITAL AND EDUCATIONAL ACHIEVEMENT: THE PISA 2000 RESULTS*

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Abstract

The paper applies the PISA 2000 survey data in order to investigate the influence of social capital on educational outcomes. The empirical analysis follows Coleman's theory on the role of social capital in determining pupils' assessment in the school. The paper has three aims: it develops a model where social capital measures serve as predictor variables in order to explain students' reading abilities; it investigates the cross-national variation in the impact of social capital on educational achievement; it discusses the measurement problems for social capital in the PISA 2000 data. The analysis confirms most of the hypotheses derived from the social capital theory and the previous studies. It also reveals more insight into the causal relations between some elements of social capital like family educational support or teacher support and students' performance. Comparative analysis displays national differences in particular for the post-socialist and non-European countries. The effect of social capital on learning outcomes may be even underestimated because relevant aspects and components of social capital were not measured in the PISA survey.

Key-words: education, school achievement, social stratification, social mobility, international comparison, social capital, measurement

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Introduction

The usual research question for investigating educational inequalities refers to the impact of social background on the highest level of education, the choice of various school types, or the probabilities of educational transitions. The PISA 2000 survey, however, offers the possibility for a different dependent variable, namely cognitive educational performance, which reflects to students' abilities as well as the efficiency of accumulated knowledge. Grading students is part of education, but its most frequent form, the school-grades are far from being the best and most objective measures of knowledge – especially in comparative sense. It is well known that *same* school-grades can cover *different* competencies in various schools. Evaluation of the students is relative, the teacher's decision on grading pupils' achievement is affected by the school as a whole, the concrete class community, the previous performance of the given pupil, or some other considerations. This is why alternate test methods have been developed in order to compare the actual knowledge and competence of the students. Accordingly, degrees and diplomas, odds of school progression indicate educational achievement on the one hand, and successful accomplishing of different tasks and students' various actual competencies reflect the effectiveness of education, on the other hand. The Programme for International Student Assessment (PISA) (OECD 2001) aims to investigate the latter type of educational outcomes.

The PISA study was initiated by the OECD; about 265,000 15 years old students were investigated in 32 countries in order to test their abilities with respect to their performance in reading, math and scientific literacy. Researchers were not interested in replication of any 'lexicological' knowledge; instead they wanted to learn about students' analytical and problem solving competences and about their capabilities to make use of learning skills under everyday circumstances. The first PISA survey put a larger emphasis on reading skills and focused on students' ability to retrieve information from written texts by understanding, using and reflecting on them. In the fields of math and science, the tests were less detailed and contained fewer items but recognition of problems and solving them was crucial in these respects, too. The performance of the 15 years old students was measured on continuous scales. The whole approach strongly differs from investigating the extent to which students have

mastered the school curriculum and are able to replicate it. On the ground of the PISA survey, OECD aimed to reveal the level of students' capacity to continue learning as well as their ability to use knowledge in real life. Accordingly, the PISA survey measures the relationship between educational inputs and learning outcomes in international comparison for tapping students' preparedness for life and for future employment ("skills for life").¹

This analysis aims to benefit from the PISA data in order to provide cross-national evidence on how *social capital* can affect students' educational performance. First, we provide a brief overview on the social capital literature with respect to the main theoretical points, the applied measures and the related findings. Second, we present the relevant part of the PISA, which can be applied for the purpose of the paper. Third, we do the empirical analysis and present the results. Fourth, we draw conclusions with respect to the empirical findings as well as to the measurement of social capital in the PISA survey.

The conceptual background

For most of the research done in the field of educational inequalities, the conclusion is that educational attainment is strongly related to social origin of the students.² Various accumulated capitals play significant role in this process, including cultural, financial and social capital (Bourdieu 1985). For the latter one, we are interested in this paper, Portes (1998) provides an accurate definition by stating that social capital inheres in the structure of relationships. "To possess social capital, a person must be related to others, and it is those others, not himself, who are the actual source of his or her advantage" (Portes 1998:7).

Social capital is an extremely broad concept and we do not intend to incorporate it as a whole into this research. Here social capital emerges in the context of educational achievement and we restrict ourselves to this problem. Accordingly two fields are especially relevant for this paper:

¹ For the theoretical framework of student assessment, see OECD (1999a).

² Examples for such studies about the persistence of this inequality in international comparison are e.g. Shavit, Blossfeld (1993) or Eriksson, Jonsson (1996).

1. Parent-child relations in the family

In this respect the theory says that children can benefit from the accumulated cultural, economic, etc. assets of their parents only if the parents invest into the human capital of their children. Putting this as a phrase: *social capital creates human capital* (Coleman 1988).

2. Teacher/school-pupil and parent-school relations in education

The main assumption here is that teachers' behavior and school climate have an impact of pupils' educational performance (Coleman et al. 1982. Putnam 2000: Ch.17). In addition, the connection between the school and the parents creates human capital, too, in consequence of the stronger interpersonal relations in parental communities around the school as it was demonstrated for the private and in particular for the Catholic schools (Coleman et al. 1982. Coleman, Hoffer 1987).

Previous measures and findings in the context of social capital

There is a large bunch of empirical studies, connected mainly to Coleman, which aimed to test empirically these theories and assumptions summarized above. At the level of the family, various elements of parental care taking are emphasized in the literature: parental expectations about their child's school performance (1); frequency of speaking about school, education between parent and child (2); parental control of the child's homework (3); participation in extra courses (4); time spent alone at home by the child when no parent is around (5); time spent by watching TV (6). After operationalizing these components of social capital and examining empirically the impact of the variables, findings can be summarized that the first four measures increased and the last two decreased the educational performance (Schneider, Coleman 1993. McNeal 1999. Putnam 2000: Ch.17).

Whether the child lives in an intact or in a broken family is a fact related to having more or less social capital. Empirical research revealed that pupils' educational performance is worse in broken families (Astone, McLanahan 1991. McLanahan, Sandefur 1994. Sandefur, Wells 1999). It also matters whether the mother stays at home or works and in the latter case if she works full time or part time. In this respect,

pupils' educational performance seems to be the highest if mother works part time (Muller 1995). Finally number of siblings and composition of siblings represent a further measure for social capital. It seems, that large number of siblings decreases educational performance, while the oldest or youngest children as well as the 'only' boys or 'only' girls achieve better in the school (Blau, Duncan 1967).

With respect to the relationship between the school and the parents, the involvement of parents in school-related decisions is important for social capital. Connected to this it matters whether parents of children who attend the same school know each other or not. Empirical studies revealed the both facts increased the effectiveness of the school and students performed better (Coleman et al. 1982. Carbonaro 1998. Morgan, Sorensen 1999). As a further indication of better social community around the school, researchers investigated whether parents know the friends of their child and the parents of the friends of their child. This knowledge turned out to increase educational performance (Coleman 1961. Carbonaro 1998. Morgan, Sorensen 1999).

Another interesting theoretical and empirical question relates to the frequency when parents contact the school in the interest of their child who studies there. Conceptually it is not fully clear what we measure here. Contacting the school, visiting the teacher can be a sign of taking care of the educational performance of the child. On the other hand, parents go to school more frequently if there are learning problems with their child. Indeed, findings are contradictory in this respect; some research indicated that higher frequency increased educational performance (Schneider, Coleman 1993), other research showed that it decreased students' achievement (McNeal 1999).³

Whether teachers pay more or less attention to students' work in the school characterizes the student-teacher relationship and measures also social capital. Research shows that teacher's more attention in the classroom increases the educational performance. At the same time, if comparing the impact of the school climate and to that of the family climate, the latter one has stronger influence on the educational performance than the prior one (Parcel, Dufur 2001).

³ In the latter case, we can probably speak about a reversed causality, when weak educational performance of the child leads to the fact that the parent and the teacher see each other more frequently.

The general view on educational inequalities assumes that possessing various capitals (including social capital) in the family increases the success in the school exactly as higher parental social status does. This would imply that possessing cultural, financial or social capital correlates with the status characteristics of the parent positively. However, research on the effectiveness of social capital for families with high or low status revealed that social capital was, in fact, more effective in families with less financial capital (Teachman, Paasch, Carver 1997).

Measuring social capital in the PISA 2000 survey

In addition to measuring students' reading, mathematical and science 'literacy', the PISA survey contained a student questionnaire. Queries in this questionnaire covered the standard demographics of the students, information on their family background and their parents' socio-economic status as well as student's perception and attitudes about several items, which can be related to social capital in accordance with the theory and the previous studies. We provide a list of these topics we will use as independent variables in the empirical section of the paper.

1. Parental involvement into the child's education

Students were asked to report on how often parents discussed political or social issues with them; discussed books, films or television programs with them; and listened to classical music with them. These three items were summarized in the *cultural communication* or *parental academic interest* index.⁴ Another three questions referred to the frequency of discussing how well the student was doing at school; of eating the main meal with the respondent around a table; and of spending time just talking to him/her. These items were summarized in the *social communication* or *parental social interest* index. Students also informed the researchers about how often their mother, father or brother / sister worked with them on their schoolwork. From these three items the *family educational support* index was constructed.

⁴ In the PISA database the index scores come from standardised Warm estimates (maximum likelihood estimates), where positive values indicate higher, negative values denote lower frequency of the given activities, occasions, events. For details see the PISA 2000 Technical Report (OECD 2002) and Warm (1985).

2. Teacher's / school's attention on pupils' education

A next section of the student questionnaire was devoted into the evaluation of teaching and learning climate. Six items asked about how often the teacher showed an interest in every student's learning (1); gave students an opportunity to express opinions (2); helped students with their work (3); continued teaching until the students understand (4); did a lot to help students (5); and helped students with their learning (6). Index of *teacher support* is based on the estimates from these items. A further set of questions asked whether the teacher wanted students to work hard; told students that they could do better; did not like it when students delivered careless work; told that students had to learn a lot. Index of *achievement press* was constructed from these items. Finally, an agreement-disagreement scale was used to see how students feel about the relationship between them and the teachers. Students evaluated whether they got along well with most teachers; most teachers were interested in students' well being; most of the teachers really listened to what students had to say; if they need extra help, they would receive it from their teachers; most of the teachers treated them fairly. From these five items the index of *teacher-student relations* was prepared.

3. Family background

Out of the standard demographics, the following information on family background is relevant for our study. Parents' level of education refers to their potential in human / cultural capital what they can invest into the development of their child.⁵ We also control for parental occupation.⁶ The fact whether the mother is working or not working is a social capital indicator. Structure of family (intact family vs. single parent family) also measures social capital. Number of siblings reflects to social (partially financial) capital.

⁵ Education is measured in the PISA survey by the ISCED scale (OECD 1999b).

⁶ The PISA database contains variables indicating the ISEI scores (Ganzeboom et al. 1992) of the occupation for father and mother. The variable named HISEI is the score for the father or mother depending on which one has the higher value.

In sum, we have a quite good set of independent variables for investigating the impact of social capital on educational outcomes in the PISA 2000 survey. However, two shortcomings of the data should be mentioned already at this point. First, some relevant fields of social capital are not covered, especially the relationship between parents and the school. More generally speaking we have no information on social community around the school, we miss data on the frequency parents and teachers communicate with each other or whether parents know other parents, know the friends of their child, etc. Consequently our results on the influence of social capital on educational performance will be somewhat underestimated. Second, it is important to keep in mind that all information we have on social capital, family background or educational climate comes from the student questionnaire, i.e. everything is based on students' knowledge, perception and evaluation. From the viewpoint of measurement reliability in the PISA 2000 data, it is a problem that the survey did not contain a teacher questionnaire or a parental questionnaire.

Educational achievement and social capital: The empirical analysis

In the empirical section of the paper, first we describe the design of the analysis and then we present the empirical results from the statistical tests. The PISA 2000 data offers the possibility of three dependent variables (reading, math and scientific 'literacy') but the present research is restricted to the reading test, which was the focus of the PISA 2000 survey and was measured in a more elaborated manner. Basically, we use two sets of independent variables: social capital in the family (parental academic interest, parental cultural interest and family educational support) and social capital in the school (indices of teacher support, achievement press and teacher-student relations).⁷

⁷ Reliability measures for these six indices are available from the PISA 2000 Technical Report (OECD 2002): CULTCOM ($\alpha=0.55$), SOCCOM ($\alpha=0.58$), FAMEDSUP (0.66), TEACHSUP ($\alpha=0.87$), ACHPRESS ($\alpha=0.54$), STUDREL (0.79). As far as the statistical relationship among these indices, their correlation matrix shows stronger connection between CULTCOM and SOCCOM (0.42), FAMEDSUP has the highest correlation with SOCCOM (0.29), TEACHSUP correlates the strongest with STUDREL (0.46) and ACHPRESS has the highest correlation with TEACHSUP (0.17). Principal Axis Factoring (PAF) with VARIMAX rotation produced the 2 factors for the expected two sets of measures of social capital in the family and in the school.

In order to provide controls for the effect of social capital we include demographic variables (gender and age) as well as those socio-economic characteristics of the family mentioned above. Part of these variables serves only control purposes but part of them is meaningful for the social capital concept.

We are interested in the bivariate relationships with reading performance as well as in the outcomes of multivariate analysis. For the latter goal, we apply OLS regression where the independent variables are introduced in three steps. The first model contains all variables on students' demographic characteristics as well as on the socio-economic background of the family. In the second step we add the measures on social capital in the family and the social capital in the school variables come in the third step. This design shows how much social capital adds to the model when demographics and characteristics of the family background are kept constant. The statistical analysis is performed on the pooled data first and then we turn to investigating the cross-national variation.

Findings on general level

Results from the statistical analysis on the pooled PISA 2000 data-file are displayed in Table1. The first column informs about the bivariate relationships between reading performance and the independent variables. Out of the social capital in the family measures parental academic interest (cultural communication) seems to be the most important, while out of the social capital in the school measures it is the teacher-student relationship. Correlations for the social capital in the family are higher than those for the social capital in the school. The connection between social capital and educational performance is expected to be positive (and this occurs in most case), but it is noteworthy the negative relation for family educational support and the achievement pressure. As an explanation for the first, the family support index may be a better indication of learning problems for the student who needs then support than a clue of parental investment into the offspring's human capital. Achievement pressure does not seem to improve educational performance and this is in line with the liberal theory on learning activities.

However, the 'hard-core' variables of the family background (parent's occupation, father's and mother's education) seem to correlate with the reading test results

stronger than the social capital measures and these correlations are also positive. Females and older students perform better, too. But (higher) number of siblings and living in a single parent family correlate with the reading abilities negatively. Finally, it looks that a working mother is more helpful for the child than a mother who stays at home.

Table 1.
The effect of social capital on educational achievement (reading test scores)
(N=72750)

Independent variables	Correlation coefficients	Unstandardized regression estimates		
		Model 1	Model 2	Model 3
Parental academic interest	0.185		13.60	13.32
Parental social interest	0.067		1.06	0.98
Family educational support	-0.093		-15.92	-16.33
Teacher support	0.027			(0.40)
Achievement pressure	-0.059			-5.47
Teacher-student relation	0.069			6.22
Gender (Female)	0.153	32.51	31.85	31.10
Age (in months)	0.061	1.52	1.26	1.22
Parent's occupation (HISEI)	0.306	1.26	1.17	1.17
Father's education (ISCED)	0.249	5.78	5.79	5.73
Mother's education (ISCED)	0.262	8.13	7.91	8.01
Number of siblings	-0.121	-6.23	-5.59	-5.56
Mother works full time	0.049	(-0.08)	(1.06)	(1.48)
Mother works part time	0.055	11.35	12.01	11.95
Single parent family	-0.030	-7.71	-11.20	-10.38
Constant		92.5	146.4	153.2
<i>Explained variance (adj. R²)</i>		<i>0.154</i>	<i>0.187</i>	<i>0.194</i>

Source: PISA 2000 database, own calculations

Note: Not significant estimates at $p < 0.05$ level are in parentheses

Turning to the multivariate analysis, Model 1 displays the estimates for the demographic and socio-economic variables. This model explains more than 15 per cent of the variation of the reading test results. Results did not cause big surprise but few things are worth to underline, especially those, which reflect to the role of the mother. She seems to be more responsible for educational performance because the mother's education is a stronger predictor than the father's one⁸ and the best is for the child if the mother works part time. Working full time does not differ significantly

⁸ We present here unstandardized estimates where the size of the coefficients cannot be compared but the metric of the education variables is identical, the ISCED scale. The difference between the mother and the father is not so high in the light of correlations but father's education seems to 'lose' more in the multivariate perspective.

from the case if the mother stays at home – as controlled for the other variables in the model (e.g. mother's education). The model also confirms that living in a single parent (mostly 'mother-run') family and having more siblings decrease educational achievement.

Model 2 and Model 3 add the variables representing social capital in the family and in the school, respectively. After these steps Model 2 increases the explanatory power by a bit more than 3 percent and Model 3 only by a bit less than 1 percent. Altogether these six social capital indices improve the model by 4 percent and we are able to explain the variation of the reading test outcomes by nearly 20 percent in the end. Cultural communication in the family turns out to be a strong positive predictor of educational achievement, social communication based on more general socializing in the family matters less. Educational support at home is a strong negative predictor, i.e. the multivariate analysis confirms the bivariate result. For social capital in the school teacher-student relation has a positive, achievement pressure has a negative impact, while teacher support is not significant. According to the results the home environment matters more than the school environment.

The cross-national variation of the findings

We are obviously interested in the cross-national variation of the results presented above. For the purpose of comparison we arranged the PISA countries into six groups, mainly on geographical ground, but partly taking into account the political history. First we summarize our results with a focus on the explanatory power of social capital. Table 2 displays the extent and the increase of which we are able to explain the total variance of the reading test results in the different countries. This is expressed in percentage based on the adjusted R^2 values from each step of the regression analysis.

For the *Anglo-Saxon* countries, our model explains more in Australia and the UK and less in Ireland. In Australia and the US already the demographics and family background have quite large explanatory power. The social capital indices in the family and in the school improve the model in the UK at most.

Table 2.
The effect of social capital on educational achievement (reading test scores)
(country results for explanatory power)

Countries	N	Explained variance (<i>and its increase</i>)*		
		Model 1	Model 2	Model 3
<i>Anglo-Saxon type</i>				
USA	1413	17.2	21.6(+4.6)	23.1(+1.5)
Australia	2410	17.7	23.3(+5.6)	24.1(+0.8)
New Zealand	1404	16.8	19.5(+2.7)	20.8(+1.3)
United Kingdom	3936	15.0	22.5(+7.5)	24.4(+1.9)
Ireland	1859	12.2	16.4(+4.2)	18.1(+1.7)
<i>Northern Europe</i>				
Finland	2199	15.4	19.8(+4.4)	22.3(+2.5)
Norway	1862	11.2	16.2(+5.0)	19.9(+3.7)
Sweden	2075	13.1	20.0(+6.9)	21.9(+1.9)
Denmark	1828	15.6	21.4(+5.8)	22.7(+1.3)
<i>Western Europe</i>				
Austria	1872	13.6	20.1(+6.5)	20.4(+0.3)
Germany	1916	20.5	25.8(+5.3)	26.9(+1.1)
France	1940	15.9	22.1(+6.2)	22.3(+0.2)
Belgium	2769	17.9	22.2(+4.3)	22.2(+0.0)
Netherlands	1159	15.0	20.4(+5.4)	21.9(+1.5)
Switzerland	2634	17.2	19.8(+2.6)	21.7(+1.9)
<i>Southern Europe</i>				
Italy	2102	15.0	18.2(+3.2)	18.8(+0.6)
Greece	2059	15.5	18.6(+3.1)	19.0(+0.4)
Portugal	1945	20.6	27.3(+6.7)	27.4(+0.1)
Spain	2552	15.6	22.1(+6.5)	22.3(+0.2)
<i>Post-socialist type</i>				
Czech Republic	2486	18.8	24.4(+5.6)	24.8(+0.4)
Poland	1299	14.5	20.7(+6.2)	20.9(+0.2)
Hungary	2163	23.7	27.5(+3.8)	27.9(+0.4)
Latvia	1575	10.9	13.8(+2.9)	14.9(+1.1)
Russia	2532	11.7	14.9(+3.2)	16.1(+1.2)
<i>Out of Europe</i>				
Brazil	2019	17.3	21.0(+3.7)	22.3(+1.3)
Korea	2238	9.2	13.3(+4.1)	14.7(+1.4)
Mexico	1994	20.8	24.3(+3.5)	24.5(+0.2)

* Adjusted R-Square in percentage; increase to the previous model in brackets with cursive.

Note:

Independent variables in Model 1: gender, age, parent's occupation, education, number of siblings, working mother, single parent family

Independent variables in Model 2: Model 1 + parent's academic interest, parent's social interest, family educational support

Independent variables in Model 3: Model 2 + teacher support, achievement pressure, teacher-student relationship

Source: PISA 2000 database, own calculations

The *Scandinavian* countries do not show much difference. Demographics and background explain a bit less in Norway, social capital in the family matters more in Sweden, while social capital in the school counts more also in Norway.

There is more variation for the countries in *Western Europe*. Two neighboring lands Austria and Germany are the extremes. Demographics and social background make the least difference in Austria and the most difference in Germany. Social capital in the family counts especially in Austria and France, while social capital in the school is effective in the Netherlands and Switzerland at most.

In *Southern Europe* Portugal is an outlier with a high explanatory power of the demographics and the family background characteristics. Social capital in the family matters also in Portugal as well as in Spain. But social capital in the school does not add to the story in these countries.

The *post-socialist* societies also differ quite a lot. One of the extremes is Hungary, where we get the highest explanatory power for Model 1 out of all nations. In the post-Soviet countries, Latvia and Russia, however, demographics and family background explain less. Social capital in the family counts in Poland at most followed by the Czech Republic. Social capital in the school does not seem to be important in the post-socialist context either. It plays perhaps a small role in Latvia and Russia.

Out of the three *non-European* countries, Korea is the outlier where demographics and family background explain the least. In Brazil and especially in Mexico reading abilities is much more dependent on the variables in Model 1. But in Mexico social capital in the school is not relevant. Social capital in the family matters in Korea at most.

In the next step, we investigate the actual estimates from the regression analysis. Tables 3a-c display the unstandardized coefficients from the final model which contains all independent variables.

Starting with the social capital in the family, parental academic interest is a significant positive predictor of reading proficiency in every country but one. Cultural communication counts especially in some Scandinavian societies like Sweden or Denmark and also in Spain but the estimates are quite low in Belgium and in some

post-socialist countries like Russia or Hungary. In Korea this predictor is not significant.⁹

Parental social interest seems to play much less role, it is not significant in several countries. But in Korea, this is the strong predictor of the reading test scores. Social communication matters more also in Portugal.

Family educational support has significant negative impact on the reading test scores in every society. This effect is especially strong in Poland or France and also in Czech Republic, Austria and Germany. In Korea or Switzerland, however, this family activity decreases the reading test outcomes to less extent.

Teacher support and teacher-student relation are elements of social capital in the school and at least one the two variables is significant in most of the countries – the few exceptions are Belgium, Portugal and Mexico. In the case if teacher support is statistically significant, its impact is frequently negative, like in Ireland, Germany, the Netherlands, Italy, Czech Republic or – especially – in Switzerland. The interpretation of the negative sign can be the same we have applied for the family educational support: those students need more help who are weaker in educational achievement. However, there are contradictory examples as well, teacher support increases students' reading performance in Norway and in most of the post-socialist countries, in Hungary, Poland, Russia and, chiefly, in Latvia.

Teacher-student relation affects positively students' achievement first of all in the Anglo-Saxon and the Scandinavian countries, in particular in the UK, Ireland and Norway. Apart from the more moderate positive influence at many places, this relationship, however, has a negative effect in two countries: Hungary and Brazil.

Achievement pressure, the third element of the social capital in the school affects negatively in most nations, this occurs mainly in New Zealand, Sweden, the Netherlands, perhaps the school climate is more liberal in these countries. However, there are two countries, Brazil and Korea where achievement pressure increases students' educational performance. It also happens that the negative effect is not significant, e.g. in some post-socialist countries (Hungary, Poland) or in Southern Europe (Italy, Spain).

⁹ We present here unstandardized coefficients but with the same metric in all country models, thus we can compare the size of the estimates 'horizontally', row-wise in the tables.

Table 3a.
The effect of social capital on educational achievement (reading test scores)
(country results for regression estimates: unstandardized coefficients)

Independent variables	USA	AUS	NZ	UK	IRE	FIN	NOR	SWE	DEN
Parental academic interest	15.7	20.0	13.6	21.8	15.0	17.5	20.8	23.0	23.4
Parental social interest	3.4	5.1	(2.5)	7.0	4.4	(1.0)	(0.5)	-4.7	(1.2)
Family educational support	-15.4	-17.0	-17.9	-20.7	-16.9	-19.3	-18.1	-20.7	-13.6
Teacher support	(-3.0)	(2.8)	(1.9)	(-1.3)	-5.1	(-0.3)	7.0	(2.8)	(2.6)
Achievement pressure	-5.7	-7.4	-12.9	-7.4	(-3.1)	-9.1	-9.5	-10.7	(-2.1)
Teacher-student relation	12.8	6.5	8.3	14.3	14.6	13.6	14.1	7.2	10.4
Gender (Female)	24.0	32.4	37.7	25.5	27.7	51.8	36.6	31.1	26.7
Age (in months)	(1.3)	2.9	2.2	1.7	1.7	1.0	1.3	1.1	1.7
Parent's occupation (HISEI)	1.2	1.1	1.1	1.4	1.4	0.7	1.1	1.3	0.7
Father's education (ISCED)	8.7	9.4	(1.7)	2.3	(1.3)	3.0	(2.9)	(0.4)	9.6
Mother's education (ISCED)	8.6	4.6	9.4	4.6	3.3	4.4	(2.2)	(0.7)	10.6
Number of siblings	-7.6	-5.6	-11.4	-4.2	-2.7	-3.0	-9.4	-4.6	(-1.8)
Mother works full time	(-8.1)	(-7.7)	(-5.2)	(4.6)	(-4.7)	(2.4)	(0.6)	18.5	(-4.6)
Mother works part time	16.9	(4.0)	(7.1)	10.3	(2.0)	(-2.7)	(1.9)	11.5	(4.1)
Single parent family	-28.5	(-4.7)	-23.3	-21.3	-14.4	-18.4	-17.8	-17.0	(-8.7)
Constant	134.2	-131.3	36.9	105.3	121.9	276.7	189.8	221.3	56.6

Source: PISA 2000 database, own calculations

Note: Not significant estimates at $p < 0.05$ level are in parentheses

Table 3b.
The effect of social capital on educational achievement (reading test scores)
(country results for regression estimates unstandardized coefficients)

Independent variables	A	GER	FRA	BEL	NL	SWI	ITA	GR	SP
Parental academic interest	19.1	16.8	15.2	9.6	11.3	15.3	12.1	12.6	23.7
Parental social interest	5.0	(-0.9)	7.3	4.5	8.4	(-0.1)	(2.1)	(1.9)	(0.2)
Family educational support	-20.6	-20.5	-21.8	-21.7	-14.6	-9.5	-15.4	-15.4	-14.7
Teacher support	(-0.4)	-8.6	(-3.5)	(-2.6)	-6.0	-12.8	-7.6	(1.2)	(-1.0)
Achievement pressure	(-3.1)	-7.4	-4.0	(-0.0)	-10.3	-6.0	(-2.7)	4.7	(-0.7)
Teacher-student relation	3.9	(3.7)	(1.6)	(1.2)	6.8	9.4	(-1.9)	4.2	5.5
Gender (Female)	32.0	39.6	26.7	30.1	20.9	25.4	28.3	40.2	25.2
Age (in months)	2.3	(0.8)	1.6	1.3	(1.2)	1.3	1.2	1.5	1.8
Parent's occupation (HISEI)	1.2	1.2	1.2	1.5	1.1	1.2	0.9	0.9	0.7
Father's education (ISCED)	4.1	11.6	3.0	(0.4)	4.4	4.4	6.7	4.8	5.2
Mother's education (ISCED)	8.4	13.0	4.9	10.5	(3.0)	10.4	4.5	5.5	6.5
Number of siblings	(-1.4)	(-2.9)	-4.0	-10.3	(-0.5)	-6.9	-13.3	-6.4	-7.2
Mother works full time	(-2.0)	(-8.9)	11.4	(6.4)	(-1.1)	-11.6	(5.3)	(0.4)	-10.0
Mother works part time	(7.6)	(5.3)	(9.1)	14.0	18.3	9.2	(5.2)	(-8.2)	-17.8
Single parent family	(-9.0)	(-3.9)	-24.3	-13.2	-22.4	(-6.6)	-11.8	(-9.6)	(-5.9)
Constant	-40.7	179.6	111.9	152.5	225.5	135.7	167.5	91.7	92.1

Source: PISA 2000 database, own calculations

Note: Not significant estimates at $p < 0.05$ level are in parentheses

Table 3c.
The effect of social capital on educational achievement (reading test scores)
(country results for regression estimates unstandardized coefficients)

Independent variables	POR	CZR	POL	HUN	LV	RUS	BRA	KOR	MEX
Parental academic interest	19.4	17.6	12.1	10.0	12.5	8.1	11.7	(0.4)	14.6
Parental social interest	11.5	5.2	(3.8)	5.9	(-2.7)	6.9	4.1	12.8	3.9
Family educational support	-15.1	-20.3	-24.8	-18.5	-17.0	-13.7	-12.2	-4.6	-14.0
Teacher support	(0.6)	-4.9	6.9	3.6	12.9	7.6	(3.9)	(0.3)	(-3.0)
Achievement pressure	-3.9	-2.9	(-0.7)	(-2.4)	(3.0)	-9.4	8.5	7.6	-3.8
Teacher-student relation	(-1.4)	6.3	(-1.8)	-7.4	(1.7)	(-1.0)	-4.6	4.7	(3.4)
Gender (Female)	19.3	30.7	33.4	34.0	41.3	26.1	14.4	14.3	18.6
Age (in months)	1.0	(0.4)	(0.8)	(-0.2)	(0.4)	(0.4)	(0.2)	(0.6)	(0.8)
Parent's occupation (HISEI)	1.6	1.0	0.9	0.7	0.7	1.1	0.7	0.4	0.8
Father's education (ISCED)	(-0.1)	17.5	15.0	18.7	5.5	5.8	6.2	5.6	2.8
Mother's education (ISCED)	(1.7)	8.3	11.8	16.1	8.0	5.3	7.0	4.2	7.6
Number of siblings	-11.1	(-2.8)	-4.3	-5.1	-6.6	-4.3	-7.5	-3.5	-9.0
Mother works full time	(3.6)	21.7	(4.7)	12.0	13.8	(2.3)	(0.2)	-8.4	-17.6
Mother works part time	-17.1	(13.7)	(7.3)	(-1.4)	(-1.6)	-16.6	-15.1	(6.0)	-10.1
Single parent family	(-0.6)	(-4.3)	(-5.8)	(-7.3)	(-3.7)	(5.8)	(-4.6)	(-6.0)	(-1.2)
Constant	215.7	226.0	168.8	314.3	257.9	270.8	295.9	357.8	245.2

Source: PISA 2000 database, own calculations

Note: Not significant estimates at $p < 0.05$ level are in parentheses

The demographic variables indicate that girls perform better than boys. This is more marked in some Scandinavian nations, especially in Finland but also in Norway, in some post-socialist countries like Latvia, Hungary, Poland, and furthermore in Greece, Germany and New Zealand, too. The same gender difference appears to less extent in the societies out of Europe (Brazil, Korea and Mexico) as well as in Portugal or the Netherlands. Older age improves reading performance in most of the Anglo-Saxon and Scandinavian countries, also in Western and Southern Europe but not in the post-socialist schools and in the nations out of Europe.

Parental status characteristics are significant positive predictors in most of the countries. Higher level of parental occupation improves the reading test results everywhere, while parental education is not significant in some Scandinavian nations (Sweden, Norway) and in Portugal. Father's education is not significant in New Zealand, Ireland and Belgium. But both father's and mother's education are strong predictors of the children's educational achievement in the post-socialist Hungary, Poland and Czech Republic as well as in Germany.

Out of the final group of independent variables on family background, higher number of siblings has a negative effect on the reading test outcomes, in particular in some nations in Southern Europe (Italy, Portugal) but also in New Zealand, Belgium, Norway or Mexico. In few countries this predictor is not significant like in Denmark, Austria, Germany, the Netherlands or the Czech Republic.

We had two measures for mother's labor force participation. None of them turned out to be significant in several Anglo-Saxon (Australia, New-Zealand, Ireland) or Scandinavian (Finland, Norway, Denmark) countries. The same holds for Austria and Germany as well as for two Southern European nations (Italy, Greece). The rest of the countries differ for the role of mother's labor force participation. It increases the child's educational achievement in the US, UK, Belgium or the Netherlands, if the mother works part-time; and also in France, if the mother works full-time. Switzerland is an interesting case, where a full-time working mother decreases, a part-time working mother increases the child's educational performance. In Sweden a working mother helps, disregarding the contract. In some Southern European nations (Spain, Portugal) and in Brazil, Korea or Mexico mother's labor force participation has a negative impact on the reading test results.

Finally, living in a single parent family is a disadvantage at many places, like in most of the Anglo-Saxon countries (especially in the US). This variable has a strong negative effect in France and Belgium as well, and in some Scandinavian nations like Finland, Norway or Sweden. The estimate, however, is not significant in the Southern European nations (except in Italy), in the post-socialist societies and in the countries out of Europe.

Conclusion and discussion

In this last section, we intend to discuss the results of this analysis in three steps. First we discuss the empirical findings of the statistical models on the pooled data-file in the light of the social capital theory. Second we try to interpret the country variations. Finally we summarize the lessons for the measurement of social capital in the PISA 2000 survey.

Lessons from the viewpoint of social capital theory

Cultural and social communication is important part of parent-child relations in the family. The PISA 2000 data proves that more communication and involvement increases educational achievement in line with the theory on parental investment into their children's human capital (Coleman 1988). At the same time, the stronger influence of cultural communication leaves open the possibility to interpret our results in the light of the cultural reproduction theory as well (Bourdieu 1973), namely that students coming from families with higher level of cultural capital achieve better in the school. Nevertheless the dependent variable of this analysis from the PISA data is not based on the teacher's evaluation. Thus, one cannot say simply that teachers appreciate students higher because they realize their higher level of cultural capital they have accumulated at home. The process is more complex in the case of the PISA data.

In the light of the theory, educational support, learning with the child could be a typical example that parents invest their time into the child's human capital. However, we have evidence that this investment does not increase educational performance. In fact, parents have to be engaged in child's learning activity if he/she has problems with learning. Thus, we interpreted this result as a consequence of a reversed causality, when learning problems forced more involvement and this led to the negative effect, we could observe in the statistical models.

Teacher-student relationship and teacher support in the school are important elements in social capital theory. In this case, the theory assumes that better relationship in the class increases educational performance. The theory is supported by the PISA data; our model proves the validity of this postulation. Teacher support, however, does not increase educational performance as expected (or it is insignificant), probably because the same reversed causality takes place as for educational support in the family.

Achievement pressure in the school is a special form of teacher-student relationship and teacher support. Theory is ambivalent in this respect. According to the concept of the '*Prussian school*' achievement pressure can increase educational attainment, while this is less the case for the liberal approach of learning. The PISA 2000 data

provides evidence on the negative effect of achievement pressure on educational performance.

The influence of parental education can be interpreted again in the light of the social capital and cultural capital theory. There is a strong statistical relationship between educational performance and father's as well as mother's education, and the associations persist even if controlled for parental occupation. In fact, we found that mothers play stronger role in this process as their level of schooling has larger influence on students' school achievement.

This makes even more important the role of working mother as being a special concept in the social capital theory as well. In principle one can argue that a working mother can accumulate more social relations, which can increase her social capital. But Coleman claims that a non-working mother is considered as someone investing into the human capital of the child and this is social capital, an important component in the parent-child relations. Our results suggest that both mechanisms are present. In accordance with other empirical findings in this respect cited before, the pooled analysis of the PISA 2000 data indicates that educational performance is the highest if mother works part-time.

Non-intact family is expected to be a disadvantage for the child. Educational performance is lower in a single parent families due to lack of social capital, among others, in comparison to nuclear families where both parents are present and can be involved in the improvement of child's educational achievement. Lower level of financial capital can also be mentioned. We have evidence here that living in a single parent family decreases educational performance according to the PISA 2000 data as well.

We had one more measure for family background and this was the number of siblings. This variable can be interpreted in the light of either the financial or the social capital but a negative impact on educational achievement is expected anyway. On the one hand, higher number of children puts higher financial burden to the family, on the other hand, parents can invest into the child's human capital relatively less if they

have more children. Evidence is, as assumed, that the higher number of siblings decreases educational performance.

Lessons for the country variation

Understanding cross-national variation of the results from this analysis is a complex task. We discuss here the outcomes by the country groups with a focus on the deviation from the model on the pooled dataset. For the *Anglo-Saxon* countries, social capital in the family is in accordance with the main pattern we found: positive effects for parental academic and social interest, negative effect for educational support. The same holds for the social capital in the school: better teacher-student relation increases educational achievement, teacher support is not significant, achievement pressure affects negatively. (Ireland deviates in this respect.) There is no particular diversity for parental characteristics either. We have a clear pattern for mother's participation in the labor force; if she works full-time, this does not differ significantly from the case if she does not work at all, but the child benefits at most if the mother works part-time. Higher number of siblings and living in a single parent family decrease students' educational achievement.

For the *Scandinavian* countries, social capital in the family and in the school indicates basically the same pattern again we described. The deviation from this pattern is that social communication is not significant in most cases. For two countries out of the four (Norway, Sweden), parental education is insignificant indicating that inequalities of social origin do not influence educational outcomes. Another deviation appears for mother's labor force participation. Most probably, this is an impact of the Scandinavian welfare state but estimates are not significant in three nations, while a working mother increases the child's educational achievement in Sweden under any circumstances. Regarding the number of siblings and the family structure, only Denmark deviates from the usual pattern with its insignificant estimates. Otherwise, living in a single parent family or having a larger number of siblings is a disadvantage in the Scandinavian societies as well.

The group of nations in *Western Europe* is quite varied. The pattern for the social capital in the family does not differ much from the general one but teacher support in

the school is negative in three countries (Germany, the Netherlands and Switzerland), and furthermore the negative effect of achievement pressure is not present in two other nations (Austria, Belgium). Teacher-student relation does not count in Germany, France and Belgium. (In fact, social capital in the school seems to play no role in Belgium at all.) For the parental characteristics, the large effect of parental education in Germany is worth to mention. The most heterogeneous picture we get for mother's labor force participation. The pattern with the insignificant estimates in Austria and Germany is close to the Scandinavian results. In France a mother working full time seems to be the best solution for the child, on the contrary to Switzerland where a full time working mother affects negatively but a part time working mother affects positively the educational outcomes of the children. Some welfare state influence is present in Austria and Germany, where the estimates are insignificant for the number of siblings and single parenthood. But we get the usual pattern with negative effects in France and Belgium.

The insignificant estimates for social communication are the special feature of the social capital in the family in *Southern Europe* (except in Portugal). Otherwise countries in this group are not much alike. Regarding social capital in the school, teacher-student relation does not count in Italy and in Portugal. In one country (Greece) the usual negative effect of achievement pressure is positive. Portugal is an outlier with the insignificant parental education effects, too. It is interesting how much the estimates differ for mother's labor force participation. In Italy and Greece, we get insignificant estimates, while a working mother harms the child in Spain under any conditions. But some familiarity is probably present in these countries in the sense that the negative impact for single parenthood does not appear (except in Italy). But higher number of siblings produces the common negative influence.

The *post-socialist* countries also have some special deviations from the general picture. This holds much less in the case of the social capital in the family but much more for the social capital in the school. First of all, the pattern for the climate in the classroom is surprising (except in the Czech Republic). The expected positive influence for the teacher-student relations does not appear in Poland, Latvia and Russia, where the estimates are not significant, and this impact is even negative in Hungary. At the same time teacher support has a positive influence on educational

outcomes in four countries, while achievement pressure is insignificant in Poland, Hungary and Latvia. Schools may not be much liberal in these countries out of five. Achievement pressure is insignificant in Poland, Hungary and Latvia. For the parental education, we have particularly high effects in Poland, Hungary and partly in the Czech Republic. The influence of mother's labor force participation is also specific. In the former socialist countries part-time work is scarce; it is not an indication of investment into the child's human capital, so this does not improve the child's educational achievement, the estimates are insignificant or even negative (in Russia). In the societies of the dual breadwinner families, a full time working mother improves the child's school performance – though this effect is not significant in Poland and Russia. The negative effect of having a higher number of siblings is present but single parenthood does not decrease educational achievement.

Finally, the *non-European* nations have one special feature for achievement pressure as it increases students' reading test results in Brazil and Korea. These societies may be more traditional because students perform worse if the mother works and does not stay at home. We can observe the negative effect of having a higher number of siblings but single parenthood does not decrease educational achievement in these countries either.

Lessons for measuring social capital

When investigating the influence of social capital on educational achievement, we recognized some measurement problems, which might influence the reliability of the our results based on the PISA 2000 data. First, some social capital measures were missing from the data. The PISA survey did not contain any measure on parental expectations toward education, parent-school relationship, students' relations in the peer group or relationship between parents and student's friends' parents. All this information would have been crucial for a better measurement of social capital. Thus we believe that the impact of social capital is underestimated in this study.

On the average, the total variation in the reading test results could be explained by nearly 20 percent and this is a moderate product. In a cross-national perspective, we have got upper extremes like 27-28 percent in Germany, Portugal or Hungary and lower extremes like 14-16 percent in Latvia and Russia. Despite of this large variation

for some post-socialist countries, the cross-national deviations are not very high in this regard. In fact, in Hungary and Germany the large proportion of explained variance is due to the strong effects of parental education.

We have one more concern for the reliability of the PISA data. All information on family social capital comes from students, parents were not asked. For getting more reliable measurement on social capital in the family, both parents and children should have been interviewed.¹⁰ Furthermore, all information on social capital in school comes again from students, teachers were not asked. For getting more reliable measurement on social capital in the school, both teachers and children should have been interviewed. Apparently, students' answers for individual items may be less reliable but more subjective, more accidental. Applying aggregate measures, as recommended by the OECD (the standardized Warm estimates in the dataset) helps to reduce this problem. This was the reason that we used these scales in the analysis. Still we have to be aware that the indices can have measurement problems. E.g. the social communication index was built from three items and only one of them was about the exact discussion of education, school and student's learning in the family. Moreover the Delta value was the smallest for this item when the index was constructed (OECD 2002:222). We cannot reject that the lower impact for social communication is a possible consequence of this problem.

Despite of these shortcomings, the PISA 2000 data turned out to be a very powerful instrument for studying the influence of social capital on educational outcomes in a comparative perspective and we believe that this analysis contributed to investigating the role social capital plays in determining educational achievement.

¹⁰ In fact, the PISA 2006 survey incorporated a teacher questionnaire but this questionnaire did not pick up those questions which were missing for the aims of this analysis. Not speaking about the large

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