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Educational Achievement

Péter Róbert

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Robert Schuman Centre for Advanced Studies

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The 2006-2007 European Forum, 'Assessing the Quality of Education and its Relationships with Inequality in European and Other Modern Societies', was directed by Prof. Jaap Dronkers, a sociologist in the Social and Political Sciences Department at the EUI, and a leading expert on cross-country comparative social research.

The aim of that European Forum was to explore the use of the PISA data-sets, but also other relevant cross-national data-sets, to provide answers to scientific and policy questions on education and its relationships to various forms of inequality in European societies (including economic, legal and historical dimensions).

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Abstract

The paper investigates the impact of homogeneous vs. heterogeneous grouping of students with respect to their social origin on the differences in educational achievement. There are two competing hypotheses in this respect: heterogeneous grouping increases students' educational outcomes, or homogeneous grouping is the proper solution for improving students' achievement. Further hypotheses refer to the conventional beliefs that a.) students with underprivileged parental background benefit from being in heterogeneous schools, or b.) students with privileged parental background perform worse in integrated schools. The paper uses the PISA 2003 data for investigating the consequences of these various possibilities in structural settings.

Social background is measured by parental socio-economic status and education. In addition to the main effects of social origin, contextual school level variables are used to investigate the impact of educational segregation. These indicators involve the general level of the school regarding the social and cultural status of the parents. Interaction terms are used to reveal the relationship between students' parental characteristics and school characteristics regarding level of segregation.

Hypotheses about the generally negative impact of school segregation on students' achievement found some support, while the assumptions on the specific benefits of the underprivileged students or on the specific disadvantages of the privileged students are less supported.

Introduction

Investigating the determinants of pupils' educational achievement is an increasingly important issue in educational research. School performance is widely considered as a relevant forecaster of future trainability and employability. This holds especially for those measures of achievement that are based on various external tests developed by experts instead of school marks given by pupils' own teachers. The PISA studies organized by the OECD represent a recent example of this kind of research. PISA aims to report on the school performance of 15-year-old pupils in different dimensions like reading, math or science 'literacy' in cross-nationally comparative way. It has strongly declared policy goals by providing information on students' achievement, in fact monitoring the outcomes of the educational system since PISA is a replicated research; and by generating nationwide discussions on the results that can lead to governmental actions. The most important lessons national governmental officials, policy makers, experts in educational research but also teachers, parents and students in each participating country can learn from the PISA results refer to the place of their own school system in the rank order of the countries regarding different field of skills as well as the various correlates of students' achievement in the different countries.

While the mirror shown by the rank order of the nations with respect to their own place is a crucial descriptive information about the efficiency and functional activity of the school system in a given country, the determinants of the school outcomes, factors associated with pupils' measured knowledge and skills can, in fact, open the room for the national policy debates on how to change and improve the situation in the educational system. These factors form basically the complex *environment* of the learning activities. The broad set of conditions involves measures for circumstances and background information both for the home- and for the school environment. Pupils' family background characterized e.g. by the level of parental education or by their labour force participation shows a large variety in every nation from the most disadvantaged to the most advantaged settings. At the same time, boys' and girls' cognitive abilities with a similarly large diversity vary relatively independently from their own social background and family circumstances. This is why schools have a functional role to counterbalance the possible home disadvantages of 'talented' pupils with good cognitive abilities. Consequently, in addition to the home environment, the school environment is considered crucial for students' achievement. Research in the fields of education, social stratification, status attainment proves clearly that the school systems of the modern societies vary a lot by the success and efficiency how they are able to meet this requirement of compensating the social and cultural difficulties pupils can have in the school in comparison to other pupils who bring a larger stock of knowledge, skills, social and cultural competencies from their own home environment. Lessons from these studies reveal the most significant shortcomings of the educational system where policy actions are needed for making the schools to work better in line with their functional roles.

It would be a naive belief to think that home environment and school environment develop independently. On the contrary, in most societies families *'contribute'* to creating and influencing the school environment to some extent. This contribution can be put on an active – inactive or direct – indirect 'scale'. Parents from high status families can actively influence educational environment in a school in a direct manner, e.g. by taking part in decisions in the school board, using their special skills or network potential to helping to the school in fund raising, in preparing applications or influencing administrative decisions that have an impact on teaching circumstances in the school. High status families also affect school environment in a more indirect way by simply making decisions on choosing or not choosing a school, by sending or not sending their offspring to a given school. The influence of the low status families on educational environment is more 'passive' and indirect by simply 'being there' in the school since these families have usually no appropriate information on the possible educational options, and no formal or informal connections for making a real school choice. This process results in the varying social *composition* of the schools and this outcome has a strong impact on the school atmosphere. Apparently social composition of schools frequently reflects to the

milieu at home when high status parents try to ensure for their offspring the same advantageous circumstances they enjoy in the family and try to keep away low status children from this environment as they do it in their everyday child raising practice as well. The phenomenon is known as school segregation and this is in the focus on the present analysis.

The chapter is organized as follows: first, the research objectives are outlined in more details by referring also to the theoretical background of the problem. Second, the research hypotheses are formulated. Measuring segregation and building models for investigating how segregation affects educational outcomes are shown thirdly. Then the results are presented and finally they are discussed in the light of policy consequences.

Research objective, conceptual background and policy relevance

The analysis investigates how higher or lower degree of school segregation, homogeneous vs. heterogeneous grouping of students contributes to the differences in educational achievement (while controlling for individual demographic and social background characteristics). The issue is many times labelled in the literature as integration vs. differentiation as well. In order to provide an adequate theoretical basis for the research, a broad sociological concept to be quoted here can be the work by Coleman on *social capital* where network ties, peer influences and investment into the child are the key notions. In this context there is a general assumption that peer relationships affect students' academic performance (Coleman, 1960; Coleman et al. 1966). If this assumption holds the social composition of schoolmates should matter for students' educational performance. Nevertheless, there is probably a difference between the public view and the policy maker's view on how this effect works in reality in the schools and what the consequences of this influence are for pupils' educational performance.

A typical public view can be that peers representing the same high level of the social and cultural milieu from home will stimulate each other in an atmosphere where skills, abilities, good educational performance are valued. And on the contrary, peers coming from families with lower level of social and cultural milieu will produce a school environment where skills, abilities, good educational performance are not valued so much and this will hinder even the performance of the talented pupils. This public view usually leads to support segregation in the school. There is a quite frequent opinion, especially among parents with a middle, upper-middle or even higher social standing that the integration of pupils with worse social background can decrease or even destroy educational climate and, consequently, school performance of students coming from better social circumstances will also turn to be weaker. Coleman (1988) states that parents have high responsibility for generating human capital for their offspring and they have to invest into their children for the purpose of increasing their human capital. A possible form of this investment can be if parents choose schools for their children where they think that the appropriate and stimulating educational environment is ensured by the suitable social composition of schoolmates as well. This behaviour is based, in fact, on the assumption of an existing peer influence with a particular direction leading to the fact that less segregated grouping of students is disadvantageous for the socially privileged children.[1]

On the other hand, the majority of educational policy recommendations argue that heterogeneous grouping of students, less education segregation is best suited for students. The claim is again that

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[1] It is important to note that expected higher academic performance of the school is just one reason which makes high status parents to prefer to choose schools where other children are alike from the viewpoint of social and cultural background. In fact, they expect the peer effects even more widespread and are afraid of any other 'bad' influence their offspring can learn from or experience with children with lower social standing. In fact, a recent study finds very limited peer effects on educational attainment on English data but concludes that parents can still keep on considering the peer composition of the school when choosing among options because of the other advantages of the peer group being not necessarily of cognitive character (Gibbons & Telhaj, 2006).

children's performance at school depends on their peers as well and it is assumed that higher levels of social segregation lead to greater inequality in academic achievement. This kind of policy argument is even stronger for pupils who come from more disadvantaged families with less favourable social background. These pupils are expected to benefit from a less segregated educational environment because their achievement can be better if they can study in a more heterogeneous environment where they can have peers who come from families with higher social status. At the same time, there is an alternative approach in educational policy and also among teachers claming that teaching can be more efficient with pupils grouped more homogeneously and students can also achieve better if they are more alike each other – especially regarding existing skills and capabilities. This latter assumption leads frequently to curriculum tracking and ability grouping of the students.

A review of the relevant literature of previous studies shows that the most frequent approach of studying integration vs. differentiation occurs perhaps by race or ethnic origin. In line with the assumptions above, Coleman et al. (1975) found a trend for an increasing racial segregation of black students when white families departed from schools where stronger integration took place due to some policy-driven measures. In fact, the intended process of integration turned to an unintended process of segregation because families with higher social standing simply followed the public view described above and 'voted' against integration in a practice: they moved to another school. In consequence the academic performance of black students, which used to be better in majority white schools, deteriorated – supporting the view of the policy makers on the usefulness of higher integration. Other studies on the same topic also confirmed the academic gains of African-American students in integrated schools (e.g. Entwisle & Alexander, 1992. 1994).

A similarly frequent and old issue in this type of research is the grouping of students on the ground of differentiation based on abilities and placing them in different schools or in different curricular tracks accordingly (e.g. Hauser & Featherman, 1976; Heyns, 1974; Kulik and Kulik, 1982; Oakes, 1985; Sorensen & Hallinan, 1986; Hallinan & Sorensen, 1987). Hallinan (1988) summarizes the findings that tracking and ability grouping have a negative effect on the achievement of lower track and ability group students and a weak to modest positive effect on the performance of higher track and ability group students. If this holds than policy makers are right that integration can be beneficial for students who ought to 'catch up', while other students who have some advantages benefit from segregation.

A more recent and relevant broad concept being suitable for investigating school segregation is the organizational approach of schools and communities (Arum, 2000). This approach puts large emphasis on aspects of the broader environment, e.g. the role of neighbourhood (which probably contributes to school segregation in accordance with the existing spatial segregation, especially when enrolment to education is based on school districts). In fact, the concept of schools as organizations has significant foregoing references (e.g. Bidwall, 1965. Meyer & Rowan, 1977) but communities around the school, differences in parental interaction with the school had strong contribution to the variance in academic performance for public and Catholic schools as well (Coleman & Hoffer, 1987). Institutional arrangements (Kerckhof, 1995) and legal regulations are also part of the environment being influential for school segregation and students' educational achievement. In a recent study Buchmann and Dalton (2002) demonstrated how peer effects are influenced by institutional context of the school system in different countries. They grouped 12 countries by type of educational system regarding stratification and tracking and found that students' educational aspirations are less influenced by their parents or peers in countries where stratification and tracking of the school system is stronger.

Indeed, countries differ a lot whether study programs or school composition are based on different kind of groupings of pupils resulting in more homogeneous or heterogeneous schools, and how educational policy handles school segregation,. Educational systems are usually characterized by higher or lower level of segregation depending – among others – on the role of tracking (e.g. academic vs. vocational tracks) in the school structure. On this ground, when investigating the extent of educational segregation Jenkins, Micklewright and Schnepf (2006) labeled Austria, Germany and Hungary as most segregated, while Finland, Norway, Sweden or Denmark as less segregated

educational systems. In addition to vocational specificity as main determinant of tracking, in a broader sense the whole welfare regime concept (and differences in the welfare regimes as formulated by Esping-Andersen, 1990. 1999) can have an impact on policy intentions to making schools to play a stronger or weaker institutional role in compensating the inequalities pupils have and bring from home when they enter the educational system. Most probably, the Scandinavian countries with their social democratic welfare regime are in special position in this regard as well, while e.g. the educational system in the Anglo-Saxon nations is more competitive under the conditions of a liberal welfare regime. This indicates that the national systems of education have strong policy responsibilities in line with the policy relevance of the issue (Postlethwaite, 1995).

Research hypotheses about the effect of segregation

Despite of the quoted studies above, this analysis does not aim to deal with segregation based on race, ethnicity or ability. Instead the study focuses on homogeneity vs. heterogeneity with respect to social background like parental education and occupation. This means that the present research follows an approach stating that if schools are socially segregated it means that students from more affluent families are concentrated and being separated from pupils from low status families who tend to concentrate in other schools.[2]

Along these lines, we can formulate a general hypothesis where we expect to find support to the major educational policy argument.

H1. Educational segregation decreases educational performance or, with other words, more heterogeneous grouping of students will increase their achievement.

In the next step we can go into more details, making distinction between pupils with better and worse social background characteristics. Here we can formulate two hypotheses.

H2. Students coming from less advantageous families benefit from heterogeneous grouping and lower segregation, their performance is higher in such educational environment with higher integration.

H3. Heterogeneous grouping of students is detrimental for the achievement of students coming from families with better social standing; low level of segregation, higher integration decreases their school performance.

In addition to these three main hypotheses we have some further expectations like social origin has a direct effect on school performance, students with more favourable family background achieve better, while less affluent pupils achieve worse; boys achieve better on math test, while girls achieve better on reading test; the average math and reading scores are higher in schools in larger settlements. The hypotheses are worth to test on different sub-groups of the countries in accordance with the expected variation in the country-specific characteristics of the institutional settings within the national systems of education. E.g. students' educational performance can be less affected by the higher integration in the Scandinavian countries where the educational system is probably more egalitarian anyway in accordance with the democratic welfare regime, but can be more affected in the Anglo-Saxon nations with a more liberal welfare regime. The Post-Communist countries have a school system where tracking plays a large role. On this ground, higher integration in schools can be assumed as having positive influence on educational outcomes. The Asian countries can perhaps be characterized by strong individual competition in the schools. This can lead to stronger peer effects as well.

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2   In fact, the PISA data used for the analysis would not make possible any other option either with respect to the available information. At the same time, in most societies ethnic or racial segregation is not independent from social segregation based on parental educational and occupational characteristics.

Research design: data, measures, and statistical models

Data

The analysis is based on the *PISA 2003 dataset*. The PISA survey has been carried out in most of the OECD + in some other countries among students aged 15 years old. Both the methods and the most important findings are well documented in various OECD publications (e.g. OECD 2004). A pooled file containing data from 41 countries are available from the Internet. Some countries have been left out from the analysis: France, Hong-Kong and Macao-China because of the missing school location; Brazil, Mexico, Tunesia and Uruguay because of the geographical location and the specificity of the national educational systems; and Lichtenstein because of the low N of cases. This means 33 countries with 215485 pupils based on the original sample size in each country. The data have been weighted by the student weight which is provided by the OECD and available in the original file. Since this weight makes up the original N of cases to the real number of students in each country, the data have been weighted back to the original sample size of the surveys in each country. In a next step, all variables to be used in the analysis were investigated from the viewpoint of missing cases. In order to avoid of losing these cases dummy variables were computed which indicate if no valid information is available for a given pupil on a given variable. By including these variables in the analysis, these cases remained in the data-set.

Variables

The *dependent* variables of the analysis are the 'so-called' plausible values for math and reading. The PISA 2003 dataset contains 5-5 of them; taking into account the measurement errors emerging from the math and reading tests, 2 * 5 plausible value variables are assigned to each respondent for math and reading. Students' real achievement is a kind of average of these values. Nevertheless, the plausible values correlate at a very high level; for math these correlations are around .920 and 921 and for reading they are a bit lower, around .851 - .853. When computing aggregate measures out of the plausible values, separately for math and reading[3], they also correlated at a very high level with the input variables: .967 - .968 for math and .938 - .939 for reading. Even so, OECD advices to run each analysis five times and to calculate the means both for the estimates and the standard errors. It is also advisable to run all analyses twice, separately for math and reading – though the aggregate measures for math and reading turned out to correlate at a level of .843. Thus students' performance in a 'real' and a 'human' field is quite close to each other – at least in terms of correlations.

The *independent* variables contain five groups of measures.

1. For demographics, we have gender where females are coded as 1; age as it was available in the PISA dataset; grade level compared to modal grade expressing the possible repetition; and family structure where single- and other forms of parenthood are contrasted to intact family as a reference.

2. The PISA-data contain a categorical variable on the location of the school; 4 dummies were computed for village, small town, city, and large city, while town is the reference category. The school-size variable informs on the number of the students in the school. These variables serve control purposes.

3. For parental social background we selected *two* measures. HISEI is a parental socio-economic index (Ganzeboom at al, 1992); PARED is the highest parental educational level measured in years. In this way the social and the cultural components of social origin are taken into account as direct and main effects influencing students' achievement.

4. Based on the same information on social background *four* measures were computed in order to characterize the school from the viewpoint of social and cultural climate. On the one hand, the *mean*

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3 Various ways of aggregating could be applied: simple arithmetic means, principal axis factoring, principal component analysis.

level of the parental socio-economic index and of the highest parental education has been computed and these means express how high or low the general level of the school is by these social and cultural parental indicators. On the other hand, the *standard deviation* for the parental socio-economic index and for the highest parental education has been computed. Both means and standard deviations are contextual variables and were computed on the school level within countries. The measures derived from an aggregation procedure were merged to each individual student.

In fact, these standard deviation variables serve as simple measures for segregation as they express homogeneity vs. heterogeneity. The higher is the standard deviation for the parental status or education, the larger is the heterogeneity in the school and the lower is the segregation with respect to the social and cultural conditions. And the smaller is the standard deviation for parental status or education, the larger is the homogeneity for the school and the stronger is the segregation in the social and cultural settings. In simple statistical terms, if we get a *positive* relationship between our predictors and the dependent variables (where higher value means better test scores and better performance), then *lower segregation increases achievement.* But if we get a *negative* relationship between our predictors and the dependent variables then *lower segregation and higher integration decreases achievement.* In this way we test Hypothesis 1.

5. The last group of the independent variables contains *interaction terms* between the two social background variables (parental socio-economic index and highest level of parental education) and the two segregation measures (standard deviations) derived from the aggregation procedure for occupation and education on the school level within countries. In fact, *four* interaction terms have been computed. For both continuous parental social background variables (HISEI and PARED) 2-2 dummies have been computed expressing that the pupil comes from a family which belongs to the highest or the lowest 25 percent regarding the socio-economic status or the level of education in the family. Consequently, the interaction terms model the following situations:

5.1. pupil from low status family in a school segregated at low level = lowest 25 percent of the socio-economic status (HISEI) * standard deviation of parental occupation (HISEI) in the school;

5.2. pupil from low culture family in a school segregated at low level = lowest 25 percent of the parental education (PARED) * standard deviation of parental education (PARED) in the school;

5.3. pupil from high status family in a school segregated at low level = highest 25 percent of the socio-economic status (HISEI) * standard deviation of parental occupation (HISEI) in the school;

5.4. pupil from high culture family in a school segregated at low level = highest 25 percent of the parental education (PARED) * standard deviation of parental education (PARED) in the school.

The interaction terms serve to model how school segregation affects educational attainment for those students coming from better or worse social background. In simple statistical terms, if we get a *positive* relationship between our predictors representing students coming from low status families (5.1., 5.2) and the dependent variables, it means that these *low status pupils benefit from lower educational segregation.* In this way we test Hypothesis 2. And if we get a *negative* relationship between our predictors representing students coming from high status families (5.3., 5.4) and the dependent variables, it means that these *high status pupils achieve worse under the conditions of lower educational segregation, in integrated schools.* In this way we test Hypothesis 3.

Models

In the whole analysis OLS regressions are applied where the math and reading are the dependent variables and they are predicted by the independent variables. The models are estimated for the full set of the selected countries (N=33) and also for five subsets of the countries: EU19, Scandinavian,

Anglo-Saxon, Post-communist and Asian nations.[4] The unstandardized regression estimates are presented in the tables if they are significant at least p<0.05 level. Fit of models is indicated by the adjusted R^2 values.

The model building is the following: Hypotheses 1-3 are tested independently in 6 models for the pooled file of the 33 countries, separately for students' reading and math performance:

1. model H1.A-B refers to Hypothesis 1; model A is the direct and uncontrolled effects of the two segregation measures (standard deviation of HISEI and PARED);

2. model B contains the same effects controlled for all other independent variables: the level of the school, the main effects of parental socio-economic background and education, gender, age, grade, school location and school size;

3. model H2.A-B refers to Hypothesis 2; model A is the direct and uncontrolled effects of the low status / culture students in the low segregated schools;

4. model B contains the same effects controlled for all other independent variables;

5. model H3.A-B refers to Hypothesis 3; model A is the direct and uncontrolled effects of the high status / culture students in the low segregated schools;

6. model B contains the same effects controlled for all other independent variables.

The same analysis is replicated for the 5 country sub-sets.[5]

Finally a full model including all independent variables is also estimated for the full set of countries as well as for all country groups.

Results

Before turning to the multivariate analysis of the educational achievement, it is worth to present an overview on the bivariate relationships between the main predictors (see Table 1A and 1B). The zero-order correlations indicate that integration by status (parental occupational score) *increases* but integration by cultural conditions (highest level of parental education) *decreases* students' performance in general.[6] This pattern holds for both reading and math and for most of the country groups. The Anglo-Saxon countries deviate where even integration by social status decreases achievement, while lower segregation increases students' performance in the Post-Communist nations. It also seems that low status / culture pupils do not benefit form integration (the correlation coefficients are negative). But the achievement of high status / culture pupils is not deteriorated either in the integrated schools (the correlation coefficients are positive). This pattern is fully consistent for all country groups. Thus, at first sight the hypotheses in this regard seem to be not supported by the data – if no controls are taken into account. At the same time both the level of the school as measured by the means of parental occupational score and the level of parental education, and the parental

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4 Country groups: EU-19: Austria, Belgium, Czech R., Denmark, Finland, Germany, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Poland, Portugal, Slovakia, Spain, Sweden, UK (N=110792); Scandinavian: Denmark, Finland, Iceland, Norway, Sweden (N=21366); Anglo-Saxon: Australia, Canada, New Zealand, UK, USA (N=57561), Post-communist: Czech R., Hungary, Latvia, Poland, Russia, Slovakia, Yugoslavia (N=37741), and Asian: Indonesia, Japan, Korea, Thailand (N=25925).

5 All models are controlled for the country dummies. Reference countries: Canada for the full set model, Italy for the EU-19 countries, Finland for the Scandinavian countries, Canada for the Anglo-Saxon countries, Slovakia for the Post-Communist countries, and Indonesia for the Asian countries.

6 It is important that this divergent pattern exists in the level of correlations, so this is not a consequence of any multicollinearity between these measures. In fact, the two segregation variables correlate only at .049 (see Table A1.)

characteristics of the students at individual level have positive impact on achievement as one can expect. (Further correlations between the independent variables are shown in the Appendix Table A1.)

Table 1A. Zero-order correlations between school segregation and educational achievement: Reading performance

Explanatory Variables	Full country set (33)	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-commu-nist (7)	Asian (4)
The effect of segregation						
- parental occupation (std)	.137	.213	.060	-.026	.114	.036
- parental education (std)	-.222	-.159	-.072	-.144	.030	-.436
Interactions terms						
Low status * low segregation	-.177	-.195	-.170	-.197	-.179	-.135
Low culture * low segregation	-.189	-.189	-.144	-.117	-.106	-.250
High status * low segregation	.232	.258	.198	.230	.244	.167
High culture * low segregation	.146	.152	.116	.156	.200	.107
The level of the school						
- parental occupation (mean)	.494	.456	.118	.330	.422	.654
- parental education (mean)	.429	.351	.060	.264	.396	.592
Parental main effects						
Occupation (Status)	.355	.326	.224	.285	.298	.418
Education (Culture)	.311	.249	.168	.212	.266	.377

Table 1B. Zero-order correlations between school segregation and educational achievement: Math performance

Explanatory Variables	Full country set (33)	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-commu-nist (7)	Asian (4)
The effect of segregation						
- parental occupation (std)	.122	.174	.045	-.034	.091	.015
- parental education (std)	-.270	-.203	-.066	-.133	.013	-.516
Interactions terms						
Low status * low segregation	-.179	-.197	-.190	-.206	-.194	-.143
Low culture * low segregation	-.205	-.198	-.154	-.118	-.154	-.253
High status * low segregation	.235	.260	.223	.244	.247	.159
High culture * low segregation	.158	.165	.134	.187	.247	.110
The level of the school						
- parental occupation (mean)	.518	.462	.121	.334	.444	.699
- parental education (mean)	.471	.383	.105	.290	.415	.640
Parental main effects						
Occupation (Status)	.375	.341	.251	.293	.316	.447
Education (Culture)	.342	.276	.189	.235	.303	.406

All correlations are significant at least at p < 0.05
Country groups:
Full country set: See text (N=215105)
EU-19: Austria, Belgium, Czech R., Denmark, Finland, Germany, Greece, Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Poland, Portugal, Slovakia, Spain, Sweden, UK (N=110792)
Scandinavian: Denmark, Finland, Iceland, Norway, Sweden (N=21366)
Anglo-Saxon: Australia, Canada, New Zealand, UK, USA (N=57561)
Post-communist: Czech R., Hungary, Latvia, Poland, Russia, Slovakia, Yugoslavia (N=37741)
Asian: Indonesia, Japan, Korea, Thailand (N=25925)

Testing Hypothesis 1.

We assumed that heterogeneous grouping of students will increase their educational achievement. In Table 2A and B, the H1.A models show that – in line with the correlations – integration by status increases but integration by culture decreases educational performance in reading and math, (controlled for country variation). When further control variables are added to the model (H1.B + the 'full model') the positive influence of status integration turns to insignificant (for reading) and even to negative for math. It seems that the expectation of policy makers that the lower level of segregation has a general favourable outcome for students' educational achievement does not hold.

Separate analysis by the country groups adds some variation to this result (Tables 3.1.A – 3.2.B). The policy related hypothesis 1 is stronger supported in the Post-Communist countries for reading and to some extent for math, too, but it fails completely in the Anglo-Saxon and Asian countries – when controlled for the other independent variables.

Testing Hypothesis 2.

When students with poor social and cultural background can study in an integrated school environment, their educational performance is expected to be better. The negative estimates from the H2A models in Table 2A and 2B do not confirm this policy assumption. The result persists even if various forms of the model are fitted to the data including the other predictor variables as well (H2B models + the 'full model'). In this respect there is not much country variation either (Tables 4.1.A – 4.2.B). Only those pupils coming from families where parents belong to the lowest quadrate culturally can benefit from studying under less segregated and more integrated school environment – if they live in the Anglo-Saxon countries.

Testing Hypothesis 3.

A typical concern for families with better social standing is that their offspring will perform worse in the school if they study under integrated conditions where schoolmates come from less advantageous social background. This assumption is not supported by this analysis either. The interaction terms expressing that pupils coming from families where parents belong to the lowest quadrate either socially or culturally study in less segregated but more integrated schools turn out to be positive – even if controlled for only the country dummies (H3A models in Table 2A and 2B) or controlled for any other independent variables (H3B models in Table 2A and 2B + the 'full model'). Nevertheless in case of reading and in the European Union countries – when the control variables are introduced – there is more probability that these pupils perform worse – given that the school is culturally integrated. In fact, the same result appears for the sub-set of the Scandinavian countries as well both for reading and math. At the same time high status / culture students in integrated schools seem to be in any danger to the least degree in the Anglo-Saxon countries (Tables 5.1.A – 5.2.B).

**Table 2A. The effect of school segregation on educational achievement:
Reading performance, full set of countries (33), N=215105**

Explanatory variables*	Model H1.A.	Model H1.B.	Model H2.A.	Model H2.B.	Model H3.A.	Model H3.B.	Full model
The effect of segregation							
- parental occupation (std)	5.092	(-0.101)					(0.043)
- parental education (std)	-21.898	-3.710					-2.799
Interactions terms 1.							
Low status * low segregation			-2.182	-0.480			-0.553
Low culture * low segregation			-9.237	-1.448			-0.816
Interactions terms 2.							
High status * low segregation					3.019	-0.092	0.194
High culture * low segregation					4.505	-1.374	-0.487
The level of the school							
- parental occupation (mean)		2.979		2.968		2.960	2.993
- parental education (mean)		4.264		5.240		5.072	4.302
Parental main effects							
Occupation (Status)		0.655		0.522		0.699	0.443
Education (Culture)		1.184		0.691		1.524	1.017
Missing occupation		-35.352		-36.769		-35.296	-36.308
Missing education		-36.887		-37.269		-37.269	-37.747
Demographics							
Sex = female		29.976		30.014		29.933	29.984
Age		-6.830		-6.793		-6.756	-6.809
Grade		34.690		34.717		34.662	34.616
Family							
- single		-11.315		-11.366		-11.931	-11.295
- mixed		-6.909		-6.998		-7.058	-6.924
- other		-26.732		-28.816		-26.726	-26.763
- missing		-22.973		-21.537		-21.459	-22.538
School							
Location							
- village		9.075		9.725		9.619	9.261
- small town		6.457		6.747		6.666	6.494
- city		-2.096		-2.287		-2.202	-2.056
- big city		-4.708		-4.905		-4.931	-4.602
School size		0.005		0.005		0.005	0.005
Missing school size		-5.345		-5.419		-5.467	-5.286
Constant	506.692	370.028	544.856	364.430	513.751	344.061	381.178
Adjusted R^2	.209	,419	.208	.419	.216	.418	.419

Significance = p < 0.05, not significant estimates in brackets

* Controlled but not shown by country dummies, reference is Canada

Note: Models H1A-B refers to hypothesis 1, H2A-B to hypothesis 2, H3A-B to hypothesis 3.

Table 2B. The effect of school segregation on educational achievement:
Math performance, full set of countries (33), N=215105

Explanatory variables*	Model H1.A.	Model H1.B.	Model H2.A.	Model H2.B.	Model H3.A.	Model H3.B.	Full model
The effect of segregation							
- parental occupation (std)	4.838	-0.244					-.156
- parental education (std)	-22.356	-2.395					-2.584
Interactions terms 1.							
Low status * low segregation			-2.286	-0.374			-0.516
Low culture * low segregation			-9.898	-0.493			(-0.293)
Interactions terms 2.							
High status * low segregation					3.114	(0.078)	0.368
High culture * low segregation					6.060	(0.013)	0.721
The level of the school							
- parental occupation (mean)		3.073		3.057		3.049	3.084
- parental education (mean)		5.468		6.181		6.134	5.519
Parental main effects							
Occupation (Status)		0.673		0.568		0.648	0.403
Education (Culture)		1.189		1.022		1.183	0.896
Missing occupation		-29.152		-29.984		-28.333	-29.494
Missing education		-30.071		-29.680		-29.324	-29.616
Demographics							
Sex = female		-14.526		-14.514		-14.542	-14.482
Age		-6.053		-6.016		-6.021	-6.092
Grade		37.075		37.078		37.098	37.104
Family							
- single		-12.631		-12.692		-12.737	-12.625
- mixed		-8.941		-9.081		-9.018	-8.873
- other		-27.051		-27.140		-27.136	-27.115
- missing		-24.611		-23.184		-23.144	-24.547
School							
Location							
- village		10.705		11.264		11.175	10.791
- small town		7.349		7.559		7.525	7.395
- city		-2.902		-3.004		-2.976	-2.922
- big city		-6.171		-6.314		-6.366	-6.160
School size		0.006		0.006		0.006	0.006
Missing school size		-3.443		-3.514		-3.567	-3.430
Constant	516.483	361.613	550.859	352.345	517.196	344.994	378.150
Adjusted R^2	.242	,424	.247	.424	.258	.424	.425

Significance = p < 0.05, not significant estimates in brackets

* Controlled but not shown by country dummies, reference is Canada

Note: Models H1A-B refers to hypothesis 1, H2A-B to hypothesis 2, H3A-B to hypothesis 3.

Table 3.1.A. The effect of school segregation on educational achievement: Hypothesis 1.
Reading performance, uncontrolled estimates, country groups

Explanatory Variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
Parental occupation (std)	7.485	0.571	(0.197)	6.609	5.033
Parental education (std)	-22.002	-12.458	-17.796	(-1.051)	-21.975
Constant	441.056	565.197	567.429	378.607	397.704
Adjusted R^2	.115	.066	.035	.132	.463

**Table 3.1.B. The effect of school segregation on educational achievement: Hypothesis 1.
Reading performance, controlled estimates, country groups**

Explanatory variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
Parental occupation (std)	(0.029)	(0.025)	-0.823	0.739	-1.234
Parental education (std)	(-.358)	-3.756	-5.491	1.531	-9.383
Constant	367.630	356.435	490.281	427.285	234.288
Adjusted R^2	.385	.240	.266	.403	.566

**Table 3.2.A. The effect of school segregation on educational achievement: Hypothesis 1.
Math performance, uncontrolled estimates, country groups**

Explanatory Variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
Parental occupation (std)	6.875	(0.235)	(-0.084)	6.073	5.406
Parental education (std)	-21.588	-12.727	-16.735	-2.316	-26.271
Constant	438.287	571.948	574.172	417.456	348.277
Adjusted R^2	.132	.052	.045	.094	.542

**Table 3.2.B. The effect of school segregation on educational achievement: Hypothesis 1.
Math performance, controlled estimates, country groups**

Explanatory Variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
Parental occupation (std)	-0.338	(-0.134)	-0.932	(0.267)	-1.476
Parental education (std)	1.133	-3.637	-2.257	1.658	-13.592
Constant	375.269	352.781	425.420	427.605	228.813
Adjusted R^2	.377	.181	.248	.363	0.625

Significance = $p < 0.05$, not significant estimates in brackets
Estimates in the 'A' tables are controlled but not shown by the country dummies only; estimates in the 'B' tables are controlled but not shown as in Table 2A and 2B (column 2).

**Table 4.1.A. The effect of school segregation on educational achievement: Hypothesis 2.
Reading performance, uncontrolled estimates, country groups**

Explanatory Variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
Low status * low segregation	-2.344	-1.913	-2.428	-2.042	-1.286
Low culture * low segregation	-9.754	-8.008	-7.302	-15.696	-7.136
Constant	493.573	558.137	543.991	482.733	396.492
Adjusted R^2	.101	.097	.060	0.143	.431

**Table 4.1.B. The effect of school segregation on educational achievement: Hypothesis 2.
Reading performance, controlled estimates, country groups**

Explanatory Variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
Low status * low segregation	-.572	-0.296	-0.162	-0.181	-0.346
Low culture * low segregation	-1.732	(-0.620)	2.458	-5.000	-2.455
Constant	383.548	322.022	407.384	460.445	197.025
Adjusted R^2	.386	.240	.264	0.404	.560

Table 4.2.A. The effect of school segregation on educational achievement: Hypothesis 2.
Math performance, uncontrolled estimates, country groups

Explanatory Variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
Low status * low segregation	-2.405	-2.141	-2.537	-2.227	-1.595
Low culture * low segregation	-10.122	-8.309	-8.232	-17.873	-8.007
Constant	484.085	560.160	550.243	513.104	377.379
Adjusted R^2	.130	.090	.078	.122	.512

Table 4.2.B. The effect of school segregation on educational achievement: Hypothesis 2.
Math performance, controlled estimates, country groups

Explanatory Variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
Low status * low segregation	-0.408	(-0.113)	(-0.105)	-0.258	-0.409
Low culture * low segregation	-0.607	(-0.083)	3.543	-3.359	-2.898
Constant	389.709	308.294	365.329	451.935	174.149
Adjusted R^2	.377	.181	.247	.364	.616

Significance = $p < 0.05$, not significant estimates in brackets
Estimates in the 'A' tables are controlled but not shown by the country dummies only; estimates in the 'B' tables are controlled but not shown as in Table 2A and 2B (column 4).

Table 5.1.A. The effect of school segregation on educational achievement: Hypothesis 3.
Reading performance, uncontrolled estimates, country groups

Explanatory Variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
High status * low segregation	3.254	2.383	2.721	2.658	2.783
High culture * low segregation	4.862	2.802	6.234	14.921	1.090
Constant	460.144	531.972	513.590	453.333	371.131
Adjusted R^2	.110	.093	.072	0.173	0.440

Table 5.1.B. The effect of school segregation on educational achievement: Hypothesis 3.
Reading performance, controlled estimates, country groups

Explanatory variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
High status * low segregation	-0.236	0.256	0.161	3.052	(-0.131)
High culture * low segregation	-1.608	-5.452	(0.146)	(-0.175)	(-0.696)
Constant	358.674	312.885	424.621	446.545	182.404
Adjusted R^2	.386	.242	.264	0.403	0.560

Table 5.2.A. The effect of school segregation on educational achievement: Hypothesis 3.
Math performance, uncontrolled estimates, country groups

Explanatory Variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
High status * low segregation	3.321	2.697	2.782	2.581	3.057
High culture * low segregation	6.170	3.905	8.639	18.827	1.651
Constant	449.015	530.680	516.477	480.705	348.281
Adjusted R^2	.143	.091	.095	.153	.518

Table 5.2.B. The effect of school segregation on educational achievement: Hypothesis 3.
Math performance, controlled estimates, country groups

Explanatory Variables	EU-19	Scandi- navian (5)	Anglo- Saxon (5)	Post-com- munist (7)	Asian (4)
High status * low segregation	(-0.061)	0.437	0.292	-0.213	(-0.096)
High culture * low segregation	(-0.406)	-4.402	3.049	4.412	-0.930
Constant	378.886	309.669	396.611	446.233	157.303
Adjusted R^2	.377	.183	.247	.363	.616

Significance = p < 0.05, not significant estimates in brackets
Estimates in the 'A' tables are controlled but not shown by the country dummies only; estimates in the 'B' tables are
controlled but not shown as in Table 2A and 2B (column 6).

The role of the control variables

The last columns of Table 2A and 2B (for the full set of countries) as well as Table 6A and 6B (for the sub-sets of the countries) display the full model with all independent variables. As we could see from the correlations, the control variables affect students' educational achievement as one can expect. Pupils perform better if the level of the school is higher socially or culturally as measured by the mean of the parental socio-economic index as well as by the mean of the parental education. Students also achieve better if their parents have higher socio-economic status or school level.

Girls are better in reading and boys are better in math. Age turns out to negative but only because its effect is controlled for grade. Grade has a stronger positive effect on school performance indicating that grade repetition decreases educational achievement.[7] In contrast to intact family background, any other family settings decrease the performance of pupils. From the multivariate model it seems that students achieve better in small settlements but this is again because of the control of the other independent variables.[8] All variables which indicate that given information is missing for given student have negative effect on educational achievement.

Explanatory power of the models

The adjusted R^2 values are included for all models in all tables in the analysis. Our models explain the variance of the reading and math performance by about 42 percent (for the full set of countries). The explained variances are somewhat smaller for the Scandinavian and the Anglo-Saxon countries, the extremes are 18 percent (math performance in the Scandinavian nations) and 25 percent (math performance in the Anglo-Saxon countries). Previous studies on the PISA data usually revealed that educational achievement is relatively strongly affected by social background in some former socialist countries, especially in Hungary. This pattern does not show up here: the adjusted R^2 values are 41 percent for reading and 36 percent for math in this country group. In the EU-19 countries the same values are 39 and 38 percent for reading and math, respectively. In fact, the adjusted R^2 values are the highest for the Asian countries: 57 and 62 percent for reading and math, respectively.

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[7] Age has a slight positive correlation with reading (.060) and with math (.070), while grade has a much stronger positive correlation: .250 with reading and .224 with math. The correlation between age and grade is .245.

[8] The bivariate relationship between school location and students' achievement clearly shows that performance increases from villages to large cities significantly though not linearly.

Table 6A. The effect of school segregation on educational achievement: full models Reading performance, country groups*

Explanatory Variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
The effect of segregation					
- parental occupation (std)	0.225	(0.064)	-0.865	0.907	-1.177
- parental education (std)	(0.376)	(-1.367)	-6.612	1.642	-9.481
Interactions terms 1.					
Low status * low segregation	-0.601	-0.414	-0.280	-0.340	(-0.146)
Low culture * low segregation	-1.476	(-0.178)	3.032	-7.891	-0.960
Interactions terms 2.					
High status * low segregation	(0.056)	0.450	0.431	(-0.027)	(0.139)
High culture * low segregation	-1.138	-5.109	1.167	6.909	1,388
The level of the school					
- parental occupation (mean)	3.115	0.839	2.931	3.104	3.575
- parental education (mean)	5.962	(1.132)	(-1.035)	9.975	1.527
Parental main effects					
Occupation (Status)	0.500	0.705	0.578	0.558	(0.113)
Education (Culture)	0.893	4.658	2.734	-2.354	-0.594
Missing occupation	-46.252	-49.792	-28.603	-39.802	-27.568
Missing education	-37.132	-46.750	-21.939	-50.820	-28.622
Demographics					
Sex	29.358	40.228	31.198	28.247	23.149
Age	-10.665	(2.443)	-9.740	-19.771	(2.658)
Grade	39.607	46.295	36.097	33.456	15.139
Family					
- single	-7.678	-12.626	-18.997	(-1.510)	-9.732
- mixed	-4.753	-8.922	-11.359	-4.421	7.257
- other	-27.551	-33.468	-45.265	-14.739	-11.420
- missing	-17.157	(-6.2)	-8.881	-41.858	-27.168
School					
Location					
- village	8.438	8.035	(-2.340)	11.075	5,437
- small town	8.214	3.028	5.712	(1.540)	4,849
- city	(0.326)	(-0.202)	-7.367	-2.760	(-1,155)
- big city	-6.842	8.892	-10.192	-3.121	-3,412
School size	0.007	(0.003)	0.008	0.014	0.005
Missing school size	-7.471	(2.691)	-4.090	(-2,777)	-12.437
Constant	375.304	341.114	492.344	479.264	243.656
Adjusted R^2	.387	.243	.267	.406	.566

Significance = p < 0.05, not significant estimates in brackets

Controlled but not shown by country dummies, reference with **bold**

* Country groups:

*EU-19: Austria, Belgium, Czech R., Denmark, Finland, Germany, Greece, Hungary, Ireland, **Italy**, Latvia, Luxembourg, Netherlands, Poland, Portugal, Slovakia, Spain, Sweden, UK (N=110792)*

*Scandinavian: Denmark, **Finland**, Iceland, Norway, Sweden (N=21366)*

*Anglo-Saxon: Australia, **Canada**, New Zealand, UK, USA (N=57561)*

*Post-communist: Czech R., Hungary, Latvia, Poland, Russia, **Slovakia**, Yugoslavia (N=37741)*

Table 6B. The effect of school segregation on educational achievement: full models.
Math performance, country groups*

Explanatory Variables	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
The effect of segregation					
- parental occupation (std)	-,0.229	(-0.219)	-0.991	0.441	-1.421
- parental education (std)	1.409	-1.876	-4.576	(1.157)	-13.930
Interactions terms 1.					
Low status * low segregation	-0.470	-0.295	-0.330	-0.370	-0.178
Low culture * low segregation	-0.770	(0.385)	3.255	-6.422	-0.640
Interactions terms 1.					
High status * low segregation	0.208	0.601	0.606	(0.001)	0.225
High culture * low segregation	(-0.284)	-4.014	3.559	7.687	1.806
The level of the school					
- parental occupation (mean)	3.138	0.812	2.973	3.432	4.070
- parental education (mean)	7.028	(1.744)	(0.888)	12.329	2.219
Parental main effects					
Occupation (Status)	0.503	0.831	0.507	0.462	0.104
Education (Culture)	0.886	4.223	2.361	-1.242	-0.803
Missing occupation	-36.463	-42.755	-24.673	-28.745	-24.054
Missing education	-30.079	-39.454	-15.284	-34.867	-24.506
Demographics					
Sex	-17.536	-7.009	-10.090	-16.666	-11.149
Age	-11.217	(3.627)	-6.849	-19.775	(2.370)
Grade	42.464	50.553	36.584	38.417	14.816
Family					
- single	-10.611	-16.382	-16.962	-2.498	-12.262
- mixed	-10.611	-9.922	-12.252	-6.563	8.006
- other	-27.129	-29.511	-40.288	-22.080	-13.950
- missing	-23.399	-11.354	-3.505	-45.400	-38.063
School					
Location					
- village	9.569	8.975	(-0.599)	14.888	8.498
- small town	8.985	3.955	6.453	(2.041)	5.602
- city	(-1.148)	(-0.808)	-6.769	-5.687	(-2.253)
- big city	-11.469	(7.058)	-9.738	-7.669	-3.680
School size	0.008	0.010	0.008	0.014	0.007
Missing school size	-7.033	(4.213)	(0.778)	(-3.399)	-16.424
Constant	385.032	341.097	444.427	479.681	240.179
Adjusted R^2	.377	.183	.250	.365	.625

Significance = p < 0.05, not significant estimates in brackets
*Controlled but not shown by country dummies, reference with **bold***
** Country groups: EU-19: Austria, Belgium, Czech R., Denmark, Finland, Germany, Greece, Hungary, Ireland, **Italy,***
Latvia, Luxembourg, Netherlands, Poland, Portugal, Slovakia, Spain, Sweden, UK (N=110792)
*Scandinavian: Denmark, **Finland**, Iceland, Norway, Sweden (N=21366)*
*Anglo-Saxon: Australia, **Canada,** New Zealand, UK, USA (N=57561)*
*Post-communist: Czech R., Hungary, Latvia, Poland, Russia, **Slovakia**, Yugoslavia (N=37741)*
*Asian: **Indonesia,** Japan, Korea, Thailand (N=25925)*

Discussion

This analysis aimed to investigate the role of educational segregation in educational achievement of 15 years old pupils. PISA 2003 data was used for this goal. Previously Jenkins, Micklewright and Schnepf (2006) used the PISA data for a similar purpose but in a more descriptive manner; they investigated the rank order of OECD countries from the viewpoint of the degree of school segregation. The present analysis had a different focus when developing a multivariate causal model and studying how educational segregation influences students' achievement in math and reading.

Educational segregation can be measured in different ways. This analysis computed measurements for segregation by aggregating student level information on parental socio-economic status and highest level of parental education. The aggregation procedure was carried out for the schools within the country. The standard deviation of the parental characteristics was considered as a measure for segregation: higher deviation means higher integration and lower segregation; lower deviation means lower integration and higher segregation. In a next step interaction terms were computed between the segregation variables and the parental social status and the parental educational level variables in order to investigate the possible different impact of segregation for those children coming from families with higher or lower level of social background.[9]

The first hypothesis on the effect of educational segregation took the point of the majority of policy makers assuming that low segregation will improve educational achievement. In practice this means *positive effect* of the segregation measure applied here: the higher the standard deviation and the higher the degree of integration and the lower the level of segregation, the better the educational achievement. The second hypothesis went beyond the first one assuming that children of families from lower social background (lower level of parental socio-economic status and education) can benefit from the less segregated educational environment. In practice this means *positive effect* of the related interaction term: the higher the standard deviation and the higher the integration and the lower the segregation in the school where the student with poor social and cultural background studies, the better the educational achievement. The third hypothesis took the point of the more affluent families who claim that heterogeneous educational environment and stronger integration of low status children can decrease the performance of pupils from families with higher social and cultural status. In practice this means *negative effect* of the related interaction term: the higher the standard deviation and the higher the integration and the lower the segregation in the school where the student with affluent social and cultural background studies, the worse the educational achievement.

The hypotheses were investigated for a pooled data-set of 33 countries as well as for sub-sets of the countries. The sub-sets of the countries were defined in accordance with some assumptions related to variation of the educational as well as the welfare system in these counties. The results are summarized in Figure 1 where + and – signs indicate the positive and negative effects. (An estimate can be non-significant as well.) The effects are presented as uncontrolled ones (= the equation contains only the predictor variables for the given hypothesis controlled for only the country dummies); as controlled ones (= the equation contains the predictor variables for the given hypothesis controlled for the country dummies + the other independent variables; and as those from the 'full model' (= the equation contains all he predictor variables for the three hypotheses controlled for the country dummies + the other independent variables).

For the first hypothesis on the effect of school segregation, the uncontrolled estimates for integrated school by parental status supported the assumption on the positive impact of heterogeneous grouping. But integrated schools by educational and cultural homogeneity did not increase students'

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[9] This simple solution of defining segregation is unusual in the measurement literature which puts larger focus on the statistical background of the problem. For an early overview of segregation indices see Duncan and Duncan (1955) for a more recent one James and Taeuber (1985).

achievement. As demonstrated, this diversity in the economic – cultural integration cannot be attributed to a high level of collinearity between economic and cultural homogeneity of the school environment. Nevertheless, when the effects are controlled for the other independent variables, the first hypothesis by the policy makers turned to fail. This holds especially for the Anglo-Saxon countries with liberal welfare regime or the Asian counties – unlike as assumed. But in accordance with the expectations, integrated schools increase educational achievement in the Post-Communist countries where the school system is highly tracked anyway.

The analysis failed to confirm the second hypothesis. Unlike policy experts assume, students coming from poor social background do not benefit from studying in more integrated schools. This result holds for all country groups with the exception of the Anglo-Saxon one. Economic heterogeneity in the schools does not help but larger cultural diversity of the school has a positive impact for less affluent students. This has been expected for these countries with liberal welfare regime.

The analysis failed to confirm the third hypothesis either. It seems that affluent families need not to have any concern for their offspring because more integrated schools will not deteriorate their educational achievement. Surprisingly and unexpectedly, this danger appears only for those students who come from highly cultured family and study in culturally integrated schools in the Scandinavian countries – their educational achievement is affected negatively under these conditions.

Apparently, educational segregation and its influence on students' educational achievement is a research topic being highly relevant for educational and social policy, especially under the circumstances when education plays a major role in the inheritance of social inequalities from one generation to the next. There is a large amount of conventional knowledge in accordance with the hypotheses of this paper. In this light it is quite astonishing that lower segregation did not seem to increase educational performance – even not for those disadvantaged students who expected to benefit from integration of schools at most. At the same time, the analysis brought good news to affluent families who could have concern for their offspring because of integration of schools.

Figure 1. Summary of the results: the effect of school segregation on educational attainment

Explanatory variables	Full set	EU-19	Scandi-navian (5)	Anglo-Saxon (5)	Post-com-munist (7)	Asian (4)
Hypothesis 1.						
Reading						
Uncontrolled: status	+	+	+	ns	+	+
Culture	-	-	-	-	ns	-
Controlled: status	ns	ns	ns	-	+	-
Culture	-	ns	-	-	+	-
Full model: status	ns	+	ns	-	+	-
Culture	-	ns	ns	-	+	-
Math						
Uncontrolled: status	+	+	ns	ns	+	+
Culture	-	-	-	-	-	-
Controlled: status	-	-	ns	-	ns	-
Culture	-	+	-	-	+	-
Full model: status	-	-	ns	-	+	-
Culture	-	+	-	-	ns	-
Hypothesis 2.						
Reading						
Uncontrolled: low status	-	-	-	-	-	-
low culture	-	-	-	-	-	-
Controlled: low status	-	-	-	-	-	-
low culture	-	-	ns	+	-	-
Full model: low status	-	-	-	-	-	ns
low culture	-	-	ns	+	-	-

Math						
Uncontrolled: low status	-	-	-	-	-	-
low culture	-	-	-	-	-	-
Controlled: low status	-	-	ns	ns	-	-
low culture	-	-	ns	+	-	-
Full model: low status	-	-	-	-	-	-
low culture	ns	-	ns	+	-	-
Hypothesis 3.						
Reading						
Uncontrolled: high status	+	+	+	+	+	+
high culture	+	+	+	+	+	+
Controlled: high status	-	-	+	+	+	ns
high culture	-	-	-	ns	ns	ns
Full model: high status	+	ns	+	+	ns	ns
high culture	-	-	-	+	+	+
Math						
Uncontrolled: high status	+	+	+	+	+	+
high culture	+	+	+	+	+	+
Controlled: high status	ns	ns	+	+	-	ns
high culture	ns	ns	-	+	+	-
Full model: high status	+	+	+	+	ns	+
high culture	+	ns	-	+	+	+

This research intends to be a solid contribution to a very alive discussion on the topic of educational segregation. It is definitely important to continue the investigation about the economic – cultural diversity of school integration that seems to have inconsistent impact on pupils' educational achievement. We cannot be sure either how much the present results are influenced by the way how the segregation measures were defined in the analysis. Thus, experimenting more with other definitions and measures of school segregation is a next task as well. An obvious further step can be to separate public and private schools and even distinguishing between government-dependent and private independent schools as demonstrated by another analysis of the PISA 2000 data (Dronkers and Róbert, 2003).

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Table A1. Zero-order correlations between school segregation and social background measures in 33 countries

	1	2	3	4	5	6	7	8	9	10
The effect of segregation										
1. parental occupation (std)	1.0	**.049**	**.116**	**-.060**	**.221**	**.096**	.236	.242	.123	.143
2. parental education (std)		1.0	**.075**	**.327**	**-.075**	**.135**	-.440	-.587	-.229	-.347
Interactions terms										
3. Low status * low segregation			1.0	**.235**	**-.313**	**-.203**	-.221	-.117	-.665	-.247
4. Low culture * low segregation				1.0	**-.237**	**-.321**	-.301	-.323	-.342	-.735
5. High status * low segregation					1.0	**.364**	.301	.205	.746	.336
6. High culture * low segregation						1.0	-.179	.130	.367	.555
The level of the school										
7. parental occupation (mean)							1.0	.795	.521	.471
8. parental education (mean)								1.0	.414	.592
Parental main effects										
9. Occupation (Status)									1.0	.487
10. Education (Culture)										1.0

Péter Róbert
Social Science Faculty, ELTE University
TARKI Social Research Institute
Budaorsi ut 45. 1112. Budapest. Hungary
robert@tarki.hu