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The Effectiveness of Public and Private Schools from a Comparative Perspective

JAAP DRONKERS and PÉTER ROBERT

BADIA FIESOLANA, SAN DOMENICO (FI)

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European University Institute
Badia Fiesolana
I – 50016 San Domenico (FI)
Italy

THE EFFECTIVENESS OF PUBLIC AND PRIVATE SCHOOLS FROM A COMPARATIVE PERSPECTIVE[1]

J. Dronkers[2] & P. Robert[3]

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[2] Address all correspondence to the first author: European University Institute, Via dei Roccettini, 9. 50016 San Domenico di Fiesole, Italy. E-mail: jaap.dronkers@iue.it

[3] Department of Sociology, ELTE University and TARKI RT - Social Research Center, Budaörsi út 45. H-1112 Budapest, Hungary. E-mail: robert@tarki.hu

ABSTRACT

In this paper the effectiveness of public, private government-dependent and private independent schools in 19 OECD countries is analysed with the PISA 2000 data, which gives educational outcomes of 15-year-old students in reading and mathematics. In a multi-level approach we control stepwise for sociological and demographic characteristics of students and parents, behavioural and attitudinal characteristics of students and parents, school composition, teaching and learning conditions of schools and the school climate. Our analysis shows clearly that private government-dependent schools are more effective than comparable public schools with the same students, parents and social composition. The main explanation of this higher effectiveness is the better school climate in the former, in comparison to the latter. The different learning and teaching conditions in private government-dependent and public schools do not explain differences in the effectiveness. Our analysis also reveals that private independent schools are less effective than public schools with the same students, parents and social composition. The main explanation of their initially higher effectiveness is the better social compositions of these schools. These effects are more or less equal in these 19 OECD countries.

Introduction

The effectiveness of public and private schools has been the topic of a large number of studies in the educational sciences, sociology and economics, not only in the USA but also in Europe. In this literature, the distinction between public owned and funded schools, private but public funded schools (often religious schools) and private owned and funded schools, is especially important. Firstly, because in many countries these three types of schools exist alongside each other, especially in Europe where this was the unintended outcome of the 19th century struggle between the State and the Church(es). Secondly, the functions of these three types of schools differ strongly, whether this be along social, cultural, religious or ethnic lines. Thirdly, the distinction between owned and public funded schools, and private but public funded schools, also relates to current policy debates about organizing and financing collective goods like education.

Although there are many exceptions, the general trend of this research on the effectiveness of private and public schools can be summarized as follows: private but public funded schools (often religious schools) are more effective in cognitive outcomes than public owned and public funded schools, even after controlling for social and cultural composition of these schools; private owned and private funded schools are less effective in cognitive outcomes than public owned and public funded schools, but only after controlling for the social and cultural composition of these schools.

Although the effectiveness of public and private schools is relevant for nearly all OECD countries, no comparative research has been conducted on the differences in the effectiveness of different types of schools. This lack of comparative research is partly due to the dominance of American research on this topic, and partly due to the strong nation-state orientation of the social sciences. Yet another contributing factor may be the political sensitivity of the

possible lower effectiveness of public schools, especially in Europe. The only overview available is that provided by Dronkers (2001), who reviews the differences in effectiveness between religious state-funded schools and public schools in a number of single-country studies, including Belgium, France, Germany, Hungary, the Netherlands and Scotland.

There is, however, a need for comparative research because, in order to explain the cause of this difference in effectiveness between public and private schools, one must have sufficient variation of various school characteristics. As this variation is often lacking within a single state, for example due to nation-wide regulations which restrict the range of variation between schools, single-country studies may fail to capture the 'real' effect of private and public schools.

Our aims in this article are therefore three-fold. Firstly, we will attempt a systematic empirical test of the degree of effectiveness differences in reading and mathematical performance of individual students in public and private secondary schools in 19 OECD countries, controlling for the characteristics of students and parents. Secondly, we will try to explain these differences in effectiveness according to the differing characteristics of schools. Thirdly, we will test whether or not these differences in effectiveness are equal in the 19 OECD countries. For these analyses, we use data from the PISA 2000 survey conducted by the OECD, which is currently the best available data for such a cross-national comparison.

Public schools, private independent schools and private government-dependent schools

As a consequence of the struggle between the church and the state within many European societies, modern private schools can have different relations with the

state. The most fundamental aspect of this relationship is the degree to which private schools are funded by the (local, regional, national) government, alongside student fees, donations, sponsorships, and parental fundraising. In a number of societies, private schools have a juridical right to funding by the state, provided they meet certain conditions. In some cases this right is enshrined in constitutional law (Germany, Netherlands), while in others this right is accorded by normal law (France, Hungary). This right of funding of private schools by the state also means a restriction of the autonomy of the funded private schools. Although these restrictions differ from society to society, and vary with the degree of state funding, one can say that, in general, this decreases the autonomy of these schools regarding their curriculum, mode of examination, payment of teachers and admission criteria of students. These private government-dependent schools can now be found in sufficient numbers in Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Switzerland, and the USA (see table 2).

Alongside these private government-dependent schools, there exist in a number of OECD countries private schools which do not get funding from the (local, regional, national) government. Financially, they are fully dependent on student fees, donations, sponsorships, and parental fundraising. However, their school autonomy can still be restricted in two ways. Firstly, authorities might set criteria even for independent private schools in order to ensure some minimum quality of the socialization of the next generation. Secondly, even independent private schools function within a societal context and are partly determined by it. For example, entrance criteria for universities will restrict the autonomy of a private school's curriculum. However, private school autonomy will be largest in their student admission policies, especially given the importance of student fees for the financing of these schools. These private independent schools can now be found in sufficient numbers in Austria,

Belgium, France, Hungary, Ireland, Italy, New Zealand, Poland, Portugal, Spain, Switzerland, United Kingdom, and USA (see table 2).

Given the different conditions for private independent and private government-dependent schools and their opportunities for competition with public schools, we will consequently distinguish between independent private schools, private government-dependent schools, and public schools. By doing so, we can test whether these two types of private schools are simply interchangeable forms of private schools, as argued by Vandenberghe & Robin (2003) in their analyses of the same PISA data.

We acknowledge that this distinction between public, private government dependent and private independent schools is still crude. Especially the history and evolution of these various types can be quite different in the various societies: church versus market oriented; one church versus various churches oriented; strong versus weak connection with various political parties; strongly contested versus broadly accepted; recent growth versus a long-standing existence. Also their actual constitutional arrangements will be quite different: based upon constitutional right versus policy agreement; a strong versus weak control by state authorities. Therefor it is important to control the effectiveness for the various conditions of teaching and learning, like teaching and material resources and degree of school autonomy, as we will do. For that reason we will also test whether these differences in effectiveness are equal in the various countries. It might be possible that public, private government dependent and private independent schools have the same function in modern society, despite the different history and constitutional arrangements.

Possible explanations of effectiveness differences between public and private schools

The literature on the possible causes of effectiveness differences between schools is extensive, but although we shall not review it here, we draw on the most recent overviews (Sammons, Hillman & Mortimore, 1995; Scheerens & Bosker 1997; Teddlie & Reynolds 2000). Thus, for example, Coleman, Hoffer and Kilgore (1982) analysed the effectiveness differences between public and catholic schools in the USA, with Coleman and Hoffer (1987) and Bryk, Lee and Holland (1993) providing comprehensive follow-up studies of these same differences. Dronkers (2001), meanwhile, reviews the empirical evidence of effectiveness differences between public, catholic and protestant schools in Europe. Below, we will summarise only the most debated causes of these differences, as a subsequent basis for selecting the relevant variables on students, parents and schools for analysing and interpret them.

Differences in student characteristics and in school composition

Given the higher probability that private schools will ask fees from parents, the social background of students in private and public schools will vary, especially in terms of the occupational, educational and financial characteristics of both parents. Consequently, more students from a more favourable background will go to private schools, which in turn might improve the social composition of the school population. More students of a favourable background will increase the opportunities of reaching higher levels of scholastic achievement, both as a result of a higher level at the start of secondary school, and of better teaching and learning conditions (especially more teaching, due to a lower level of non-academic disturbances). This will promote a potentially better reputation of academic quality for private schools in comparison to public schools, thus attracting different students. We will try to control for as many social

background characteristics as possible, as well as the social composition of the student body of schools.

Deliberate school choice

Closely related to the reputation of academic quality of private schools is the argument of a deliberate educational choice. A deliberate choice for an 'unconventional' school (as compared to a 'traditional' choice for a common school) will increase the possibility of this 'unconventional' school becoming a community in which students perform better. Depending on a deliberate educational choice, and the self-selection following on from such a choice, both private and public schools can become a community of shared values and dense social ties which can affect student achievement. Given the fact that in most of the 19 OECD countries we will analyse (except for Belgium, Ireland, and the Netherlands) public schools are the most common, private schools will be the deliberately chosen schools. Parents, students and teachers of deliberately chosen schools will expect more efforts from each other, will tend to form a community of shared values and dense social ties, and will generally be more ready to help the school. We will try to control for the causes of these effects of deliberate choice of school by controlling for the academic and cultural interests, resources, attitudes and behaviours of parents and students.

Different conditions for teaching, learning and school administration

Public and private schools differ in their administrations and conditions for teaching and learning. While public schools are fully dependent on the state for their finances and their administration, private schools depend more on student fees and private charity, and only occasionally on the state for additional support. It is not self evident that private schools have the optimal conditions compared to public school (for instance the student/staff ratio), but differences

in these conditions might influence effectiveness. There is also a variation in educational administration between public and private schools (Hofman, 1993) and this can also help explain some of the differences in educational performance. These differences refer, not to the formal differences in educational administration, but rather to the tendency for stronger informal relations between board and teachers in private schools, which may partly explain the better performance of their pupils. We will try to control for these differences in administration, learning and teaching conditions by controlling for various aspects of the school characteristics.

Different school climates

Given the possible differences in students, parents, social composition of the school population, school administration and conditions for teaching and learning between public and private schools, different patterns of behaviour from teachers and students might develop. These different behavioural patterns will promote more or less shared beliefs about what students should learn, about the proper norms of instruction, and how student and teachers should relate to each other. These patterns, which form the basis of a school climate, might affect the effectiveness of teaching and learning within these schools. These patterns may also affect teacher morale, which can also influence teaching effectiveness. We will try to control for these differences in school climate by controlling for various indicators of the behaviour of teachers and students.

Stronger core curriculum

Public and private schools can differ in the strength of the core curriculum they offer to their students, regardless of their personal background or future educational plans. A strong core curriculum integrates the structure and policy of schools, not only for students but also for teachers. Private schools tend to

have a more limited differentiation in their curriculum compared to public schools. This limitation in curricular differentiation can be partly the consequence of the smaller school size and the more limited resources of private schools, due to their (in part) dependence on non-governmental funds. However, the limitation in curricular differentiation can also be the consequence of long-standing traditions about what constitutes a proper education. Religious schools in particular (Jewish, Catholic or Protestant) can draw on such old traditions to shape their curriculum, thus avoiding strong curricular differentiation, even if the religious inspiration has been weakened. Unfortunately, we cannot control directly for these differences in core curriculum (although we try indirectly by the amount of time dedicated to reading and mathematics), because the PISA data contains hardly any of the relevant indicators. Nevertheless, it is important to keep this factor in mind.

Use of PISA data and measures

Data

Our analysis is based on the PISA 2000 survey organized by the OECD, under the project title *The OECD Programme for International Student Assessment*. This research aimed to provide internationally comparable evidence on the performance of 15-year-old students in all the OECD countries. The data-file used for the empirical analysis is exactly the same, which the OECD has made available on the Internet for the purpose of secondary analysis. The content and structure of this data is summarized as follows on the OECD's website: "From this page you can download the PISA 2000 dataset with the full set of responses from individual students and school principals. These files will only be of use to statisticians and professional researchers who would like to undertake their own analysis of the PISA 2000 data. The files available on this page include the

questionnaires, the data files, the codebooks as well as SAS and SPSS control files in order to process the data."

The database comprises data collected in 2000 in 32 countries. In addition to the original variables derived from the survey, OECD researchers have developed numerous aggregated measures based on students' and school principals' responses, and these variables are also added to the dataset. Information on these aggregated measures is available from the *Manual for the PISA 2000 Database* as well as from the *PISA 2000 Technical Report*, including their reliability and internal consistency. We decided to use these broadly accepted measures and arrange them into sociologically meaningful groups for estimating student achievement and the characteristics of their parents and schools, rather than developing our own (potentially more contestable) indicators.

The strength of the PISA 2000 data is its cross-national comparability. The OECD/CERI has developed scheme to compare the outcomes of various educational systems by making use of the experiences of earlier efforts to compare cross-nationally educational results (AERA; TIMMS). By using a multilateral approach to develop this scheme, it has avoided a one-sided measurement and its results are widely recognized throughout the OECD countries. Although one can doubt whether the PISA indicators cover all particularities of the education systems of each analyzed country, it are the most reliable and valid data for a cross-national comparison across a large number of modern societies. A weakness of the PISA 2000 data is the cross-sectional nature of the collected data. It is a one-moment picture of the 15-year-old students: we don't know anything about their further development, neither about their earlier education experiences and outcomes. It is widely recognized that a longitudinal measurement of educational outcomes in relation to school characteristics is superior to a cross-sectional measurement, because longitudinal data allows better to control for unmeasured variables and (self-

)selection. Unfortunately such a cross-national and longitudinal data set is not available and will probably not available in the coming years. Moreover we know from the history of the study of school effectiveness that the higher effectiveness of non-public schools is lower in longitudinal data, but that the direction of the results is equal to those obtained with cross-sectional data. (for instance the analogous between the outcomes of Coleman, Hoffer and Kilgore (1982) using cross-sectional data and those of Coleman and Hoffer (1987), using longitudinal data) Therefore, we think that an analysis of these special cross-sectional data is worth while and scientifically interesting.

Private and public schools

For the purpose of this paper, for studying effectiveness of public and private schools in a comparative perspective, we have selected a certain number of countries to be included in the analysis. The selection was based on choosing those countries where both the public and private sectors of education are developed, and which represent a wide range of different types of societies from different regions. We also distinguish between private independent schools and private government-dependent schools. This division was developed earlier by the OECD, and was applied by the PISA survey. The schools are classified as either public or private solely according to whether a public agency or a private entity has the ultimate power to make decisions concerning the institution's affairs. An institution is classified as public if it is (1) controlled and managed directly by a public education authority or agency or, (2) is controlled and managed either by a government agency directly or by a governing body (Council, Committee etc.), most of whose members are appointed by a public authority or elected by public franchise. In contrast, an institution is classified as private if it is controlled and managed by a non-governmental organization (for example a Church, Trade Union or business enterprise), or if its Governing

Board consists mostly of members not selected by a public agency. The terms "government-dependent" and "independent" refer only to the degree of a private school's dependence on funding from government sources; they do not refer to the degree of government direction or regulation. A government-dependent private school is one that receives more than 50 per cent of its core funding from government agencies. An independent private school is one that receives less than 50 per cent of its core funding from government agencies. "Core funding" refers to the funds that support the basic educational services of the schools. It does not include funds provided specifically for research projects, payments for services purchased or contracted by private organisations, or fees and subsidies received for ancillary services, such as lodging and meals.

The countries we have selected are, in alphabetical order, Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Netherlands, New Zealand, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the USA. These countries have enough absolute numbers of students attending a form of private school in the PISA data for reliable estimates of effectiveness to be made (see table 2 for our final data set).

Data preparation

We use the unweighted data, because we are interested in the 'quasi-experimental' effect that being a student in a private or public school has on educational results. From this perspective, each country is an 'experimental' case, which should not be reweighted because of its population size. Such a reweighting with real student population sizes for each country would produce an unbalanced result, in which countries with the highest student populations (and thus with certain types of public and private schools) would dominate the results, while countries with small student populations (and thus with certain

types of public and private schools) would have a lesser effect on the outcomes. An analysis with reweighted data would, therefore, produce invalid estimates of the effectiveness of the various public and private schools. For this reason, the analysis sticks to the original number of cases, with some corrections for very small schools (see below). Fortunately, the sample-size in the various countries did not vary too much, allowing us to treat countries under more or less equal 'experimental' conditions, and without deleting cases.

In addition to the selection of countries, we also follow a selection procedure with respect to schools and students, and include only those students for whom the basic information on gender, school grade, valid score of achievement (the dependent variables), on type of school as described above, location of school, and family type was available. In the case of the other independent variables, if missing cases occurred in the data, these were replaced by the mean value of the variable. We deleted also all schools with less than 11 pupils who participated in the study, because too many schools with very low numbers of students could jeopardize the reliable estimation of the effectiveness of these schools. The PISA data had a large number of schools with only a few participating students, because of its aim to measure a representative sample of all 15 year old students. In order to include retarded 15 year old students at lower grades or advanced 15 year old students at higher-grades, schools with these retarded or advanced students were added by PISA to the sample. This procedure produced a relatively large number of schools with very low numbers of 15 years old students, which we deleted from our analyses. This necessary deletion may lead to a bias towards sectors with larger schools, but we prefer this bias to unstable or unreliable estimates of school effects.

Variables

Dependent variables

For this analysis, we decided to use two of the three possible dependent variables on students' performance. The survey contained measures on students' reading, mathematics and science abilities; we will use the reading and the maths scales as dependent variables in the analysis in order to have one measure which is of a more cultural character, and one measure which is of a more cognitive character. The reading scale gives information on the reading proficiency of students, which is based on retrieving information from text, interpreting text, and reflecting on a text or evaluating it, based on numerous tasks. The maths scale aims to measure the ability of students with respect to interpreting and translating problems into a mathematical context, using mathematical knowledge to solve problems, and interpreting and communicating their results, again based on various tasks. Both performance measures were constructed by applying weighted maximum likelihood estimates (see Warm 1985) and were translated into scales with a mean of 500 and a standard deviation of 100. In addition, the PISA file contains measurement error variables for both the reading ability and for the maths ability estimations. We will include these error term variables in our analysis to control for the possible measurement error of the performance variables. Given this possibility to correct measurement error, we decided not to combine the dependent variables into one scholastic achievement indicator. Indeed, loosing this possibility for correcting measurement error is an important argument against a combination of the dependent variables.

Sociological and demographic characteristics of students and parents

Most of the independent variables used to predict students' achievement are combined indices, developed by PISA. These were also constructed by applying weighted maximum likelihood estimates (see Warm 1985) and were standardized in such a way as to have a mean of 0 and a standard deviation of 1 at the international level of all countries. The first set of independent variables involves students' as well as their parents' social and demographic characteristics. We will differentiate between males and females in the analysis. Despite a slight variation, we will control for *school grade* and *age* (measured in months in the data).[1] In keeping with established traditions of social mobility and status attainment research, we will include *father's and mother's occupation and education* as indicators of social origin. Occupation is measured in the data by the international socio-economic index (ISEI) (Ganzeboom *et al.* 1992), while education is measured by the ISCED scale (OECD 1999). Further information on family background is *number of siblings,* as well as *family structure* which distinguishes between nuclear families, single parent families and other family constructions. The cultural climate of the family is expected to be an important factor of students' performance. In this regard, the PISA survey provides information on how frequently parents discuss political and social issues, books, films, and television-programs with their offspring. PISA has combined these individual items into an index labeled *Parents' academic interest.* Similarly, students were asked to report on how frequently parents discuss school issues with them, eat together with them around the table or spend time talking to them at all. PISA combines these variables in an index labeled *Parents' social interest.* Obviously, students' personal cultural participation is also part of this climate. The survey included questions on visiting museums, art galleries, going to the theatre, classical music concerts, or ballet. As previous research provides evidence of the effect of high cultural participation on school achievement (for example DiMaggio 1982), we included

the combined scale score on *Students' cultural activities* in our analysis. In line with studies on cultural capital (Bourdieu 1983), possession-related classical culture contributes to the cultural level of the family. The PISA index on *Family cultural possession* is based on having classical literature, books of poetry, works of art at home. In addition to cultural possessions, financial capital can also be of importance for educational outcomes. As a direct measure of parental income is quite unreliable given that it is the students in the school who report on it, a *Family wealth* index has been constructed based on the presence of dishwasher, television, cellular phone, motor car, computer, and a link to the internet at home. Since the research aims to explore the predictors of students' performance, we need to control for students' educational circumstances at home. This is measured by the PISA index labeled as *Home educational resources*, and considers whether or not the student has a desk, a quiet place for study at home, and if the family has dictionary, textbooks, and calculators. Finally, it probably also matters whether parents work with student on their schoolwork and help them to do their homework. The frequency of these events, as reported by the students, is measured by the *Family educational support* index.

Behavioral and attitudinal characteristics of students and parents

The behavioral and attitudinal characteristics of students and parents related to education and school is the next set of independent variables. Students were asked to report how much time they spend on doing their homework for languages, mathematics and science. The index for *Time spent on homework* is based on these three pieces of information. The PISA survey collected information on attitudes towards the school and teacher behavior. Students were asked to report on how much interest teachers show in their learning progress, how frequently teachers let them to express their own opinion in school or how

frequently teachers help them to understand school materials. Our *Teacher support index* is based on these items. Further questions were asked about how well students get along with teachers, how much teachers are interested in students, how much they listen to what students have to say, and how fairly they treat students. PISA combined these questions in the *Teacher-student relationship* index. Students' performance is affected by the general climate in the school and in the class. It matters if the teacher has to wait until students sit down quietly at the beginning of the class, if students do not start to work when the class begins, if students do not listen to what teacher says, and if there is noise or disorder during the class. The *School disciplinary climate* index is based on students' responses to these questions. Another aspect to be considered is how much the teacher wants students to work hard, how much he/she tells them they can work better, how much he/she dislikes if students do not work well. Students' responses to these questions are combined in the *Achievement pressure* index. An overall indicator of the student-school relationship emerges from the questions on how much the student feels himself/herself as an outsider in the school or feels awkward in the place, how easily he/she can make friends there, how much he/she feels liked by the other students, or how lonely he/she feels. The PISA index entitled *Sense of belonging in the school* provides combined information on this.

As part of the behavioral and attitudinal characteristics, the PISA study put a large emphasis on reading habits. A series of items were devoted to students' attitudes on whether or not they like to read, enjoy to going to a bookstore or library, feel happy if receiving a book as a gift, and if they like talking about books with other people. Or, on the contrary, whether he/she feels reading is a waste of time, reads only to get information, or finds it hard to finish a book. The *Enjoyment of reading* index is based on the answers given by students. The *Reading diversity* index summarizes students' reports on how often they read magazines, comics, fiction or non-fiction books, emails and

newspapers. Finally, two further simple indicators are considered for student performance which measure the time in terms of *number of minutes spent each week at school reading and in maths classes.*

School composition

Since the intention of this analysis is to compare students' performance in different kind of public and private schools, we must control for the social composition of the school population in order to avoid biased measuring in evaluating the effectiveness of these types of schools. In order to achieve this goal, we compute three aggregated variables from individual students' characteristics: the *school average of father's occupational status* (ISEI), the *school average of family's wealth* and the *school average of parents' academic interest*. These three aggregated indices of school compositions cover the three most important dimensions of inequality in school composition (financial; occupation; cultural). Adding more aggregated indices do not change our results.

The next indicator of school composition is the *proportion of girls* in the school. Finally a series of variables indicates the *place of residence* for the student ranging from small settlements (inhabitants less than 3000) up to capital city, is included in the analysis.

Teaching and learning conditions

Indicators for the teaching and learning conditions in schools are also considered as variables in the analysis of differences in effectiveness. This type of information was provided in the PISA survey by school principals. The first indicator of this kind is *school size,* measured by the number of students in the school. Principals were also asked to report on the number of teaching weeks per year, the number of class periods per week, and the number of teaching minutes per class; the variable *Hours of schooling per year* summarizes this

information. There is a widespread belief that availability of high-tech devices improves students' achievement in the school. In order to test this assumption, we included one measure with respect to high-tech infrastructure from the PISA data, namely the *Number of computers per student per school*, measured as the ratio of the total number of computers to the total number of students in the school. The availability of "human capital" in the school is another factor which may affect students' performance. We use one "rough" indicator to measure conditions in the school in this respect, and this is the *School size – teacher ratio*, where the total number of students is divided by the total number of teachers in the school. We also include further indices in the analysis, based on additional information from school principals on the conditions in the school. Thus, the *Schools' instructional resources* score is based on the principals' reports on the availability or lack of teaching materials, multi-media resources, science laboratory equipment and facilities for fine art education. Furthermore, the *Schools' material resources* index draws on the principals' reports on physical infrastructure, in other words the condition of the school buildings, the quality of the heating, cooling and lighting systems, and the availability or lack of space (for example classrooms) in the school. In addition, and with respect to human capital resources in the school, principals' views were elicited on the shortage of teachers in general, and in particular in the case of languages, mathematics and sciences. This information is summarized in the index of *Shortage of teachers.*

Finally, autonomy also denotes a crucial part of teaching and learning conditions in the school, and may have an influence on students' achievement. The *School autonomy* index is derived from a number of questions to which school principals were asked to state whether or not different activities, like hiring / firing teachers, deciding about teachers' salaries and its increases, about the school budget, about students' admission to the school, about choosing textbooks, offering courses, determining the content of the courses, are the

responsibilities of the school or not. In a next step, principals reported on whether or not teachers can take part in the kind of activities mentioned above. These answers served as a basis for the *Teacher autonomy index*, an indicator of teachers' participation in decision making.

School climate

School climate represents a final set of school related variables which can influence student performance and thus explain differences in effectiveness. The PISA survey asked school principals to express their general perceptions of both teacher-related and student-related factors affecting the school climate. Teacher related factors include high or low expectations of the teachers towards their students, teacher absenteeism, frequency of changes in the teaching staff, teachers' encouragement of students to achieve better, or strictness with the students. Student related factors include student absenteeism, disruption of or skipping of classes, lack of respect for teachers, use of alcohol or drugs, and the intimidation of other students. These indicators are combined into two indices labeled *Teacher misbehavior* and *Student misbehavior*. Finally, the *Teacher morale index* expresses principals' perceptions of teachers' morale, enthusiasm, on how much they take pride in the school and how much they value academic achievement.

Descriptive results

Dependent variables

We have produced three descriptive tables in order to provide a general view of the basic features of the PISA data. Table 1 shows the means and standard deviations for the dependent variables, as well as for their error terms, by type

of school. The data indicates that both the reading and the mathematical scores are significantly higher in the two types of private schools as compared to the public schools, indicating the higher achievement of students in private sector education. In other words, according to the PISA data, it appears that students in private independent schools perform somewhat better. At the same time, however, the standard deviation of students' performance is smaller in private schools than in public schools. For the reading score, the measurement error seems slightly bigger in private schools, while this error term is smaller for the math score in private schools.

Private and public schools

Table 2 shows the distribution of the types of schools in the 19 countries included in the analysis, after our disregard of schools with less than 11 interviewed 15 years old pupils. On average, more than 80% of the students analyzed here attend public schools, about 15-16% of them study in private government-dependent schools, while only about 3% attend private independent schools.[2] A strong deviation from this pattern can be seen in Belgium and the Netherlands where only one-fourth of the students attend public schools. The equivalent proportion is one-third in Ireland and two-thirds in Spain. In Belgium and in the Netherlands about 75% of students attend private government-dependent schools. The same proportion in Ireland is about 60%, nearly 30% in Spain, whereas one-fifth of students attend such schools in Denmark. The percentage of students in private independent schools is the highest (around 8%) in Spain and France.

While there are only a few countries where public secondary schools are much less attended, there are several countries where more than 90% of students study in these schools instead of in private institutions. The former socialist countries (the Czech Republic, Hungary, Poland), the Scandinavian

countries (Finland, Sweden) and Anglo-Saxon countries (New Zealand, the United Kingdom and theUSA) belong to these cases. In addition, we also find Germany, Portugal and Switzerland in this group of countries. Indeed, the private independent secondary schools seem to be non-existent in the educational systems of the Czech Republic, the Scandinavian countries (Denmark, Finland, Sweden), Germany and the Netherlands. Furthermore, this type of private school also seems to play a marginal role in secondary schooling in Belgium, Hungary, Poland and Portugal. Private government-dependent educational institutions are missing in New Zealand, Poland and the United Kingdom. They also seem to play an especially marginal role (around 3% or less of students) in Italy, Finland, Sweden, Switzerland and the USA.[3]

Sociological and demographic characteristics of students and parents

Turning to the independent variables, table 3a displays means for students' and parents' characteristics. With respect to gender, significantly less boys study in private government-dependent schools. Our data refer to students attending, on average, slightly higher grades in the private independent institutions; consequently, they are also somewhat older. The classic indicators of social origin - father's and mother's occupation and education - show that students in public schools come from a significantly lower family background. The regular nuclear family background with both parents characterizes significantly less students in public schools, with a higher proportion of students from these institutions living in mixed families. Also, significantly less students live in one-parent families in private government-dependent schools.

With respect to the cultural capital indicators, students in public schools live in families where both cultural and social communication is less frequent compared to the family climate of students in private independent schools. The same holds for students' own cultural participation. In addition, the cultural

possession, family wealth and home educational resources indices are also the highest for these students. In contrast to public schools, both the cultural possession and family educational support indices are significantly lower for students in private government-dependent schools.

Behavioral and attitudinal characteristics of student and parents

Table 3b displays the behavioral and attitudinal characteristics of students and parents related to education and schools. The first indicator in this respect shows that students in private independent schools spend the most time on homework. Teachers seem to express more interest in students in these schools, and the teacher-student relationship index scores the highest. The school disciplinary climate, however, is the lowest in these institutions. Students in private government-dependent schools report less support from their teachers, but also less achievement pressure in comparison to student reports in independent private schools. Achievement pressure is also the highest in independent private schools. Both measures of reading (enjoyment and diversity) are the highest for the latter category, while they are the lowest for students in private government-dependent schools. Students in private independent schools spend the most time reading and in maths classes.

Social composition of schools

Table 3c gives information on the social composition of schools. Girls are significantly underrepresented in private independent schools and are significantly overrepresented in private government-dependent schools. Public schools have the lowest averages of family background characteristics. The school average of father's social status is the highest for private independent schools; the same holds for the school average in family wealth. The private government-dependent schools are only slightly better in this respect, in

comparison to public schools. Interestingly, pupils in private independent schools report both the most intensive cultural communication and parental academic interest. This index scores the lowest for the private government-dependent schools. In comparison to public schools, private independent schools can be found more frequently in larger cities, while private government-dependent schools are mostly located in middle-sized settlements.

Teaching and learning conditions

Teaching and learning conditions are presented in Table 3d. In comparison to public schools, the number of students is significantly larger in private government-dependent schools and smaller in private independent schools. The total schooling hours per year is the highest in government-dependent private schools, followed by private independent schools. The teacher-student ratio is significantly worse in private schools in comparison to public schools. Despite this quantitative difference, however, the more qualitative measure indicates less of a shortage of teachers for languages, mathematics or sciences in the private schools, especially in the independent ones. According to the evaluation of the school principals, teaching resources are worse in the private schools, especially in the independent ones; the same pattern can also be observed for the material resources. It is, of course, possible that the principals of private schools had some higher criteria in mind in comparison to the principals of public schools. The total number of computers per school size is also the lowest in private government-dependent institutions. However, the situation is to the contrary when autonomy in schools is considered. According to principals' reports, the degree of school autonomy is lower in public institutions; the same also holds for teachers' participation in decision making.

School climate

The last set of school-level measures in Table 3e shows further indicators of school climate. Principals evaluate the misbehavior of both the teacher and of the students to be more frequent in public schools. Teacher morale, on the other hand, is perceived to be higher in private schools, especially in the independent ones.

Controls or explanations?

Some of these characteristics and indicators of schools, like teaching and learning conditions or school climate, can also be considered as possible (intermediary) outcomes of the differences between public and private schools, and are not only control variables, such are students' and parents' characteristics or social composition of the school. Therefore, we will treat them as intermediary outcomes by adding them in special steps into the further analysis, thus separating them from the more demographic and sociological variables and the school composition indicator. The reader can decide for himself or herself which step in the analysis is the correct step in assessing the differences in effectiveness between public and private schools. However, we believe that these intermediary variables, important as they are, should not be the final dependent variables of school effectiveness analyses. Real acquired knowledge and skills, like reading and maths, are more appropriate final indicators of school effectiveness, while school climate, learning and teaching conditions or behavioral and attitudinal characteristics of parents and students are only instruments to reach these final goals of schooling, namely knowledge and skills.

Multi-level analyses

Nested multilevel models

We use multi-level analyses (MlwiN 1.1, Rasbash *et al*. 2000) with four levels: 1. Test: reading and mathematical outcomes as dependent variables and the standard deviations of the error of these outcomes; 2. Students: student and parent characteristics as control variables; 3. Schools: government-dependent private schools and private independent schools as two dummy variables and public schools as the omitted reference category; other school characteristics, including social composition as control variables but also degree of freedom of action at the school level as variables to explain effectiveness differences; 4. Country: no specific variables.

We start with an empty zero-model with four levels: test, students, schools, and countries. At the lowest level we have either reading or mathematics weighted likelihood estimates as the dependent variable, and the standard deviation of the error of this estimate. The variance at the lowest level is fixed at 1.00. This results in a measurement model of the next level of the students (see Hox, 2002). It gives a more reliable estimation of the true score of the students, because the model takes the measured error into account.

Model 1 is an extension of this empty zero-model: we add two dummy variables to the equation at the school level: private government-dependent schools ('private dependent') and private independent schools ('private independent'). Public schools act as the omitted reference category. The parameters of both dummies indicate to which degree students within these two types of schools have higher or lower scores on reading or mathematics.

Model 2 is an extension of model 1: we add all of the sociological and demographic characteristics of the students and their parents at the student level to the equation. If differences in reading or mathematical scores between students from private independent, private government-dependent and public

schools are caused by the differences in the sociological and demographic characteristics of the students and their parents, the parameters of the dummies 'private independent' and 'private dependent' should become insignificant.

Model 3 is an extension of model 2: we add the behavioral and attitudinal characteristics of students and parents related to education and schools to the equation at the student level. If differences in reading or mathematical scores between students from private independent, private government-dependent and public schools remain significant, one can conclude that the measured characteristics of the students and their parents are not a sufficient explanation of the differences in reading or mathematical scores between students from private independent, private government-dependent and public schools. The results of model 3 can be interpreted as reliable estimates of the higher effectiveness of both forms of private schools, given the characteristics that individual students and their parents bring to their private and public schools, or develop while attending these schools.

Model 4 is an extension of model 3: we add the social composition of the school-population at the school level to the equation. If differences in reading or mathematical scores between students from private independent, private government-dependent and public schools are caused by differences in the social composition of the school-population, the parameters of the dummies 'private independent' and 'private dependent' should become insignificant. The results of model 4 can be interpreted as reliable estimates of the higher effectiveness of both forms of private schools, given the compositional school characteristics, resulting from the aggregate choices of the individual students and parents.

Model 5 is an extension of model 4: we add the variables which are indicators of the teaching and learning conditions in schools to the equation. If differences in reading or mathematical scores between students from private independent, private government-dependent and public schools are caused by

differences in the teaching and learning conditions in schools, the parameters of the dummies 'private independent' and 'private dependent' should become insignificant.

Model 6 is an extension of model 5: we add the variables which are indicators of school climate to the equation. If differences in reading or mathematical scores between students from private independent, private government-dependent and public schools are caused by differences in school climate, the parameters of the dummies 'private independent' and 'private dependent' should become insignificant.

The results of models 5 and 6 can be interpreted as possible explanations of the possible higher effectiveness of private schools, given the characteristics individual students and their parents bring to their private and public schools or gain by the compositional school characteristics, and which result from the aggregate of choices of students and parents. They open partly the 'black box' of the likely causes of the higher effectiveness of certain schools, which is not related to individual characteristics or compositional effects, but can be considered as the 'real' added value of schools.

All these models assume that the parameters of the dummies 'private independent' and 'private dependent' are fixed at the country-level. This means that these effects are estimated with the assumption that they do not vary significantly between the 19 countries. However, if the parameters of the dummies 'private independent' and 'private dependent' at the country level happen to be significantly random, then the differences in reading or mathematical scores between students from private independent, private government-dependent and public schools are not true for a significant number of countries. We test for this possibility of random variance of the slope of the dummies 'private independent' and 'private dependent' in all models independently and separately, both for reading and mathematics separately, and the results are reported respectively in Tables 4b and 5b. Finally, Tables 4b and

5b give the relation between the slope of the relevant dummy and the level of the intercept of that model, which allows us to see whether the variations of the slope of the dummy can be explained by a bottom or a ceiling effect. A significant relationship between the slope of the relevant dummy and the level of the intercept indicates that slope and intercept are not independent. A positive relation suggests a bottom effect: the slope of this school variable is higher if the intercept of that school is higher, while a negative relation suggests a ceiling effect: the slope of this school variable is higher if the intercept of that school is lower. We test only the significance of the slope of the dummies 'private independent' and 'private dependent' at the country level, but not the significance of the variances of the slopes of other independent variables, because that is not the topic of this paper. Neither do we test the significance of the slope of the dummies 'private independent' and 'private dependent' at the school level, because that would only test whether the effect of these schools within countries varies, and not whether this effect varies between countries.

The results for the dependent variable reading scores are given in Tables 4a and 4b, and for the dependent variable mathematics score in Tables 5a and 5b. Because we assume that the effect of private and public schools will not differ strongly for these two dependent variables, we discuss the multilevel analysis results for both dependent variables together.

Model 0: variances at student, school and country level

The zero-model shows the amount of variance at the different levels of student, school and country. As always, the greatest amount of variance of the dependent variables is at the student level (60% for reading, 56% for mathematics), followed by the school level (36%, 33%) and the country level (5%, 11%). However, the variance at all levels is significant and must be explained. The changes in the amount of remaining variances at the different

levels in the different models illustrate that the independent variables do explain a substantial part of these variances. The variance at the individual level declines by 28% for reading scores (from 4397 in model 0 to 3166 in model 6) and 22% for mathematical scores (2905 to 2267). The decline of the remaining variance at the school level is even stronger between model 0 and 6: 73% for reading score (from 2638 to 713) and 70% for mathematical score (from 1717 to 516). However, the change of the remaining variance at the country level has an inverted U-form. It increases strongly from model 0 to model 2 (201% reading (348 to 699) and 132% for mathematical score (556 to 780)) and then declines slowly until model 6 to a level above model 0 (591 for reading, 680 for mathematical score). This strong increase of the remaining variance occurs in model 2, where the sociological and demographic characteristics of the students and their parents are added to the equation at the student level. Such an increase in the remaining variance at a higher level is not strange if important variables are included in a multi-level equation at a lower level. Nevertheless, such increases indicate that differences in the dependent variables have been hidden by differences at a lower level, in this case the sociological and demographic characteristics of the students and their parents. This means that differences between the educational outcomes of the analyzed countries are larger than it seems at first sight, but only if one takes the differences in the sociological and demographic characteristics of the students and their parents into account.

Model 1: without any control

The first model of Tables 4a and 5a shows that students in private independent schools and private government-dependent schools have higher scores in reading and mathematical tests than students at public schools. Furthermore, students in private independent schools have higher scores than students on private government-dependent schools. Although reported in another form, the

coefficients of model 1 are analogous to the results of table 1. However, these differences are not yet a reliable indication of the higher effectiveness of private independent and private government-dependent schools, because these schools also have different students and parents, and a different composition of their populations. Tables 4b and 5b show that these different effects of private independent schools and private government-dependent schools do not vary significantly between countries. The variances of the slopes are not at least twice as large as their standard errors, and thus the variance of the slopes do not significantly deviate from the fixed coefficient at the country level.

Models 2 & 3: controlling for students' and parental characteristics

In model 2 and 3 we control the effects of private independent schools and private government-dependent schools for the characteristics of students and parents only.

The sociological and demographic characteristics of the students and their parents (model 2 in Tables 4a and 5a) do not explain fully the higher scores in reading and mathematical tests of students in private independent and private government-dependent schools, but these variables explain about half of the original advantages in reading and mathematical tests of students in private independent schools and private government-dependent schools. Therefore, the differences of these characteristics between schools only partly explains the higher effectiveness of private independent schools and private government-dependent schools.

We will not discuss the effects of the different control variables, both because they are mostly self-evident and because of limitations of space. We will only comment on those results which are contra-intuitive or which give more insight into the possible causes of the higher effectiveness of private independent schools and private government-dependent schools. The effect of

parental wealth is significantly negative, but this is only true because we have strong controls for the social and cultural characteristics of the students and their parents. This simply means that high scores in reading and mathematics depends on the social and cultural characteristics of students and their parents, and that family wealth *per se* can be more of a hindrance than an advantage, given these social and cultural characteristics. The parameter of family educational support is negative, which could lead to the strange conclusion that families should not support their children educationally. However, this support measures, among other things, how often the student reports that the parents help the student with their homework. This parental help normally becomes more frequent at the moment that scholastic results are low, and is more or less absent so long as the scholastic results are good. This revised causal direction can explain the negative parameter.

The behavioral and attitudinal characteristics of students and parents related to education and schools (model 3 of tables 4a and 5a) do not change the higher scores in reading and mathematical tests of students in private independent and private government-dependent schools, in comparison with the scores in model 2 (with only sociological and demographic characteristics of the students and their parents as control variables). This does not mean that the behavioral and attitudinal characteristics of students and parents related to education and schools are unimportant for the prediction of the level of scores on reading and mathematical tests. It only means that they are irrelevant for the explanation of the higher effectiveness of private independent and private government-dependent schools.

The negative sign of the coefficient of teacher support can be explained in the same way as that of family educational support, that is, by a revised causal direction. An increase of help by teachers is often more related to bad scholastic results than to good results. The negative signs of the variables school

disciplinary climate and achievement pressure will only surprise those who are not familiar with the didactic literature.

The results produced by model 3 can be interpreted as reliable estimates of the higher effectiveness of both forms of private schools, given the different characteristics that individual students and their parents bring to their private and public schools, or develop while attending these schools.

Model 4: controlling for school composition

In model 4 we control for the social composition of schools. This is a vital step in the assessment of the effects of schools, given that the (self-)selection and allocation processes of schools and parents mean that the social composition of schools will differ strongly. This differential social composition will determine partly the opportunities within schools to teach and to learn at a certain level, independently from the individual characteristics of students and parents, because it influences the real time spent on teaching and the level of non-academic disturbances. The results from model 4 show the importance of controlling for social composition of the school in explaining the higher scores in reading and mathematical tests of students in private independent and private government-dependent schools. In fact, the higher scores in reading and mathematical tests of students in private independent schools can be fully explained by the social composition of these schools. In effect, this means that private independent schools are not necessarily more effective in their teaching then public schools, but rather that the former schools attract on the average more children from the higher classes of society (in terms of occupational status, wealth, academic interest), which in turn creates a better opportunity structure for learning and teaching. The negative sign for private independent schools in model 4 even suggests that these schools are less effective than

public schools with the same social composition, although this negative coefficient is not yet significant (it will become significant in model 6).

The same is not equally true for private government-dependent schools. Although the strength of the positive coefficient decreases substantially (it decreases by more than 50%) by controlling for social composition of the schools, it remains positive and significant for reading, and positive but insignificant for mathematics.

In model 4 we also control for other compositional characteristics of schools, like the % of girls and the characteristic of the location of the school. Although these variables have significant and interesting effects, they are not responsible for the switch of the sign of the coefficient with regard to private independent schools.

The results from model 4 can therefore be interpreted as reliable estimates of the higher effectiveness of both forms of private schools, taking into consideration the characteristics of individual students and their parents bring to their private and public schools or gain by the compositional school characteristics, and which result from the aggregate of choices of students and parents.

Models 5 & 6: conditions and school climate as explanations

In the next two models, 5 and 6, we try to explain why students from private independent schools have lower scores for reading, and students from private government-dependent schools have higher scores for reading than students at public schools. The possible explanation of these differences might be the different learning and teaching conditions in these schools (school size; number of schooling hours; student-teacher ratio; instructional resources; shortage of teachers; school autonomy; teacher participation in decision making; material

resources - see model 5) and the different school climates of these schools (teacher misbehavior; student misbehavior; teacher morale – see model 6).

Although a number of these conditions affect the reading scores, they do not influence the strength of the negative effect of private independent schools. To the contrary, the negative effect of private independent school is even stronger in model 5 than in model 4. However, if we add the variables for school climate to the equation in model 6, the effect of private independent schools becomes even more negative than in model 4 or 5. This suggests that private independent schools have a better school climate than public schools, but if one take that difference in school climate into account they are even less effective than comparable public schools. Moreover, controlling for school climate also gives a significant negative effect for mathematical scores in private independent schools.

Neither can learning and teaching conditions explain the higher effectiveness of the private government-dependent school. On the contrary, the effect of private government-dependent schools becomes even stronger in model 5 compared with model 4. This suggests that the learning and teaching conditions in private government-dependent school are, on average, less positive than in public schools, although if one take that difference into account they are even more effective than comparable public schools. However, the higher effectiveness of the private government-dependent school can partly be explained by their better school climate. As is illustrated in model 6, when the school climate variables are added to the equation, the effect of private government-dependent schools becomes substantially smaller for reading scores, and even insignificant for mathematical scores, compared with models 4 and 5.

Random variances of slopes

In Tables 4b and 5b we can see that the effects of private independent schools and private government-dependent schools did not vary significantly between countries in any of the models. The variance of the slopes are not at least twice as large as their standard errors, and thus the variance of the slopes do not significantly deviate from the fixed coefficient at the country level. This means that these effects are more or less equal for the 19 countries we have analyzed.

In the last column of Tables 4b and 5b, we report no significant variance between the slopes of these two dummy variables and the intercepts of the models. This means that ceiling or bottom effects cannot explain the coefficients of these variables in the different models. This result is important for the interpretation of the lower effectiveness of private independent schools, after controlling for students' and parental characteristics and school composition, because it indicates that this lower effectiveness is not a statistical artifact, caused by ceiling effects.

Conclusions

Our analysis shows clearly that private government-dependent schools are more effective than comparable public schools with the same students, parents and social composition. The main explanation of this higher effectiveness is the better school climate in the former, in comparison to the latter. The different learning and teaching conditions in private government-dependent and public schools do not explain differences in the effectiveness. This does not mean that private government-dependent schools do not have a more favorable social composition, and that this does explain fully the higher educational outcomes of their students. Rather, it only means that next to students, parents and social composition, the more favorable school climate do provide the full explanation

of the higher educational outcomes of students from private government-dependent schools, both in comparison with public and with private independent schools.

Contrary to this, our analysis also reveals that private independent schools are less effective than public schools with the same students, parents and social composition. However, poorer learning and teaching conditions, or a more negative school climate, cannot explain this lower effectiveness. The main explanation of their initially higher effectiveness is the better social compositions of these schools. This better social composition increases the educational outcomes of the students of these schools significantly above the level of the other schools, as shown in analyses without school composition as a control variable. It might be that this positive effect of better social composition reduces the necessity for private independent schools to increase their effectiveness further, because even with a lower effectiveness their students obtain high levels of educational outcomes thanks to the better social composition of these schools. Also, parents who are willing to pay a substantial fee might not be so concerned about this positive effect of the social composition of these private independent schools. The causes of the higher effectiveness of schools is less important for choosing parents, as long as the final scholastic attainment of their child is not substantially lower than they may wish. This also gives these private independent schools teaching and learning time, which can be devoted to the acquisition of qualifications other than the purely scholastic (for example team-work, competition, leadership, cultural capital).

These different outcomes underline the different function and position of private independent and private government-dependent schools within the educational systems of these countries. It is, therefore, incorrect to treat these two types of schools as equal in their relation to the market of students or as interchangeable forms of private schools (Vandenberghe & Robin, 2003). To

the contrary, private independent schools do not need to be effective, because the characteristics of their students and parents, as well as the school's composition, are so favorable that a further increase of scholastic scores would be inefficient due to its low marginal productivity. Private independent schools are good because they can 'attract' or 'buy' the best means of production (students, school composition), that can sufficiently guarantee high scholastic outcomes. Private government-dependent schools also have more favorable characteristics among their students, parents and school composition, but that is not enough. However, they also can develop a better school climate to increase their effectiveness. Apparently, their marginal productivity is not yet too low to make the investment in a better school climate inefficient. Private government-dependent schools cannot fully use 'attracting' and 'buying' the best means of production (possible as a consequence of their dependence on the government or the constraints of their religion or ideology), but also use the school climate as a means of acquiring a competitive edge for attracting students and parents from the public school sector. Stated differently, private independent schools attract such a high surplus of production means from their students and their parents, that they can allow themselves to be less effective and to give time and money to extra-curricular qualifications, needed by the next generation of the rich and powerful (not necessary only financial). Private government-dependent schools use both the means to attract a surplus of production means and a favorable school climate to produce better educational outcomes, needed by upwardly mobile students or by weaker students.

These effects of private independent and private government-dependent schools are more or less equal in the 19 different OECD countries. This means that none of these countries are exceptional regarding the deviating educational outcomes of their private independent or private government-dependent schools, whatever the historical background and origin of the non-public schools or their current constitutional arrangements. This also means that the

higher effectiveness of the private government-dependent sector doesn't vary with the largeness of this sector. Their effectiveness in countries like Belgium and the Netherlands with a large proportion of private government-dependent schools is as large as their effectiveness in the US or Italy, with a tiny private government-dependent sector. This 'universal' effect of private independent and private government-dependent schools suggests that these differences in effectiveness may be a consequence of modern post-industrial societies, wherein education has become a major dimension of inequality, alongside occupation and wealth. In these modern societies school choice and educational 'markets' have become important means for mobility along the education inequality dimension.

However, it is important to keep in mind that these results doesn't necessarily mean that educational systems with a high percentage of private schools (and especially private government-dependent schools) is more efficient as a system, providing the best education to all children. As we have seen, the social composition of private schools explains an important part of the higher educational outcomes of their pupils. If the social composition of schools within a educational system is very polarized between public schools (the less favorable composition) and the private schools (the more favorable composition), such a educational system will be less efficient because the public school pupils attain lower educational outcomes than they would attain in a less polarized system. In that case, the lower educational outcomes of public schools pupils might not be compensated by the higher educational outcomes of private school pupils and thus this educational system will be less efficient for that society than an educational system without private schools or a less polarized school composition. But a polarized school composition between the public and private school sectors is not unique for educational systems with an important private school sector, as the US educational system shows with its the financing of public education by varying local taxation and a forced school choice within

the public sector. And the Dutch educational system, with a large private sector financed at the same footing as the public sector combined with free school choice between and within the public and private sectors, shows that polarized school composition can also exists within both the public and private school sectors alike.

It is also important to keep in mind that an educational system with a large private government-dependent school sector is not necessarily a cheaper educational system. The rights for state grants of the private sector can lead to a larger number of smaller schools in the same neighborhood. A large number of small schools means that they cannot profit from the normal economy-of-scale advantages and thus that this educational system can be less efficient. The Dutch educational system (at least at the primary school level) is an example of this lower efficiency, due to a large number of small schools in the same neighborhood as a consequence of established right of the private government-dependent school sector (Dronkers, 1995).

Within a balanced context without too strong rights of a private sector, a private provider of collective goods like education, for which the personal relations between provider and receiver affect the quality of the good, can produce better outcomes for two reasons. First, because of a larger vulnerability for competition in educational 'markets', the private provider has to be more concerned about the quality of this collective good than a public provider. Secondly, a private provider also has more 'space' for influencing the quality of its product than a public provider, which has more legal and political constraints, as well as interests other than those of the school (other public services like fire-brigades, police, sport facilities and cultural activities). The better outcomes of private providers in supplying this kind of collective good are, however, conditional, and can be constrained by a public context (such as financing, regulations, final examination, and so forth) which aims to avoid very strong differences between the social composition of schools. If these

constraints are absent, a private provider of this type of collective good might be temped to obtain a higher quality, not through organization and efficiency, but by ‘buying’ only the best means of production, for example, students and school composition.

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TABLE 1: DEPENDENT VARIABLES: MEANS OF READING AND MATHS SCORES, AS WELL AS OF THEIR ERROR TERMS, BY TYPE OF SCHOOLS (STANDARD DEVIATION IN PARENTHESES)

School type	Private independent	Private government-dependent	Public	Total
Reading score	553.5* (91.7)$	529.9* (94.0)$	504.3 (99.9)	509.7 (99.5)
Error term of reading score	34.1* (9.7)$	33.1* (9.7)$	32.4 (9.4)	32.6 (9.5)
Maths score	546.5* (92.4)	528.0* (92.7)$	503.8 (96.2)	508.8 (96.2)
Error term of maths score	42.3* (13.5)$	41.6* (13.3)$	43.5 (16.3)	43.1 (15.8)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

TABLE 2: PERCENTAGES OF STUDENTS AND, BETWEEN PARENTHESES, THE ABSOLUTE NUMBER OF SCHOOLS BY TYPE OF SCHOOL AND COUNTRY IN OUR FINAL DATA SET

Countries	Type of school			N of cases
	Private independent	Private government-dependent	Public	
Austria	6.1% (7)	5.7% (7)	88.2% (107)	1985 (121)
Belgium	0.5% (1)	74.7% (138)	24.8% (49)	3352 (188)
Czech Republic	-	4.7% (7)	95.3% (144)	2430 (151)
Denmark	-	21.3% (28)	78.7% (102)	1620 (130)
Finland	-	2.8% (4)	97.2% (146)	2629 (150)
France	8.0% (11)	14.2% (21)	77.8% (107)	2170 (139)
Germany	-	4.9% (7)	95.1% (143)	2068 (150)
Hungary	0.6% (1)	4.4% (6)	95.0% (133)	2488 (140)
Ireland	2.8% (4)	61.8% (77)	35.4% (48)	2001 (129)
Italy	3.4% (5)	0.6% (1)	96.0% (135)	2420 (141)
Netherlands	-	76.1% (62)	23.9% (20)	1164 (85)
New Zealand	4.1% (5)	-	95.9% (123)	1748 (128)
Poland	1.8% (2)	-	98.2% (110)	1796 (112)
Portugal	1.8% (2)	5.5% (7)	92.7% (120)	2254 (129)
Spain	8.4% (13)	29.2% (46)	62.4% (104)	2963 (163)
Sweden	-	3.3% (5)	96.7% (136)	2317 (141)
Switzerland	2.9% (5)	1.8% (3)	95.3% (138)	2358 (146)
United Kingdom	5.0% (14)	-	95.0% (284)	4151 (298)
USA	3.6% (3)	1.3% (1)	95.1% (83)	1292 (87)
Total	2.7% (73)	15.9% (420)	81.4% (2232)	43607 (2725)

TABLE 3A: INDEPENDENT VARIABLES 1.: MEANS OF SOCIAL CHARACTERISTICS OF THE STUDENTS AND OF THEIR PARENTS BY TYPE OF SCHOOL (STANDARD DEVIATION IN PARENTHESES)

School type	Private independent	Private government-dependent	Public	Total
Male	0.49 (0.5)	0.47* (0.5)	0.5 (0.5)	0.49 (0.5)
School grade	9.9* (0.8)	9.6 (0.6)$	9.6 (0.8)	9.6 (0.8)
Age (in months)	189.0* (3.5)	188.5 (3.5)	188.5 (3.4)	188.5 (3.4)
Father's ISEI	54.9* (17.3)$	45.9* (16.3)$	43.6 (15.4)	44.3 (15.7)
Mother's ISEI	50.4* (15.4)$	43.4* (14.7)	43.0 (14.5)	43.2 (14.6)
Father's education	5.0* (1.2)	4.5* (1.4)$	4.3 (1.3)	4.4 (1.3)
Mother's education	4.8* (1.3)	4.4* (1.4)$	4.3 (1.3)	4.3 (1.3)
Number of siblings	1.5* (1.1)$	1.8* (1.3)	1.8 (1.3)	1.8 (1.3)
Family structure				
- Single parent family	0.15 (0.35)$	0.12* (0.33)$	0.16 (0.37)	0.15 (0.36)
- Nuclear family	0.78* (0.41)$	0.8* (0.4)$	0.74 (0.44)	0.75 (0.43)
- Mixed parent family	0.05* (0.21)$	0.06* (0.24)$	0.07 (0.26)	0.07 (0.25)
- Other family type	0.02 (0.15)	0.02* (0.14)$	0.03 (0.16)	0.03 (0.16)
Parental academic interest	0.41* (0.90)	-0.09* (1.01)$	0.02 (0.95)	0.01 (0.97)
Parental social interest	0.24* (0.94)	0.03* (0.97)$	0.07 (0.98)	0.07 (0.98)
Students cultural activities	0.43* (1.01)	0.04 (0.96)$	0.04 (.099)	0.05 (.099)
Family cultural possession	0.46* (0.89)$	-0.12* (1.00)$	-0.03 (0.99)	-0.03 (0.99)
Family wealth	0.55* (0.93)	0.03* (0.82)$	-0.02 (0.95)	0.00 (0.94)

Family educational support	0.01 (0.98)	-0.14* (0.97)	0.03 (0.98)	0.00 (0.98)
Home educational resources	0.30* (0.79)$	0.19* (0.88)$	0.07 (0.94)	0.09 (0.93)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

TABLE 3B: INDEPENDENT VARIABLES 2.: MEANS OF BEHAVIORAL AND ATTITUDINAL CHARACTERISTICS OF STUDENTS AND OF THEIR PARENTS BY TYPE OF SCHOOL (STANDARD DEVIATION IN PARENTHESES)

School type	Private independent	Private government-dependent	Public	Total
Time spent on homework	0.26* (0.93)	0.07* (0.92)$	-0.01 (0.93)	0.01 (0.93)
Teacher support	0.16* (1.03)$	-0.11* (0.96)	0.00 (0.98)	-0.01 (0.98)
Teacher-student relationship	0.26* (1.02)$	0.01* (0.91)$	-0.01 (0.97)	0.01 (0.96)
School disciplinary climate	-.20* (1.06)$	0.01* (1.01)	-0.00 (0.99)	0.00 (1.00)
Achievement pressure	0.08* (1.05)$	-0.09* (1.00)$	0.02 (0.98)	0.00 (0.98)
Sense of belonging in the school	0.09 (1.04)$	-0.05* (0.94)$	0.03 (0.97)	0.02 (0.097)
Enjoyment of reading	0.14* (1.08)$	-0.08* (1.01)$	0.00 (1.00)	-0.01 (1.01)
Reading diversity	0.10* (0.92)$	-0.09* (1.02)$	-0.02 (0.97)	-0.03 (0.98)
Time in minutes spent reading per week	203.0* (55.6)$	192.2* (59.1)$	196.0 (82.1)	195.6 (78.3)
Time in minutes spent in maths class per week	194.5* (54.0)$	188.5* (63.4)$	183.6 (66.7)	184.6 (65.9)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

TABLE 3C: INDEPENDENT VARIABLES 3.: MEANS OF MEASURES FOR SOCIAL COMPOSITION OF THE SCHOOL POPULATION BY TYPE OF SCHOOL (STANDARD DEVIATION IN PARENTHESES)

School type	Private independent	Private government-dependent	Public	Total
% of girls in the school	47.7* (28.3)$	51.4* (26.5)$	49.7 (18.1)	49.9 (20.0)
School average: Father's ISEI	53.9* (8.3)$	45.9* (7.4)$	43.6 (7.0)	44.3 (7.3)
School average: Family wealth	0.55* (0.48)$	0.03* (0.40)$	-0.02 (0.57)	0.00 (0.55)
School average: Parental academic interest	0.41* (0.34)$	-0.09* (0.41)$	0.02 (0.36)	0.01 (0.38)
Location of the school				
- capital city	0.10* (0.30)$	0.05 (0.23)$	0.05 (0.21)	0.05 (0.22)
- big city (> 1.000.000)	0.13* (0.34)$	0.02* (0.14)$	0.05 (0.22)	0.05 (0.22)
- city (100.000-1.000.000)	0.35* (0.48)$	0.21* (0.40)$	0.17 (0.37)	0.18 (0.38)
- town (15.000-100.000)	0.19* (0.4)$	0.42* (0.49)$	0.37 (0.48)	0.38 (0.48)
- small town (3.000-15.000)	0.11* (0.31)$	0.21* (0.41)$	0.27 (0.44)	0.25 (0.44)
- village (< 3000)	0.12* (0.32)$	0.09 (0.28)	0.09 (0.28)	0.09 (0.28)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

TABLE 3D: INDEPENDENT VARIABLES 4.: MEANS OF INDICATORS FOR TEACHING AND LEARNING CONDITIONS IN THE SCHOOL BY TYPE OF SCHOOL (STANDARD DEVIATION IN PARENTHESES)

School type	Private independent	Private government-dependent	Public	Total
School size: N of students in school	666* (357)$	712* (420)$	694 (435)	696 (431)
Total number of schooling hours per year	983.9* (151.1)$	991.1* (109.1)$	943.4 (138.6)	952.1 (136.0)
Total number of computers per school size	0.13 (0.14)$	0.10* (0.09)$	0.13 (0.13)	0.12 (0.12)
School size per number of teachers	13.4* (4.5)$	13.3* (4.3)$	12.8 (4.7)	12.9 (4.6)
Teaching resources	-0.73* (0.87)	-0.24* (0.96)	-0.08 (0.96)	-0.13 (0.97)
Shortage of teachers	-0.69* (0.65)$	-0.16* (0.85)$	-0.09 (0.92)	-0.11 (0.90)
School autonomy	0.68* (0.96)$	0.31* (0.68)$	-0.02 (0.98)	0.05 (0.95)
Teacher participation in decision making	0.25* (0.72)$	0.19* (0.88)	0.15 (0.88)	0.16 (0.86)
Material resources	-0.66* (0.75)$	-0.34* (0.87)$	-0.06 (0.95)	-0.13 (0.95)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

TABLE 3E: INDEPENDENT VARIABLES 5.:
MEANS OF INDICATORS FOR SCHOOL CLIMATE BY TYPE OF SCHOOL
(STANDARD DEVIATION IN PARENTHESES)

School type	Private independent	Private government-dependent	Public	Total
Teacher misbehavior	-0.84* (0.96)$	-0.13* (1.00)$	-0.01 (0.9)	-0.05 (0.93)
Student misbehavior	-0.88* (0.96)$	-0.29* (1.04)$	0.04 (0.89)	-0.04 (0.93)
Teacher morale	0.39* (1.03)$	0.06* (0.89)$	-0.08 (0.95)	-0.05 (0.95)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

TABLE 4A: THE FIXED COEFFICIENTS OF NESTED MULTILEVEL EQUATIONS WITH READING SCORE AS THE DEPENDENT VARIABLE (STANDARD ERROR BETWEEN PARENTHESES)

	0	1	2	3	4	5	6
Constant	506.5 (4.4)	501.2 (4.1)	298.1 (19.9)	292.8 (19.1)	196.9 (20.0)	198.9 (20.8)	220.6 (20.8)
Private independent		50.8 (6.5)	25.7 (4.7)	25.1 (4.5)	-7.3 (4.1)	-7.1 (4.3)	-9.4 (4.1)
Private government-dependent		25.1 (3.7)	13.2 (2.8)	13.4 (2.6)	6.3 (2.3)	7.1 (2.4)	4.8 (2.3)
Public		Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Students' School Grade			38.8 (.8)	37.5 (.7)	36.5 (.7)	36.4 (.7)	36.3 (.7)
Male			-21.9 (.7)	-13.1 (.7)	-12.3 (.7)	-12.4 (.7)	-12.3 (.7)
Mother's ISEI*10			3.2 (.3)	3.2 (.2)	3.0 (.3)	3.0 (.3)	3.0 (.3)
Father's ISEI*10			4.5 (.3)	4.2 (.3)	3.4 (.3)	3.4 (.3)	3.4 (.3)
Age in months			-.9 (.1)	-.9 (.1)	-.9 (.1)	-.9 (.1)	-.9 (.1)
Number of siblings			-3.8 (.3)	-4.1 (.3)	-3.9 (.3)	-3.9 (.3)	-3.9 (.3)
Father's education			1.3 (.3)	1.0 (.3)	.8 (.3)	.8 (.3)	.8 (.3)
Mother's education			3.0 (.3)	2.7 (.3)	2.5 (.3)	2.5 (.3)	2.5 (.3)
Family wealth			-3.5 (.5)	-1.6 (.4)	-2.3 (.4)	-2.3 (.4)	-2.3 (.4)
Parental academic interest			9.4 (.4)	5.4 (.4)	4.9 (.4)	4.9 (.4)	4.9 (.4)
Parental social interest			1.0 (.4)	.1 (.4)	.1 (.4)	.1 (.4)	.1 (.4)
Students' cultural activities			4.0 (.4)	-.02 (.4)	-.3 (.4)	-.3 (.4)	-.3 (.4)
Family cultural possessions			5.8 (.4)	3.0 (.4)	2.8 (.4)	2.8 (.4)	2.7 (.4)
Family educational support			-13.2 (.4)	-13.2 (.4)	-13.0 (.4)	13.0 (.4)	-13.0 (.4)
Home educational resources			8.8 (.4)	7.5 (.4)	7.5 (.4)	7.5 (.4)	7.5 (.4)

Nuclear family			Ref.	Ref.	Ref.	Ref.	Ref.
Single parent family			-10.3 (1.0)	-7.9 (.9)	-8.2 (.9)	-8.2 (.9)	-8.1 (.9)
Mixed parent family			-4.9 (1.3)	-4.9 (1.3)	-4.9 (1.3)	-4.8 (1.3)	-4.7 (1.3)
Other family type			-23.6 (2.2)	-22.1 (2.1)	-22.2 (2.1)	-22.2 (2.1)	-22.1 (2.1)
Time spent on homework				2.5 (.4)	2.3 (.4)	2.3 (.4)	2.2 (.4)
Teacher support				-1.3 (.4)	-1.3 (.4)	-1.3 (.4)	-1.3 (.4)
School disciplinary climate				-1.6 (.4)	-1.6 (.4)	-1.6 (.4)	-1.5 (.4)
Achievement pressure				-2.0 (.4)	-1.9 (.4)	-1.9 (.4)	-1.9 (.4)
Teacher-student relationship				1.1 (.4)	1.2 (.4)	1.2 (.4)	1.2 (.4)
Sense of belonging in the school				2.5 (.4)	2.4 (.4)	2.4 (.4)	2.4 (.4)
Enjoyment of reading				17.0 (.4)	16.8 (.4)	16.8 (.4)	16.9 (.4)
Reading diversity				6.3 (.4)	6.4 (.4)	6.4 (.4)	6.3 (.4)
Time in minutes spent reading per week *100				.7 (.5)	.8 (.5)	.8 (.5)	.8 (.5)
School average: Father's ISEI					2.0 (.1)	1.9 (.1)	1.6 (.1)
School average: Family wealth					15.6 (2.3)	15.3 (2.3)	13.3 (2.3)
School average: Parental academic interest					15.2 (2.3)	15.6 (2.3)	13.8 (2.3)
School in Capital city					Ref.	Ref.	Ref.
School in city >1.000.000					-3.1 (4.0)	-3.7 (4.0)	-5.1 (3.8)
School in city 100.000-1.000.000					6.0 (3.2)	5.7 (3.2)	4.5 (3.1)
School in town 15.000-100.000					10.8 (3.1)	10.9 (3.1)	8.0 (3.0)

School in small town 3.000-15.000					12.6 (3.2)	13.3 (3.2)	9.9 (3.1)
School in village < 3.000					15.2 (3.6)	15.7 (3.6)	9.8 (3.6)
% of girls in school					15.8 (3.4)	15.2 (3.3)	11.5 (3.3)
School size*100						.3 (.2)	.4 (.2)
Total number of schooling hours per year *100						.5 (.5)	.4 (.5)
Total number of computers per school size						-3.2 (5.6)	-1.5 (5.4)
School size per number of teachers *10						-3.4 (1.8)	-4.9 (1.7)
Instructional resources						-2.4 (.8)	-1.6 (.8)
Shortage of teachers						-2.5 (.8)	-1.1 (.8)
School autonomy						-1.1 (1.0)	-1.2 (1.0)
Teacher participation in decision making						-.5 (.8)	-.5 (.7)
Material resources						.5 (.8)	1.3 (.8)
Teacher misbehavior							3.9 (.9)
Student misbehavior							-11.5 (.9)
Teacher morale							1.8 (.8)
Variance at country level	348 (120)	297 (104)	699 (230)	578 (190)	528 (175)	566 (186)	591 (194)
Variance at school level	2638 (81)	2535 (78)	1247 (42)	1122 (38)	794 (29)	779 (29)	713 (27)
Variance at student level	4397 (38)	4396 (38)	3479 (32)	3173 (29)	3166 (29)	3166 (29)	3166 (29)
2*log likelihood	508152	508054	498783	495641	494856	494817	494634

TABLE 4B: THE RANDOM COEFFICIENTS AND THEIR VARIANCES OF THE PRIVATE INDEPENDENT SCHOOL AND PRIVATE GOVERNMENT-DEPENDENT SCHOOL VARIABLES AT COUNTRY LEVEL (WITH PUBLIC SCHOOLS REFERENCE) IN THE DIFFERENT MODELS OF READING SCORES (STANDARD ERROR BETWEEN PARENTHESES)

	Model	-2*log likelihood	Coefficient	Variance slope	Covariance intercept & slope
Private independent	1	508050	51.9 (7.8)	262.4 (297.4)	243.1 (146.4)
Private independent	2	498782	22.8 (5.3)	61.8 (123.9)	-130.4 (144.0)
Private independent	3	495640	22.3 (5.2)	71.9 (121.2)	-110.2 (128.7)
Private independent	4	494855	-10.0 (4.1)	12.9 (67.4)	-111.6 (94.5)
Private independent	5	494818	-7.1 (4.3)	0.0 (0.0)	0.0 (0.0)
Private independent	6	494634	-11.7 (4.1)	5.9 (59.2)	-102.3 (93.7)
Private government-dependent	1	508047	21.4 (5.6)	204.6 (160.1)	-79.4 (110.2)
Private government-dependent	2	498776	11.8 (4.1)	105.7 (84.6)	-93.9 (115.0)
Private government-dependent	3	495633	11.2 (4.0)	105.5 (81.2)	-81.2 (103.3)
Private government-dependent	4	494847	5.1 (3.6)	90.2 (65.6)	-99.5 (87.9)
Private government-dependent	5	494809	5.3 (3.7)	94.2 (67.1)	-100.7 (91.6)
Private government-dependent	6	494626	2.3 (3.5)	79.3 (60.1)	-31.5 (85.7)

TABLE 5A: THE FIXED COEFFICIENTS OF NESTED MULTILEVEL EQUATIONS WITH MATHEMATICS SCORE AS THE DEPENDENT VARIABLE (STANDARD ERROR BETWEEN PARENTHESES)

	0	1	2	3	4	5	6
Constant	514.1 (5.5)	510.2 (5.3)	302.0 (19.1)	291.2 (18.8)	211.1 (19.4)	212.1 (20.0)	231.0 (20.0)
Private independent		41.1 (5.3)	20.7 (4.1)	20.0 (3.9)	-7.4 (3.7)	-7.1 (3.8)	-9.0 (3.7)
Private government-dependent		17.5 (3.1)	9.3 (2.4)	8.8 (2.3)	3.0 (2.1)	3.6 (2.1)	1.6 (2.0)
Public		Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Students School Grade			33.5 (.7)	32.6 (.7)	31.5 (.7)	31.4 (.7)	31.3 (.7)
Male			14.7 (.7)	18.8 (.7)	19.3 (.7)	19.3 (.7)	19.3 (.7)
Mother's ISEI*10			3.2 (.3)	3.2 (.3)	3.0 (.2)	3.0 (.2)	3.0 (.2)
Father's ISEI*10			3.2 (.3)	3.0 (.2)	2.2 (.3)	2.2 (.3)	2.2 (.3)
Age in months			-.9 (.1)	-.9 (.1)	-.8 (.1)	-.8 (.1)	-.8 (.9)
Number of siblings			-2.1 (.3)	-2.3 (.3)	-2.0 (.3)	-2.0 (.3)	-2.0 (.3)
Father's education			1.8 (.3)	1.5 (.3)	1.3 (.3)	1.3 (.3)	1.3 (.3)
Mother's education			2.6 (.3)	2.5 (.3)	2.3 (.3)	2.3 (.3)	2.2 (.3)
Family wealth			-.5 (.4)	.5 (.4)	-.3 (.4)	-.3 (.4)	-.3 (.4)
Parental academic interest			5.5 (.4)	3.2 (.4)	2.7 (.4)	2.8 (.4)	2.7 (.4)
Parental social interest			-1.2 (.4)	-1.6 (.4)	-1.5 (.4)	-1.5 (.4)	-1.5 (.4_
Students' cultural activities			4.1 (.4)	1.8 (.4)	1.4 (.4)	1.4 (.4)	1.4 (.4)
Family cultural possessions			3.3 (.4)	1.8 (.4)	1.6 (.4)	1.6 (.4)	1.5 (.4)
Family educational support			-11.0 (.4)	-11.1 (.4)	-10.8 (.4)	-10.8 (.4)	-10.8 (.4)
Home educational resources			8.8 (.4)	8.0 (.4)	8.0 (.4)	8.0 (.4)	8.0 (.4)

Nuclear family			Ref.	Ref.	Ref.	Ref.	Ref.
Single parent family			-8.6 (.9)	-7.0 (.9)	-7.2 (.9)	-7.2 (.9)	-7.1 (.9)
Mixed parent family			-6.1 (1.3)	-5.9 (1.3)	-5.8 (1.3)	-5.8 (1.3)	-5.6 (1.3)
Other family type			-21.1 (2.1)	-20.2 (2.1)	-20.3 (2.1)	-20.2 (2.1)	-20.2 (2.1)
Time spent on homework				1.6 (.4)	1.4 (.4)	1.4 (.4)	1.3 (.4)
Teacher support				-2.7 (.4)	-2.7 (.4)	-2.7 (.4)	-2.7 (.4)
School disciplinary climate				-.4 (.4)	-.4 (.3)	-.4 (.3)	-.3 (.3)
Achievement pressure				-2.3 (.3)	-2.2 (.3)	-2.1 (.3)	-2.2 (.3)
Teacher-student relationship				2.9 (.4)	3.0 (.4)	3.0 (.4)	3.0 (.4)
Sense of belonging in the school				.4 (.3)	.3 (.3)	.3 (.3)	.3 (.3)
Enjoyment of reading				8.3 (.4)	8.1 (.4)	8.1 (.4)	8.1 (.4)
Reading diversity				4.9 (.4)	5.0 (.4)	5.0 (.4)	4.9 (.4)
Time in minutes spent in maths class per week *100				5.5 (.6)	5.5 (.6)	5.5 (.6)	5.4 (.6)
School average: Father's ISEI					1.7 (.1)	1.7 (.1)	1.4 (.1)
School average: Family wealth					14.2 (2.0)	13.9 (2.0)	12.1 (2.0)
School average: Parental academic interest					13.7 (2.0)	13.7 (2.0)	12.1 (2.0)
School in Capital city					Ref.	Ref.	Ref.
School in city >1.000.000					-3.3 (3.5)	-4.0 (3.5)	-5.2 (3.4)
School in city 100.000-1.000.000					5.2 (2.9)	4.9 (2.9)	3.8 (2.8)
School in town 15.000-100.000					12.5 (2.7)	12.6 (2.7)	10.0 (2.6)
School in small					15.4	16.3	13.3

town 3.000-15.000					(2.8)	(2.8)	(2.8)
School in village < 3.000					17.7 (3.2)	18.7 (3.2)	13.5 (3.1)
% of girls in school					4.6 (3.0)	4.1 (3.0)	.9 (2.9)
School size*100						.5 (.2)	.6 (.2)
Total number of schooling hours per year *100						.4 (.4)	.3 (.4)
Total number of computers per school size						.1 (4.9)	1.7 (4.8)
School size per number of teachers *10						-3.2 (1.6)	-4.5 (1.5)
Instructional resources						-1.6 (.7)	-1.0 (.7)
Shortage of teachers						-2.5 (.7)	-1.4 (.7)
School autonomy						-.3 (.9)	-.4 (.9)
Teacher participation to decision making						-.1 (.7)	-.1 (.7)
Material resources						.6 (.7)	1.3 (.7)
Teacher misbehavior							3.9 (.8)
Student misbehavior							-10.2 (.8)
Teacher morale							1.4 (.7)
Variance at country level	556 (185)	504 (169)	780 (256)	705 (231)	642 (211)	676 (222)	680 (223)
Variance at school level	1717 (55)	1656 (53)	890 (31)	812 (29)	578 (23)	567 (22)	516 (21)
Variance at student level	2905 (32)	2904 (32)	2375 (28)	2271 (27)	2267 (27)	2267 (27)	2267 (27)
2*log likelihood	502381	502297	495611	494362	493619	493582	493402

TABLE 5B: THE RANDOM COEFFICIENTS AND THEIR VARIANCES OF THE PRIVATE INDEPENDENT SCHOOLS AND PRIVATE GOVERNMENT-DEPENDENT SCHOOLS VARIABLES AT COUNTRY LEVEL (WITH PUBLIC SCHOOLS REFERENCE), IN THE DIFFERENT MODELS OF MATHEMATICAL SCORES (STANDARD ERROR BETWEEN PARENTHESES)

	Model	-2*log likelihood	coefficient	variance slope	covariance intercept & slope
Private independent	1	502292	37.3 (8.3)	409.7 (323.8)	-43.7 (188.7)
Private independent	2	495607	16.4 (5.2)	130.0 (132.5)	-218.4 (155.8)
Private independent	3	494358	15.6 (5.3)	145.6 (135.3)	-201.2 (148.8)
Private independent	4	493615	-11.0 (4.8)	118.3 (107.6)	-177.8 (126.6)
Private independent	5	493579	-10.8 (4.8)	113.3 (103.9)	-194.5 (128.5)
Private independent	6	493398	-12.9 (4.8)	131.2 (107.3)	-223.4 (131.5)
Private government-dependent	1	502293	14.7 (4.4)	97.7 (91.7)	-10.3 (100.8)
Private government-dependent	2	495609	7.9 (3.2)	48.9 (50.1)	4.4 (91.4)
Private government-dependent	3	494360	7.4 (3.0)	40.1 (43.7)	-8.8 (82.0)
Private government-dependent	4	493616	1.9 (2.9)	41.6 (39.2)	-4.2 (72.7)
Private government-dependent	5	493580	2.4 (2.8)	34.3 (35.3)	-17.7 (71.5)
Private government-dependent	6	493400	-.1 (2.8)	35.8 (34.9)	51.3 (70.3)

APPENDIX

TABLE A1: MEANS AND STANDARD DEVIATIONS FOR READING AND MATH SCORES BY TYPE OF SCHOOL AND COUNTRIES

Country	School type	Reading score		Math score	
		Mean	Std	Mean	Std
Austria	Private independent	583.3	77.3	527.5	84.5
	Private gov. dependent	542.1	84.3	534.4	85.3
	Public	510.5	94.1	516.0	89.4
Belgium	Private independent	577.2	99.9	555.8	87.3
	Private gov. dependent	535.0	98.0	540.1	94.5
	Public	475.4	113.9	491.6	105.0
Czech Republic	Private independent	-	-	-	-
	Private gov. dependent	501.5	78.8	483.6	77.5
	Public	509.4	92.4	509.2	95.4
Denmark	Private independent	-	-	-	-
	Private gov. dependent	498.4	99.1	525.1	90.5
	Public	500.4	101.7	515.0	85.6
Finland	Private independent	-	-	-	-
	Private gov. dependent	550.5	104.6	538.7	94.2
	Public	548.4	90.3	533.5	82.5
France	Private independent	517.7	93.3	535.4	82.4
	Private gov. dependent	500.0	97.7	513.0	100.1
	Public	501.2	98.2	511.6	94.2
Germany	Private independent	-	-	-	-
	Private gov. dependent	569,6	71.4	552.9	74.2
	Public	506.3	103.8	509.9	95.5
Hungary	Private independent	392.0	79.4	376.4	70.7
	Private gov. dependent	500.0	107.0	504.8	108.0
	Public	487.2	89.6	490.6	94.4
Ireland	Private independent	586.6	65.8	562.4	70.1
	Private gov. dependent	539.3	89.3	509.3	82.4

Ireland	Public	505.6	98.0	488.2	88.0
Italy	Private independent	510.4	65.6	480.5	74.4
	Private gov. dependent	427.5	65.7	380.8	97.5
	Public	490.1	93.7	461.2	93.0
Netherlands	Private independent	-	-	-	-
	Private gov. dependent	548.9	88.9	570.6	86.3
	Public	537.7	95.5	558.3	98.1
New Zealand	Private independent	603.7	96.0	591.7	85.3
	Private gov. dependent	-	-	-	-
	Public	527.4	108.7	535.8	95.7
Poland	Private independent	561.5	71.1	564.9	72.2
	Private gov. dependent	-	-	-	-
	Public	470.4	102.2	466.1	98.2
Portugal	Private independent	537.8	75.9	533.0	78.9
	Private gov. dependent	476.7	87.3	474.3	81.5
	Public	476.8	95.0	464.1	89.7
Spain	Private independent	539.9	77.9	524.1	87.6
	Private gov. dependent	513.0	82.5	496.9	84.4
	Public	480.9	91.0	467.2	93.0
Sweden	Private independent	-	-	-	-
	Private gov. dependent	532.2	88.6	505.8	84.6
	Public	513.7	94.6	509.2	94.0
Switzerland	Private independent	538.5	77.3	549.0	85.6
	Private gov. dependent	545.6	59.5	565.3	64.1
	Public	504.1	101.3	535.0	98.1
United Kingdom	Private independent	615.1	90.5	613.5	79.2
	Private gov. dependent	-	-	-	-
	Public	521.3	102.1	525.0	89.6
USA	Private independent	550.5	77.9	526.3	88.0
	Private gov. dependent	552.8	96.9	519.5	78.1
	Public	496.4	104.8	486.4	92.6

NOTES

[1] In fact, age is taken as a serious explanatory variable for students' performance even if the grade of the target population was defined in a narrow way (15 years old). This is why a very precise measure of age in month is applied in the data, and only a three-month testing window was allowed for the data collection in the countries in order to ensure the accuracy of students' age at the time of assessment.

[2] Percentages in Table 2 are unweighted. Weighted percentages (when applied the student weight as provided with the PISA dataset and described in the documentation) result in slightly different distributions, but the pattern with respect to the school types basically does not change. Weighted percentages produce even higher share of students in public sphere and the proportion of students in the private, government dependent institutions is smaller. The national deviations from the main average present the same picture.

[3] As a combination of Table 1 and Table 2, Table A1 (in the Appendix) displays the mean and standard deviation of the reading and maths scores by type of school and country. It seems that the declining trend in the mean of the reading / maths scores from private independent schools to public schools, as well as the increasing trend in the standard deviation of the reading /math scores from private independent schools to public schools, is present for most of the different nations. Even if there are deviations from this trend in certain countries, these deviations do not seem to be related to the variation of the private – public sector distribution in the given countries.