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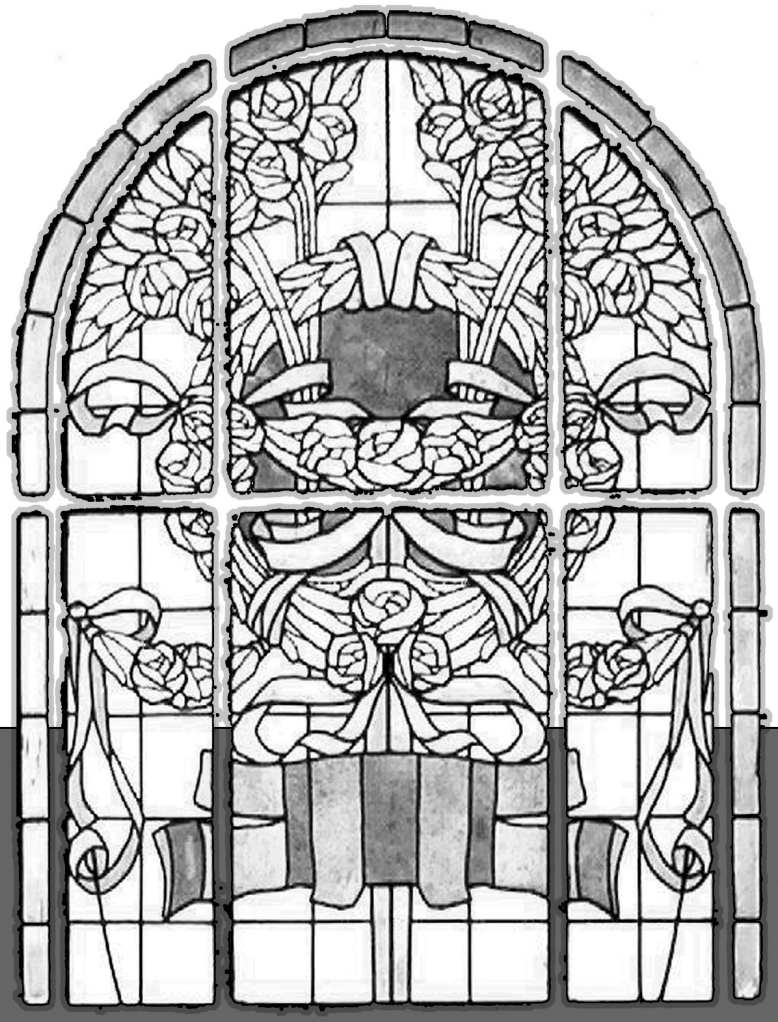

Issue 13 – 2007

DEALING WITH SCHOOLS IN SOUTHERN ITALY.

AN ANALYSIS OF THE SKILL GAP AMONG FIFTEEN-YEAR-OLDS IN ITALY

M. Foresti and A. Pennisi

Ministero dell'Economia e delle Finanze
Dipartimento per le Politiche di Sviluppo
Unità di Valutazione degli Investimenti Pubblici

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Dealing with schools in Southern Italy.
An analysis of the skill gap among fifteen-year-olds in Italy

Abstract

The recent debate on development, growth and competitiveness stresses the increasingly important role of education. Although it is not easy to isolate the direct effects of education on development outcomes from other variables, economists, sociologists and other researchers agree that the quantity and the quality of education are essential for growth and well-being, for both individuals and the society as a whole. According to the OECD Programme for International Student Assessment (PISA), Italy's young school leavers are among the worst performing and are positioned at the lowest levels of international rankings. Furthermore, there is a gap between the level of skills achieved by fifteen-year-olds in the Centre-North and the South. This paper explores the systematic geographical differences in skills among Italian students, in an attempt to identify the key factors that determine an educational system which, as a whole, is not only ineffective but also unfair. The picture drawn identifies the "context" in itself as one of the causes of the serious shortcomings of the education system in southern Italy. The territorial factor seems to count more than the type of school and the economic, social and cultural background of students. The marked skill gap between young people in the two areas of the country might be among the factors that contribute to the persistent lack of development in some regions, creating a vicious circle where the context contributes to the lack of skills and the lack of skills prevents a positive change in the context. Moreover, the low expectations of students and society in the South do not help generate pressure to improve the education system. It is against this background that we argue for a more prominent and clearer role of education in regional development policies. This is necessary in order to help raise the average level of skills, to promote excellence and to guarantee a minimum level of skills for everyone, which is of particular importance in the least developed regions of the country.

Fare i conti con la scuola nel Mezzogiorno.
Analisi dei divari tra le competenze dei quindicenni in Italia

Sommario

Nel dibattito recente su sviluppo, crescita e competitività emerge con sempre più forza il ruolo rilevante dell'istruzione. Non è sempre facile isolare gli effetti diretti dell'istruzione sullo sviluppo da quelli di altre variabili, ma economisti, sociologi e altri ricercatori concordano nell'affermare che la quantità e la qualità dell' istruzione influenzano la crescita economica e il benessere sia individuale che collettivo in vario modo. I risultati del *Programme for International Student Assessment* (PISA) dell'OCSE, pongono le giovani leve di italiani agli ultimi posti nelle classifiche internazionali e rilevano una drammatica spaccatura tra il Centro-Nord e il Sud. In questo lavoro si indaga sui divari territoriali sistematici tra le competenze degli studenti quindicenni italiani nell'intento di verificare alcuni dei fattori che determinano un sistema nel complesso poco efficace e poco equo. Il quadro che ne emerge attribuisce al "contesto" in sé una delle cause della grave situazione in cui versa il Mezzogiorno. Il fattore territoriale sembra contare più della tipologia di scuola e del *background* socio-economico e culturale degli studenti. La marcata differenza di competenze di base tra i giovani che vivono nelle due aree del Paese rischia di rafforzare i fattori che causano il ritardo di sviluppo di alcuni territori, creando un circolo vizioso dove le condizioni di contesto contribuiscono alla mancanza di competenze e la mancanza di competenze impedisce il cambiamento del contesto. Inoltre, le aspettative basse degli studenti e della società nel Sud non contribuiscono a creare la pressione per il miglioramento del servizio dell'istruzione. Sulla base di tale scenario si individua la necessità di un ruolo rafforzato dell'istruzione nelle politiche regionali per lo sviluppo per contribuire – nelle aree più in ritardo – a innalzare il livello medio degli apprendimenti, a promuovere le eccellenze e ad assicurare un livello minimo di competenze per tutti.

The authors:

***Aline Pennisi**, member of the Public Investment Evaluation Unit, Department for Development Policies, Ministry of Economic Development.*

***Marta Foresti**, evaluation expert, Overseas Development Institute (United Kingdom)*

A number of the issues addressed in this paper were discussed at the seminar "Conoscenza per lo sviluppo: il ruolo della scuola e dei processi di apprendimento nelle politiche di sviluppo", organised by the Department for Development Policies and the Ministry of Education, Universities and Research in Rome on 7 July 2005 as part of the preparation of the National Strategic Reference Framework 2007-2013. The related documentation can be consulted at:

http://www.dps.mef.gov.it/quadro_strategico_nazionale_seminari.asp#scuola

A preliminary version of this paper was presented on 17 October 2006 at a joint seminar held by the Department of Economic, Business and Financial Sciences and the Department of Statistical and Mathematical Sciences of the Faculty of Economics at the University of Palermo.

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Contents

I. Introduction

The major role played by education emerges with increasing force in the recent debate on development, growth and competitiveness. It is not easy to isolate education's direct impact on development from that of other variables or to measure its intensity, but an enormous volume of literature is now available to support the assertion that human capital is crucial to economic growth and prosperity in both individual and collective terms. A recent study by De La Fuente and Ciccone (2002) estimates, for example, that an extra year's education is equivalent to an approximately 6 per cent increase in individual income in the European countries. In a subsequent work (2003), De La Fuente stresses that the return on investment in human capital is greater than that on physical capital in terms of increased productivity. Although limited, not always comparable and constrained by the data available[1] and the methodology adopted, the empirical evidence makes it possible, at the *micro* level, to measure the relationship between educational attainment and a broad range of private returns (from occupational status to income level, the likelihood of benefiting from further learning and training opportunities, state of health, etc.) and, at the *macro* level, to capture the importance of education in terms of productivity and the other channels that contribute to a country's economic growth.

The very strategy that the Lisbon European Council adopted for turning the European Union into "*the world's most competitive and dynamic knowledge-based economy*" by the end of 2010 acknowledges the importance of education for growth and competitiveness and introduced specific educational targets into its programme, including raising the proportion of young people with higher secondary school qualifications to 85 per cent and lowering the proportion of young people with low skills, and increasing the number of university graduates in technical and scientific disciplines[2].

After the considerable progress in the spread of literacy achieved in the second half of the last century, Italy is now showing widespread shortfalls in the population's level of

[1] Virtually all existing studies focus on quantity the of education, measuring, for instance, the qualifications attained or the number of years of schooling.

[2] In order to enhance the contribution of education policies to the Lisbon strategy, in 2001 the EU Member States' education ministers adopted a report on the common education and training targets to be met by the end of 2010 and prepared a work schedule. There are 13 specific targets covering the various types and levels of education and training (formal, non-formal and informal) throughout a entire lifetime. See European Commission Communications COM/2002)779, COM(2003)685 and COM(2006)481; further details on: http://ec.europa.eu/education/policies/2010/et_2010_en.html.

skills. Meeting such targets thus requires Italy to make a greater effort than other European countries and to pay special attention to ensuring that its internal disparities[3] are not neglected (Table I.1).

Table I.1 Italy's position with respect to the Lisbon Education and Training Strategy benchmarks.

	Indicator	Target for 2010	2000		2005			
			EU (25)	Italy	EU (25)	Italy	Centre-North	South
1	**Early school leavers:** percentage of the population in the 18-24 age group holding, at most, a lower secondary school qualification and taking part in no further form of education or training	not more than 10 per cent	17.3	25.3	15.7	22.4	18.8	27.2
2	**Low achieving in reading**: percentage of 15-year-old students with, at most, level 1 reading skills	a 20 per cent reduction compared with level for 2000	19.4	18.9	19.8	23.9	14.7	34.7
3	**Completion of upper secondary education:** percentage of the population in the 20-24 age group holding at least an upper secondary school qualifications	at least 85 per cent	76.4	68.8	76.7	73.0	76.8	68.0
4	**Mathematics, science and technology graduates:** number of tertiary graduates in mathematics, science and technology per 1,000 inhabitants aged 20-29	a 15 per cent increase over level for 2000	10.2	5.6	12.3	10.7	13.1	7.3
5	**Lifelong learning**: percentage of adults in the 25-64 age group involved in lifelong learning	at least 12.5 per cent	7.9	5.5	9.9	5.8	6.1	5.3

Note: (1), (3) and (5) Istat, *Rilevazione continua delle Forze di Lavoro* – These indicators are expressed as annual averages (whereas the figure disseminated by Eurostat refers to the second quarter of the survey); (2) The figures refer to 2003; (4) The goal of a 15 per cent increase in mathematics, science and technology (MST) graduates refers to the number of graduates.

Source: Istat, Eurostat, OCSE Pisa 2003

Although considerable advances in levels of education participation rates have been made in Italy in recent years, there are signs of inadequacy and unevenness in the quality of the learning acquired and evidence of unsatisfactory interaction and mutual support

[3] Most of the indicators are improving, with the percentage of 15-year-old students with no more than the first level of reading skills being the sole exception. The fact that a considerable deterioration has been observed has given rise to controversy and is partly attributed to the fact that the first skill tests were those for the most in-depth section of the OECD-PISA survey, one that changes with each survey: it was reading in 2000 and mathematics in 2003. The Italian students are thought to have struggled more when taking the tests furthest down in the sequence of sessions, thus penalising reading. Be that as it may,

between school and society as a whole. Furthermore, the definition of international standards for measuring basic education levels has underscored the accumulated lag[4]. In 2003, about 44 per cent of the adult population (those aged 25 to 64) in Italy had completed upper secondary education, a proportion that is still low if compared with the 66 per cent attained on average in the OECD countries[5] and is only partly attributable to the lag accumulated over time as a result of the statutory school-leaving age having been raised only quite recently. An examination of the differences between the various age groups shows a narrowing of the gap with the OECD average by about 12 percentage points over three generations. Nonetheless, Italy remains in 26th place in the OECD country ranking, testifying to the fact that, compared with other advanced countries, the effort to increase the proportion of people with higher qualifications has been too limited[6].

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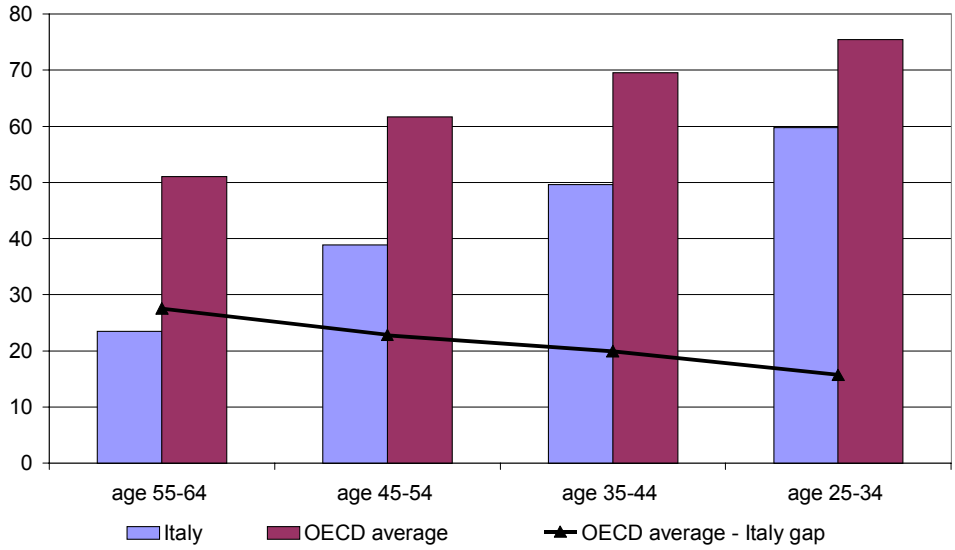
although Italy has not lost many places in the country league table, it has not improved its ranking in reading between the two surveys either; a "non-improvement" in skills thus remains.

[4] An international standard classification of education (ISCED) was established by UNESCO in the early seventies to make it possible to draw up comparable statistics. The International Association for the Evaluation of Educational Achievement (IEA) was founded at around the same time to help the international community identify the strengths and weaknesses of the various education systems, launching the first comparative surveys of skills in mathematics and science (the TIMMS survey) and in reading and literary skills (the PIRLS survey).

[5] Source: OECD, *Education at a Glance 2005* (Table A1.2a).

[6] A number of Central and Eastern European countries that have joined the European Union recently can boast higher levels of education than Italy (in 2003, the percentage of the population in the 25-64 age group holding upper secondary education qualifications stood at 86.4 in the Czech Republic, 86.7 in the Slovak Republic, 74 in Hungary and 48.3 in Poland). Some researchers point out that better-qualified human capital, together with lower labour costs, in such countries might give them a competitive edge over Italy in terms of business location choices.

Figure I.1 **Percentage of the population that has completed upper secondary education by age group. Year: 2003**



Source: DPS based on OECD data, *Education at a Glance* 2005

In a system like Italy's, marked by widespread entrepreneurship, an economy characterised by small and medium-sized enterprises and unevenly distributed capacity for innovation, it is reasonable to assume that education is an even more decisive factor for growth. The average level of education among entrepreneurs in Italy is generally low: according to an analysis[7] of the Bank of Italy's Survey of Household Income and Wealth, this category of workers not only holds lower qualifications than other groups (such as office workers and professional people), but has shown no significant upward trend in terms of level of education over the last decade. The recent ISTAT survey of the new entrepreneurial class[8] confirms that in about one case in three even firms started up recently and still in business are run by holders of no more than a lower middle school certificate.

[7] In particular, Ferrante and Sabatini (2006) highlight the high proportion of Italian entrepreneurs with qualifications below the level of compulsory education. In 2004, they accounted for over a third of entrepreneurs: holders of at most a middle school certificate account for around 28 per cent of sole proprietors, about 40 per cent of owners or members of family businesses and 36 per cent of active shareholders. Furthermore, university graduates are very thin on the ground in the entrepreneur class, accounting for only 12 per cent of sole proprietors, 6 per cent of owners or members of family businesses and 4 per cent of active shareholders. Barca and Cannari (1997) also discuss the relationship between education and entrepreneurship in Italy.

[8] The survey was conducted on a sample of "real" businesses (the technical definition being new businesses whose production factors start from scratch, meaning that they are not subsidiaries of other businesses) started up in 2002 and surviving/still in operation three years later. The findings are available on: http://www.istat.it/salastampa/comunicati/non_calendario/20060713_00/.

There are, moreover, few incentives for lifelong learning, as is shown by the small percentage of adults aged between 25 and 64 attending educational or occupational training courses in Italy (barely 6 per cent overall)[9]. These factors stress the importance of ensuring a high level of skills throughout the country.

Schools' role in society extends far beyond their potential impact on the learning and skills handed on to future generations of workers and citizens. Given their almost total coverage of the population of young people, schools also constitute a fundamental channel for achieving greater social mobility and for countering the inequalities due to origins and environment. This is once again becoming particularly important on a continent marked by lack of social mobility like Europe, and in a country with pronounced inequalities like Italy.

While the quantity of education has an impact on growth and development in general, quality of education matters even more. Sad to say, the most recent evidence available in this connection is anything but reassuring: the findings of one of the most authoritative international surveys on students' basic skills, the OECD *Programme for International Student Assessment* (PISA)[10], relegate the younger Italian generations to the bottom places in the international rankings and highlight a dramatic divide between the country's central and northern regions and the South[11].

This work[12] probes the systematic territorial divides between students' skill levels with a view to ascertaining a number of the factors that make for what is, overall, an ineffective and unfair system. The picture that emerges from an analysis of the PISA 2003 findings identifies "context" as such - rather than availability of financial and infrastructural resources - as one of the causes of the serious situation afflicting the South. The marked

[9] In Italy, an adult worker (in the 25-64 age group) with a secondary school diploma earns, on average, 22 per cent more than one without, and university graduates about 53 per cent more than non-graduates (source: OECD, *Education at a Glance, 2006*). So in terms of formal education at least, the return that Italians obtain on investment in educational qualifications is hardly negligible, albeit lower than in other advanced countries like the United States, the United Kingdom and Korea. Be that as it may, the figures for the labour force in the younger age groups (15-34) show that qualifications generate a return in terms of occupational status much later than in other countries.

[10] For further information on PISA see http://www.pisa.oecd.org/

[11] In this paper, the South includes the following regions: Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sicily and Sardinia.

[12] The text is accompanied by a comprehensive statistical appendix. The value it adds to the tables published in the National Report on PISA 2003 by INVALSI and the various OECD reports is represented by the tables covering the country's various macro-areas. The estimates cite the standard margins of error so as to enable readers to assess their reliability and interpret the figures correctly. This initiative sets out to facilitate analysis and promote further surveys of a local nature. The tables are numbered according to the chapters to which they refer.

gap in basic skills between adolescents living in the two areas of the country threatens to consolidate the factors at the root of some regions' retarded development, creating a vicious circle in which context conditions contribute to the lack of skills and the lack of skills prevents the context from changing. The low expectations of students and society in the South do not help foster the build-up of the pressure needed to improve the educational system.

For these reasons, education requires a stronger, more conscious role for regional development policies, which must contribute over the coming years – especially in the most backward areas – to raising the average standard of learning, promoting excellence and ensuring that everybody acquires a minimum level of skills.

II. The skills of fifteen-year-olds in Italy

According to the findings of the 2003 PISA survey, only one young Italian in five has the mathematical skills required to solve complex problems, a figure that is a cause for concern: indeed, the survey sets out to measure what abilities a 15-year-old, approaching the statutory school-leaving age[13], has mastered in terms of the skills deemed essential for performing an active, informed role in society and for continuing to learn. The picture of Italy it provides is that of a country where the average level of secondary school students' skills is significantly lower than that of students of the same age in the most advanced countries and in many emerging economies.

The skills and abilities assessed in PISA are the basic ones: reading, mathematics, science and problem solving (understood as an interdisciplinary skill). The findings are expressed in the form of a point scale, with reference to a conventional OECD average of 500 points and standard deviations of 100, and by levels of skill[14]. This paper focuses primarily on an analysis of the mathematical skills findings, for which the 2003 PISA round supplies the greatest details. The picture obtained is entirely in line with the assessments drawn from analyses of the other skill areas examined by PISA, but it is particularly emblematic given the role that logical and computational skills play in today's world. Sound mathematical skills are a decisive factor for sustaining scientific research and development, for benefiting in full from information and communications technologies and for manipulating and evaluating increasingly extensive sets of information and data, which is now a necessity of daily life. Mathematical skills – which are bound up with logic, rules and abstraction – cannot therefore be confined to a few cases of excellence, but must be broadly disseminated throughout the population.

This would not appear to be the case in Italy, which ranks 25th among the OECD countries in terms of average score (466), tied with Portugal and only slightly ahead of Greece (445), and where the percentage of students capable of solving complex problems[15] is considerably lower than the OECD average and up to 2.5 times lower than countries like Korea and Finland (Figure II.1).

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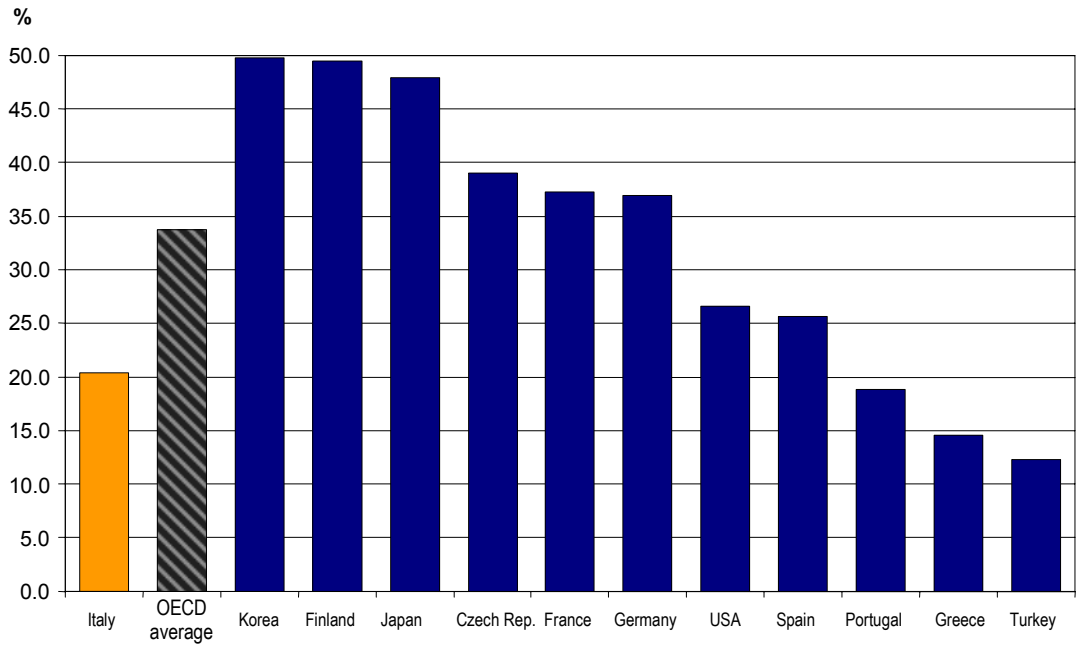
[13] The reference population covered by the survey is made up of 15-year-old students; this is the age that precedes or coincides with the end of compulsory schooling in the majority of the OECD countries.
[14] In statistical terms, a student belongs to a given level if he or she can be expected to give correct answers to, on average, 62 per cent of the questions for that level.
[15] There are six levels of skill in the mathematics scale. The students capable of solving complex problems in mathematics are those with a skill level higher than level 3. The same applies to reading.

Figure II.1 **Percentage of 15-year-old students with the mathematical skills required to solve complex problems in selected OECD countries**



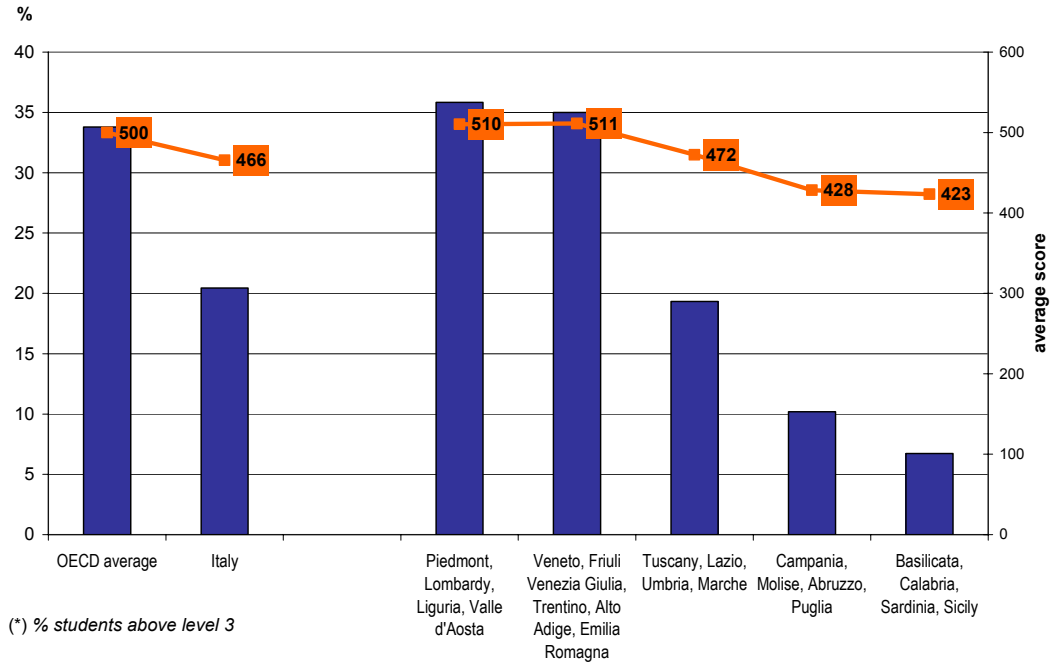
Source: Based on OECD-PISA 2003 data

II.1 A country split between excellence and mediocrity

Nevertheless, Italy's average poor performance in terms of mathematical skills as compared with the results in other countries is only part of the story. The broadening of the national sample (which makes it possible to estimate scores and levels of average skill with sufficient reliability for a number of individual regions as well) reveals that whereas, on average, students in Trento (547) and Bolzano (536) achieve results comparable with Finland (544) – which tops the 2003 PISA league table with Korea (542) – and those in Lombardy (519) and Veneto (511) exceed the OECD average, results in the southern regions (426) are on a par with the Turkish average (423), one of the lowest-ranking countries[16]. The difference between the results achieved in mathematics in the country's various areas is obvious: the North in line with the OECD average, with peaks of excellence in some regions, the Centre struggling to keep up and the South far short of satisfactory (Table II.1 and Figure II.2).

[16] The bottom place in the 2003 OECD PISA ranking is occupied by Mexico, with an average score of 385 in mathematics and only 3.9 per cent of 15-year-old students with sufficient mathematical skills to solve complex problems.

Figure II.2 **Average score and proportion of students with sufficient mathematical skills to solve complex problems (*) by macro-area**



Source: Based on OECD-PISA 2003 data

Concern over Italian students' average level and the skills divide is not restricted to mathematics alone, but covers the other areas measured by PISA as well. Not only is Italy's average score in reading, science and problem-solving skills consistently lower than the OECD average, but it is also worse in the southern areas (in Figure II.3, they form the innermost trapezia of the diamond – all distant from the square drawn around the 500 value that represents the OECD average). It shows some improvement in central Italy and is manifestly better in the northern regions. Although the results for science and reading shift in the direction of better scores in all the macro-areas[17], the gaps are of the same breadth and the scenario outlined for mathematics remains largely unchanged.

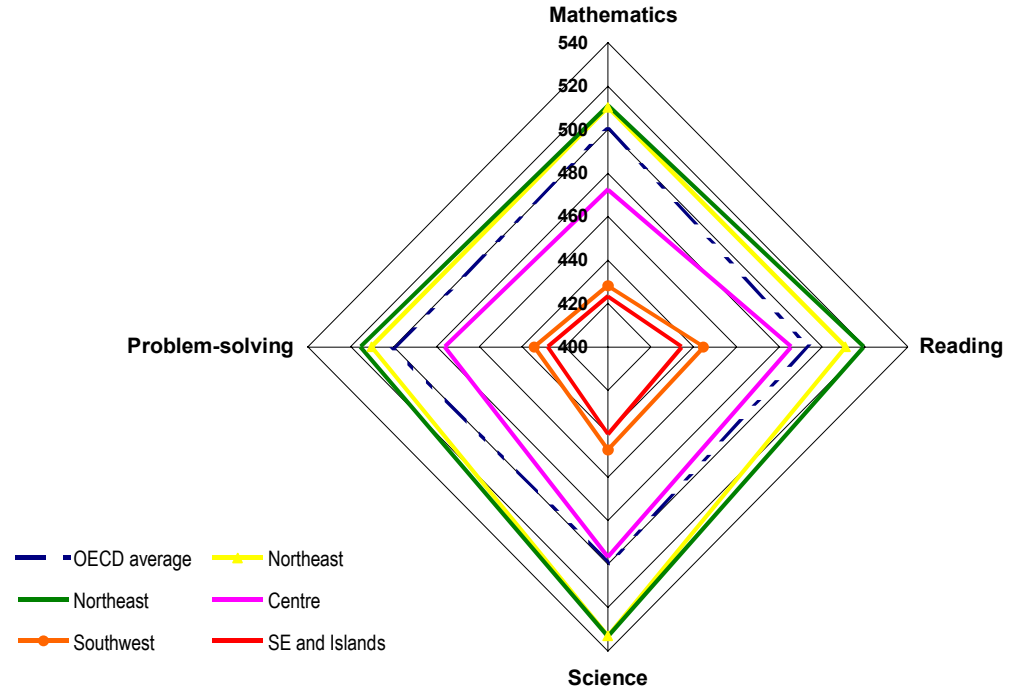
[17] PISA 2006 focuses on scientific skills. It will be interesting to discover in the coming months (the findings are due for publication in autumn 2007) whether the signs of higher average skills in science than in the other spheres are confirmed, and likewise the North-South divide. It would, moreover, be interesting to see whether generally better performance in science than in mathematics is the result of differences in schools' teaching methods in these subjects.

Table II.1 **Average score and proportion of students with sufficient mathematical skills to solve complex problems by macro-area and selected regions and autonomous provinces**

Macro-areas	Average score	Standard error	per cent students above level 3
Northwest	510	(5.1)	35.0
Northeast	511	(7.7)	35.8
Central Italy	472	(5.6)	19.3
Southwest	428	(8.2)	10.2
Southeast and Islands	423	(6.1)	6.8
Region/Autonomous Province			
Bolzano	536	(4.8)	46.2
Trento	547	(3.0)	51.8
Lombardy	519	(7.3)	36.0
Piedmont	494	(4.9)	28.2
Tuscany	492	(4.3)	28.2
Veneto	511	(5.3)	34.5

Source: Based on OECD-PISA 2003 data

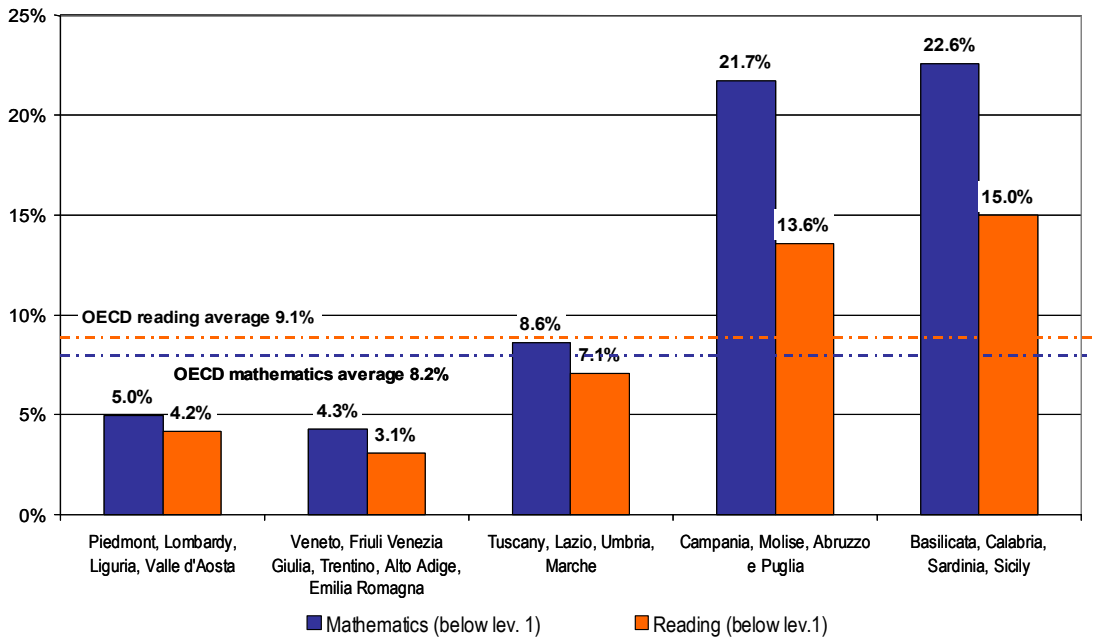
Figure II.3 **Fifteen-year-old students' average score in the various areas of the PISA survey by macro-area (OECD average=500).**



Source: Based on OECD-PISA 2003 data

Our remarks so far on the Italian education system's poor overall performance and on the substantial divide refer to average results. The picture that emerges from PISA 2003 becomes even more alarming when the focus turns to the proportion of students who fail to reach even the first level of skills18. On average, 8 per cent of 15-year-olds are below skill level 1 in mathematics in the OECD. In Italy, the figure is below 5 per cent in the North and 9 per cent in the Centre, but it exceeds 20 per cent in the South: one student in five cannot be considered skilled in mathematics at even the lowest level. The low level of ability is less striking in reading, but the distance from the OECD average and the gaps between the macro-areas are just as evident (Figure II.4).

Figure II.4 **Percentage of 15-year-old students with mathematical and reading skills below level 1 by macro-area.**

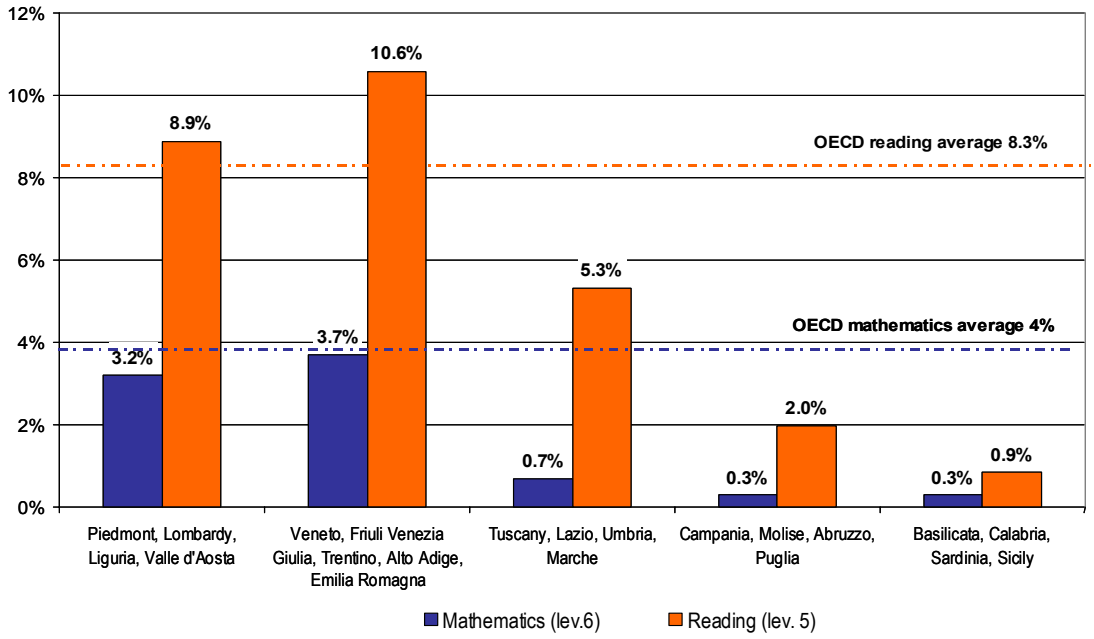


Source: Based on OECD-PISA 2003 data

[18] The minimum level of skill is level 1 and starts with a score of 358 in mathematics and 335 in reading. Those who achieve a lower score are classified as "below level 1", having proved incapable of addressing the most elementary, routine tasks set in the PISA tests with sufficient skill. Level 1 features basic tasks; for example, in mathematics: Level 1 students are capable of answering questions on contexts familiar to them and in which all the relevant information is supplied and the question is clearly defined. They are also capable of identifying information and applying routine procedures within the bounds of explicitly defined situations and following precise instructions. These students are also capable of taking obvious action directly stemming from the stimulus provided. For a full description of the skills associated with the various levels, see INVALSI (2005), *Il livello di competenza dei quindicenni italiani in matematica, lettura, scienze e problem-solving – Rapporto Nazionale di PISA 2003*.

The divide is equally marked and symmetrical in the cases of excellence, namely the percentages of young people ranked at the highest skill level envisaged (level 6 for mathematics and 5 for reading; Figure II.5).

Figure II.5 **Percentage of 15-year-old students achieving excellence in mathematics and reading by macro-area.**



Source: Based on OECD-PISA 2003 data

II.2 Attending high school does not, in itself, make students achieve

The stratification of the national sample enables us to make an accurate estimate of performance – in terms of average score and percentage of students attaining a given level of skill – by category of school (academic high schools (*liceo*), technical schools and vocational schools) as well. In all subject areas, the results of 15-year-old Italian high school students were in line with the OECD average, whereas those attending technical schools were well below the average (472) and vocational school students ranked substantially further down (408). In the light of these results, recent developments in schools has to give rise to concern, not only because one student in four is attending a vocational school (figures for the 2003-2004 academic year), but also because there has been a fall-off in technical school attendance in recent years, with part of these students attending vocational schools rather than high schools: since the 1999-2000 academic

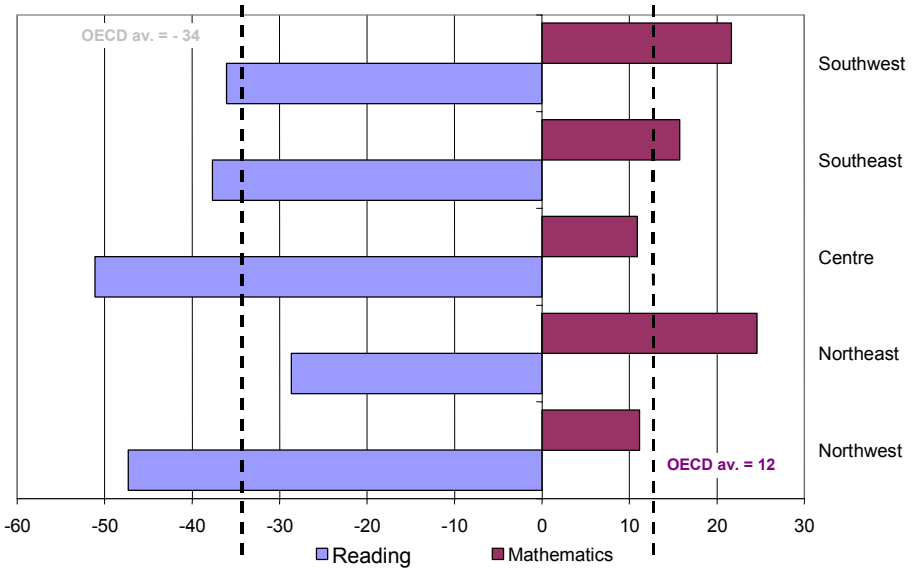
year, the former have seen a 9 per cent rise in enrolment and the latter a 4 per cent rise[19].

The skills gap between students attending high schools and technical and vocational schools may in part be considered a foregone conclusion and common knowledge. However, the persistent difference in performance among the students attending the same category of school in different areas, a fact that emerges from an analysis by category of school and macro-area, is undoubtedly less so.

Box A - Gender Differences in Skills

The PISA 2003 findings confirm the evidence that has already emerged from other comparative studies and from the same survey conducted in 2000: females have superior skills in reading, but inferior skills in mathematics. The size of the gap varies from one country to another, but is statistically significant in the majority of cases. The ability gap between females and males in reading averages 34 points in the OECD, over half a skill level. The lead is slightly larger (40 points) in Italy and is found in all the macro-areas, with the exception of the Northeast. The situation is reversed as regards mathematics (Iceland is sole exception among the countries that took part in the PISA 2003 survey), where males show higher ability than females, although the gap is smaller than with reading (an average 11-point difference in the OECD).
The difference in Italy is one of the highest recorded in the countries taking part in the survey (18 points) but the size of the gap varies from one macro-area to another.
One of the Lisbon plan's targets for 2010 is a 15-percent increase in university graduates in mathematics, science and technology fields over the figure for 2000. Over the last eight years, the Italian figures for the ratio between graduates in scientific and technical disciplines and the total 20-29 age group have been trending toward the target. Nevertheless, the gap between central and northern Italy and the South, and between males and females, has widened. The PISA data confirm that Italy must still encourage students to select scientific education and training courses, paying particular attention to encouraging young women to opt for science and technology subjects.

Figure A.1 Differences between average male and female reading and mathematics scores



Source: Based on OECD-PISA 2003 data

[19] The figures are drawn from the MIUR publication *La Scuola in cifre 2005*.

The skills divide between the areas in the country extends to all categories of school. In central and northern Italy, about 45 per cent of high school students have skills sufficient to solve complex problems, as opposed to only 16 per cent in high schools in the South. The situation worsens in technical and vocational schools, where not only does the percentage of students with good skills decline, but the divide between central-northern and southern Italy widens. In order to interpret the figures correctly, it should be borne in mind that the survey sample does not guarantee that the estimates by category of school within each macro-area are representative. Nevertheless, the standard errors set out in Table II.2 for the estimates made on the two areas are modest and, even considering only the interval of values in the vicinity of the average score for greater precision, the gap remains significant[20]. The conclusions are thus clear and reliable: students attending high school in the South attain, on average, results far worse than those attending a technical school in central and northern Italy (who, all things considered, attain good results on average). The situation for vocational school students is very different, as they present poor skills nationwide and completely inadequate skills in the South, where fewer than 1 per cent are capable of solving complex problems. Young people in this situation approach adult life with a major handicap, jeopardising their chances not only of successfully continuing their studies or entering the labour market, but also of playing an active role in any change in the context in which they live.

Table II.2 Average score and percentage of students classified according to mathematical skills in central-northern and southern Italy by category of school.

Category of school	Centre-North		South		per cent students above level 3		per cent students below level 1	
	Average score	standard error	Average score	standard error	Centre-North	South	Centre-North	South
High schools	536	(4.9)	465	(9,8)	45.0	16.0	1.1	10.2
Technical schools	509	(5.1)	424	(10.0)	31.9	5.7	2.6	20.0
Vocational schools	431	(4.4)	376	(6.6)	6.8	0.9	16.6	39.8

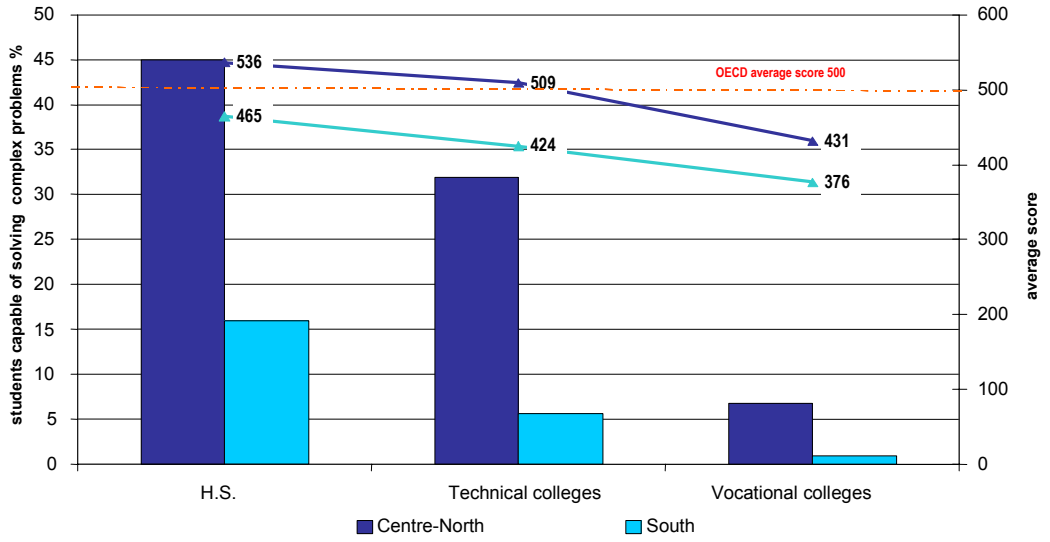
Source: Based on OECD-PISA 2003 data

The persistence of poor skills in the South is not a composition effect, in the sense of a low-performance category of school predominating in the area concerned: student concentration by category of school is fairly even across the whole country, with about 38 per cent of secondary school students attending high school, about 38 per cent

[20] The standard errors are reported beside the estimated values in all the tables in the statistical appendix.

technical schools, and the remaining 25 per cent vocational schools (Table II.3). Indeed, it emerges from PISA that even the schools traditionally regarded as the "best" post fairly disappointing results in the South.

Figure II.6 **Average score and percentage of 15-year-old students with mathematical skills sufficient to solve complex problems by macro-area and category of school**



Source: Based on OECD-PISA 2003 data

Table II.3 **Percentage distribution of students by category of secondary school and macro-area. 2003-2004 academic year**

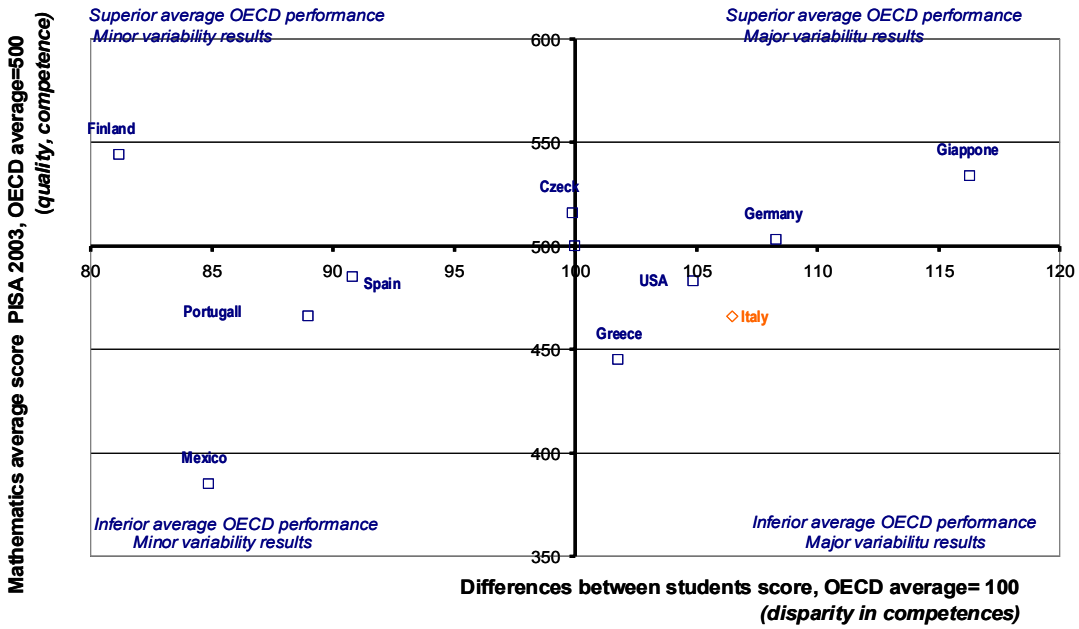
	North	Centre	South	Italy
High schools	35.7	40.9	38.8	38.0
Technical schools	38.7	34.7	36.2	36.8
Vocational, art schools	25.6	24.4	25.0	25.2
Total	**100**	**100**	**100**	**100**

Source: Ministry of Education, Universities and Research, *La Scuola in Cifre 2005*

III. Equal educational opportunities for all?

The level of 15-year-old students' skills differs greatly according to geographical area and category of school in Italy. In fact, the differences between areas and schools are larger than the divide between the average scores of Italian students and students in other countries. The result is one of the highest variances in results among the OECD countries and denotes what is, overall, a less fair system, without this being offset by a higher average score, as is the case in Germany and Japan (where a policy of fostering excellence is pursued, with the result that the variance in students' skills is high, but the overall averages are better than in Italy). In the bottom right-hand quadrant Figure III.1 shows a number of other countries that, like Italy, have lower average mathematical skills and greater variability of results than the OECD average.

Figure III.1 Average mathematics score of 15-year-old students and variance of results in selected OECD countries



Source: Based on OECD-PISA 2003 data

III.1 Differences in results between students and between students from different schools

A more detailed analysis of the variance[21] between Italian students' skills reveals that while variance between young people attending the same school is in line with the situation in other countries, the variance between schools is particularly high: almost double the OECD figure (Figure III.2). The variance in results within individual schools is representative of the differences between individuals who, despite being exposed to the same type of school environment, the same curriculum and, in some cases, the same teacher and the same textbooks, have differing skill levels for a wide range of reasons: talent, application and motivation, interest and skills already acquired, or acquired outside school. The variance between schools is, however, a yardstick of the extent to which the "best" students are grouped in the same schools and the "poorer" students gravitate towards other schools (for reasons of student and parental choice, geographical location of schools, intake policies, student selection[22] etc.). The inter-school variance accounts for 57 per cent of the total in Italy, but no more than 34 per cent , on average, in the OECD. Cases against which the Italian situation can be compared include Finland, where the average difference in results observed between schools amounts to only 4 per cent (thus meaning that every school is representative of the overall population, and choice of school makes no difference) and Japan, where it stands at 60 per cent (pointing to a highly selective, segmented school system).

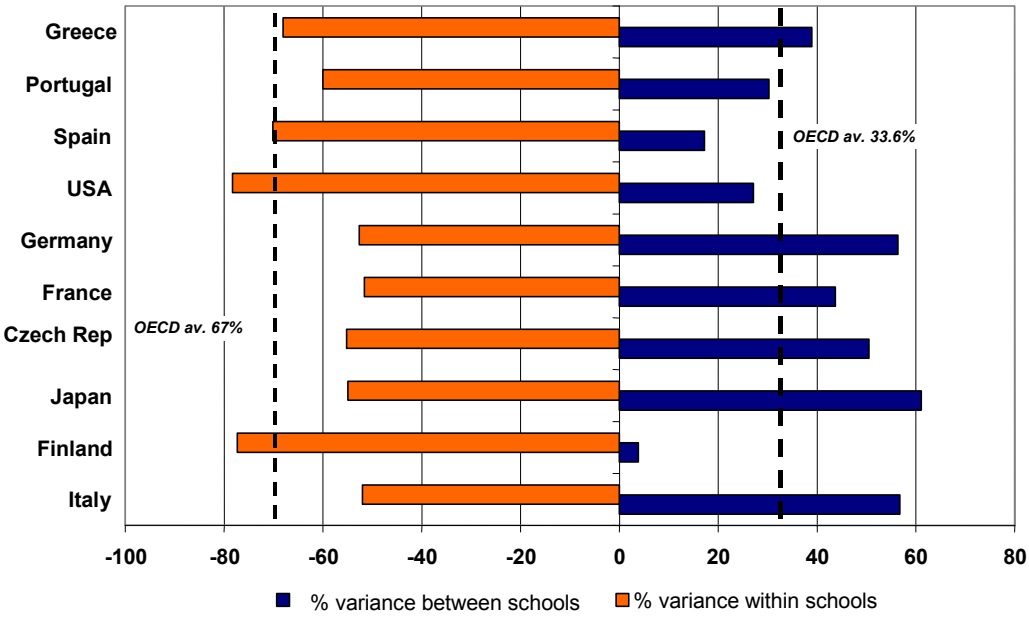
The inter-school variance is not determined solely by the differences already observed in the average student results by category of school. Indeed, the total variance in results between individual schools is in any case fairly high, whether between high schools (31.5 per cent), between technical schools (31 per cent) or, to a somewhat lesser extent, between vocational schools (23.1 per cent). This confirms the fact that, in Italy, the likelihood of acquiring good mathematical skills depends greatly on the school attended (not only on the category of school, but on the school itself): a somewhat worrying finding in terms of the fairness of the school system, which provides services that are

[21] Variance analysis is a statistical technique that makes it possible to compare two or more sets of data by observing the variability *within* these sets and the variability *between* them. For a full discussion, see Ornello Vitali (1999), *Statistica per le scienze applicate - Vol. 1,* Cacucci ed., Bari, 1999).

[22] A typical education policy issue is the choice between a selective system, in which students are streamed very early (from age 10) into different schools according to their ability (early tracking) and a comprehensive system, in which there are no distinctions in school category until after middle school (as is the case in Italy).

not only below the minimum quality standards, but also markedly uneven from one to another[23].

Figure III.2 Breakdown of the variance in 15-year-old students' mathematics results within and between schools – comparison among selected OECD countries



Note: In the chart, each country's overall variance is set at 100 (with the exception of a few countries, whose estimated overall variance is slightly higher). See Figure III.1 to assess the differences in the size of the variances between the countries.

Source: Based on OECD-PISA 2003 data

The answers PISA obtained from a questionnaire directed at the students make it possible to collate the performance and skills assessment against information on family background, perception of the school environment, study methods, preferences and aspirations. The database disseminated by the OECD provides a composite index of the economic, social and cultural status of the families of origin (ESCS), obtained by combining information on the parents' educational qualifications and highest occupational status with that on the availability of educational and cultural resources

[23] Inter-school variance is higher than the OECD average within the country's macro-areas as well, as illustrated in Figure III.4.

(such as books, a place and desk for working, a PC, Internet, a dictionary etc..) in the home[24].

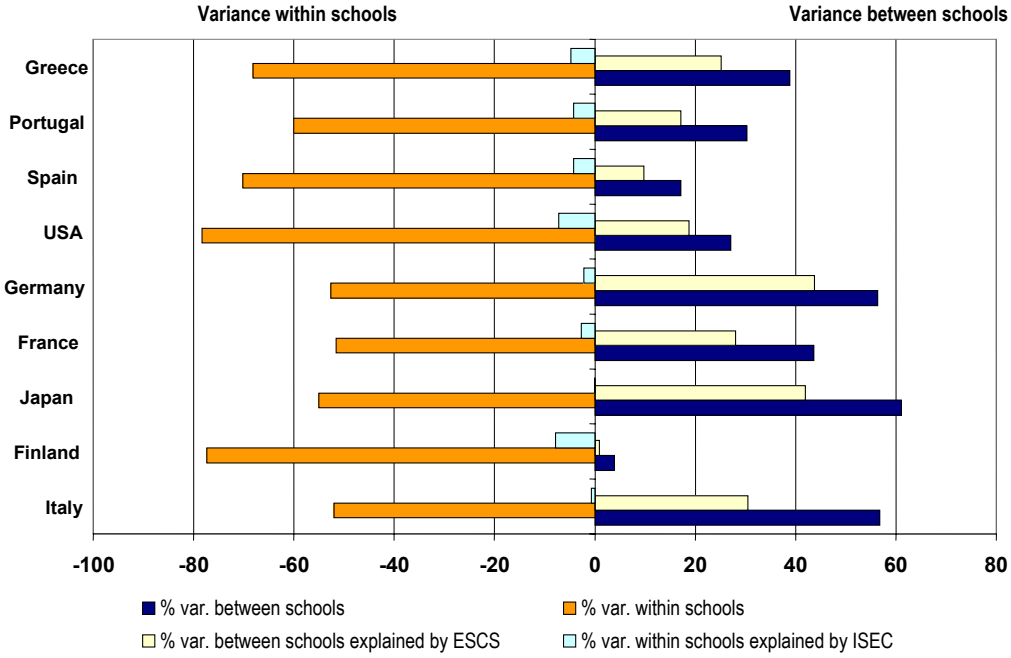
An analysis of the variance breakdown reveals, for instance, that almost a third of the variance between schools (31 per cent) is explained precisely by the school's overall socio-economic and cultural index. Estimating the extent to which the index explains the variance in student results between schools is tantamount to measuring what proportion of the difference in average scores attained by school is attributable to the different economic, social and cultural status of the students. Almost a third of the skills gap is attributable to status, a fairly high figure, not least in comparison with the OECD average of 23 per cent.

It is important to note that, in itself, the economic, social and cultural status of individual students explains little of the average difference in results between schools (see Table A.3.8 in the Statistical Appendix) – only 6.6 per cent (which above all is less than the amount it explains in other countries, given that the OECD average is 8.5 per cent) – and virtually none of the variance in results between schools (no more than 0.7 per cent , as compared with an OECD average of 4.4 per cent). So a student's socio-economic background counts less than the overall economic, social and cultural context in which he or she is studying. The negative implication that emerges from the considerable variance in mathematics scores between students from different schools is thus even more serious in terms of real achievement of equal opportunity among the young, given that it reflects a non-negligible part of existing economic and social differences[25].

[24] An analysis of the principal components was used to calculate the index. The values thus obtained were standardised with the OECD average as zero and standard deviation one (so that two-thirds of the population falls between +1 and -1).

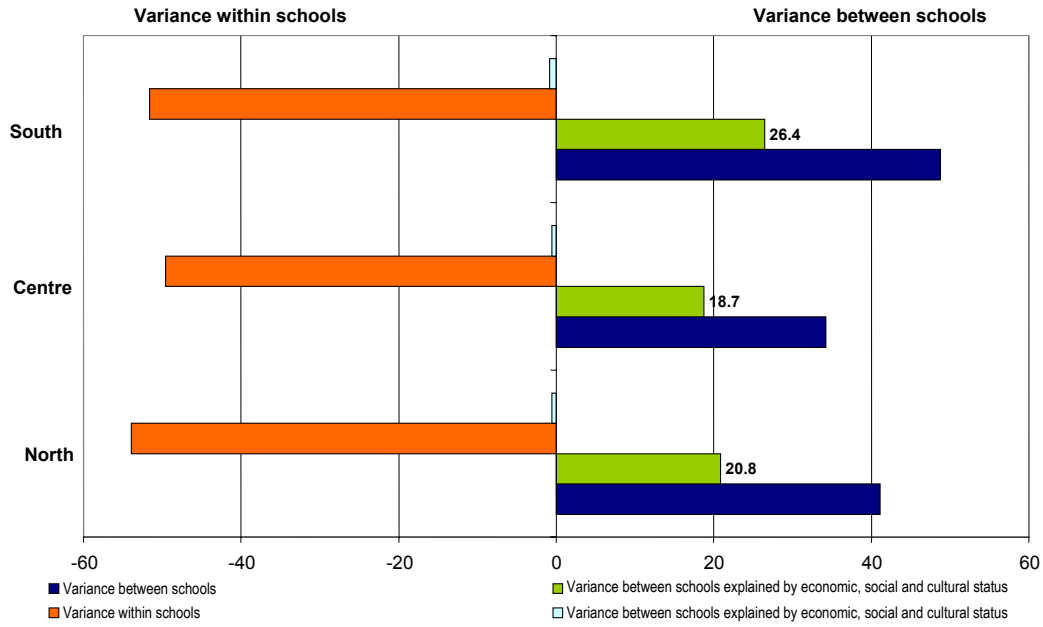
[25] The impact of economic, social and cultural status is also greater in the South than in central and northern Italy (Figure III.4), suggesting that there is an even stronger context-related factor in that area of the country.

Figure III.3 **Percentage variance in mathematics results within schools and between schools as explained by schools' overall economic, social and cultural status indices (ESCS) – comparison among a number of OECD countries**



Source: Based on OECD-PISA 2003 data

Figure III.4 **Percentage variance in mathematics results within schools and between schools as explained by schools' overall economic, social and cultural status indices (ESCS) – comparison among macro-areas in Italy**

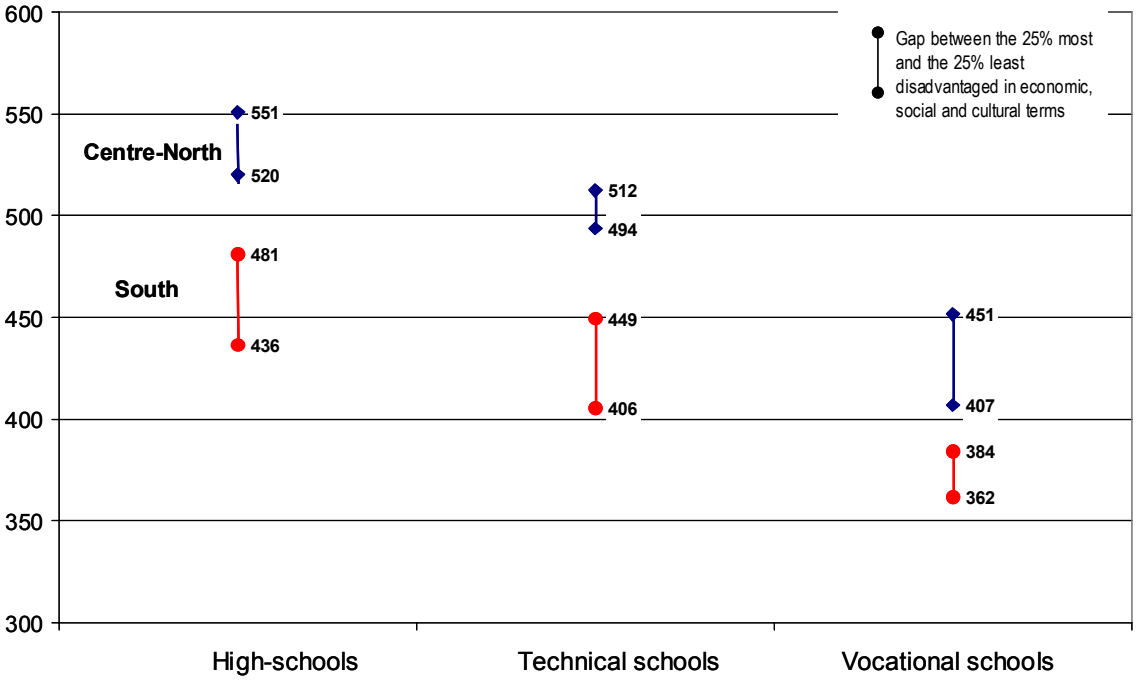


Source: Based on OECD-PISA 2003 data

III.2 The good with the good and the rich with the rich

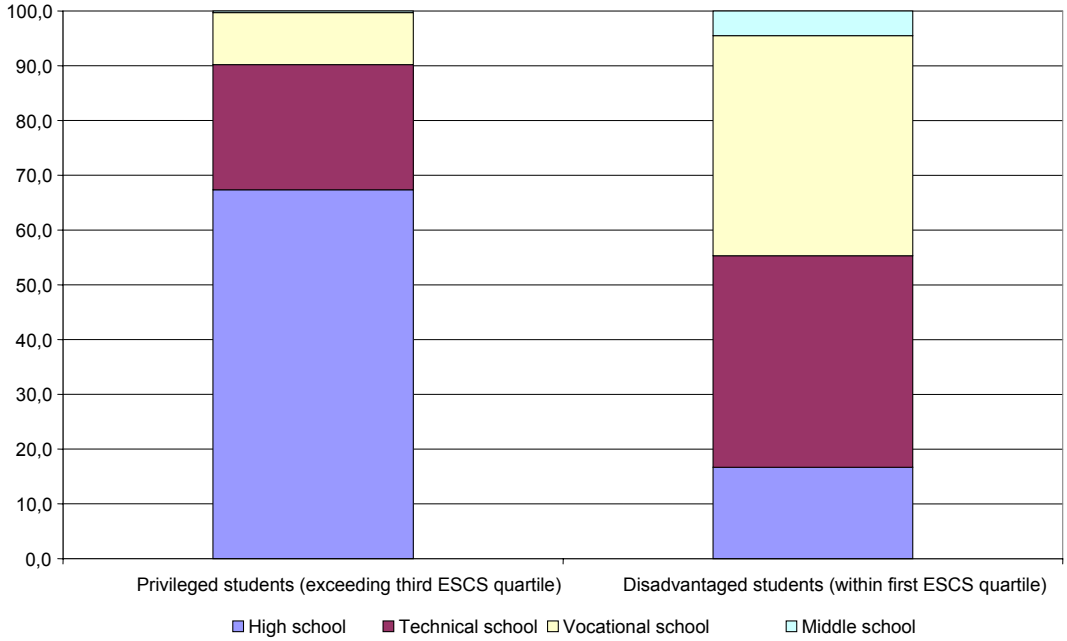
The students whose family backgrounds give them a relative advantage tend to show better skills in every area of the country. This notwithstanding, for those living in the South, coming from a privileged background (the economically best off 25 per cent of students, for instance) and attending the schools that perform best (the high schools) are not sufficient to attain OECD average scores. On average, the skills of "privileged young people" in the South are lower than those of the students attending technical schools and coming from the least advantaged strata of society (the most under-privileged 25 per cent) in central and northern Italy (Figure III.5).

Figure III.5 Average mathematics score of the 25 per cent of students least and most disadvantaged in terms of economic, social and cultural status by category of school



Source: Based on OECD-PISA 2003 data

Figure III.6 **Percentage distribution of 15-year-old students by category of school attended by the most advantaged 25 per cent and the most disadvantaged 25 per cent (in economic, social and cultural terms)**



Note: The OECD-PISA survey covers 15-year-old students regardless of the grade they are in. Some are still attending middle school. Given the small number of students in this category, it is generally not taken into account in the tables in the Appendix.

Source: Based on OECD-PISA 2003 data

This finding, along with an analysis of the variance breakdown and its link to the students' economic, social and cultural status, strengthens the impression that social segmentation in Italy is absorbed by segmentation by category of school and, within each category, by individual schools.

About 70 per cent of the students from the most privileged stratum of society (in other words, from the 25 per cent that rank highest in the economic, social and cultural status index) attend high school, whereas barely 10 per cent of them attend a vocational school. The situation is reversed for the most disadvantaged students (Figure III.6).

In addition to presenting the percentage of students from the top group according to the composite index, Table III.1 analyses the composition of the various categories of schools in terms of a number of individual features of the economic, social and cultural context of the students attending them.

Table III.1 Percentage of Italian students in relation to features of the economic, social and cultural context by category of school

	High school	Technical school	Vocational school
High economic, social and cultural status index	43.6	16.4	9.6
Mother's occupational status: white-collar	70.9	50.5	41.7
Mother's occupational status: white-collar high-skilled	45.6	25.3	21.6
Highest parental occupational status: white-collar	84.8	67.2	55.4
Highest parental occupational status: white-collar high-skilled	66.7	41.9	32.7
Mother's educational level: university	37.8	19.5	15.8
Parents' highest educational level: university	48.5	27.6	22.1
Cultural resources readily available (CULTPOS)	66.1	34.1	24.9
High access to educational and cultural resources in the home (HEDRES)	74.9	67.1	54.0
High access to information and communication technology in the home (COMPHOME)	31.5	25.1	17.8

Note: All the composite indicators (ESCS, HEDRES, COMPHOME) are conventionally standardised with the OECD averages set at zero and a standard deviation of one. For the purposes of the table, the students who had an index value above the third quartile, calculated in relation to the total for Italy, are regarded as belonging to the "high" stratum. The economic, social and cultural status index (ESCS) combines the information supplied by the students on their parents' highest educational qualifications and occupational status with the data on the availability of educational and cultural resources in the home. Access to educational and cultural resources at home (HEDRES) assesses the availability in the home of: a dictionary, a place set aside for study, a desk, a calculator and books for homework, as stated by the students. The availability of cultural resources (CULTPOS) refers to "traditional" cultural assets, such as: literary classics, poetry and works of art (examples were provided in the questionnaire put to the students). Lastly, access to information and communication technology in the home (COMPHOME) combines information on PC, educational software and Internet connection ownership.
Source: Based on OECD-PISA 2003 data

In all the cases considered, a larger proportion of students privileged in terms of parental status and availability of resources was manifestly concentrated in the high schools. In the majority of cases, a substantial majority of high school students came from a relatively privileged economic and social background, in the same way that the majority of vocational school students came from disadvantaged backgrounds. The situation in the technical schools was more varied. Taking the percentage of students with mothers who had completed university into account as well (the least common situation throughout Italy), the number of high school students in this situation was

more than that of vocational school students. These differences in student characteristics by category of school are found in all the macro-areas (using the macro-area median as the reference value for the composite indexes), but in addition to a high degree of social segmentation in the various school streams, the considerable variance in results among individual high schools, individual technical schools and individual vocational schools denotes a system in which schools tend automatically to select their students according to "*class*" criteria. The variance between high schools accounts for about 37 per cent of the overall variance in high schools' mathematical skills, and about 9 per cent of the variance between schools is explained by the economic, social and cultural status of the students attending a given institution, whereas the same factor explains less than 1 per cent of the variance in skills among the students attending a given school. Similarly extreme results emerge for both the technical and the vocational schools (see Table A.3.8). It is important to stress that, even controlling for the geographical variable and factoring out the portion attributable to the socio-economic and cultural index, the variance that remains to be explained among schools of the same type is high and, in the majority of cases, in the region or in excess of 20 of the total (see Table A.3.9). These figures suggest that, despite the increase in participation rates and universal access to education, students' social backgrounds continue to affect educational opportunity in Italy. A recent study[26] on the accessibility of academic skills observes that, in addition to the systematic divide between geographical areas that persists across all individual socio-economic status categories, there is an obvious skills gap among students from families with different educational backgrounds in each geographical area. Indeed, numerous empirical studies into the relationship between children's educational qualifications and those of their parents show that "relative" educational inequalities have shown no substantial change over the last century in the more advanced countries, and even less change in some, such as Italy[27]. The clear-cut association between the social position of one's family of origin and the probability of obtaining good educational credentials impede social mobility in Italy, in the same way that the strong correlation between macro-area of origin and skills acquired is threatening to widen the development gap between central-northern Italy and the South.

[26] Checchi and Peragine's study (2005) is based on the detailed reading skills findings of the PISA 2000 survey.

[27] Schizzerotto and Barone (2006) offer a review of the issue, in which "relative educational inequality" is taken to mean the degree to which, net of the effect of the school attendance rate, each social class of origin is associated with educational qualifications and type of course completed.

IV. Factors that could explain the gap

The Italian school system is thus marked by more marked concentration of the "*good with the good and rich with the rich*" than is the case in other countries. All the same, this does not suffice to explain the enormous gap between the attainments of students in central and northern Italy and in the South and what is essentially a "breakdown" in education in the South. In order to determine what action might be taken to narrow the gap, the factors that make for such disappointing performance on the part of students in the South must be examined.

Contrary to the common perception, structural factors regarding the delivery of education, such as school size and number of students per teacher[28] do not appear to create different average conditions from one region to another. Nor do the quantity and quality of teaching resources and school infrastructure appear to be decisive in explaining the skills variance in the country, and they have values showing little correlation with the geographical divide in student performance[29]. At least, such is the scenario painted by the responses of school principals to the PISA survey on a number of the factors that, as they see it, could have negative repercussions on the quality of the service provided, at times contradicting the "objective" data on the state of school buildings and equipment.

According to the available figures[30], the average proportion of buildings temporarily converted for use as schools stands at about 20 per cent in the South, as compared with 11 per cent in central and northern Italy, and the proportion of premises with poor roofing, electrical wiring, water piping, drains, heating and flooring amounts to at least 32 per cent in the South, as compared with 22 per cent in the Centre and North. At the provincial level, the worst conditions are found in the provinces of Crotone, Reggio

[28] The average number of students per class in higher secondary schools is fairly stable and homogeneous nationwide, and is in the region of 21.4 (source: MIUR, *La Scuola in cifre*, with reference to the 2003-2004 academic year); the highest ratio is reached in Lazio (22.1) and the lowest in Friuli Venezia Giulia (19.8).

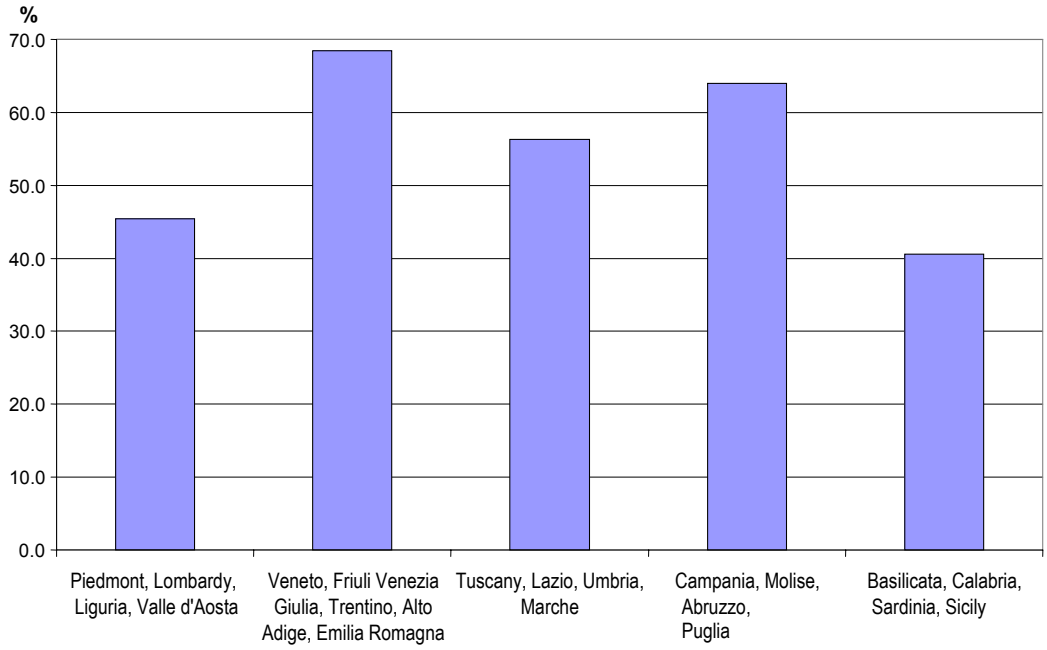
[29] This finding is also discussed by Checchi (2005), in a study of the determinants of reading skills for the PISA 2000.

[30] Despite the fact that a school building register has been created (Article 7 of Law 23/1996), the most recent official Education Ministry figures date back to 2000. They assess the percentage of buildings temporarily converted for use as schools and those presenting poor roofing, electrical wiring, water piping, drains, heating and flooring. A composite index is formed by taking the averages for the individual indicators, establishing a ranking of the Italian provinces for each level of school. As far as upper secondary schools are concerned, the worst conditions are found in the provinces of Crotone, Reggio Calabria, Vibo Valentia, Cagliari and Cosenza, with an index equal to or higher than 35 points.

Calabria, Vibo Valentia, Cagliari, Cosenza and Brindisi, where more than one school in three presents symptoms of decaying infrastructure.

The school principals' appraisal, as it emerges from PISA, indicates that about 37 per cent of the 15-year-old school population in the southwestern regions and the islands attends a school in which the state of the educational facilities is such as to interfere with teaching, compared with an average of over 50 per cent in the rest of the country (Figure IV.1 and Table A.4.5). The proportion is high in all the macro-areas, albeit not particularly marked in the very regions where the worst conditions are found.

Figure IV.1 **Percentage of students attending schools where the infrastructure resources available are perceived by school principals as having a negative impact on teaching, by macro-area**



Note: Results based on the statements made by principals in proportion to the number of 15-year-olds attending their respective schools. The chart is generated with reference to a composite infrastructure index comprising an appraisal of the school building and its outside areas, heating and lighting systems and classrooms. The figure represents the cases in which infrastructure quality is deemed a factor exerting a more negative influence on teaching than the OECD average.
Source: Based on OECD-PISA 2003 data.

Similarly, the perception that the lack of science laboratories is a critical factor for education is not particularly stronger in the South than in other areas of the country[31],

[31] For a more in-depth analysis, readers are referred to Tables A.4.1 – A.4.5 in the Appendix, which analyse the frequency of a number of critical factors, their relationship to average student performance and the percentage variance in mathematics results seen as explained by them.

whereas a monitoring exercise conducted by the Education Ministry[32] indicates that the South presents a manifest handicap, only 50.6 per cent of schools having such facilities there as compared with 66.2 per cent in central and northern Italy.

An analysis of the figures for public spending on education[33] does not reveal a radical divide in the distribution of resources. Overall, public expenditure on education in Italy is no lower than in other advanced countries (both European and otherwise), both as a percentage of GDP and on an annual per student basis[34]. Approximately 75 per cent of the over €50 billion envisaged in the Education Ministry budget for 2006 is earmarked for meeting schools' expenditure (a total of about €38 billion (Figure IV.2)[35]. The resources concerned are those transferred to the Regional Education Offices and almost exclusively cover current spending by schools[36].

The resources are allocated to the regions using demographic and equalising criteria based on indicators established at the national level, such as school population, number of classes and teachers and the hardships faced by schools in terms of the state of facilities, the drop-out rate and so on[37] (Figure IV.3).

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[32] The monitoring exercise is conducted with reference to the Education and Training Opportunity Plans. The figures are for 2004.

[33] The revision of Title V of the Italian Constitution had a profound impact on the structure of the education governance system, changing the distribution of responsibilities among central, regional and local authorities and bestowing full autonomy on schools. Nevertheless, the regions have not yet exercised the powers to legislate on education conferred on them under Article 117 of the Constitution, and the transfers of administrative functions, personnel and resources provided for in Article 1183 have not yet been implemented.

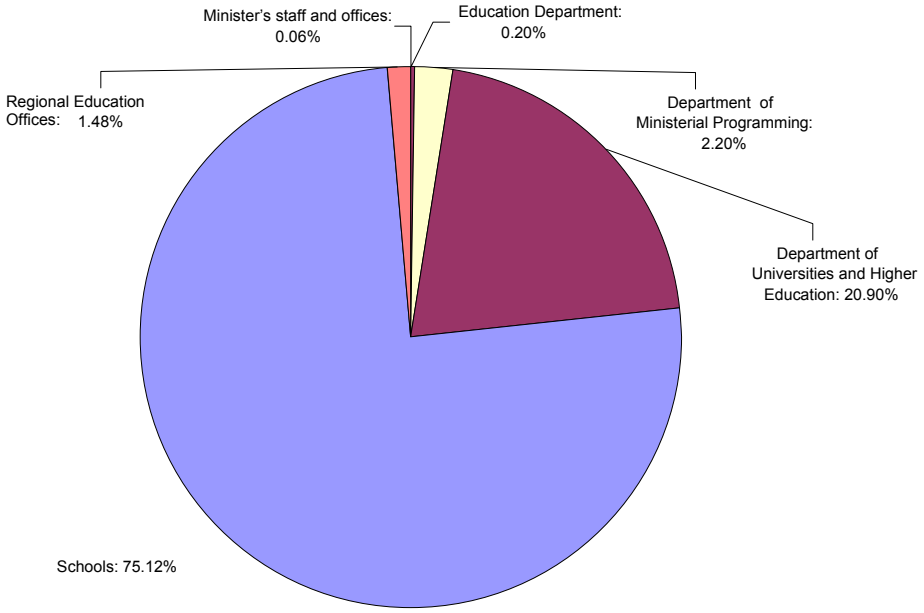
[34] The figures from *OECD: Education at a Glance (2006)* show that Italian public spending allocated to education (from primary school to university) in 2003 accounted for 4.6 per cent of GDP, with the equivalent figure for the OECD area being close to 4.9 per cent. Spending per student on a PPP stood at US$ 7,963 per annum in Italy, as compared with US$ 7,471 per annum in the OECD. Nevertheless, in terms of composition of public spending on education, there are a number of differences: the share of current expenditure in Italy is one of the highest in the OECD countries (93.5 per cent in Italy in 2003 compared with about 92 per cent), with a correspondingly smaller proportion of capital expenditure is lower (6.5 per cent as opposed to 8 per cent).

[35] Source: "Bilancio di previsione dello Stato per l'anno finanziario 2006" (MEF Ministry for the Economy and Finance Decree of 29/12/2005, Art. 7 and Table 7).

[36] The resources in question do not include the Education and Training Opportunity Expanion Fund for schools in support of the new rules on school autonomy (Law 440/1997). In the Education Ministry's annual budget, funding for Law 440 is entered under the 2.2 per cent allocated to the Department of Ministerial Planning, Ministerial Budget, Human Resources and Information Management. This funding is the sole tool the schools have for launching additional and extracurricular activities, experimental, innovation and research, training for each school's staff and anything else that might help improve education and training opportunities. The national priorities and the distribution of funds to cover them are established in an ad hoc ministerial directive.

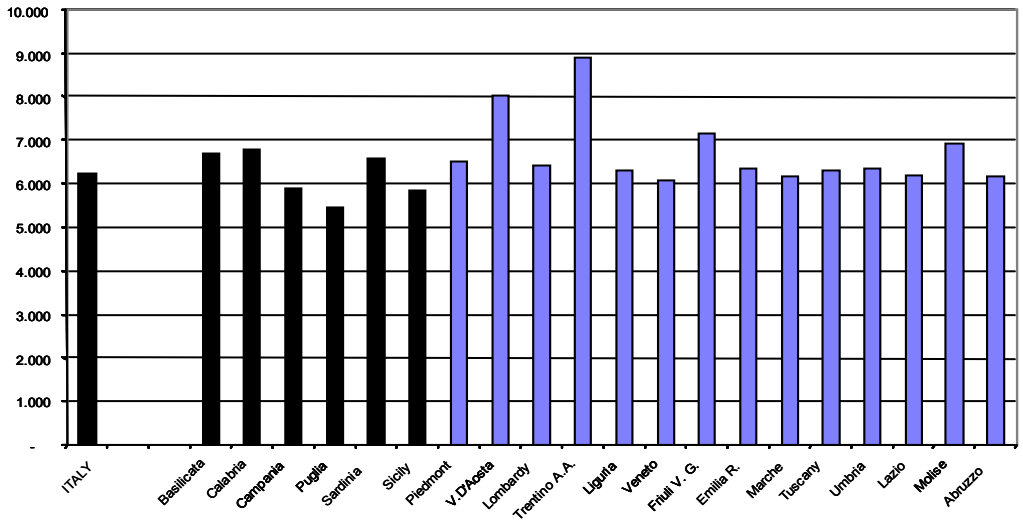
[37] The 2000-2006 Education National Operational Programme (NOP), which is co-financed by the European Structural Funds for seven southern regions, has also used "measurable" criteria for distributing the available resources among the regions. In addition to reflecting consolidated routine

Figure IV.2 Allocation of the 2006 budget of the Ministry of Education (formerly MIUR) for central offices (minister's staff and departments) and local level transfers (Regional Education Offices and individual schools)



Source: Based on data from the central government budget for the 2006 fiscal year, Table 7

Figure IV.3 Public spending per student in the Italian regions: 2004



Source: Ministry of Education – Research and Planning Department and OECD

education budget practice, the Education NOP has thus adopted the guidelines set out by the 1997 State and Regions Conference and in CIPE (Interministerial Economic Planning Committee) Resolution 139/99 on the regional distribution of additional resources for development policies, adapting the method used for the whole body of resources to reflect its own reference population and to vary the amount of funding in relation to the seriousness of the problems the programme sets out to address.

In addition to central government budget resources, local authorities and households contribute to education as well. The reconstruction of overall annual spending per student reveals a certain degree of heterogeneity from one region to another, but this is mainly affected by Trentino Alto Adige and Valle d'Aosta (which have greater spending autonomy) and cannot be attributed the traditional divide between central and northern Italy and the South, as Liguria has spending levels similar to Campania and Puglia, whereas Sardinia's is equal to that in Friuli Venezia Giulia[38].

It is chiefly at the primary school level, for which town councils are largely responsible, that the greatest geographical differences are to be encountered, while spending per upper secondary school student is the most geographically homogeneous of the various school levels (see Table A.4.7). Moreover, the average central government contribution is higher in the southern regions than in the rest of the country, whereas the contribution from local authorities in those regions is lower. The discouraging findings regarding the skills of young people in the South do not, therefore, appear to be explained merely in terms of availability of financial and structural resources, but to a large extent are determined by "context." The expectations of society, parents and students, teacher satisfaction and motivation and the way the schools are run are all factors that affect results and, given the schools' high degree of segmentation as well, reinforce each other. The PISA results can help identify potential levers for improving skills, first and foremost by assessing the Italian educational system in the light of international best practices and also by observing correlations between educational tools and results achieved by students. For example, it would appear that continuing to foster access to information and communication technologies in schools may constitute an effective traditional channel, because increased use of new technologies is accompanied by an improvement in skills (as discussed in the next section) and impacts those needed to cope with future changes.

At the same time, the expectations of the school users (students) and the world surrounding them (parents, businesses, society as a whole) have to be addressed with a view to creating a greater awareness of learning quality and exerting greater pressure on the schools themselves. In many situations, indeed, the subjective perception of a

[38] The ASPIS III (2003) survey by the MIPA-INVALSI consortium reconstructed overall spending per student for each school level and region, including an estimate of the household contribution (which is in the region of 10.8 per cent at national level). Average annual spending per student in upper secondary school is estimated at €7,666, peaking at €10,154 in Trentino Alto Adige and €6,378 in Campania, with a deviation of €863.

service by its users can be used as a fly-wheel for generating improvements, whereas it is a dangerous recipe for stagnation if, conversely, it has little or no awareness of problem situations. The fact that, despite their poor scores, 15-year-olds in the South have a far more positive perception of their skills than their contemporaries in central and northern Italy, as recounted in the last paragraph of this chapter, confirms that this is the case with education in the South.

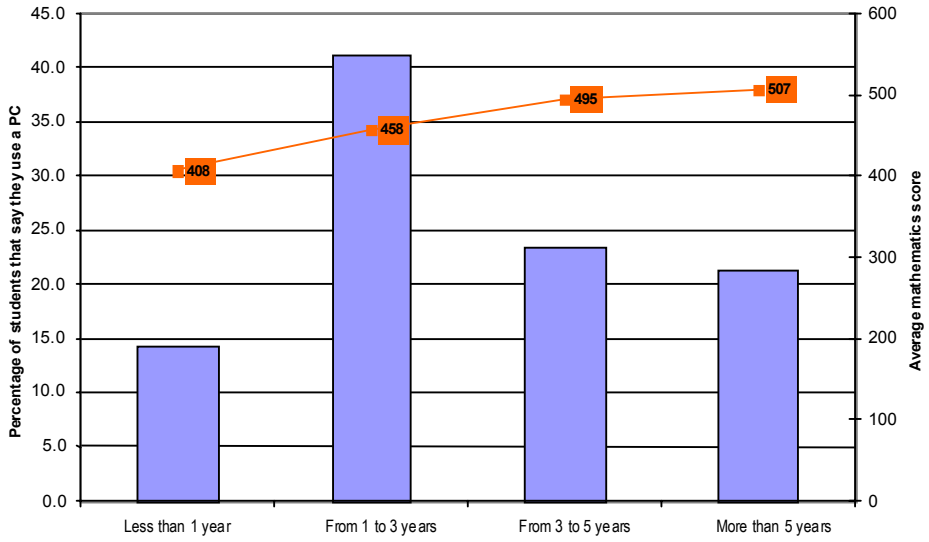
IV.1 Access to information and communication technologies

One factor that may provide clues to the infrastructural intervention to be taken in schools is the fact that students who claim greater familiarity with the use of computers achieve better results in mathematics: there is, on average, a 100-point gap on the mathematics scale between students who have been using a computer for a long time and those who have been using one for less than a year (Figure IV.4). The most significant differences (50 points) are to be found at the bottom of the scale, between those who have been using a PC for less than a year and those who have been using one for between one and three years. The positive association between experience in the use of a computer and mathematical skills is corroborated in the majority of the countries that took part in the survey, with a variable, but, on average, very similar magnitude (a 101-point gap between the groups at the ends of the scale, comprising a 46-point gap between those with less than one year's computer experience and those with between one and three years' experience)[39]. The figures do not prove that familiarity with a PC makes for better performance in mathematics. Indeed, differences in performance might merely reflect the fact that the students who have used a computer for longer are also the ones from a more privileged socio-economic background. Nevertheless, even when controlling for this factor the average difference between the mathematics scores of students most and least familiar with the PC remains large in the OECD – equivalent to the gap between two skill levels in the subject (about 64 points) – and is even greater in Italy (71 points). So the fact remains that, on average, students who have never used a computer or are just beginning to do so have a significantly lower level of mathematical

[39] Thirty-two out of forty-one countries took part in the PISA 2003 option regarding the availability and use of information and communication technologies (ICT), asking 15-year-old students specific questions on the availability of such tools and their approach to using them, and asking the head teachers to assess ICT availability and its impact in their schools. The OECD countries that did not gather information on the subject include France, Luxembourg, the Netherlands, Norway and Spain.

skills than the others. Italy has geographical divergences both in the average level of familiarity with PCs and in opportunities for access to IT resources from the home or school. In central and northern Italy, about one student in four (25 per cent) says he or she has been using a computer for over five years, compared with 16-17 per cent of the 15-year-olds living in the South. Similarly, information and communication technology is present to a greater extent in the homes of young people in central and northern Italy than in the South. Indeed, over 70 per cent of students in the Centre and North said they had easy access to a PC, educational software and Internet connections at home, whereas the figure in the South was 56-58 per cent of the overall population, albeit still a majority[40].

Figure IV.4 Percentage of students claiming familiarity with PCs and their average mathematics scores



Source: Based on OECD-PISA 2003 data

So promoting the information society in schools – and in the South in particular – might yet be a way of giving young people greater opportunities for learning, even though mere access to information and communication technologies is not sufficient.

In 2003, the percentage of students with access to IT resources at school was nevertheless higher in central and northern Italy, although overall the divide does not look all that great and the values in any case exceed 80 per cent in all the geographical

[40] The approximately 10-point gap estimated on the basis of the PISA findings is confirmed by the findings of the ISTAT Multiscopo survey on the percentage of families that state they have Internet access, which was 37.2 per cent in central and northern Italy and 28.7 per cent in the South in 2005.

areas. What is more, the differences do not always work out in central and northern Italy's favour when the various categories of school are examined.

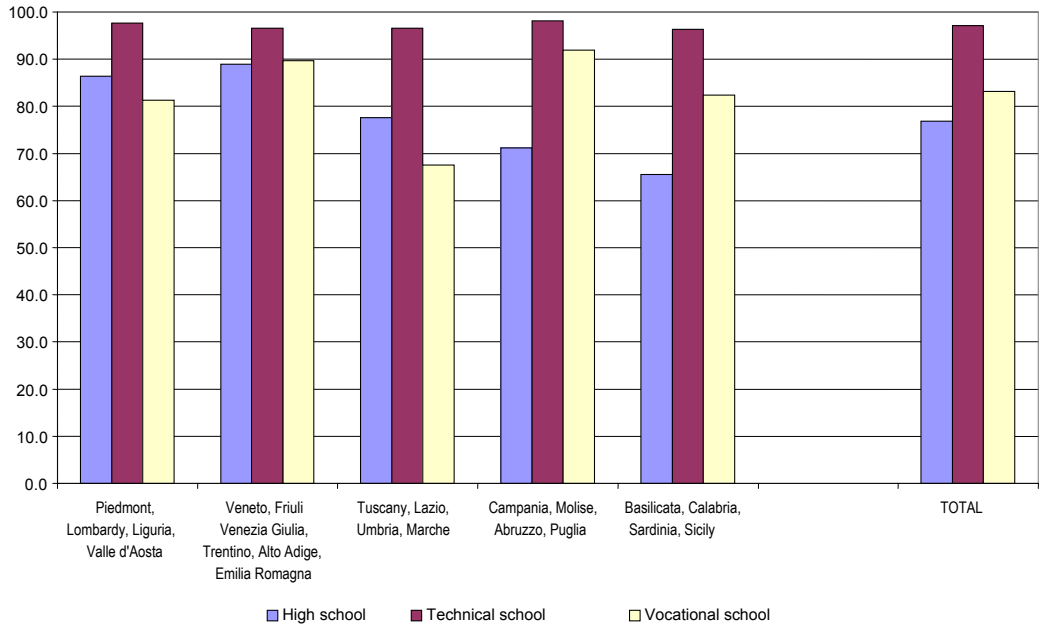
Students attending vocational schools in the South seem to have ready access to IT resources at school, particularly when compared with their opposite numbers in central Italy (where about 32 per cent of students in vocational education complain about the scarcity of such equipment in the schools in their area).

The ample availability of IT resources in technical and vocational schools in the South might be partly the result of information society promotion programmes in schools funded under the additional development policies and, over the 2000-2006 period, out of the European Structural Funds[41].

It is clearly important to flank the campaign to achieve good equipment ratios with a further drive to ensure that all the available tools are used effectively.

[41] The "Schools for Development" programme (Education NOP) funded out of the European Structural Funds since 2000 targeted at the economically weakest regions (Objective 1 regions) have made it possible to conduct over 13,000 information society promotion drives in schools in the South. The campaigns have not been directed solely at the acquisition of PCs, but also at the introduction of general and sector-specific multimedia technologies. The NOP has helped meet one of the targets set at the European level by the e-Europe Action Plan. According to a 2004 survey, the number of students per PC in schools had not only more than halved since 2001 (from 28 to 11), but the lag between the Objective 1 regions and the national average had been entirely recouped (the drop in the area concerned being from 33 to 11 students per PC). The contribution of the Education NOP has been calculated as accounting for 47 per cent of the PCs installed in the southern regions.

Figure IV.5 Percentage of students who state they have access to PCs at school by macro-area and category of school



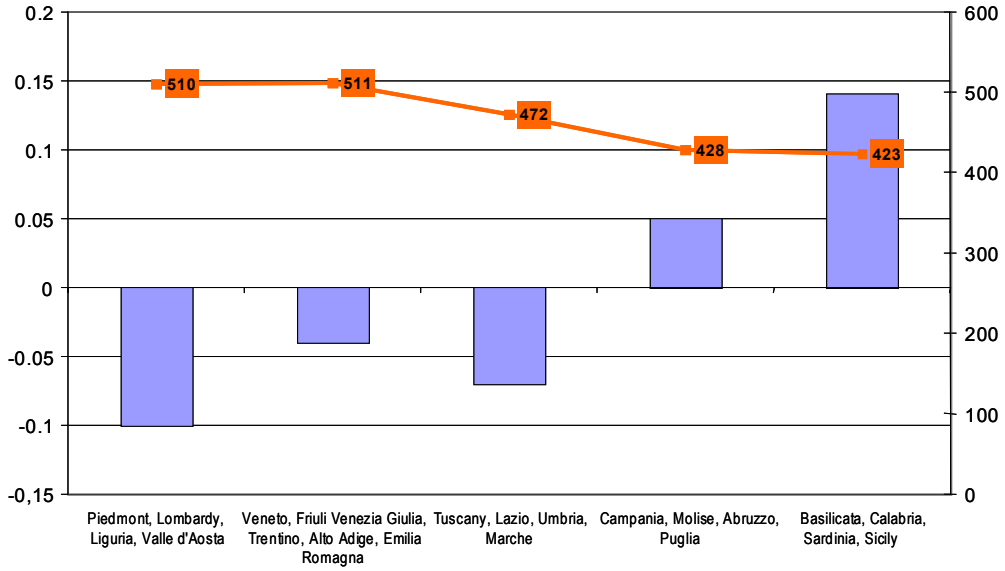
Source: Based on OECD-PISA 2003 data

IV.2 Students' perception of their skills

One key element that offers insight into the importance of context in determining the serious lag in skill levels in the South is the assessment of the students themselves, i.e. the perception they have of their own skills. In addition to appraising the results of the cognitive tests put to the students, the PISA survey provides data that can be used to analyse the subjective assessment that young people make of their experience of school, and in particular their skills in, grasp of and familiarity with mathematics. The information gathered makes it possible to determine, for example, the extent to which student feel that they are "*good*" at mathematics, what the latest marks they obtained were, whether they think they are fast learners in the subject, whether it is the subject at which they have always done best and how much they understand during lessons in the classroom. By combining these factors, the 15-year-old students' self-assessment of their mathematical skills can be synthesised into a single composite index and compared with the average perception of students in the OECD countries.

At the national level, students' perception of their skills in and familiarity with mathematics is similar to that of their contemporaries in the OECD countries (in both cases, the index value is zero). Nevertheless, an analysis by macro-area reveals that the average perception of Italian students once again masks major geographical differences. The perception of students in the South deviates significantly from the scores achieved in the cognitive tests. In particular, the perception of students in the South is decidedly positive compared with the OECD average, despite what is, objectively, poor performance, whereas the situation in central and northern Italy is reversed: on average, the students think they know less than the cognitive test findings suggest (Figure IV.6).

Figure IV.6 Average index of perception of own mathematical skills and average score by macro-area



Note: The index is equal to zero for the Italian total, matching the OECD average. Students who claim to a thorough familiarity with and high skills in mathematics have the highest positive values, whereas the students who see the subject as presenting greater problems have negative values

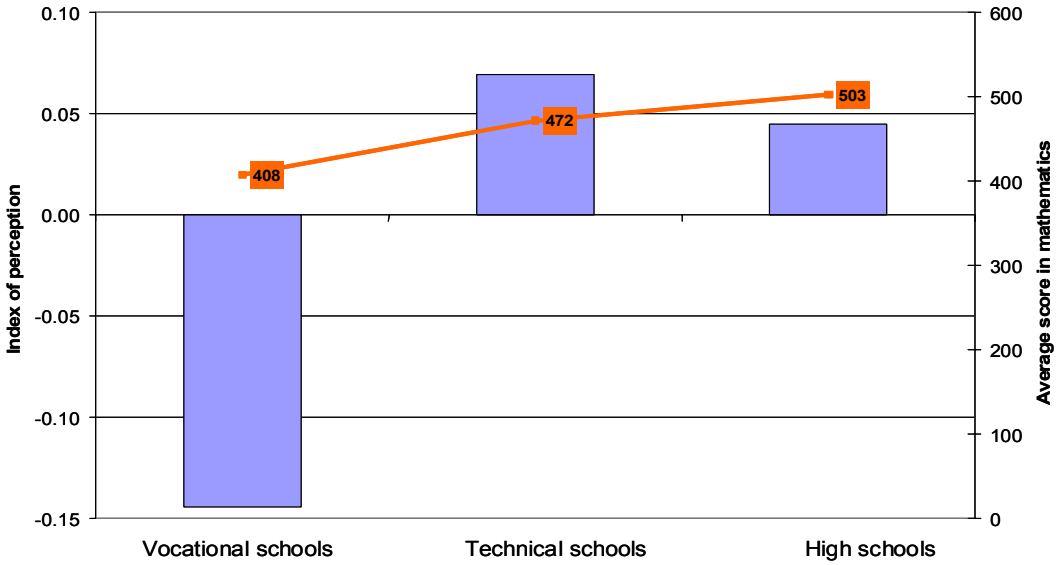
Source: Based on OECD-PISA 2003 data.

The reasons for this discrepancy between student perception and skills actually acquired are not easy to discern. The fact that 15-year-olds in the South are unaware of their limited mathematical skills, which, on the contrary, they regard as satisfactory, is worrying.

It is important to emphasise that the discrepancy between self-assessment and actual skills is strictly limited to one geographical area. In general, at national level and on average in the OECD countries, the correlation between perception of students' own skills and results scored is positive, with students who say they take a negative view of their mathematical skills achieving scores lower than those who take a better view of themselves[42].

Further confirmation is provided when the findings on students' perception of their own skills are analysed by category of school: the students who are objectively the weakest and have the lowest skills and who attend vocational schools are the ones who, on average, experience greater difficulty and have a lower degree of familiarity with mathematics (Figure IV.7).

Figure IV.7 Average index of perception of own mathematical skills and average score by category of school



Note: The bar graph represents the index of perception; the values joined by a line represent the score

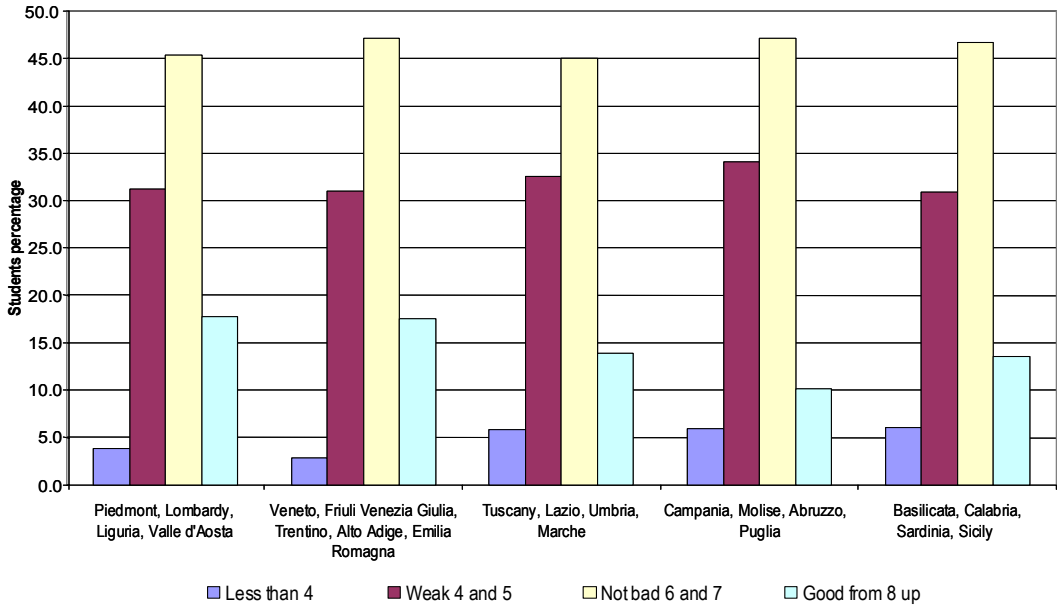
Source: Based on OECD-PISA 2003 data

The marks in mathematics that the students say they were awarded in their previous school report reflect the discrepancy already described between perceptions and results achieved (indeed, marks sway students' perceptions of their skills) and give pause for

[42] This is the case in the majority of the countries that took part in the OECD-PISA survey, as emerges from the OECD(2004) report, *Learning for Tomorrow's World – First Results from PISA 2003.*

thought as to the teachers' expectations. Marks are distributed in very similar proportions within each geographical area (Figure IV.8), with the worst performers accounting for a small proportion (around 5 per cent), about a third of those students deemed weak, a substantial proportion (around 45 per cent) with pass marks and the remainder of students considered strong performers (although this category is slightly larger in the north). In other words, teachers' appraisals are heavily swayed by the context in which they work, with the result that the percentage of students to whom teachers award pass or even good marks in mathematics is the same in the South as in central and northern Italy. In the light of the PISA findings, it may be concluded that passable marks awarded in a school in the South are "worth less" than passable marks awarded in the Centre and North, given that the evenness of the distribution of marks is not matched by the picture PISA provides of the distribution of skill levels.

Figure IV.8 Marks received by 15-year-old students for mathematics in their latest school report by macro-area



Source: Based on OECD-PISA 2003 data

The hypotheses regarding the factors that explain the discrepancy between student perception and results, and the over-optimistic self-appraisal by students in the South in particular, call for further exploration. Teachers' expectations of students, too, are lower in the South, and it is likely that this reflects on student and parental expectations. The risk is that the lack of awareness of their own shortcomings will turn into an obstacle to

improvement: students in the South who regard their abilities as adequate or even good feel no spur to change and betterment. Conversely, the risk in central and northern Italy is that the students (and the world surrounding them) will fail to acknowledge their own potential and leverage excellence. Last but not least, the shortcomings in the collective assessment of students' abilities and skills might curb students' motivation and interest in expanding their knowledge (the experience in Finland – the country with the best PISA score in terms of both efficacy and equity – confirms the importance of these factors: see *Box B*).

Box B – The role played by motivational factors in improving skills in Finland

Compared with the average for the OECD countries, Finnish students emerge from the PISA 2000 and PISA 2003 findings with the highest level of reading skills and one of the highest in mathematics and science. According to a study conducted of the PISA 2000 findings ("The Finnish Success in PISA – and Some Reasons Behind It," Institute for Educational Research, University of Iyavaskyla. 2002), the factors that most help explain the variance of Finnish students' average performance are students' direct involvement in reading (22 per cent compared with the OECD average of 13 per cent) and their interest in reading (18 per cent compared with the OECD average of 8 per cent). Parental socio-economic status, on the other hand, accounts for only 6 per cent of the variance, as compared with the OECD countries' 11 per cent . Some 44 per cent of Finnish students borrow books from the library at least once a month, as compared with 17 per cent of Italian students. Students' awareness of their own reading level is higher, on average, in Finland than in the other OECD countries and accounts for 6 per cent of the variance in reading performance compared with the OECD average of 2 per cent . The analysis suggests that a flexible school curriculum combined with opportunities for students to cultivate their interest in reading, in the form of readily available services, such as libraries, have contributed to Finland's success. The emphasis on individual needs and abilities is also at the root of the policy recommendations advanced by the authors for the future of education policies in Finland, which must continue to promote the student and his or her individual learning capacity and autonomy, instead of focusing solely on the development of a number of basic skills common to all students.

One approach for encouraging a greater awareness in students of their own skills is precisely the dissemination and analysis of data that emerge from surveys like PISA. If given appropriate coverage, not only in specialist spheres, this can help spark a debate on the level of education in the country and the factors and areas where action needs to be taken to make the system fairer and more effective.

The approach adopted by PISA – what it assesses, the way skills are defined and measured, the form of the tests, the intervals at which the survey is conducted, the reference population, and the method used to summarise the results (opting for the item

response model) – has been criticised by some[43] and, like all surveys, it presents a number of limitations. Be that as it may, the PISA findings are substantially in line with other international surveys on learning, such as TIMSS (*Trend in International Mathematics and Science Study*) and PIRLS (*Progress in International Reading Literacy Study*), whose methodological features differ from those adopted in PISA. Analyses of the robustness of the findings of the existing surveys[44] suggest that restricting the comparisons to the more advanced countries makes for substantial agreement among the assessments of average skills and drop-out rates.

In Italy, interest in the PISA 2003 findings has increased by comparison with the 2000 survey, although it is still limited and mostly takes the form of analyses by specialists and academics[45] (see also Appendix 1). In addition to the limited dissemination of the findings, and in particular the elementary data to be analysed freely, the situation has probably been compounded by a lack of an assessment and accountability culture in political spheres, the weakness of research and scientific culture as a whole and long-standing mistrust of international comparative research (especially when it threatens to demonstrate the weakness of the Italian system)[46]. This attitude runs totally counter to the spirit of the initiative: the OECD publicly releases the micro-data, duly rendered anonymous, and all the technical documentation needed to analyse them on its Internet site, providing research workers, policy-makers and private individuals with the chance to conduct their analyses.

The wealth of data and the evaluative scope of a survey like PISA can provide guidelines and promote policies for action in education that are better informed and can be

[43] In particular, the intention of measuring and comparing skills with a view to solving problems encountered in the real world, and not necessarily linked to school curricula, has its critics. Some academics have voiced misgivings as to the lack of precision in the questions and the results expected from the tests, the lack of help provided by the exercise in developing ways to improve mathematical skills, its vulnerability in the event of international comparisons, the existence of a cultural bias in the approach and the lack of a control group (capable of checking whether students who do not have a given subject in their curriculum perform differently in the tests for skills in that subject). Some have also objected that a survey like PISA attempts to shift policy-makers' attention away from the problem of guaranteeing equal opportunities for the young and onto the issue of equal skills. See, for example, the comments published on the Internet:
http://education.guardian.co.uk/schools/teach/story/0,14037,1372814,00.html;
http://www.currentconcerns.ch/archive/2004/01/20040119/php;
http://www.math.nyu.edu/mfdd/braams/links/pisa0207.html;
http://www.math.nyu.edu/mfdd/braams/links/pisa2003-sci1.html.

[44] See G. Brown, J. Micklewright, S. Schnepf, R. Waldmann (2005).

[45] The cognitive tests and results can be downloaded from
http://www.invalsi.it/invalsi/ri/pisa2006.php?page=pisa2006_it_05.

[46] See also Solomon Gursky, "Foto di scuola con studenti", *La Voce* 28-10-2004 (www.lavoce.info).

assessed against measurable results. In some European countries where the PISA findings were quickly welcomed and disseminated, wide-ranging debate has ensured, not only among education experts, but also in the news media, and hence among the public, as well. International experience shows that, despite its limitations, a skill appraisal system can be a tremendous tool for provoking wide-ranging public debate on the state of education and, in some cases, for setting reform processes in motion. Since the publication of the findings of the first, 2000, PISA survey, a broad and at times fierce debate has sprung up on the interpretation of the data, the reasons why the students deemed weak perform badly and the decisions to be adopted with a view to improving education systems (see *Box C* on reactions to the PISA 2000 findings in Germany).

BOX C – PISA as a lever for reform: the example of Germany

Experience in a number of European countries shows that the PISA findings can foster broad debate not only on the future of education policies, but also on that of other policies that can play a role in improving students' skills and ensuring equal access and learning opportunities for all students.
In Germany, the PISA 2000 findings depicted an education system that was not particularly effective: German students' average reading and mathematics performance ranked respectively 21st and 20th in the OECD league table. The disappointing findings in terms of average student performance surprised the experts and generated considerable debate on the future of German schools, which led to a reform of the German education system.
The main features of the reform were a reduction in the length of a number of education cycles and, first and foremost, greater autonomy for the individual schools in managing the curriculum. As is often the case with reforms, the changes are gradual and not necessarily homogeneous nationwide, all the more so in a federal country like Germany, where operating the school system is partly the responsibility of the Länder.
The PISA 2003 findings point to a general improvement in German students' average performance, which ranks above the average for the OECD countries in mathematics, on a level similar to France and Sweden. Nevertheless, Germany remains a country where students' socio-economic status has a significant effect on their performance. These findings have contributed not only to a debate on the direction and content of the reform process under way in Germany, but on the socio-economic consequences for society on the whole as well.

Finally, acquiring a greater awareness of one's own skills by self-assessment is a necessary (albeit not in itself sufficient) prerequisite for enabling students but also teachers and the general public to help pinpoint the current critical areas, identify their causes and, above all, develop solutions. The voice of students and teachers[47] can be decisive in improving the effectiveness of education in the southern regions, and in achieving a fairer service nationwide. If students, parents and teachers are to be able to raise this voice, sample-based surveys like PISA will have to be flanked by systematic

[47] The voice concept – described by Hirschman in *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States* (1970) – refers to the attempt by members of an organisation (public or private) to remedy or improve a condition by voicing a demand, a protest and/or a proposal for change. It is interesting to note that one of the examples cited by Hirschman to describe this concept regarded schools and the importance of parental voice in maintaining and enhancing quality standards.

monitoring and appraisal work on the various components of education: schools, student skills and teaching quality. Assessment can, indeed, play a major role not only with a view to identifying and explaining the chief characteristics of the system – including areas of excellence and shortfalls – but also for the purpose of informing the public about the achievements and quality of the service provided, thus creating an opportunity for directly involving the immediate users and the general public[48] in the education debate in Italy.

[48] The link between assessment and democratic action in support of the active public is analysed by, among others, J. Greene (2000) and O. Kalrsson (1998).

V. The rationale for a development policy for education

The current state of young people's skills and the data on their participation in education underscore the importance of stepping up measures on education, first and foremost as a channel for enhancing learning. The upper secondary education participation rate has increased significantly over the last decade and now stands at well over 90 per cent of the population in the 15-19 age group[49]. The rise has been even faster in the South, substantially bridging the gap with central and northern Italy (from 7.5 percentage points in the 1994-1995 academic year to just 1.3 points in 2003-2004). The figures suggest that the message can primarily be delivered students at school, so it is the school system that is called upon to take the lead in providing future generations with skills and the ability to play an active role in society. The PISA findings analysed in the foregoing chapters suggest that much still remains to be done to improve the outcome of educational careers and learning opportunities for young Italians, particularly in the South. For a given framework of regulations, funding system, teaching staff and category of school, and despite the setting of reference standards on basic education service performance, the South continues to lag behind in terms of skills. The growing awareness of the importance of education (not only with a view to enhancing individual performance, but also for the purpose of achieving broader development and social mobility objectives) opens up scope for intervention in the form of development policies over the coming years, complementing routine policies and accelerating the processes of innovation and reform.

The 2007-2013 National Strategic Reference Framework, which sets out to direct European and national cohesion policy resources for development over the next decade in both the southern and central-northern areas[50], took heed of the findings on young Italians' skills and attributes an even more central role to education, especially in the South[51], allocating a large amount of additional resources to it. The attention paid to education by regional policy has been somewhat limited in recent years. Although Italy

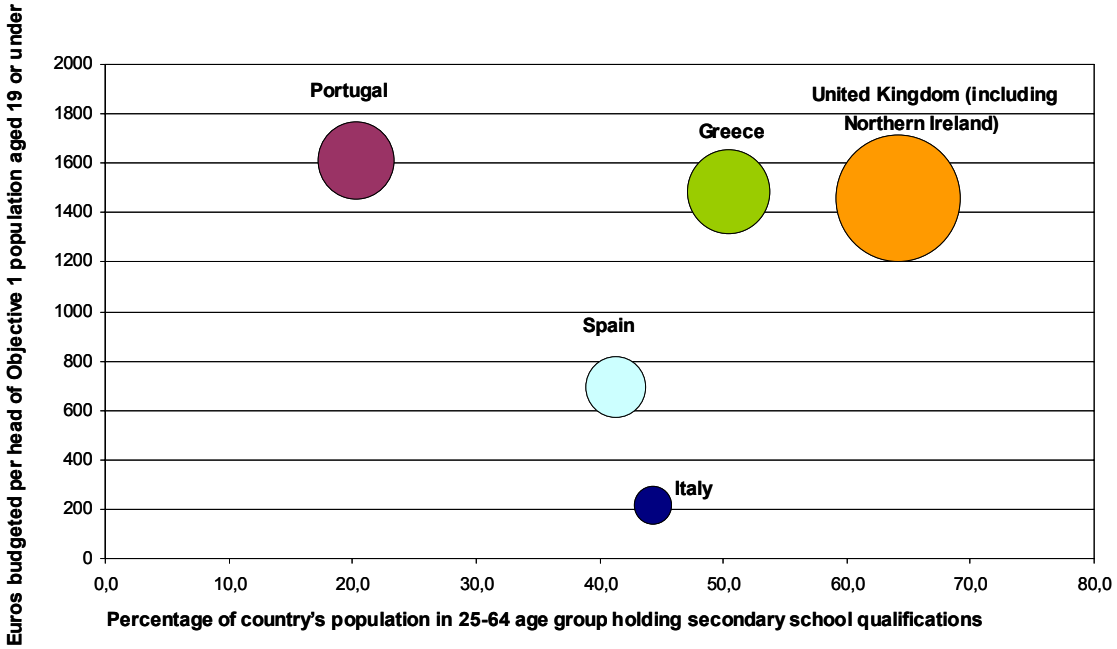
[49] Source: DPS-Istat, Regional Context Indicator Database, which may be consulted at http://www.istat.it/ambiente/contesto/infoterr/azioneB.html (in Italian).

[50] In the guidelines adopted pursuant to the 3 February 2005 agreement, the state, regions and local authorities decided to seize the opportunity offered by the NSRF to consolidate and complete the unification of Community and national regional policy planning and to bind those policies more closely to routine domestic policies, and they defined the guidelines for the drafting of the NSRF itself. Further information is available at http://www.dps.tesoro.it/qsn/qsn.asp.

[51] The 2007-2013 strategy paper on the South drawn up by the southern regions in conjunction with the DPS, had already identified the raising of young peoples' skills as an "agreed priority" for which coordinated, joint measures had to be sought.

has allocated specific resources to education in the areas lagging furthest behind via the 2000-2006 NSRF, the overall scope of the "Education for Development" operational programme (the Education NOP) managed at the national level by the Education Ministry accounts for only 1.8 per cent of the entire measure (which totals about €830 million euros). Even adding the resources that the individual regions have allocated to education in their regional operational programmes[52], budgeted investment remains low, not least in comparison with other EU countries, in some of which the quantitative and qualitative performance of education is similar to Italy's(Figure V.1).

Figure V.1 **Funding for schools/education in the Objective 1 regions and percentage of the adult population with upper secondary school qualifications in selected EU countries**



Source: The Structural Funds resources earmarked for education in the Objective 1 regions are drawn from a critical reading of the research report on OPs and education in Europe prepared by MIUR-Formez-IRRE (2002) and from an evaluative DPS study of social inclusion. The population figures are as of 1 January 2000 (source: Eurostat), and those on the secondary education rate as of 2002 (source: OECD).

[52] The regional operational programmes (ROPs) of the 2000-2006 Objective 1 regions chiefly provided for measures countering school abandonment (measure 3.6, for a total of about €147 million) and, in Sicily, fostering legality (measure 6.8, for a total of €30 million). Of the national operational programmes (apart from the Education NOP), only the one on security seems to envisage measures directed at education (once again concerning legality, in the amount of about €50 million), but it is difficult to determine how much of this sum is earmarked for measures actually in schools.

The 2000-2006 Education NOP has generally been acknowledged[53] as having good planning capability, a high level of school involvement[54] and a number of concrete results in terms of its objectives, and of an increase in the attractiveness of education in particular (with a positive impact on rates of school abandonment and regression into illiteracy), growth in the information society and basic skills, promotion of social integration, education in democracy and legality (including education in sustainable growth) and network creation.

The evidence currently available calls for a greater focus on measures to support a universal increase in skill levels, the promotion of excellence (not least via initiatives in favour of abler but more deprived students) and a narrowing of the quality gap marking the education system in the South of the country[55]. Responsibility for the complete implementation of the reforms and the full burden of meeting the targets set at the European level cannot be laid on development policy, although it is possible to identify a number of specific lines of intervention and systemic action to spur and mobilise ordinary policy[56]. An improvement in students' basic skills must be pursued, particularly in the areas lagging behind, both with actions directed at the school system and by measures impacting on the context surrounding and interacting with it. From an operational point of view, centralised management of the education programme funded with development resources over the 2007-2013 period, with strong involvement of the regions in developing policies and their implementation, brings a number of advantages. Much of the responsibility for education has been devolved to schools as autonomous bodies. In such an institutional framework, the involvement of the national level in the management of additional resources simplifies a number of operational aspects regarding the allocation of resources to the schools implementing the projects. The

[53] 2000-2006 Education NOP mid-term assessment report.

[54] Many schools have benefited under the Education NOP: about 90 per cent of upper secondary schools in the Objective 1 regions (52 per cent of the total, if schools of other types are included) and about 668,198 students. A considerable amount of the demand made by schools on the NOP is unmet: about 33 per cent of the projects submitted were approved, but not funded owing to lack of resources.

[55] These considerations have led to the adoption of two indicators in the 2007-2013 NSRF – the percentage of the population in the 18-24 age group holding educational qualifications lower than the upper secondary school diploma and not taking part in further education or training, and the percentage of 15-year-old students with skills lower than level 1 – as strategic goals for which targets to be met by the end of the planning period are to be set and for the meeting of which an incentive mechanism has been established for the regional and central governments, comprising a financial incentive as well.

[56] Partly in view of its traditional tendency to foster innovation in methods, policies funded with additional resources cannot in any case be entirely effective unless ordinary policies – at which, moreover, the coordination processes promoted by the EU in the Lisbon Strategy are directed – mobilise to renew their substance and to allocate funds transparently and in sufficient quantities.

drafting of a national programme is also of relevance given the period of adjustment of the education system's organisation (there is currently a degree of uncertainty due to the incomplete implementation of the reforms' statutory framework and its suspension[57]) and the simultaneous implementation of measures in another start-up period in the event of a change of policy. In any event, national intervention would ensure systemic actions to guarantee nationwide uniformity in the essential levels of performance. Teacher training campaigns must involve central government, as teaching staff are registered on a single national list. Action at the international level requires a coordinating centre to ensure consistency and non-duplication with the other education-related Community policies. Lastly, the fund of know-how and good practices built up while managing the 2000-2006 Education NOP and the management systems and relationship networks extending beyond the regional level and comprising schools, local authorities and other entities are elements to be leveraged in the coming years.

Another key aspect concerns evaluation. The PISA findings suggest that it is necessary to impact the expectations and perception that users have of educational services in order to encourage families, students and teachers to use their voice to exert pressure to obtain higher quality. Doing this requires raising the awareness of adults of participation in quality education and enhancing communication between the educational system and other parties (universities, research centres, third sector and business). In order to increase the knowledge and awareness of the public of the minimum standards of the services supplied and their actual achievement, it is necessary to expand the dissemination of performance data at the aggregate level and for individual schools. From this standpoint, additional investment in tools for evaluating student skills takes on strategic importance.

A number of changes in the system for assessing schools were announced in the summer of 2006 by the Education Minister and incorporated in Directive 649

[57] The reform under Law 53/03 makes education and training for at least 12 years, meaning until a vocational qualification has been attained by age 18, a right and a duty in lower and upper secondary schools and, at the upper secondary level, introduces the so-called "second channel," namely training colleges accredited by the regions and the provinces of Trento and Bolzano (or in the form of apprenticeships as per Legislative Decree 276/2003). In both cases, upper secondary curricula from ages 15 to 18 may feature alternating periods of classroom learning and work experience. Legislative Decree 226/2005 defines the essential levels of performance at the upper secondary level: the reform was being implemented on an experimental basis, now suspended, pending its complete implementation (Framework Agreement of the 19/6/03 Unified Conference.

containing guidelines for INVALSI[58]. The stated objective is to adopt more highly focused survey methods and more scientific and verifiable procedures to produce: (a) an overall assessment of the education system (not individual schools or students) using general indicators; (b) an assessment of learning achievement through tests administered by external testers on the same day to a statistically valid sample of schools. The results will be provided to schools to support the periodic evaluations of student performance, which is the exclusive preserve of teachers. However, the directive does not make any express provision for the assessments to be made public and easily available to the public (families, students and the research community). Moreover, it is great loss for the system not to have data and assessments of individual schools, a common practice in other countries that fosters competition among schools and enables families to make informed decisions.

[58] This is the Istituto nazionale per la valutazione del sistema educativo di istruzione e di formazione (National Institute for the Evaluation of the Education and Training System). See. http://www.invalsi.it/invalsi/index.php.

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Appendix 1. The OECD-PISA survey experience in Italy

The *Programme for International Student Assessment* is one of the OECD's most extensive and detailed studies. Begun in 2000, the survey is conducted every three years, with over 50 countries throughout the world participating. In 2003, PISA tests were administered to over 11,000 young people in the Italian schools, representing a student population of about 500,000 15-year-olds. Unlike the first set of tests, the results of the 2003 PISA have enabled Italy to develop statically-representative estimates not only for the country's five macro-areas and three types of secondary schools (academic high schools, technical schools and vocational schools), but also for the six individual regions (all in central and northern Italy) that contributed a larger sample to the study.

Basically, PISA attempts to measure the skills of a 15-year-old student nearing the end of compulsory schooling. Therefore, the tests administered do not so much test the concepts acquired by following a school curriculum, but rather focus on the degree of understanding of young people and their ability to apply their knowledge in real-life situations, in daily life and over the course of their lives. These tests are generally contextualised and require a range of skills, from the simplest skills or routine calculations, reading, and comprehension of scientific materials to critical reflections on the methods for solving the proposed problem. Measuring skills in a way that makes international comparison possible is certainly an ambitious goal and it is reasonable to ask whether the tests administered are up to the challenge. However, it should be noted that PISA has coordinated the most serious, thorough effort available to date to achieve assessments that can be used for this purpose.

Survey tools and organisation

The PISA survey was conducted by an international consortium formed of five international research agencies[59] and, within the participating countries, by the Ministry of Education, research institutes, groups of experts and the heads of the test administration operations within each school involved in the survey. Management of the Italian survey was entrusted to INVALSI with a legislative decree of 1999. Its role is to

[59] The international consortium that conducted the 2000, 2003 and 2006 PISA testing cycles is composed of the Australian Council for Educational Research (ACER), the Netherlands National Institute for Educational Measurement (CITO), the Educational Testing Service of the United States (ETS), the National Institute for Educational Research of Japan (NIER) - and WESTAT (United States).

assess the effectiveness and efficiency of the educational system as a whole and on an individual level.

International studies on education have existed since the 1950s and 1960s when the International Association for the Evaluation of Educational Achievement[60] was founded. Studies such as the TIMSS in science and mathematics and the PIRLS in reading were among the predecessors of the PISA. However, none of the previous surveys were able to obtain such a broad consensus and to attract the attention of policymakers. In addition to the vast geographical scope and the considerable size of the samples, PISA has been able to offer an innovative evaluation framework – hinging on the measurement of skills and abilities in using tools rather than on learning the curriculum – and to ensure timely public circulation of well-documented information that is not restricted to specialists alone. Another interesting feature of the PISA is that it is publicly, not privately, funded and it directly involves the competent ministries and national authorities, which have not only agreed to cooperate, but have actually managed the survey.

The sample[61] of 15-year-old students to whom the tests were administered was built using a two-tiered stratification process: first, the schools are chosen (with probability proportional to their size) and then, within the schools, the students are selected. The sample was chosen by the international consortium from a list of schools provided by the country, in Italy's case by INVALSI.

There are basically three tools adopted in conducting the survey (*see Box D*):

1. cognitive tests to measure student performance and skills using written tests featuring multiple choice, short answer and extended response questions (two-hour test);
2. a student questionnaire on the economic, social and cultural background of the family, classroom and extracurricular activities, study habits in general and in reading and mathematics in particular, familiarity with computers, and learning strategies;

[60] Association for the Evaluation of Educational Achievement – IEA, http://www.iea.nl/index.html
[61] Table AV.1 in the Appendix provides information on the number of schools sampled, the expected number of students in each sample, and the actual number of students who sat the tests by geographic area and type of school.

3. a school questionnaire, completed by the principal, which asks for information on the student body, the school's structure and resources (size, equipment, financial management) and its organisation (educational and classroom "environment", teacher-student ratio, teaching practices).

Box D – Development of the PISA cognitive tests

Student skills are measured using a set of written "cognitive" tests. The tests may contain multiple choice, short answer and extended response questions. One of the most-often raised criticisms of PISA in the debate that has arisen in the media and in different institutional settings is that the tests to not take into account the realities of the Italian schooling system and are skewed in favour of Anglophone cultures, since they are based on methods not used in Italy and because they are crafted by international experts (although the top-ranking countries are Finland, Japan and Korea, not the United States and the United Kingdom). Like the other phases of study preparation, the definition of the set of cognitive tests to be administered was conducted by OECD following strict procedures necessary to obtain the general consensus of the participating countries and to reflect the contributions of different countries and parties. The national experts of each country are represented at the political level on the Governing Board, at the technical level with the National Project Managers, and on various subject-specific advisory groups. The set of tests was constructed with the help of experts from the international consortium responsible for directing the study, with experience gained from similar international studies and with the input of the participating countries themselves. The tests undergo a further control performed by a Cultural Review Panel whose job it is to verify, through meticulous work on the results of the pilot study, the adequacy of the instruments in relation to the different cultural and linguistic contexts of the OECD countries, the scaling system and the rules shared in each countries and to general differences.

During the pilot study, Project Managers are invited to give an organised, detailed opinion on the importance of each test for 15-year-olds in their countries based on cultural factors, familiarity with the type of test and the existence of linguistic problems (tied to the translation of the tests into the national language).

Measuring the skills of individual test-takers and ensuring international comparability of these measurements is certainly an ambitious task and the approach adopted by PISA may give rise to criticism, but the process and its organisation were agreed by external experts and by many teachers involved in the initiative. In Italy, the evaluation of the PISA 2003 tests also involved the Unione Matematica Italiani, an association of mathematicians. Documentation available on the OECD website and direct statements of some of the Italian experts involved in preparing the survey reveal a completely solid, transparent framework with information sharing to permit verification at all levels.

Prior to administration, a variety of training seminars were held for teachers concerning methods to ensure that testing conditions were uniform (in Bari, Bolzano, Cosenza, Florence, Milan, Naples, Padua, Palermo, Rome, Turin, and Trento). A control is conducted on about 10% of the schools in the sample to check whether administrative procedures are being followed. This control is performed by a number of project quality monitors (recruited by the International Consortium) who arrive without warning at the school on the morning on which the test is to be administered. The points assigned to the most complex answers of the cognitive tests (but not all) were assigned by an independent panel of experts, in an attempt to ensure full comparability between countries.

In addition, it should be emphasised that, compared with other international surveys in this field, PISA is publicly financed. Although organised and promoted by the OECD, PISA was demanded by and decided upon by the education ministries of the participating countries, financed solely with public funding and conducted by a group whose members were selected by the public authorities of each country.

Dissemination and visibility of the results in Italy

Starting with the publication of the results of the first PISA survey in 2000, many countries have reacted with a broad and often heated debate on the interpretation of the data, on the causes of the inadequate performance of students and on the decisions to be adopted to improve education systems. In the Scandinavian countries and in Germany, the debate sparked by the initial results of the PISA survey had an impact on the political world and the media (*see Box E*). Italy, by contrast, no specific report on the Italian results in PISA 2000 was even published and only recently has any interest arisen in the dramatic regional differences in the skills of the country's young people[62].

Box E - PISA and policy, some comparative experiences

Based on the results of PISA 2000, the Scandinavian countries (Norway, Denmark, Sweden, Finland and Iceland) published a comparative analysis of the results, prepared by the PISA national project managers in their respective countries. The goal of the analysis was to compare the experience in the four geographically adjoining countries, with similar education systems and cultures, and to explore the most significant variables behind the aggregate results at the national level.

The average performance in all sectors of the PISA survey (reading, mathematics and science) of Scandinavian 15-year-olds was higher overall than the OECD average, with Finland reporting some of the highest average performance figures of all the OECD countries (546 in reading, 536 in mathematics and 538 in science), Swedish reporting average figures higher than the OECD average in all subjects, and Denmark and Norway reporting figures at or slightly below the OECD average in mathematics and science.

Perhaps the most significant result of the comparative analysis in the Scandinavian countries is that in all five countries the educational systems are able to combine good results in terms of effectiveness with substantial equity in the system, which guarantees equal learning opportunities for most of the students compared with other OECD countries. In fact, the total variance in results (between schools and within schools) is explained only in part by the students' socio–economic background, especially in Finland and Iceland, where the variance within schools is low and only in part explained by socio-economic differences. In addition, in these two countries, average performance depends to a lesser extent on the economic, social and cultural status index compared with the average of the OECD countries. In Norway, Sweden, and especially Denmark, by contrast, the variance of the results is higher and is explained to a significant extent by the socio-economic background of the parents.

The results on system equity obtained by PISA 2000 were the subject of much attention in the Nordic countries, where there is a long tradition of schools playing a role in fostering social cohesion and equal opportunity. In particular, attention focused on the extent to which the differences between the five countries in terms of equity could be due to the power of families to choose the school. In fact, it is possible that, in countries where the possibility to choose between schools is broader (Denmark and Sweden), this could lead to a gradual social stratification of the school system. However, it is important to stress that in all the Nordic countries the educational system is not highly selective, i.e. it offers similar services, programmes and levels of teacher preparation in all schools.

The wider publication of the PISA-2003 results led thirteen Italian autonomous provinces and regions to participate with a supplemental sample during the 2006 test, which was administered in the spring and focused on 15-year-old students' ability in science. Some of these regions had also participated in the 2003 survey (such as

[62] See Foresti and Pennisi (2005), Cecchi and Peragine (2005) and Abburrà (2006).

Piedmont, Lombardy, Veneto, Trento and Bolzano), while others were directly involved for the first time (such as Emilia Romagna, Liguria and Friuli Venezia Giulia), with some regions of southern Italy (Campania, Basilicata, Puglia, Sardinia and Sicily), the area of greatest concern, participating for the very first time. From the information available on the INVALSI site, Italy is participating in the international options for PISA 2006 on student familiarity with information and communication technologies and parental behaviour. The latter is new and regards the role of parents in the scientific education of students, which could offer invaluable insights into the relationship between students' backgrounds and their performance[63].

[63] The questions contained in the experimental questionnaire on parental behaviour relate to the level of parental involvement in the scientific education of their children (for example, extra-curricular activities carried out with their children, interaction with the school); the parents' socio-economic background (for example, education, employment); professions connected with the sciences and the labour market (for example, perception of their children's' ambitions); awareness of issues with the environment and interest in science.

Appendix 2. Statistical Tables

Tables for Chapter II

Tables for Chapter III

Tables for Chapter IV

Table for Chapter V

Table A.2.1 Average score and percentage of students by reading skill level by macro-area - Italian and OECD average

	Average		Standard Deviation		Levels on overall reading scale									
					Below Level 1 (up to 335 points)		Level 1 (from 335 to 407 points)		Livello 2 (da 408 a 480 punti)		Livello 3 (da 481 a 552 punti)		Livello 4 (da 553 a 626 punti)		Livello 5 (oltre 626 punti)	
	Score	S.E	S.D.	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E
Italy	476	(3.0)	101	(2.2)	9.1	(0.9)	14.8	(0.8)	24.9	(0.8)	28.3	(1.0)	17.8	(0.7)	5.2	(0.3)
OECD average	494	(0.6)	100	(0.4)	6.7	(0.1)	12.4	(0.2)	22.8	(0.2)	17.1	(0.2)	21.3	(0.2)	8.3	(0.1)
Macroarea																
Northwest	511	(4.4)	93	(3.5)	4.2	(0.8)	8.5	(1.1)	20.6	(1.5)	32.0	(1.5)	25.8	(1.4)	8.9	(0.7)
Northeast	519	(5.7)	89	(3.0)	3.1	(0.8)	7.8	(1.2)	19.8	(1.6)	31.9	(2.0)	26.8	(2.1)	10.6	(1.3)
Centre	486	(6.2)	96	(4.3)	7.1	(1.8)	13.5	(1.9)	24.3	(2.2)	29.8	(2.6)	20.0	(2.0)	5.3	(0.9)
Southeast	445	(7.9)	98	(4.7)	13.6	(2.8)	20.7	(2.3)	27.4	(2.2)	24.9	(2.4)	11.4	(1.5)	2.0	(0.6)
Southwest/Islands	434	(6.0)	95	(4.2)	15.0	(2.3)	20.8	(2.1)	30.5	(2.0)	24.4	(2.5)	8.4	(1.4)	0.9	(0.5)

Note: S.E. standard error; S.D. standard deviation

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest and the Islands includes Calabria, Basilicata, Sicily and Sardinia.

Table A.2.2 Average score and percentage of students by reading skill level by type of school

	Average		Standard Deviation		Levels on overall reading scale											
					Below Level 1 (up to 335 points)		Level 1 (from 335 to 407 points)		Level 2 (from 408 to 480 points)		Level 3 (from 481 to 552 points)		Level 4 (from 553 to 626 points)		Level 5 (over 626 points)	
	Score	S.E	S.D.	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E
High schools	525	(4.3)	82	(2.6)	1.5	(0.4)	6.7	(1.4)	19.2	(1.4)	34.0	(1.6)	28.7	(1.5)	9.9	(0.7)
Technical schools	474	(5.2)	90	(4.0)	6.8	(1.5)	15.2	(1.3)	28.3	(1.2)	30.8	(1.8)	15.7	(1.2)	3.2	(0.3)
Vocational schools	410	(6.6)	94	(2.8)	21.3	(2.8)	26.4	(2.0)	29.4	(1.8)	17.1	(1.7)	5.0	(0.9)	0.8	(0.4)

Note: S.E. standard error; S.D. standard deviation

Type of school

The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.2.3 Average score and percentage of students by reading skill level by macro-area and type of school

	Average		Standard Deviation		Levels on overall reading scale									
					Below Level 1 (up to 335 points)		Level 1 (from 335 to 407 points)		Level 2 (from 408 to 480 points)		Level 3 (from 481 to 552 points)		Level 4 (from 553 to 626 points)		Level 5 (over 626 points)	
	Score	S.E	S.D.	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E
Northwest																
High schools	563	(3.8)	70	(2.2)	0.1	(0.1)	1.7	(0.5)	9.8	(1.4)	30.7	(1.9)	39.7	(2.2)	18.1	(1.8)
Technical schools	507	(4.3)	77	(2.4)	2.2	(0.5)	7.7	(1.0)	24.3	(2.3)	17.1	(2.6)	22.9	(2.2)	4.8	(0.9)
Vocational schools	444	(11.7)	90	(4.6)	11.2	(2.8)	20.2	(3.2)	32.6	(2.7)	25.6	(3.7)	9.3	(2.7)	1.2	(0.6)
Northeast																
High schools	570	(7.7)	71	(3.2)	0.1	(0.3)	1.2	(0.6)	9.3	(1.9)	28.1	(3.8)	39.7	(3.5)	21.6	(3.0)
Technical schools	526	(6.2)	73	(4.0)	1.0	(0.5)	4.8	(1.5)	19.1	(2.6)	38.7	(3.0)	28.5	(2.8)	7.8	(1.6)
Vocational schools	456	(7.8)	86	(4.4)	9.0	(2.1)	18.6	(3.4)	32.0	(2.6)	27.9	(3.5)	10.7	(2.0)	1.8	(1.2)
Centre																
High schools	538	(5.1)	72	(2.6)	0.4	(0.4)	4.6	(1.5)	15.4	(2.8)	36.6	(3.2)	33.3	(3.4)	9.7	(1.7)
Technical schools	485	(12.9)	83	(7.6)	4.1	(2.4)	13.1	(4.3)	28.9	(2.5)	32.5	(5.1)	17.8	(3.7)	3.6	(0.9)
Vocational schools	407	(18.3)	90	(5.2)	20.9	(6.0)	27.5	(4.6)	31.1	(4.5)	16.5	(4.7)	3.1	(1.6)	1.0	(1.6)
Southeast																
High schools	504	(9.2)	79	(3.2)	2.4	1.0	9.0	2.7	24.7	3.0	36.4	3.3	22.9	3.1	4.6	1.4
Technical schools	427	(16.0)	91	(7.7)	15.5	5.2	23.9	3.4	29.9	3.9	24.0	5.3	6.0	2.4	0.7	0.6
Vocational schools	392	(11.3)	85	(5.7)	23.2	6.4	33.2	6.0	30.0	4.5	11.1	3.0	2.4	1.4	0.3	0.3
Southwest/Islands																
High schools	478	(9.0)	77	(4.6)	3.7	(1.7)	13.5	(4.3)	30.8	(3.3)	35.9	(3.7)	14.6	(2.8)	1.6	(0.9)
Technical schools	439	(10.5)	78	(4.1)	8.8	(2.6)	24.1	(3.2)	38.1	(3.4)	22.4	(5.4)	6.2	(2.4)	0.6	(0.6)
Vocational schools	354	(15.3)	85	(4.6)	41.8	(7.4)	30.2	(3.9)	21.0	(5.0)	6.7	(2.9)	0.7	(0.7)	0.0	(0.0)

Note: S.E. *Standard error*; S.D. *Standard deviation*

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest and the Islands includes Calabria, Basilicata, Sicily and Sardinia.

Type of school

The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.2.4 Average score and percentage of students by mathematical skill level by macro-area, Italian and OECD average

	Average		Standard Deviation		Levels on overall mathematics scale											
					Below Level 1 (up to 358 points)		Level 1 (from 358 to 420 points)		Level 2 (from 421 to 482 points)		Level 3 (from 483 to 544 points)		Level 4 (from 545 to 606 points)		Level 5 (from 607 to 668 points)		Level 6 (over 668 points)	
	Score	S.E	S.D.	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E
Italy	466	(3.1)	96	(1.9)	13.2	(1.2)	18.7	(0.9)	24.7	(1.0)	22.9	(0.8)	13.4	(0.7)	5.5	(0.4)	1.5	(0.2)
OECD average	500	(0.6)	100	(0.4)	8.2	(0.2)	13.2	(0.2)	21.1	(0.1)	17.1	(0.2)	19.1	(0.2)	10.6	(0.1)	4.0	(0.1)
Macroarea																		
Northwest	510	(5.1)	91	(2.7)	5.0	(0.8)	11.0	(1.4)	20.8	(1.3)	27.3	(1.4)	21.8	(1.3)	10.3	(1.2)	3.7	(0.7)
Northeast	511	(7.7)	88	(3.0)	4.3	(1.2)	11.1	(1.8)	21.1	(2.3)	28.5	(2.5)	21.2	(2.7)	10.6	(1.5)	3.2	(0.6)
Centre	472	(5.6)	83	(2.7)	8.6	(1.3)	17.6	(1.7)	28.0	(1.9)	26.4	(1.7)	14.2	(1.9)	4.4	(0.9)	0.7	(0.2)
Southeast	428	(8.2)	91	(4.2)	21.7	(3.2)	25.9	(2.2)	24.5	(2.8)	17.7	(2.2)	7.5	(1.5)	2.4	(0.7)	0.3	(0.2)
Southwest/Island	423	(6.1)	84	(2.2)	22.6	(3.2)	24.8	(2.1)	28.6	(2.0)	17.3	(2.3)	5.2	(1.1)	1.2	(0.5)	0.3	(0.2)

Note: S.E. standard error; S.D. standard deviation

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest and the Islands includes Calabria, Basilicata, Sicily and Sardinia.

Table A.2.5 Average score and percentage of students by mathematical skill level by type of school

	Average		Standard Deviation		Levels on overall mathematics scale													
					Below Level 1 (up to 358 points)		Level 1 (from 358 to 420 points)		Level 2 (from 421 to 482 points)		Level 3 (from 483 to 544 points)		Level 4 (from 545 to 606 points)		Level 5 (from 607 to 668 points)		Level 6 (over 668 points)	
	Score	S.E	S.D.	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E
High schools	503	(5.9)	89	(3.9)	5.4	(1.9)	12.4	(1.2)	22.8	(1.3)	28.0	(1.5)	19.3	(1.4)	9.1	(0.9)	3.0	(0.4)
Technical schools	472	(5.2)	88	(3.1)	10.1	(1.8)	16.9	(1.6)	27.4	(1.7)	25.0	(1.5)	14.4	(1.2)	5.2	(0.6)	1.1	(0.2)
Vocational schools	408	(4.1)	78	(2.4)	26.6	(2.5)	31.3	(2.1)	24.5	(1.6)	17.1	(1.3)	3.6	(0.6)	0.7	(0.2)	0.0	(0.0)

Note: S.E. standard error; S.D. standard deviation

Type of school

The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.2.6 Average score and percentage of students by mathematical skill level by macro-area and type of school

	Average		Standard Deviation		Levels on overall mathematics scale											
					Below Level 1 (up to 358 points)		Level 1 (from 358 to 420 points)		Level 2 (from 421 to 482 points)		Level 3 (from 483 to 544 points)		Level 4 (from 545 to 606 points)		Level 5 (from 607 to 668 points)		Level 6 (over 668 points)	
	Score	S.E	S.D.	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E	%	S.E
Northwest																		
High schools	556	(8.1)	79	(2.9)	1.1	0.5	3.3	1.1	12.6	2.0	27.9	2.3	29.9	2.3	17.6	2.5	7.6	1.7
Technical schools	514	(6.7)	76	(2.4)	1.9	0.6	8.9	1.9	23.7	2.5	17.1	1.9	23.0	2.1	8.9	1.8	2.2	0.7
Vocational schools	439	(7.5)	78	(3.7)	13.7	2.7	26.8	4.1	29.9	1.9	20.9	2.8	7.5	1.7	1.1	0.5	0.1	0.1
Northeast																		
High schools	546	(16.4)	82	(5.0)	0.7	1.0	6.9	3.7	14.1	4.1	27.3	4.6	27.3	6.6	17.3	4.0	6.4	1.5
Technical schools	530	(5.0)	73	(2.4)	0.8	0.4	4.9	1.1	21.4	3.3	32.1	3.2	26.3	2.9	11.7	1.8	2.9	1.0
Vocational schools	449	(8.5)	78	(3.8)	12.5	3.0	23.3	3.8	28.8	2.4	25.2	4.2	8.1	2.4	2.0	1.1	0.1	0.1
Centre																		
High schools	508	(5.9)	72	(2.0)	1.5	0.6	9.7	1.7	25.2	2.1	33.8	2.7	21.5	2.9	7.2	1.7	1.2	0.5
Technical schools	483	(13.1)	76	(4.1)	5.3	2.7	14.8	3.7	29.4	3.7	29.4	3.8	16.0	3.9	4.6	1.4	0.5	0.2
Vocational schools	408	(9.4)	68	(3.5)	23.1	4.2	33.1	3.7	30.2	4.1	11.9	2.7	1.5	0.8	0.2	0.1		
Southeast																		
High schools	475	(12.0)	82	(4.6)	7.5	3.1	19.1	3.5	26.3	3.3	26.7	3.7	14.3	2.9	5.2	1.7	0.8	0.6
Technical schools	422	(15.9)	84	(4.8)	22.6	6.1	25.9	4.3	27.8	5.2	16.7	4.4	5.8	2.5	1.2	0.7		
Vocational schools	382	(8.1)	66	(3.6)	36.2	6.3	37.2	5.1	18.6	3.9	7.4	2.6	0.5		0.1			
Southwest/Islands																		
High schools	454	(14.1)	82	(7.3)	12.8	6.6	19.1	2.6	31.5	3.8	25.0	4.7	8.7	2.4	2.3	0.9	0.6	0.5
Technical schools	427	(10.4)	71	(3.1)	16.8	4.7	27.6	3.7	34.3	2.9	17.3	3.9	3.3	1.3	0.6	0.5	0.1	
Vocational schools	369	(10.8)	70	(4.8)	44.7	6.4	33.7	5.0	16.7	3.8	3.5	1.8	1.3	1.0	0.2			

Note: S.E. standard error; S.D. standard deviation

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest and the Islands includes Calabria, Basilicata, Sicily and Sardinia.

Type of school

The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.2.7 Average score of scientific skill by macro-area, Italian and OECD average

	Average		Standard Deviation	
	Score	S.E	S.D.	S.E
Italy	486	(3.1)	108	(2.0)
OECD average	500	(0.6)	105	(0.4)
Macroarea				
Northwest	533	(5.2)	101	(3.4)
Northeast	533	(7.7)	97	(3.3)
Centre	497	(5.3)	99	(3.4)
Southeast	447	(8.7)	102	(4.6)
Southwest/Islands	440	(6.0)	99	(3.8)

Note: S.E. standard error; S.D. standard deviation

Geographical macro-areas
The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest and the Islands includes Calabria, Basilicata, Sicily and Sardinia.

Table A.2.8 Average score of scientific skill by type of school

	Average		Standard Deviation	
	Score	S.E	S.D.	S.E
High schools	531	(5.4)	95	(3.4)
Technical schools	491	(5.5)	99	(3.6)
Vocational schools	423	(5.4)	94	(3.0)

Note: S.E. standard error; S.D. standard deviation

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.2.9 Average score of scientific skill by macro-area and type of school

	Average		Standard Deviation	
	Score	S.E	S.D.	S.E
Northwest				
High schools	581	(6.4)	82	(2.5)
Technical schools	535	(6.8)	87	(3.2)
Vocational schools	462	(10.4)	94	(4.5)
Northeast				
High schools	576	(14.0)	87	(5.8)
Technical schools	549	(6.8)	84	(2.8)
Vocational schools	467	(9.8)	87	(4.5)
Centre				
High schools	544	(4.7)	81	(2.9)
Technical schools	500	(11.7)	89	(6.1)
Vocational schools	423	(14.0)	89	(3.5)
Southeast				
High schools	502	(11.2)	89	(5.1)
Technical schools	435	(17.1)	93	(5.5)
Vocational schools	400	(11.5)	81	(5.2)
Southwest/Islands				
High schools	478	(12.0)	89	(5.1)
Technical schools	447	(11.5)	84	(3.8)
Vocational schools	372	(14.2)	86	(6.3)

Note: S.E. standard error; S.D. standard deviation

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest and the Islands includes Calabria, Basilicata, Sicily and Sardinia.

Type of school

The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.2.10 Average score and percentage of students by problem-solving skill level by macro-area, Italia and OECD average

	Average		Standard Deviation		Levels on Problem Solving Scale							
					Below Level 1 (up to 405 points)		Level 1 (from 405 to 499 points)		Level 2 (from 499 to 592 points)		Level 3 (over 592 points)	
	Score	S.E	S.D.	S.E	%	S.E	%	S.E	%	S.E	%	S.E
Italy	469	(3.1)	102	(2.1)	24.7	1.3	34.7	1.2	30.0	1.0	10.6	0.7
OECD average	500	(0.6)	100	(0.4)	17.3	0.2	30.4	0.2	34.2	0.2	17.1	0.2
Macroarea												
Northwest	510	(5.0)	95	(3.2)	12.8	1.5	30.2	1.4	37.7	1.4	19.3	1.6
Northeast	516	(7.3)	89	(3.7)	11.2	1.8	28.9	1.9	40.5	2.0	19.4	2.8
Centre	476	(6.7)	94	(4.2)	21.8	3.0	34.9	2.7	33.7	2.6	9.6	1.4
Southeast	434	(8.3)	101	(5.2)	36.5	3.3	36.9	2.4	21.8	2.1	4.8	1.2
Southwest/Islands	428	(5.8)	95	(3.9)	36.2	2.8	40.6	2.3	20.7	2.3	2.5	0.7

Note: S.E. standard error; S.D. standard deviation

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest and the Islands includes Calabria, Basilicata, Sicily and Sardinia.

Table A.2.11 Average score and percentage of students by problem-solving skill levels by type of school

	Average		Standard Deviation		Levels on Problem Solving Scale							
					Below Level 1 (up to 405 points)		Level 1 (from 405 to 499 points)		Level 2 (from 499 to 592 points)		Level 3 (over 592 points)	
	Score	S.E	S.D.	S.E	%	S.E	%	S.E	%	S.E	%	S.E
High schools	513	(5.1)	87	(3.4)	10.9	1.8	31.2	1.4	40.0	1.8	17.9	1.5
Technical schools	474	(5.7)	93	(3.9)	20.8	2.4	38.4	1.5	31.7	1.9	9.2	0.9
Vocational schools	407	(5.2)	91	(2.8)	48.4	2.7	36.3	2.4	13.7	1.3	1.7	0.4

Note: S.E. standard error; S.D. standard deviation

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.2.12 Problem-solving skill by macro-area and type of school

	Average		Standard Deviation		Levels on Problem Solving Scale							
					Below Level 1 (up to 405 points)		Level 1 (from 405 to 499 points)		Level 2 (from 499 to 592 points)		Level 3 (over 592 points)	
	Score	S.E	S.D.	S.E	%	S.E	%	S.E	%	S.E	%	S.E
Northwest												
High schools	558	(7.2)	78	(2.3)	2.9	0.8	18.4	2.5	45.7	1.7	33.0	3.5
Technical schools	512	(6.0)	79	(2.5)	8.1	1.6	34.7	2.3	41.6	2.4	17.1	2.3
Vocational schools	439	(8.6)	87	(4.1)	32.4	4.1	43.8	3.0	20.0	3.1	3.8	1.1
Northeast												
High schools	558	(14.0)	77	(4.3)	3.2	1.9	17.8	3.5	45.7	3.7	33.4	7.2
Technical schools	529	(4.9)	72	(3.0)	4.1	1.3	29.8	2.1	46.6	3.1	19.6	3.6
Vocational schools	452	(8.7)	85	(3.0)	29.0	3.9	40.2	3.8	27.1	3.4	3.7	1.5
Centre												
High schools	520	(6.6)	76	(3.1)	7.0	1.7	31.1	2.9	45.1	3.5	16.8	2.9
Technical schools	481	(16.0)	87	(11.2)	17.2	6.7	36.5	3.7	38.4	6.2	7.9	1.8
Vocational schools	405	(15.0)	83	(5.0)	49.2	8.5	38.6	6.7	11.0	4.3	1.2	1.1
Southeast												
High schools	487	(10.2)	83	(5.0)	16.4	4.0	38.6	2.9	35.4	4.0	9.7	2.7
Technical schools	425	(16.7)	95	(6.5)	38.8	6.9	39.8	4.2	18.3	4.2	3.2	1.7
Vocational schools	388	(9.2)	83	(4.6)	57.8	4.5	33.7	4.3	8.3	1.9	0.6	0.5
Southwest/Islands												
High schools	468	(11.7)	80	(6.3)	20.0	5.5	42.9	2.8	32.2	5.1	4.9	1.7
Technical schools	433	(11.5)	79	(4.1)	31.4	(5.3)	49.9	(3.1)	17.7	(4.3)	1.1	(0.7)
Vocational schools	356	(13.4)	86	(4.4)	70.3	(6.1)	25.4	(5.3)	4.2	(1.9)	0.3	(0.4)

Note: S.E. standard error; S.D. standard deviation

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest and the Islands includes Calabria, Basilicata, Sicily and Sardinia.

Type of school

The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.2.13 Average mathematics score by gender and by macro-area, Italian and OECD average

Macro-area	Gender	Average mathematics score	S.E.
Northwest	Male	516	(9.18)
Northeast	Female	499	(11.92)
	Male	523	(7.43)
Centre	Female	467	(5.79)
	Male	478	(7.44)
Southeast	Female	421	(7.68)
	Male	437	(12.47)
Southwest	Female	413	(8.13)
	Male	434	(7.97)
Italy	**Female**	**457**	**(3.80)**
	Male	**475**	**(4.60)**
OECD average	**Female**	**494**	**(0.80)**
	Male	**506**	**(0.80)**

Table A.2.14 Average reading score by gender and by macro-area, Italian and OECD average

Macro-area	Gender	Average reading score	S.E.
Northwest		534	(3.99)
	Male	487	(8.09)
Northeast	Female	534	(10.21)
	Male	505	(8.82)
Centre	Female	510	(4.94)
	Male	459	(9.48)
Southeast	Female	462	(7.33)
	Male	424	(13.04)
Southwest	Female	452	(6.08)
	Male	416	(10.00)
Italy	**Female**	**495**	**(3.40)**
	Male	**455**	**(5.10)**
OECD average	**Female**	**511**	**(0.50)**
	Male	**477**	**(0.70)**

Note: S.E. standard error; S.D. standard deviation

Geographical macro-areas
The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.2.15 Percentage of students by mathematical skill level, by gender and macro-area

Macro-area	Gender	Mathematical skill level	% of students	S.E.
Northwest	Female	Below Level 1 (under 358 points)		
		Level 1 (from 358 to 420 points)	11.23	(1.54)
		Level 2 (From 412 to 482 points)	23.14	(2.10)
		Level 3 (from 483 to 544 points)	29.69	(1.88)
		Level 4 (from 545 to 606 points)	21.63	(1.70)
		Level 5 (from 607 to 668 points)	8.27	(1.19)
		Level 6 (over 668 points)	2.06	(0.63)
	Male	Below Level 1 (under 358 points)	6.06	(1.78)
		Level 1 (from 358 to 420 points)	10.85	(2.55)
		Level 2 (From 412 to 482 points)	18.31	(1.52)
		Level 3 (from 483 to 544 points)	24.89	(1.84)
		Level 4 (from 545 to 606 points)	22.04	(2.07)
		Level 5 (from 607 to 668 points)	12.38	(1.58)
		Level 6 (over 668 points)	5.47	(1.03)
Northeast	Female	Below Level 1 (under 358 points)	4.78	(2.65)
		Level 1 (from 358 to 420 points)	11.96	(2.99)
		Level 2 (From 412 to 482 points)	24.34	(2.43)
		Level 3 (from 483 to 544 points)	30.72	(3.43)
		Level 4 (from 545 to 606 points)	18.68	(3.30)
		Level 5 (from 607 to 668 points)	8.26	(1.94)
		Level 6 (over 668 points)	1.27	(0.43)
	Male	Below Level 1 (under 358 points)	3.85	(1.44)
		Level 1 (from 358 to 420 points)	10.28	(1.85)
		Level 2 (From 412 to 482 points)	17.95	(2.88)
		Level 3 (from 483 to 544 points)	26.26	(3.08)
		Level 4 (from 545 to 606 points)	23.61	(3.15)
		Level 5 (from 607 to 668 points)	12.92	(1.89)
		Level 6 (over 668 points)	5.13	(0.98)

cont.

cont.

Macro-area	Gender	Mathematical skill level	% of students	S.E.
Centre	Female	Below Level 1 (under 358 points)	9.22	(1.60)
		Level 1 (from 358 to 420 points)	18.81	(2.78)
		Level 2 (From 412 to 482 points)	28.42	(2.04)
		Level 3 (from 483 to 544 points)	26.10	(2.14)
		Level 4 (from 545 to 606 points)	13.86	(2.04)
		Level 5 (from 607 to 668 points)	3.41	(1.01)
		Level 6 (over 668 points)	0.19	(0.10)
	Male	Below Level 1 (under 358 points)	8.02	(1.99)
		Level 1 (from 358 to 420 points)	16.32	(2.21)
		Level 2 (From 412 to 482 points)	27.44	(2.75)
		Level 3 (from 483 to 544 points)	26.82	(2.52)
		Level 4 (from 545 to 606 points)	14.64	(2.38)
		Level 5 (from 607 to 668 points)	5.57	(1.14)
		Level 6 (over 668 points)	1.19	(0.47)
Southeast	Female	Below Level 1 (under 358 points)	22.36	(3.46)
		Level 1 (from 358 to 420 points)	27.68	(2.93)
		Level 2 (From 412 to 482 points)	26.25	(2.84)
		Level 3 (from 483 to 544 points)	17.47	(2.76)
		Level 4 (from 545 to 606 points)	5.15	(1.34)
		Level 5 (from 607 to 668 points)	1.06	(0.53)
		Level 6 (over 668 points)	0.00	
	Male	Below Level 1 (under 358 points)	20.98	(4.72)
		Level 1 (from 358 to 420 points)	23.85	(3.95)
		Level 2 (From 412 to 482 points)	22.39	(4.22)
		Level 3 (from 483 to 544 points)	17.91	(3.09)
		Level 4 (from 545 to 606 points)	10.25	(2.08)
		Level 5 (from 607 to 668 points)	3.98	(1.22)
		Level 6 (over 668 points)	0.63	(0.48)

cont.

cont.

Macro-area	Gender	Mathematical skill level	% of students	S.E.
Southwest/Islands	Female	Below Level 1 (under 358 points)	24.75	(4.68)
		Level 1 (from 358 to 420 points)	26.78	(2.59)
		Level 2 (From 412 to 482 points)	29.62	(3.02)
		Level 3 (from 483 to 544 points)	15.23	(2.73)
		Level 4 (from 545 to 606 points)	3.22	(1.18)
		Level 5 (from 607 to 668 points)	0.39	(0.30)
		Level 6 (over 668 points)	0.00	
	Male	Below Level 1 (under 358 points)	20.38	(4.01)
		Level 1 (from 358 to 420 points)	22.72	(3.28)
		Level 2 (From 412 to 482 points)	27.47	(3.01)
		Level 3 (from 483 to 544 points)	19.45	(3.03)
		Level 4 (from 545 to 606 points)	7.23	(1.79)
		Level 5 (from 607 to 668 points)	2.14	(0.89)
		Level 6 (over 668 points)	0.60	(0.44)

Note: S.E. standard error

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; The Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.2.16 Percentage of students by reading skill level, by gender and macro-area

Macro-area	Gender	Reading skill level	% of students	S.E.
Northwest	Female	Below Level 1 (under 335 points)	1.23	(0.42)
		Level 1 (from 335 to 407 points)	5.03	(0.98)
		Level 2 (From 40812 to 4802	16.83	(1.60)
		Level 3 (from 481 to 552 points)	34.45	(1.73)
		Level 4 (from 553 to 626 points)	30.53	(1.64)
		Level 5 (over 626 points)	11.94	(1.15)
	Male	Below Level 1 (under 335 points)	7.31	(1.58)
		Level 1 (from 335 to 407 points)	11.91	(1.76)
		Level 2 (From 40812 to 4802	24.64	(2.32)
		Level 3 (from 481 to 552 points)	28.77	(2.32)
		Level 4 (from 553 to 626 points)	21.49	(2.51)
		Level 5 (over 626 points)	5.89	(0.99)
Northeast	Female	Below Level 1 (under 335 points)	1.70	(1.11)
		Level 1 (from 335 to 407 points)	5.34	(1.91)
		Level 2 (From 40812 to 4802	17.23	(2.55)
		Level 3 (from 481 to 552 points)	32.67	(3.16)
		Level 4 (from 553 to 626 points)	30.15	(2.97)
		Level 5 (over 626 points)	12.91	(2.74)
	Male	Below Level 1 (under 335 points)	4.53	(1.23)
		Level 1 (from 335 to 407 points)	9.99	(1.96)
		Level 2 (From 40812 to 4802	22.18	(2.79)
		Level 3 (from 481 to 552 points)	30.57	(3.61)
		Level 4 (from 553 to 626 points)	24.24	(3.09)
		Level 5 (over 626 points)	8.49	(1.65)

cont.

cont.

Macro-area	Gender	Reading skill level	% of students	S.E.
Northwest	Female	Below Level 1 (under 335 points)	1.23	(0.41)
		Level 1 (from 335 to 407 points)	5.03	(0.98)
		Level 2 (From 40812 to 4802	16.83	(1.60)
		Level 3 (from 481 to 552 points)	34.45	(1.73)
		Level 4 (from 553 to 626 points)	30.53	(1.64)
		Level 5 (over 626 points)	11.94	(1.15)
	Male	Below Level 1 (under 335 points)	7.31	(1.58)
		Level 1 (from 335 to 407 points)	11.91	(1.76)
		Level 2 (From 40812 to 4802	24.64	(2.32)
		Level 3 (from 481 to 552 points)	28.77	(2.32)
		Level 4 (from 553 to 626 points)	21.49	(2.51)
		Level 5 (over 626 points)	5.89	(0.99)
Northeast	Female	Below Level 1 (under 335 points)	1.70	(1.11)
		Level 1 (from 335 to 407 points)	5.34	(1.91)
		Level 2 (From 40812 to 4802	17.23	(2.55)
		Level 3 (from 481 to 552 points)	32.67	(3.16)
		Level 4 (from 553 to 626 points)	30.15	(2.97)
		Level 5 (over 626 points)	12.91	(2.74)
	Male	Below Level 1 (under 335 points)	4.53	(1.23)
		Level 1 (from 335 to 407 points)	9.99	(1.96)
		Level 2 (From 40812 to 4802	22.18	(2.79)
		Level 3 (from 481 to 552 points)	30.57	(3.61)
		Level 4 (from 553 to 626 points)	24.24	(3.09)
		Level 5 (over 626 points)	8.49	(1.65)

cont.

cont.

Macro-area	Gender	Reading skill level	% of students	S.E.
Southwest/Islands	Female	Below Level 1 (under 335 points)	9.34	(1.89)
		Level 1 (from 335 to 407 points)	19.14	(3.04)
		Level 2 (From 40812 to 4802	31.72	(3.51)
		Level 3 (from 481 to 552 points)	28.69	(3.19)
		Level 4 (from 553 to 626 points)	10.05	(1.97)
		Level 5 (over 626 points)	1.05	(0.85)
	Male	Below Level 1 (under 335 points)	21.05	(4.03)
		Level 1 (from 335 to 407 points)	21.87	(2.52)
		Level 2 (From 40812 to 4802	29.35	(3.49)
		Level 3 (from 481 to 552 points)	20.06	(3.20)
		Level 4 (from 553 to 626 points)	6.99	(1.52)
		Level 5 (over 626 points)	0.69	(0.45)

Note: S.E. standard error

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.3.1 **Index of economic, social and cultural status and results on the mathematics scale (by quartile of the index) by macro-area, Italian and OECD average**

	Index of economic, social and cultural status										Results on the mathematics scale by quartile of the index								Change in math score per unit of ESCS index		% variance in math results explained by the index	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Index average	S.E.	Index average	S.E.	Index average	S.E.	Index average	S.E.	Index average	S.E.	Average score	S.E.	Average score	S.E.	Average score	S.E.	Average score	S.E.	Points	S.E.	%	S.E.
Italy	-0.11	(0.0)	-1.41	(0.0)	-0.49	(0.0)	0.22	(0.0)	1.23	(0.0)	417.16	(4.4)	456.66	(4.0)	482.28	(3.5)	506.92	(4.2)	34.47	(2.0)	13.60	(1.3)
OECD average	0.0	(0.0)	-1.3	(0.0)	-0.3	(0.0)	0.3	(0.0)	1.2	(0.0)	439.6	(1.0)	490.9	(0.7)	518.6	(0.6)	554.1	(0.8)	44.8	(0.4)	20.3	(0.3)
Macroarea																						
Northwest	0.06	(0.04)	-1.18	(0.03)	-0.24	(0.01)	0.38	(0.01)	1.29	(0.02)	472.13	(5.78)	500.91	(5.08)	522.51	(5.75)	548.04	(6.18)	32.07	(2.67)	11.34	(1.78)
Northeast	0.03	(0.07)	-1.17	(0.04)	-0.31	(0.01)	0.30	(0.01)	1.32	(0.06)	476.92	(9.70)	501.97	(8.29)	518.51	(4.70)	546.94	(15.77)	27.70	(5.94)	9.27	(4.32)
Centre	0.08	(0.05)	-1.19	(0.03)	-0.26	(0.02)	0.41	(0.01)	1.37	(0.03)	433.53	(7.83)	468.65	(8.34)	484.75	(6.88)	503.84	(5.60)	26.82	(2.92)	10.25	(1.82)
Southeast	-0.35	(0.06)	-1.59	(0.03)	-0.77	(0.02)	-0.04	(0.01)	1.02	(0.05)	392.47	(10.24)	412.33	(9.72)	441.96	(10.41)	466.33	(8.27)	29.68	(4.45)	11.17	(2.38)
Southwest/Islands	-0.29	(0.04)	-1.60	(0.02)	-0.77	(0.02)	0.03	(0.01)	1.16	(0.05)	380.31	(8.19)	413.42	(6.40)	438.29	(10.31)	460.92	(7.81)	28.74	(3.52)	13.46	(3.19)

Note: Figures based on student statements
S.E. standard error; S.D. standard deviation

Geographical macro-areas
The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.3.2 Index of economic, social and cultural status and results on the mathematics scale (by quartile of the index) by type of school

	Index of economic, social and cultural status										Results on the mathematics scale by quartile of the index								Change in math score per unit of ESCS index		% variance in math results explained by the index	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Index average	S.E.	Index average	S.E.	Index average	S.E.	Index average	S.E.	Index average	S.E.	Average score	S.E.	Average score	S.E.	Average score	S.E.	Average score	S.E.	Points	S.E.	%	S.E.
High schools	0.4	0.04	-0.9	0.02	0.1	0.01	0.8	0.01	1.6	0.02	469	(10.1)	501	(6.6)	515	(5.0)	525	(7.0)	23.4	(3.76)	6.46	(1.87)
Technical schools	-0.3	0.03	-1.4	0.02	-0.6	0.01	0.0	0.01	0.9	0.02	442	(7.2)	468	(6.8)	485	(6.7)	495	(4.5)	24.1	(2.99)	5.85	(1.24)
Vocational schools	-0.6	0.03	-1.7	0.02	-1.0	0.01	-0.4	0.01	0.6	0.02	382	(4.8)	404	(6.6)	418	(5.4)	427	(4.6)	20.6	(2.21)	5.51	(1.22)

Note: Figures based on student statements
S.E. standard error; S.D. standard deviation

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.3.3 Index of economic, social and cultural status (ESCS) and results on the mathematics scale (by quartile of the index) by macro-area and type of school

	Index of economic, social and cultural status										Results on the mathematics scale by quartile of distribution								Change in math score per unit of ESCS index		% variance in math results explained by the index	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Index average	S.E.	Index average	S.E.	Index average	S.E.	Index average	S.E.	Index average	S.E.	Average score	S.E.	Average score	S.E.	Average score	S.E.	Average score	S.E.	Points	S.E.	%	S.E.
Northwest																						
High schools	0.53	(0.05)	-0.59	(0.02)	0.25	(0.01)	0.83	(0.01)	1.62	(0.02)	534	(9.3)	551	(9.3)	559	(9.3)	579	(9.1)	19.5	(3.41)	4.50	(1.55)
Technical schools	-0.06	(0.04)	-1.17	(0.02)	-0.33	(0.01)	0.22	(0.01)	1.04	(0.03)	500	(8.4)	514	(8.0)	521	(6.7)	521	(8.2)	10.7	(3.42)	1.49	(0.92)
Vocational schools	-0.47	(0.07)	-1.59	(0.05)	-0.79	(0.01)	-0.16	(0.01)	0.65	(0.04)	415	(7.4)	448	(5.9)	437	(8.1)	459	(9.0)	17.8	(3.03)	4.05	(1.27)
Northeast																						
High schools	0.68	(0.16)	-0.50	(0.03)	0.39	(0.01)	1.04	(0.02)	1.78	(0.04)	524	(9.9)	542	(9.1)	562	(12.6)	557	(32.4)	16.3	(6.67)	3.09	(2.87)
Technical schools	-0.18	(0.05)	-1.20	(0.02)	-0.40	(0.01)	0.07	(0.03)	0.82	(0.03)	514	(6.5)	540	(13.1)	531	(7.0)	533	(6.7)	8.1	(4.38)	0.82	(0.80)
Vocational schools	-0.41	(0.07)	-1.46	(0.06)	-0.71	(0.02)	-0.17	(0.02)	0.72	(0.05)	418	(14.8)	458	(9.7)	445	(6.1)	478	(12.2)	24.6	(3.95)	7.55	(2.43)
Centre																						
High schools	0.66	(0.10)	-0.44	(0.03)	0.38	(0.01)	0.96	(0.01)	1.74	(0.04)	502	(9.5)	495	(6.1)	519	(11.3)	515	(7.7)	10.8	(5.15)	1.69	(1.65)
Technical schools	-0.11	(0.07)	-1.16	(0.02)	-0.39	(0.02)	0.20	(0.01)	0.94	(0.03)	467	(15.7)	483	(13.6)	502	(15.7)	484	(16.4)	10.3	(4.91)	1.23	(1.22)
Vocational schools	-0.52	(0.05)	-1.55	(0.03)	-0.84	(0.02)	-0.34	(0.03)	0.68	(0.06)	387	(11.4)	404	(11.1)	422	(9.6)	418	(9.9)	13.6	(3.97)	3.15	(1.86)
South																						
High schools	0.23	(0.10)	-1.07	(0.05)	-0.14	(0.02)	0.59	(0.02)	1.54	(0.04)	454	(19.9)	476	(15.3)	482	(12.1)	490	(12.7)	14.8	(7.07)	3.25	(2.93)
Technical schools	-0.58	(0.09)	-1.65	(0.06)	-0.90	(0.03)	-0.26	(0.01)	0.50	(0.06)	400	(17.8)	419	(14.4)	429	(19.3)	439	(17.9)	19.3	(6.67)	3.93	(2.27)
Vocational schools	-0.76	(0.07)	-1.73	(0.02)	-1.15	(0.02)	-0.57	(0.01)	0.42	(0.06)	373	(7.9)	387	(11.1)	380	(11.5)	389	(12.2)	4.7	(5.53)	0.41	(1.07)
South Island																						
High schools	0.18	(0.1)	-1.17	(0.0)	-0.17	(0.02)	0.50	(0.0)	1.57	(0.0)	419	(19.1)	451	(18.0)	473	(8.8)	473	(15.8)	20.7	(4.86)	7.06	(3.20)
Technical schools	-0.45	(0.1)	-1.58	(0.0)	-0.89	(0.01)	-0.15	(0.0)	0.85	(0.1)	413	(10.7)	413	(6.9)	432	(12.6)	451	(13.0)	17.9	(3.25)	5.91	(2.23)
Vocational schools	-0.95	(0.1)	-1.97	(0.0)	-1.29	(0.01)	-0.77	(0.0)	0.23	(0.1)	349	(13.5)	369	(15.0)	378	(14.8)	379	(10.4)	12.0	(5.83)	2.27	(2.06)

Note: Figures based on student statements
S.E. standard error; S.D. standard deviation

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Type of school

The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.3.4 **Index of parental employment status and results on the mathematics scale (by quartile of the index) by macro-area, Italian and OECD average**

	Occupational status of parents										Results on the mathematics scale by quartile of the index of parents' employment status								Change in math score per 16.434 units of the international employment status index		Variance explained by student results	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Points	S.E.	%	S.E.
Italy	46.83	(0.4)	26.89	(0.2)	40.35	(0.1)	50.61	(0.1)	69.51	(0.4)	430.47	(4.2)	456.83	(3.9)	478.19	(3.6)	502.19	(4.1)	27.09	(1.9)	8.32	(1.0)
OECD average	48.8	(0.1)	28.2	(0.0)	42.3	(0.1)	53.2	(0.1)	71.2	(0.1)	455.5	(0.9)	493.2	(0.8)	516.1	(0.7)	547.7	(0.8)	33.7	(0.4)	11.7	(0.2)
Macroarea																						
Northwest	48.60	(0.53)	29.09	(0.16)	43.46	(0.16)	51.91	(0.08)	69.95	(0.40)	474.77	(6.49)	506.01	(6.05)	520.83	(4.32)	544.67	(6.62)	1.68	(0.19)	8.53	(1.63)
Northeast	48.03	(1.08)	28.78	(0.26)	41.87	(0.32)	51.36	(0.15)	70.18	(1.09)	487.79	(8.00)	510.59	(10.32)	513.45	(4.88)	535.98	(17.90)	1.08	(0.38)	4.01	(3.08)
Centre	49.37	(0.95)	28.83	(0.48)	43.71	(0.23)	52.42	(0.17)	72.60	(0.76)	441.08	(6.30)	464.27	(8.26)	486.78	(8.11)	500.32	(6.47)	1.32	(0.15)	7.15	(1.48)
Southeast	44.56	(0.82)	25.34	(0.45)	37.64	(0.30)	48.80	(0.13)	66.56	(0.98)	405.82	(10.08)	413.14	(10.00)	431.93	(10.18)	468.12	(7.89)	1.49	(0.24)	7.48	(1.85)
Southwest/Islands	44.42	(0.64)	24.66	(0.32)	36.50	(0.42)	48.29	(0.15)	68.38	(0.84)	394.66	(9.67)	411.83	(7.61)	432.95	(6.73)	456.99	(9.46)	1.43	(0.22)	8.66	(2.60)

Note: Figures based on student statements
1. 16.3 index units correspond to an international standard deviation
S.E. standard error; S.D. standard deviation

Geographical macro-areas
The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.3.5 Index of parental employment status and results on the mathematics scale (by quartile of the index) by type of school

	Occupational status of parents										Results on the mathematics scale by quartile of the index of parents' employment status								Change in math score per 16.434 units of the international employment status index		Variance explained by student results	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Points	S.E.	%	S.E.
High schools	54.44	(0.68)	32.86	(0.40)	48.38	(0.11)	59.19	(0.22)	77.35	(0.50)	476.32	(8.86)	499.96	(5.91)	513.46	(5.51)	521.64	(7.60)	16.19	(2.89)	3.72	(1.18)
Technical schools	43.67	(0.5)	26.30	(0.3)	38.34	(0.3)	48.60	(0.1)	61.46	(0.5)	452.23	(6.1)	469.49	(6.2)	476.71	(7.4)	493.98	(5.2)	17.50	(2.5)	2.93	(0.7)
Vocational schools	39.98	(0.5)	25.04	(0.2)	32.61	(0.1)	44.11	(0.2)	58.24	(0.7)	392.18	(6.3)	405.68	(7.1)	410.40	(5.6)	428.11	(4.9)	14.84	(3.0)	2.58	(1.0)

Note: Figures based on student statements
1. 16.3 index units correspond to an international standard deviation
S.E. standard error; S.D. standard deviation

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.3.6 Index of parental employment status and results on the mathematics scale (by quartile of the index) by macro-area and type of school

	Occupational status of parents										Results on the mathematics scale by quartile of the index of parents' employment status								Change in math score per 16.434 units of the international employment status index		Variance explained by student results	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Points	S.E.	%	S.E.
Northwest																						
High schools	55.41	(0.9)	35.68	(0.5)	49.79	(0.1)	59.72	(0.3)	76.52	(0.6)	540	(8.9)	547	(8.3)	559	(10.5)	577	(8.4)	15.25	(3.0)	3.58	(1.3)
Technical schools	46.29	(0.47)	29.01	(0.22)	41.53	(0.25)	50.19	(0.11)	64.51	(0.68)	506	(8.12)	509	(6.84)	522	(7.08)	520	(8.60)	7.98	(2.96)	0.82	(0.59)
Vocational schools	41.64	(1.1)	26.79	(0.5)	34.46	(0.2)	46.64	(0.3)	58.76	(0.7)	425	(6.6)	425	(13.7)	451	(7.8)	457	(8.3)	16.47	(3.2)	2.95	(1.1)
Northeast																						
High schools	57.44	(2.9)	37.74	(0.5)	50.49	(0.1)	63.01	(0.7)	78.74	(1.8)	535	(12.3)	537	(8.9)	559	(17.1)	555	(25.3)	8.54	(6.3)	1.12	(1.7)
Technical schools	44.04	(0.9)	28.13	(0.3)	39.16	(0.7)	48.54	(0.2)	60.49	(1.3)	525	(5.6)	535	(8.2)	532	(11.0)	528	(5.2)	1.77	(4.3)	0.10	(0.3)
Vocational schools	42.56	(1.10)	26.72	(0.62)	34.65	(0.39)	47.11	(0.20)	62.05	(1.92)	436	(15.22)	445	(13.47)	457	(8.11)	464	(21.01)	11.94	(10.58)	1.91	(3.19)
Centre																						
High schools	58.29	(1.62)	38.64	(0.86)	51.35	(0.17)	63.16	(0.27)	80.22	(0.63)	496	(7.43)	510	(10.87)	512	(9.47)	515	(9.62)	8.14	(4.65)	1.33	(1.52)
Technical schools	45.04	(1.6)	28.23	(0.4)	39.79	(0.6)	49.56	(0.2)	62.79	(0.9)	470	(12.5)	474	(14.9)	498	(18.9)	497	(14.2)	12.83	(5.1)	2.03	(1.7)
Vocational schools	41.68	(0.8)	26.00	(0.9)	34.97	(0.4)	45.52	(0.3)	60.55	(1.1)	402	(10.0)	405	(19.2)	410	(9.2)	413	(10.9)	6.80	(3.6)	0.80	(0.8)
South																						
High schools	52.33	(1.6)	29.87	(0.4)	46.58	(0.2)	57.04	(0.4)	76.13	(1.3)	468	(16.2)	462	(15.2)	479	(15.1)	493	(13.5)	10.12	(5.1)	1.80	(1.7)
Technical schools	41.15	(1.17)	24.37	(1.05)	35.46	(0.41)	47.45	(0.09)	57.55	(1.04)	407	(15.46)	418	(19.85)	408	(19.77)	455	(13.25)	16.86	(4.37)	2.82	(1.23)
Vocational schools	38.43	(0.8)	24.41	(0.4)	31.34	(0.2)	42.36	(0.4)	55.89	(1.7)	380	(12.3)	380	(14.0)	384	(9.9)	388	(12.1)	3.52	(4.9)	0.22	(0.6)
South Island																						
High schools	50.84	(0.9)	28.05	(0.7)	44.70	(0.4)	54.86	(0.6)	76.13	(1.0)	423	(21.0)	459	(12.5)	456	(13.8)	475	(16.0)	15.02	(4.1)	4.20	(2.3)
Technical schools	41.93	(1.1)	23.66	(0.6)	35.32	(0.6)	47.12	(0.4)	61.88	(1.8)	410	(11.2)	425	(14.7)	425	(9.3)	447	(14.8)	14.29	(4.7)	3.74	(2.4)
Vocational schools	35.64	(1.4)	21.72	(0.8)	29.87	(0.12)	38.37	(0.5)	52.87	(1.6)	356	(15.9)	370	(16.9)	375	(10.0)	379	(15.9)	9.13	(7.87)	1.11	(1.9)

Note: Figures based on student statements
1. 16.3 index units correspond to an international standard deviation
S.E. standard error; S.D. standard deviation

Geographical macro-areas
The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.3.7 Variance between schools and within schools in mathematics results by macro-area, Italian and OECD average

Mathematics												
Total variance of results1	Variance expressed as a percentage of the average variance in the results of students of OECD countries											Total variance between schools expresses as a percentage of the total variance within the country2
	Total variance of results expressed as a percentage of the average variance of the results of students of OECD countries	Total variance of results between schools	Total variance of results within schools	Variance explained by the index of students' economic, social and cultural status		Variance explained by the index of the students' and the schools' economic, social and cultural status		Variance explained by the structure of the school system		Variance explained by the structure of the school system and by the international index of students' and schools' economic, social and cultural status		
				Variance between schools explained	Variance within schools explained	Variance between schools explained	Variance within schools explained	Variance between schools explained	Variance within schools explained	Variance between schools explained	Variance within schools explained	
9153	106.5	56.8	52.0	6.6	0.7	30.5	0.7	26.0	0.1	34.6	0.7	52.2
8 593	100.0	33.6	67.0	8.5	4.4	23.0	4.4	17.8	2.6	26.4	6.5	
8032	93.5	41.1	53.9	4.7	0.6	20.8	0.6	24.5	0.0	27.3	0.6	43.3
6922	80.6	34.2	49.6	4.8	0.5	18.7	0.5	22.6	0.2	24.3	0.6	40.8
7719	89.8	48.8	51.6	7.4	0.8	26.4	0.8	28.5	0.0	32.1	0.8	48.6

Note:

1. The variance components were estimated for all students for whom information was available on their socio-economic background and the type of school attended.
2. This index is frequently called intra-class correlation (rho).
3. The North includes the regions comprising the Northwest and Northeast macro-areas and the South includes the South and South Islands macro-areas.

S.E. standard error; S.D. standard deviation

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.3.8 Variance between schools and within schools in mathematics results by type of school

	Mathematics								
	Total variance of results1	Variance expressed as a percentage of the average variance in the results of students of OECD countries							Total variance between schools expresses as a percentage of the total variance within the country2
		Total variance of results expressed as a percentage of the average variance of the results of students of OECD countries	Total variance of results between schools	Total variance of results within schools	Variance explained by the index of students' economic, social and cultural status		Variance explained by the index of the students' and the schools' economic, social and cultural status		
					Variance between schools explained	Variance within schools explained	Variance between schools explained	Variance within schools explained	
High schools	7 920	92.2	31.5	52.9	2.4	0.7	9.2	0.7	37.3
Technical schools	7 813	90.9	31.0	52.9	1.8	0.6	10.4	0.6	36.9
Vocational schools	6 067	70.6	23.1	50.0	2.6	0.8	12.0	0.8	31.6

Note:
1. The variance components were estimated for all students for whom information was available on their socio-economic background and the type of school attended.
2. This index is frequently called intra-class correlation (rho).

S.E. standard error; S.D. standard deviation

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.3.9 Variance between schools and within schools in mathematics results by macro-area and type of school

	Mathematics								
		Variance expressed as a percentage of the average variance in the results of students of OECD countries							
	Total variance of results1	Total variance of results expressed as a percentage of the average variance of the results of students of OECD countries	Total variance of results between schools	Total variance of results within schools	Variance explained by the index of students' economic, social and cultural status		Variance explained by the index of the students' and the schools' economic, social and cultural status		Variance explained by the structure of the school system and by the international index of students' and schools' economic, social and cultural status
					Variance between schools explained	Variance within schools explained	Variance between schools explained	Variance within schools explained	
North									
High schools	6 469	75.3	16.8	53.3	1.3	0.5	4.5	0.5	23.9
Technical schools	5 634	65.6	12.5	54.1	0.1	0.4	0.2	0.4	18.7
Vocational schools	6 019	70.0	17.2	54.4	2.3	1.2	7.7	1.3	24.1
Centre									
High schools	5 190	60.4	15.9	47.5	1.1	0.5	3.8	0.5	25.0
Technical schools	5 863	68.2	12.5	52.8	0.3	0.4	0.9	0.4	19.1
Vocational schools	4 610	53.6	5.5	49.0	1.3	1.0	3.4	1.3	10.1
South									
High schools	6 861	79.8	22.8	55.1	2.3	0.9	5.2	0.9	29.3
Technical schools	6 117	71.2	21.8	52.1	2.1	1.0	8.6	1.0	29.5
Vocational schools	4 676	54.4	8.7	47.1	0.4	0.4	1.0	0.4	15.6

Note:
The variance components were estimates for all students for whom information was available on their socio-economic background and the type of school attended.
This index is frequently called intra-class correlation (rho).

S.E. standard error; S.D. standard deviation

Geographical macro-areas
The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.3.10 Percentage of students based on economic, social and cultural background by type of school

	High school	Technical school	Vocational schools
High economic, social and cultural status index	43.6	16.4	9.6
Status occupazionale della madre: white-collar	70.9	50.5	41.7
Mother's occupational status: white collar high-skilled	45.6	25.3	21.6
Highest parental employment status: white collar	84.8	67.2	55.4
Parents' highest employment status: high-skilled white collar	66.7	41.9	32.7
Mother's educational level: university	37.8	19.5	15.8
Parents' highest education level: university	48.5	27.6	22.1
Cultural resources readily available (CULTPOS)	66.1	34.1	24.9
High access to educational and cultural resources in the home (HEDRES)	74.9	67.1	54
High access to information and communication technology in the home (COMPHOME)	31.5	25.1	17.8

Note: Figures based on student statements
S.E. standard error; S.D. standard deviation

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.3.11 Percentage of students enrolled by type of secondary school and macro-area - 2003/2004 academic year

	North	Centre	South	ITALY
High schools	35.7	40.9	38.8	**38.0**
Technical schools	38.7	34.7	36.2	**36.8**
Vocational schools	25.6	24.4	25.0	**25.2**
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: MIUR

Note: Figures based on student statements

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.4.1 Index of the quality of the school's teaching resources and results on the mathematics scale (by quartile of the index) by macro-area, Italian and OECD average

	Index of the quality of the school's teaching resources										Results on the mathematics scale by quartile of the index of the quality of the school's teaching resources								Change in math score per unit of ESCS index		% variance in math results explained by the index	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Points	S.E.	%	S.E.
Italy	0.14	(0.1)	-1.08	(0.1)	-0.16	(0.0)	0.38	(0.0)	1.40	(0.1)	440.32	(9.3)	468.58	(9.1)	478.46	(7.3)	476.99	(8.4)	14.40	(4.2)	2.21	(1.2)
OECD average	0.00	(0.0)	-1.21	(0.0)	-0.31	(0.0)	0.23	(0.0)	1.28	(0.0)	475.60	(1.8)	500.85	(1.7)	507.27	(1.5)	515.27	(1.8)	15.90	(1.0)	2.52	(0.3)
Macroarea																						
Northwesr	0.23	(0.09)	-0.81	(0.13)	-0.04	(0.03)	0.46	(0.03)	1.32	(0.10)	480.45	(13.08)	525.44	(9.52)	523.49	(15.45)	511.93	(10.24)	9.08	(7.13)	0.76	(1.20)
Northeast	0.22	(0.14)	-0.85	(0.12)	-0.07	(0.04)	0.37	(0.05)	1.44	(0.15)	498.66	(26.06)	500.80	(23.16)	510.98	(15.80)	534.21	(6.88)	16.55	(7.20)	2.93	(2.56)
Centre	-0.08	(0.16)	-1.56	(0.19)	-0.25	(0.09)	0.29	(0.04)	1.22	(0.15)	444.40	(12.71)	481.31	(13.41)	484.38	(11.59)	477.80	(13.11)	14.61	(8.49)	3.69	(4.43)
South	0.21	(0.18)	-1.21	(0.16)	-0.16	(0.07)	0.61	(0.07)	1.62	(0.17)	411.62	(21.49)	429.52	(13.24)	422.90	(14.32)	448.93	(18.18)	9.18	(8.16)	1.27	(2.32)
South Islands	0.07	(0.18)	-0.82	(0.07)	-0.31	(0.04)	0.14	(0.07)	1.26	(0.23)	390.12	(16.23)	433.66	(18.97)	426.91	(13.27)	448.03	(12.35)	22.50	(8.52)	5.24	(4.51)

Note: Results based on the statements of school principals in proportion to the number of 15-year-olds enrolled.
The scale was inverted, so that high positive values indicate that educational resources are not perceived as a serious problem (are perceived as a less severe problem than the OECD average).
The teaching resources considered in the index include: text books, computers for school use, educational software, calculators, library materials, audiovisual materials, and science laboratory equipment.
S.E. standard error

Geographical macro-areas
The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.4.2 Index of the quality of the school's teaching resources and results on the mathematics scale (by quartile of the index) by type of school

	Index of the quality of the school's teaching resources1										Results on the mathematics scale by quartile of the index of the quality of the school's teaching resources								Change in math score per unit of ESCS index		% variance in math results explained by the index	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Points	S.E.	%	S.E.
High schools	0.19	(0.10)	-0.73	(0.06)	-0.15	(0.03)	0.37	(0.04)	1.29	(0.12)	503	(10.3)	496	(19.26)	515	(12.35)	496	(11.3)	0.38	(6.45)	0.0	(0.27)
Technical schools	0.48	(0.14)	-0.80	(0.16)	0.15	(0.03)	0.75	(0.05)	1.80	(0.10)	467	(12.4)	477	(13.65)	482	(10.92)	470	(13.5)	1.75	(7.67)	0.0	(0.59)
Vocational schools	-0.38	(0.12)	-1.56	(0.15)	-0.67	(0.03)	-0.06	(0.06)	0.76	(0.08)	409	(7.9)	393	(15.36)	404	(8.88)	425	(10.9)	8.64	(4.54)	*1.1*	*(1.04)*

Note: Results based on the statements of school principals in proportion to the number of 15-year-olds enrolled.
The scale was inverted, so that high positive values indicate that educational resources are not perceived as a serious problem (are perceived as a less severe problem than the OECD average).
The educational resources considered in the index include: text books, computers for school use, educational software, calculators, library materials, audiovisual materials, and science laboratory equipment and materials.
S.E. standard error

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.4.3 **Index of the quality of the school's infrastructure and results on the mathematics scale (by quartile of the index) by macro-area, Italian and OECD average**

	Index of the quality of the school's teaching resources1										Results on the mathematics scale by quartile of the index of the quality of the school's infrastructure								Change in math score per unit of ESCS index		% variance in math results explained by the index	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Points	S.E.	%	S.E.
Italy	-0.03	(0.1)	-1.28	(0.1)	-0.36	(0.0)	0.20	(0.0)	1.33	(0.0)	443	(8.0)	470	(8.8)	480	(5.1)	471	(8.7)	11.41	(4.5)	1.44	(1.1)
OECD average	0.0	(0.0)	-1.3	(0.0)	-0.3	(0.0)	0.3	(0.0)	1.3	(0.0)	485	(1.9)	500	(1.6)	502	(1.4)	512	(1.6)	10.2	(1.0)	1.0	(0.2)
Macroarea																						
Northwest	0.10	(0.10)	-1.10	(0.10)	-0.14	(0.02)	0.33	(0.03)	1.33	(0.06)	491	(10.50)	510	(10.18)	518	(9.93)	522	(11.56)	12.42	(6.77)	1.59	(1.69)
Northeast	-0.17	(0.15)	-1.32	(0.18)	-0.39	(0.03)	-0.06	(0.04)	1.08	(0.07)	492	(22.38)	533	(19.10)	503	(13.33)	516	(12.24)	10.10	(9.91)	1.17	(2.45)
Centre	-0.06	(0.14)	-1.15	(0.21)	-0.47	(0.03)	0.22	(0.06)	1.15	(0.16)	464	(15.49)	470	(11.36)	476	(9.13)	479	(13.47)	5.26	(8.01)	0.36	(1.22)
South	-0.17	(0.19)	-1.50	(0.20)	-0.61	(0.06)	0.05	(0.09)	1.38	(0.06)	402	(18.62)	407	(14.30)	447	(17.61)	457	(16.65)	21.69	(6.49)	7.08	(4.55)
South Islands	0.16	(0.17)	-1.19	(0.15)	-0.12	(0.05)	0.45	(0.08)	1.49	(0.00)	417	(16.52)	433	(15.82)	434	(16.22)	415	(17.42)	2.50	(9.56)	0.11	(1.41)

Note: Results based on the statements of school principals in proportion to the number of 15-year-olds enrolled
The scale was inverted, so that high positive values indicate that educational resources are not perceived as a serious problem (are perceived as a less severe problem than the OECD average)
Infrastructure include: the school building and outdoor spaces, heating and lighting systems and classrooms.
S.E. standard error

Geographical macro-areas
The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.4.4 **Index of the quality of the school's infrastructure and results on the mathematics scale (by quartile of the index) by macro-area, Italia and OECD average**

	Index of the quality of the school's teaching resources1										Results on the mathematics scale by quartile of the index of the quality of the school's infrastructure								Change in math score per unit of ESCS index		% variance in math results explained by the index	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Points	S.E.	%	S.E.
High schools	0.17	(0.10)	-0.89	(0.05)	-0.27	(0.03)	0.36	(0.06)	1.47	(0.01)	516	(10.9)	512	(11.86)	506	(6.30)	477	(17.5)	-17.04	(7.69)	2.99	(2.63)
Technical schools	0.16	(0.11)	-1.13	(0.15)	-0.06	(0.03)	0.43	(0.03)	1.41	(0.03)	452	(13.7)	484	(11.60)	475	(9.48)	485	(14.0)	11.15	(7.42)	1.51	(1.75)
Vocational schools	-0.57	(0.16)	-1.81	(0.15)	-0.87	(0.06)	-0.30	(0.04)	0.71	(0.13)	404	(11.1)	406	(10.40)	405	(9.85)	416	(8.8)	4.63	(4.47)	0.36	(0.66)

Note:
Results based on the statements of school principals in proportion to the number of 15-year-olds enrolled
The scale was inverted, so that high positive values indicate that educational resources are not perceived as a serious problem (are perceived as a less severe problem than the OECD average).
Infrastructure include: the school building and outdoor spaces, heating and lighting systems and classrooms.
S.E. standard error

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.4.5 **Percentage of students (according to the perceptions of their school principals) relating to certain critical factors for ensuring quality of service by macro-area**

	School buildings and equipment (1)					Lack of qualified mathematics teachers (2)					Lack of science laboratories (3)				
Macro-area	**Critical factor**	**% of students**	**S.E.**	**Average mathematics score**	**S.E.**	**Critical factor**	**% of students**	**S.E.**	**Average mathematics score**	**S.E.**	**Critical factor**	**% of students**	**S.E.**	**Average mathematics score**	**S.E.**
Northwest	no	33.81	4.528948	503	(13.15)	yes, very	41.79	5.2485529	522	(8.09)	yes, very	26.15	3.366887591	514	(12.74)
	minor	30.69	(4.15)	529	(7.54)	yes, fairly	42.32	(5.77)	503	(9.74)	yes, fairly	37.90	(5.58)	521	(12.73)
	fairly	22.45	(4.49)	512	(8.10)	no	12.96	(3.71)	495	(16.02)	no	20.37	(4.69)	504	(10.53)
	very	13.04	(3.21)	484	(17.32)	not at all	1.70	(1.24)	504	(5.50)	not at all	14.78	(4.38)	487	(15.06)
	n.a.					n.a.	1.24	(1.24)	521	(6.31)	n.a.	0.80	(0.47)	485	(43.04)
Northeast	no	18.08	(4.83)	526	(7.95)	yes, very	33.36	(6.94)	488	(12.89)	yes, very	18.44	(2.79)	530	(10.44)
	minor	26.65	(6.54)	507	(16.08)	yes, fairly	47.86	(9.54)	519	(18.77)	yes, fairly	39.65	(7.48)	519	(20.20)
	fairly	28.53	(4.59)	514	(27.06)	no	15.63	(4.24)	542	(8.98)	no	35.43	(7.85)	496	(19.27)
	very	26.75	(7.05)	502	(23.83)	not at all	1.13	(0.61)	444	(23.89)	not at all	5.38	(2.07)	493	(13.35)
	n.a.					n.a.	2.01	(1.31)	509	(14.65)	n.a.	1.09	(0.99)	487	(3.48)
Centre	no	26.94	(5.47)	469	(16.40)	yes, very	33.67	(8.47)	461	(10.82)	yes, very	15.44	(5.83)	468	(19.05)
	minor	24.99	(7.64)	485	(11.45)	yes, fairly	37.78	(7.95)	482	(8.86)	yes, fairly	33.05	(7.72)	487	(8.68)
	fairly	29.82	(5.88)	441	(7.84)	no	20.21	(5.73)	468	(19.08)	no	31.83	(8.11)	485	(13.16)
	very	17.71	(6.23)	511	(16.01)	not at all	7.80	(4.64)	481	(46.46)	not at all	19.14	(5.94)	429	(14.67)
	n.a.	0.54	(0.54)	562	(6.24)	n.a.	0.54	(0.54)	562	(6.24)	n.a.	0.54	(0.54)	562	(6.24)
Centre-North	**no**	**27.23**	**(2.92)**	**496**	**(8.09)**	**yes, very**	**36.77**	**(4.37)**	**495**	**(5.72)**	**yes, very**	**20.46**	**(2.55)**	**506**	**(9.22)**
	minor	**27.68**	**(3.45)**	**510**	**(6.67)**	**yes, fairly**	**42.29**	**(4.84)**	**502**	**(8.32)**	**yes, fairly**	**36.74**	**(3.71)**	**510**	**(7.76)**
	fairly	**26.58**	**(2.86)**	**486**	**(10.15)**	**no**	**16.13**	**(2.70)**	**496**	**(11.73)**	**no**	**28.31**	**(3.68)**	**494**	**(9.51)**
	very	**18.33**	**(3.15)**	**500**	**(11.72)**	**not at all**	**3.60**	**(1.63)**	**482**	**(33.76)**	**not at all**	**13.70**	**(2.74)**	**460**	**(10.58)**
	n.a.	**0.18**	**(0.18)**	**562**	**(6.24)**	**n.a.**	**1.21**	**(0.63)**	**522**	**(11.47)**	**n.a.**	**0.79**	**(0.37)**	**503**	**(24.56)**
Southeast	no	25.05	(7.75)	463	(15.90)	yes, very	47.80	(9.46)	424	(11.91)	yes, very	21.81	(5.78)	453	(19.84)
	minor	19.39	(6.61)	406	(19.86)	yes, fairly	34.22	(8.40)	444	(14.93)	yes, fairly	28.13	(7.79)	443	(10.67)
	fairly	31.02	(8.78)	431	(17.04)	no	13.92	(5.79)	405	(36.60)	no	31.04	(8.85)	423	(22.07)
	very	22.55	(7.65)	406	(20.45)	not at all	4.06	(3.09)	425	(41.86)	not at all	16.20	(6.42)	389	(19.84)
	n.a.	1.99	(1.99)	412	(11.50)	n.a.					n.a.	2.82	(2.80)	378	(7.97)
Southwest Islands	no	42.15	(10.32)	425	(13.86)	yes, very	29.14	(9.22)	400	(19.12)	yes, very	6.83	(4.88)	482	(14.33)
	minor	17.41	(7.94)	425	(20.19)	yes, fairly	48.18	(11.04)	438	(10.03)	yes, fairly	46.32	(8.50)	425	(13.25)
	fairly	18.87	(4.91)	439	(21.41)	no	19.90	(6.82)	428	(21.92)	no	38.97	(7.20)	425	(12.56)
	very	18.80	(6.65)	409	(20.73)	not at all					not at all	5.10	(1.06)	340	(18.77)
	n.a.	2.78	(2.80)	376	(3.24)	n.a.	2.78	(2.80)	376	(3.24)	n.a.	2.78	(2.80)	376	(3.24)
South	**no**	**32.99**	**(6.36)**	**441**	**(11.24)**	**yes, very**	**39.13**	**(6.51)**	**415**	**(10.32)**	**yes, very**	**14.85**	**(3.89)**	**459**	**(16.62)**
	minor	**18.47**	**(5.13)**	**415**	**(15.07)**	**yes, fairly**	**40.71**	**(6.78)**	**441**	**(8.28)**	**yes, fairly**	**36.58**	**(5.86)**	**432**	**(9.00)**
	fairly	**25.38**	**(5.22)**	**434**	**(13.32)**	**no**	**16.70**	**(4.44)**	**417**	**(21.04)**	**no**	**34.73**	**(5.77)**	**424**	**(12.19)**
	very	**20.81**	**(5.13)**	**407**	**(14.36)**	**not at all**	**2.17**	**(1.65)**	**425**	**(41.86)**	**not at all**	**11.04**	**(3.48)**	**378**	**(17.17)**
	n.a.	**2.35**	**(1.68)**	**392**	**(14.27)**	**n.a.**	**1.29**	**(1.29)**	**376**	**(3.24)**	**n.a.**	**2.80**	**(1.98)**	**377**	**(5.04)**

cont.

cont.

	Availability of computers per student (4)					Teacher enthusiasm (5)				
Macro-area		**% of students**	**S.E.**	**Average mathematics score**	**S.E.**		**% of students**	**S.E.**	**Average mathematics score**	**S.E.**
Northwest	less than one PC per 10 students	30.35	(3.42)	531	(10.97)	yes, very	4.59	2.157982	491	(15.93)
	between one PC every 10 students and one PC every	42.84	(4.15)	515	(8.14)	yes, fairly	79.80	(4.71)	513	(6.48)
	between one PC every 5 students and one PC every 3	17.03	(2.69)	479	(13.20)	no	15.61	(4.16)	501	(11.78)
	More than one PC every 3 students	9.78	(3.23)	481	(24.03)	not at all				
						n.a.				
Northeast	less than one PC per 10 students	27.96	(2.96)	529	(18.98)	yes, very	3.58	(1.74)	519	(28.69)
	between one PC every 10 students and one PC every	43.90	(5.87)	495	(9.42)	yes, fairly	67.78	(6.50)	513	(13.43)
	between one PC every 5 students and one PC every 3	19.47	(8.98)	521	(17.55)	no	27.68	(6.24)	505	(12.59)
	More than one PC every 3 students	8.67	(3.87)	514	(13.77)	not at all	0.96	(0.96)	516	(5.31)
						n.a.				
Centre	less than one PC per 10 students	53.26	(6.08)	482	(10.13)	yes, very	3.60	(2.57)	473	(22.73)
	between one PC every 10 students and one PC every	25.43	(7.08)	459	(9.63)	yes, fairly	54.80	(7.73)	470	(7.04)
	between one PC every 5 students and one PC every 3	12.60	(4.73)	471	(23.23)	no	29.17	(8.72)	479	(12.06)
	More than one PC every 3 students	8.71	(1.13)	458	(24.78)	not at all				
						n.a.	12.43	(6.33)	468	(27.06)
Southeast	less than one PC per 10 students	66.28	(6.45)	427	(10.16)	yes, very	6.51	(3.66)	439	(40.05)
	between one PC every 10 students and one PC every	25.53	(5.30)	436	(15.26)	yes, fairly	74.91	(8.11)	421	(11.61)
	between one PC every 5 students and one PC every 3	5.60	(3.94)	377	(27.89)	no	12.76	(5.79)	429	(19.98)
	More than one PC every 3 students	2.59	(2.57)	484	(4.50)	not at all				
						n.a.	5.82	(4.11)	513	(13.53)
Southwest Islands	less than one PC per 10 students	53.45	(7.37)	437	(8.53)	yes, very	3.49	(3.49)	489	(5.79)
	between one PC every 10 students and one PC every	28.48	(9.41)	421	(14.27)	yes, fairly	87.32	(5.68)	425	(7.31)
	between one PC every 5 students and one PC every 3	11.36	(6.46)	388	(22.40)	no	9.19	(4.48)	385	(12.79)
	More than one PC every 3 students	6.71	(3.95)	385	(13.81)	not at all				
				376	(3.24)	n.a.				

Note: Results based on the statements of school principals in proportion to the number of 15-year-olds enrolled
School buildings and grounds, SC08Q11 variable (closed response) (2) Availability of qualified mathematics teachers, SC08Q01 variable (closed response) (3) Science laboratory equipment and materials, SC08Q20 variable (closed response). (4) Availability of computers for student use, RATCOMP variable (index calculated based on the statements of school principals). (5) Teachers work with enthusiasm, SC24Q02 variable (closed response).

Geographical macro-areas
The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.4.6 Budget of the Ministry of Education. Year 2006

Destination	Computer use (*)	Millions of Euro
Central offices	Staff and Offices of the Minister	16.0
	Education Department	83.0
	Department of Ministerial Planning, Ministerial Budget, Human Resources and Information Management	1,000.0
	Department for Universities, Advanced Training in Art, Music and Dance and Scientific and Technological Research	10,570.0
Transfer of resources to territory	Schools	37,953.1
	Regional Education Offices	746.9
Total		**50,369.0**

Source: Based on State Budget for 2006, Table 7

Table A.4.7 Annual total expenditure per student, grade level and region. Year 2003

Region	Annual expenditure per student				Total expenditure	
	Pre-school	Elementary	Middle	Upper	Total	% families
Trentino Alto-Adige	7,096	15,095	9,795	10,154	176,922	7.9
Piedmont and Valle d'Aosta	6,481	8,194	8,290	9,193	131,245	18.5
Veneto	7,651	7,628	7,370	8,184	124,124	11.0
Molise	6,250	7,648	8,118	8,186	122,270	10.1
Lombardy	5,109	8,150	7,782	8,095	119,901	10.4
Umbria	6,332	7,294	7,636	8,205	119,402	10.2
Emilia Romagna	5,107	7,802	7,551	8,427	119,120	10.4
Tuscany	6,059	7,438	7,304	8,173	118,141	10.0
Sardinia	6,404	7,283	7,877	7,493	116,727	20.8
Friuli Venezia Giulia	5,169	7,323	7,560	8,347	116,537	10.3
Marche	6,317	7,075	7,150	7,986	115,703	10.6
Basilicata	6,125	7,290	7,791	7,441	115,402	7.5
Abruzzo	6,566	6,755	7,021	7,805	113,557	10.7
Calabria	5,536	7,135	7,611	7,551	112,870	7.6
Lazio	5,116	6,703	6,804	7,739	107,972	10.4
Sicily	4,856	5,989	6,743	7,137	100,424	9.0
Campania	4,777	5,769	6,781	6,378	95,410	8.7
Liguria	1,699	7,013	6,511	7,013	94,761	11.4
Puglia	4,701	5,460	6,150	6,814	93,924	9.1
Total	**5,183**	**7,041**	**7,238**	**7,666**	**110,797**	**10.8**

Source: Based on MIPA-INVALSI data, ASPIS III, 2003

Table A.4.8 Percentage of students, based on familiarity with computer use and results on the mathematics scale by macro-area and for Italy

Macro-area	Use of computers (*)	% of students	S.E.	Average math score	S.E.
Northwest				423	(14.94)
	Less than 1 year	8.88	(0.97)	455	(8.79)
	Between 1 and 3 years	36.67	(0.89)	498	(4.30)
	Between 3 and 5 years	27.91	(0.78)	525	(5.38)
	More than 5 years	26.53	(1.06)	542	(5.93)
Northeast				434	(12.42)
	Less than 1 year	6.42	(0.73)	468	(14.46)
	Between 1 and 3 years	41.50	(1.88)	499	(7.66)
	Between 3 and 5 years	28.23	(1.95)	527	(5.43)
	More than 5 years	23.85	(1.87)	535	(12.64)
Centre				412	(11.66)
	Less than 1 year	11.87	(1.13)	425	(9.81)
	Between 1 and 3 years	38.84	(1.59)	468	(7.77)
	Between 3 and 5 years	24.87	(0.71)	489	(5.31)
	More than 5 years	24.43	(1.28)	501	(6.06)
Southeast				385	(13.24)
	Less than 1 year	20.32	(1.35)	394	(10.96)
	Between 1 and 3 years	44.63	(2.20)	421	(8.10)
	Between 3 and 5 years	19.51	(1.65)	459	(9.32)
	More than 5 years	15.55	(1.55)	475	(11.23)
Southwest and Islands				381	(11.08)
	Less than 1 year	21.05	(1.96)	379	(9.27)
	Between 1 and 3 years	43.83	(1.87)	425	(6.95)
	Between 3 and 5 years	17.79	(1.86)	459	(6.09)
	More than 5 years	17.33	(1.73)	460	(7.49)
ITALY				398	(5.69)
	Less than 1 year	14.20	(0.59)	408	(5.35)
	Between 1 and 3 years	41.14	(0.74)	458	(3.52)
	Between 3 and 5 years	23.37	(0.64)	495	(2.89)
	More than 5 years	21.28	(0.65)	507	(3.99)

Note: Figures based on student statements

(*) use of computer, variable ic03q01

S.E. standard error

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.4.9 Percentage of students, based on computer ownership at home and results on the mathematics scale by macro-area

Macro-area	At-home computers (*)	% of students	S.E.	Average math score	S.E.
Northwest				503	(31.75)
	-1.6763	12.08	(1.12)	452	(6.71)
	-0.7469	14.48	(0.69)	488	(5.51)
	0.0806	42.60	(1.31)	518	(5.05)
	1.0513	30.84	(1.15)	533	(6.17)
Northeast				442	(44.49)
	-1.6763	13.32	(1.11)	454	(11.72)
	-0.7469	14.88	(1.24)	494	(9.38)
	0.0806	42.41	(1.06)	515	(7.40)
	1.0513	29.40	(1.38)	540	(8.64)
Centre				422	(13.23)
	-1.6763	15.51	(1.12)	435	(8.18)
	-0.7469	14.04	(1.06)	454	(9.42)
	0.0806	44.29	(2.09)	480	(6.67)
	1.0513	26.16	(1.25)	492	(4.87)
Southeast				409	(72.16)
	-1.6763	27.14	(2.21)	396	(9.28)
	-0.7469	15.01	(1.50)	412	(15.07)
	0.0806	35.23	(1.95)	443	(8.33)
	1.0513	22.63	(1.63)	456	(9.62)
Southwest and Islands				435	(37.40)
	-1.6763	31.66	(2.39)	387	(7.60)
	-0.7469	12.71	(1.58)	412	(9.47)
	0.0806	34.70	(1.62)	436	(7.21)
	1.0513	20.93	(2.36)	464	(7.18)

Note: Figures based on student statements

(*) at-home computer, "comphome" composite index compiled by the OECD

S.E. standard error

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; The Southeast includes Abruzzo, Molise, Campania, and Puglia; The Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.4.10 Percentage of students, based on at-school computers and results on the mathematical scale by macro-area and for Italy

Macro-area	Type of school	At-school computers	% of students	S.E.	Average math score	S.E.
Northwest	Vocational School	no	18.75	(6.46)	436	(18.79)
		yes	81.25	(6.46)	443	(6.30)
		n.a.			412	(18.76)
	Technical School	no	2.29	(0.49)	494	(23.72)
		yes	97.71	(0.49)	515	(6.76)
		n.a.			507	(10.97)
	High School	no	13.62	(3.43)	549	(12.47)
		yes	86.38	(3.43)	559	(8.52)
		n.a.			507	(12.07)
	Middle School	no	6.42	(5.25)	378	(35.24)
		yes	93.58	(5.25)	361	(30.07)
		n.a.			280	(45.54)
	TOTAL	no	10.20	(2.03)	498	(17.54)
		yes	89.80	(2.03)	515	(4.47)
		n.a.			459	(12.80)
Northeast	Vocational School	no	10.35	(7.60)	472	(3.00)
		yes	89.65	(7.60)	450	(8.00)
		n.a.			414	(34.97)
	Technical School	no	3.46	(1.75)	504	(16.65)
		yes	96.54	(1.75)	532	(5.50)
		n.a.			512	(11.25)
	High School	no	11.11	(1.81)	570	(18.47)
		yes	88.89	(1.81)	542	(16.04)
		n.a.			567	(17.43)
	Middle School	no	1.91	(2.74)	374	(42.42)
		yes	98.09	(2.74)	459	(23.05)
		n.a.			353	(26.68)
	TOTAL	no	7.99	(2.24)	522	(16.03)
		yes	92.01	(2.24)	511	(8.22)
		n.a.			495	(12.64)
Centre	Vocational School	no	32.45	(8.07)	418	(8.74)
		yes	67.55	(8.07)	410	(8.89)
		n.a.			384	(16.84)
	Technical School	no	3.45	(1.35)	492	(13.81)
		yes	96.55	(1.35)	486	(12.90)
		n.a.			438	(15.88)
	High School	no	22.36	(7.69)	509	(13.20)
		yes	77.64	(7.69)	508	(5.11)
		n.a.			502	(20.79)
	Middle School	no	35.69	(21.81)	378	(38.97)
		yes	64.31	(21.81)	430	(50.05)
	TOTAL	no	18.46	(3.94)	468	(12.71)
		yes	81.54	(3.94)	479	(6.06)
		n.a.			429	(13.65)

cont.

cont.

Macro-area	Type of school	At-school computers	% of students	S.E.	Average math score	S.E.
Southeast	Vocational School	no	8.14	(4.61)	383	(19.79)
		yes	91.86	(4.61)	386	(6.76)
		n.a.			353	(21.40)
	Technical School	no	1.87	(0.87)	451	(47.69)
		yes	98.13	(0.87)	421	(15.07)
		n.a.			429	(27.05)
	High School	no	28.85	(8.09)	478	(13.95)
		yes	71.15	(8.09)	477	(13.32)
		n.a.			459	(22.94)
	Middle School	no	14.29	(13.18)	359	(46.18)
		yes	85.71	(13.18)	301	(67.69)
		n.a.			222	(38.16)
	TOTAL	no	13.59	(3.15)	460	(13.72)
		yes	86.41	(3.15)	426	(8.95)
		n.a.			403	(18.36)
Southwest and Islands	Vocational School	no	17.62	(6.66)	363	(12.37)
		yes	82.38	(6.66)	374	(14.91)
		n.a.			355	(8.39)
	Technical School	no	3.64	(2.06)	384	(21.06)
		yes	96.36	(2.06)	432	(8.99)
		n.a.			390	(23.79)
	High School	no	34.47	(9.04)	466	(8.44)
		yes	65.53	(9.04)	454	(17.30)
		n.a.			413	(24.35)
	Middle School	yes	100.00	(0.00)	279	(28.30)
	TOTAL	no	19.96	(3.94)	443	(10.85)
		yes	80.04	(3.94)	424	(6.32)
		n.a.			386	(12.84)
TOTAL	**Vocational School**	**no**	**16.86**	**(3.24)**	**415**	**(8.38)**
		yes	**83.14**	**(3.24)**	**412**	**(4.47)**
		n.a.			**377**	**(9.35)**
	Technical School	**no**	**2.83**	**(0.57)**	**462**	**(16.34)**
		yes	**97.17**	**(0.57)**	**474**	**(4.98)**
		n.a.			**446**	**(11.65)**
	High School	**no**	**23.18**	**(3.14)**	**495**	**(6.37)**
		yes	**76.82**	**(3.14)**	**509**	**(6.40)**
		n.a.			**468**	**(11.58)**
	Middle School	**no**	**9.74**	**(6.21)**	**369**	**(29.95)**
		yes	**90.26**	**(6.21)**	**331**	**(29.01)**
		n.a.			**235**	**(30.20)**

Note: Figures based on student statements

(*) use of computer, ic01q02 variable with yes/no answer

S.E. standard error

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Type of school

The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.4.11 Index of perception of own mathematical skills by macro-area and type of school

Macro-area	Type of school	Index of perception of own mathematical skills (*)	S.E.
TOTAL	**Middle School**	**-0.248**	**(0.17)**
	Technical School	**0.070**	**(0.02)**
	Vocational School	**-0.144**	**(0.05)**
	High School	**0.045**	**(0.03)**
	Vocational School (Bolzano)	**-0.042**	**(0.08)**
Northwest	TOTAL	-0.10	(0.03)
	Middle School	-0.33	(0.20)
	Technical School	-0.08	(0.04)
	Vocational School	-0.29	(0.05)
	High School	0.01	(0.06)
Northeast	TOTAL	-0.04	(0.04)
	Middle School	0.21	(0.26)
	Technical School	0.08	(0.04)
	Vocational School	-0.23	(0.08)
	High School	-0.02	(0.09)
	Vocational School (Bolzano)	-0.04	(0.08)
Centre	TOTAL	-0.07	(0.06)
	Middle School	0.99	(0.26)
	Technical School	0.01	(0.04)
	Vocational School	-0.31	(0.19)
	High School	0.00	(0.05)
Southeast	TOTAL	0.05	(0.04)
	Middle School	-0.54	(0.05)
	Technical School	0.14	(0.07)
	Vocational School	0.02	(0.06)
	High School	0.03	(0.08)
Southwest/Islands	TOTAL	0.14	(0.04)
	Middle School	-0.28	(0.25)
	Technical School	0.20	(0.06)
	Vocational School	0.05	(0.08)
	High School	0.16	(0.05)

Note: Figures based on student statements

(*) Index calculated by OECD ("scmat" variable) based on student statements. The Italian index is equal to 0 (which corresponds to the OECD average). The highest positive figures correspond to students who claim to have good familiarity and are good in mathematics, while negative figures indicate students who have greater difficulty with this material.

S.E. standard error

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; The Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Type of school

The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.4.12 Percentage of students, based on mark in most recent school report and results on the mathematics scale by macro-area

Macro-area	Grades on most recent school report	% of students	S.E	Average math score	S.E
Northwest	1-less than 4	3.79	(0.41)	434	(8.29)
	2-poor, 4 and 5	31.25	(1.48)	474	(6.21)
	3-good, 6 and 7	45.43	(1.40)	525	(5.00)
	4-excellent, 8 and up	17.73	(0.80)	562	(5.70)
	5 - n.a.	1.80	(0.57)	414	(38.00)
Northeast	1-less than 4	2.84	(0.54)	440	(12.82)
	2-poor, 4 and 5	30.98	(1.64)	485	(8.03)
	3-good, 6 and 7	47.14	(1.19)	518	(8.94)
	4-excellent, 8 and up	17.56	(1.44)	554	(11.16)
	5 - n.a.	1.47	(0.22)	467	(41.83)
Centre	1-less than 4	5.83	(0.83)	412	(10.30)
	2-poor, 4 and 5	32.59	(2.51)	451	(9.15)
	3-good, 6 and 7	45.10	(2.00)	487	(6.79)
	4-excellent, 8 and up	13.93	(1.68)	513	(8.05)
	5 - n.a.	2.55	(0.64)	411	(16.72)
Southeast	1-less than 4	5.90	(1.09)	377	(15.53)
	2-poor, 4 and 5	34.09	(1.78)	399	(7.41)
	3-good, 6 and 7	47.21	(1.54)	443	(8.77)
	4-excellent, 8 and up	10.09	(1.49)	501	(12.04)
	5 - n.a.	2.71	(0.49)	372	(31.62)
Southwest/Isalnds	1-less than 4	6.07	(0.81)	392	(14.24)
	2-poor, 4 and 5	30.87	(2.06)	407	(8.69)
	3-good, 6 and 7	46.68	(1.72)	426	(6.95)
	4-excellent, 8 and up	13.55	(1.16)	480	(8.71)
	5 - n.a.	2.84	(0.67)	347	(24.50)

Note: Figures based on student statements

(*) Mark on most recent school report, ec07q01 variable

S.E. standard error

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.4.13 Percentage of students, based on mark in most recent school report and results on the mathematics scale by type of school

Macro-area	Voti dell'ultima pagella (*)	% studenti	E.S.	Punteggio medio in matematica	E.S.
Middle School	1-less than 4				
	2-poor, 4 and 5	33.08	(7.33)	334	(38.67)
	3-good, 6 and 7	34.81	(9.50)	309	(30.56)
	4-excellent, 8 and up	5.86	(4.60)	450	(38.76)
	5 - n.a.	26.24	(8.07)	288	(39.38)
Technical School	1-less than 4	5.44	(0.67)	417	(14.41)
	2-poor, 4 and 5	34.02	(1.30)	447	(6.22)
	3-good, 6 and 7	46.01	(1.05)	485	(5.75)
	4-excellent, 8 and up	12.53	(0.82)	530	(5.57)
	5 - n.a.	2.00	(0.36)	418	(13.03)
Vocational School	1-less than 4	8.75	(0.94)	370	(8.09)
	2-poor, 4 and 5	37.69	(1.82)	395	(4.40)
	3-good, 6 and 7	39.08	(1.59)	418	(6.20)
	4-excellent, 8 and up	11.16	(1.33)	455	(6.79)
	5 - n.a.	3.32	(0.58)	369	(18.08)
High School	1-less than 4	2.43	(0.37)	452	(13.63)
	2-poor, 4 and 5	26.70	(1.45)	474	(7.21)
	3-good, 6 and 7	51.66	(1.15)	503	(6.60)
	4-excellent, 8 and up	18.22	(1.01)	551	(5.51)
	5 - n.a.	1.00	(0.17)	489	(14.05)
Vocational School (Bolzano)	1-less than 4	0.76	(0.76)	534	(21.15)
	2-poor, 4 and 5	5.84	(1.93)	471	(33.86)
	3-good, 6 and 7	59.25	(4.04)	481	(7.81)
	4-excellent, 8 and up	26.31	(3.29)	518	(12.59)
	5 - n.a.	7.85	(2.02)	461	(21.49)

Note: Figures based on student statements

(*) Mark on the most recent school report, ec07q01 variable.

S.E. standard error

Type of school

The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.4.14 **Index of help received from teacher on mathematics lessons and results on the mathematics scale (by quartile of the index) by macro-area, Italian and OECD average**

	Index of help received from teacher on mathematics lessons										Results on the mathematics scale by quartile of the index of help received from the teacher								Change in math score per unit of index		% variance in math results explained by the index	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Points	S.E.	%	S.E.
Italy	-0.12	(0.0)	-1.47	(0.0)	-0.40	(0.0)	0.20	(0.0)	1.19	(0.0)	484	(3.8)	477	(3.7)	464	(4.2)	441	(5.1)	-16.33	(1.7)	3.27	(0.6)
OECD average	0.0	(0.0)	-1.2	(0.0)	-0.3	(0.0)	0.3	(0.0)	1.3	(0.0)	505	(0.8)	506	(0.7)	503	(0.9)	496	(1.0)	-4.2	(0.4)	0.2	(0.0)
Macro-area																						
Northwest	-0.26	(0.05)	-1.53	(0.03)	-0.54	(0.01)	0.06	(0.01)	0.96	(0.02)	509	(7.30)	517	(6.25)	513	(6.46)	505	(7.40)	-2.71	(2.99)	0.09	(0.21)
Northeast	-0.36	(0.04)	-1.60	(0.03)	-0.61	(0.01)	-0.07	(0.01)	0.83	(0.03)	519	(7.45)	511	(5.07)	510	(12.75)	505	(11.69)	-5.99	(4.07)	0.44	(0.63)
Centre	-0.21	(0.06)	-1.51	(0.03)	-0.48	(0.01)	0.10	(0.01)	1.05	(0.05)	486	(7.54)	480	(7.15)	473	(5.73)	455	(8.15)	-11.48	(1.84)	2.01	(0.62)
South	0.12	(0.04)	-1.19	(0.05)	-0.16	(0.01)	0.44	(0.01)	1.42	(0.03)	443	(11.10)	438	(9.48)	426	(9.91)	406	(10.72)	-13.92	(4.03)	2.54	(1.39)
South/Islands	0.02	(0.07)	-1.51	(0.10)	-0.23	(0.01)	0.38	(0.01)	1.43	(0.04)	452	(8.35)	422	(8.29)	422	(9.40)	400	(9.04)	-16.05	(2.56)	4.83	(1.61)

Note: Figures based on student statements

Positive, high figures in the index indicate the perception of support from the teacher that is higher than the OECD average

S.E. standard error

Geographical macro-areas

The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Table A.4.15 Index of help received from teacher on mathematics lessons and results on the mathematics scale (by quartile of the index) by type of school

	Index of help received from teacher on mathematics lessons										Results on the mathematics scale by quartile of the index of help received from the teacher								Change in math score per unit of index		% variance in math results explained by the index	
	All students		Quartile								Quartile											
			1st		2nd		3rd		4th		1st		2nd		3rd		4th					
	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Average	S.E.	Points	S.E.	%	S.E.
High schools	-0.27	(0.05)	-1.65	(0.05)	-0.57	(0.01)	0.07	(0.01)	1.07	(0.04)	503	(6.3)	512	(6.00)	510	(6.63)	486	(10.9)	-6.71	(3.59)	0.67	(0.67)
Technical schools	-0.10	(0.04)	-1.41	(0.03)	-0.38	(0.01)	0.23	(0.01)	1.17	(0.03)	490	(5.1)	480	(5.53)	470	(6.22)	451	(8.4)	-15.30	(2.12)	3.20	(0.80)
Vocational schools	0.06	(0.04)	-1.24	(0.03)	-0.21	(0.01)	0.35	(0.01)	1.33	(0.04)	422	(5.7)	414	(6.01)	407	(6.26)	389	(6.1)	-13.03	(3.09)	2.93	(1.32)

Note: Figures based on student statements

Positive, high figures in the index indicate the perception of support from the teacher that is higher than the OECD average

S.E. standard error

Type of school

The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

Table A.5.1 Description of the Italian sample of PISA-2003

Geographical area	Number of schools sampled (*)	Number of students who sat the tests	Number of students envisaged for the sample
Northwest	118	3,339	3,692
Northeast	139	4,159	4,545
Centre	73	2,132	2,371
Southeast	40	1,091	1,273
Southwest and Islands	36	918	1,086
Total	**406**	**11,639**	**12,967**

Type of School	Number of schools sampled (*)	Number of students who sat the tests
High Schools	137	4,331
Technical Schools	142	4,277
Vocational Schools	103	2,959
Middle Schools	24	72
Total	**406**	**11,639**

Note:
(*) The selected sample was 493 schools, but of these, 87 schools (86 middle schools and 1 upper secondary school) were excluded, in accordance with established international procedures, due to the lack of at least 3 15-year-olds enrolled, thus the sample consisted of 406 schools of which 382 upper secondary schools and 24 middle schools.

Geographical macro-areas
The Northwest includes Piedmont, Lombardy, Liguria and Valle d'Aosta; the Northeast includes Veneto, Friuli-Venezia Giulia, Trentino-Alto Adige and Emilia-Romagna; the Centre includes Tuscany, Lazio, Umbria and Marche; the Southeast includes Abruzzo, Molise, Campania, and Puglia; the Southwest includes Calabria, Basilicata, Sicily and Sardinia.

Type of school
The category of high schools includes: scientific high school, classical high school, social sciences high school, scientific-technological high school, linguistic high school; the category of vocational schools includes, in addition to the latter, art colleges, artistic high schools and the Bolzano provincial vocational schools taught in German.

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