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Learning divides across the Italian regions: Some evidence from national and international surveys

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LEARNING DIVIDES ACROSS THE ITALIAN REGIONS:
SOME EVIDENCE FROM NATIONAL AND INTERNATIONAL SURVEYS [1]

by Pasqualino Montanaro*

Abstract

Student performance has been tested by various surveys at the international level in recent years, using different aims and methodologies. On the basis of a comparative analysis, this paper aims to describe the differences in performance between Italian regions, subjects and ages or grades. All the surveys revealed significant gaps in performance across the Italian regions, with students in the South being far behind those in the North in all the subjects surveyed (reading, mathematics, science). This gap is particularly marked in technical ("istituti tecnici") and vocational ("istituti professionali") schools. Also the degree of disparity in scores is higher in the South. The geographical divides increase with grade: the gaps between North and South are more mitigated at the earlier grades and concentrated among students with a low parental background. Student achievement is strongly correlated with the socio-cultural and economic conditions of the family. However, this relationship seems to be sharper at the earlier grades, while it vanishes at the upper secondary school level, when the type-of-program and school effects have much greater impact. Finally, this paper also suggests that marks (or final grades) given internally by schools do not reflect the real levels of proficiency, and do not, therefore, distinguish good students from bad ones.

JEL Classification: I20, I21.
Key words: quality of education, international assessments, regional disparities.

Contents

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1. Summary and introduction

The renewal of interest in growth theory has resulted in many efforts to explain the nature of income differentials, focussing on the role played by human capital. The earliest literature on this subject accounted only for physical capital and labor, while many subsequent studies have been increasingly considering different human capital specifications, in order to check for labor heterogeneity and differences in input quality. In fact, there is strong evidence that ignoring "quality" differences significantly distorts the relationship between education and growth.

One of the alternatives in measuring the quality of human capital is assessing skills directly. While educational attainment takes account neither of skills and competences gained after the completion of formal education nor of the deterioration of abilities through lack of use, assessing the students' skills directly can give evidence of various characteristics at a given point in time. Even if the tests cannot completely measure attitudes and motivation, which are obviously to be included in the human capital definition, their results are able to capture a large part of labor force quality and to enrich research on the causal relationship either between education and economic outcomes or between policy initiatives and educational outcomes. That said, it is an open issue *whether* the quality of education comes from schools, rather than from parents or other sources.

This descriptive paper aims to compare methodologies and findings of the most important surveys testing Italian students' performances at the international level in recent years, in order to understand: *i)* if they univocally reveal wide differences in scholastic proficiency across the Italian regions; *ii)* if the results significantly vary across ages or grade of the students; *iii)* if the external assessment outcomes differ from the schools' "internal" evaluations; *iv)* if the parental background affects scholastic performance.

All of the most important surveys on scholastic achievement (including the national assessment INValSI[2]) univocally reveal significant gaps in performance across the Italian regions, with students in the South far behind those in the North in all the subjects (*reading*, *mathematics*, *science*). This paper also shows that the gaps are very much wider in technical and vocational schools and the geographical divides increase with grade.

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Apart from studying what international surveys tell us about geographical divides in scholastic performance, this paper provides information on the relationship between geographical location and the internal marks (or final grades) given by the schools, and on the relationship between performance and parental background. This paper shows that parental background effects are stronger at the earlier grades than at the upper secondary school, when type-of-programs and especially school fixed effects are clearly more important. Moreover, at the lower grades the gaps between North and South are more mitigated and concentrated among pupils with a low parental educational level. Nevertheless, these gaps are shown to be mainly due to school characteristics which are particularly disadvantageous to pupils in the South.

There are several policy implications here. Certainly a policy focusing only on schools in order to reduce the North-South gaps, might not be completely successful, considering how strongly social factors, such as local environment or socio-cultural and economic background, make Southern regions deteriorate in terms of scholastic achievement. Nevertheless, disparities *between* schools seem to be quite marked too, requiring more specific policy measures.

The paper is organized as follows. Section 2 will give a brief overview of the literature on the measures of scholastic outcomes and their use; Section 3 will present the results at the regional level and grade by grade, while Section 4 will make a comparison with internal marks; finally, Section 5 will estimate the effect of the parental background on performance.

2. The theoretical and empirical literature

The debate on the social and economic role of education became lively in the later 1960s, when by correlating scholastic outcome with several socio-cultural factors some authors concluded that *"schools don't make the difference"*, radically discussing the choice whether to invest in education or not, in order to raise the proficiency level of the students and to fill the gaps across students from different social contexts (Coleman, 1966; Jenchs, 1973).

For England, at the end of the 1970s Rutter et al. (1980) tried to demonstrate that, on the contrary, *"schools do make the difference"*. Since then, wide research has shown that education policy does affect both economic growth and innovation at a macro level or student performance at a micro level (Büeler, 1998; Grisay, 1997). On the basis of more reliable data, more recent works reveal that the effects of the social composition of provinces, schools and classrooms ("local externalities") are as significant as those of parental background (Card and Krueger, 1992; Cooper et al., 1994; Bratti et al., 2007).

When adjusting for skills, as expressed by direct performance measures, the most recent growth literature shows that a significant part of the returns on investment in human capital is a return on intellectual capacity and cognitive abilities. Hanushek and Kimko (2000) emphasize how the explanation of cross-country growth is affected by the inclusion of quality measures. They show that there is consistent evidence that labor-force quality measures, which are influenced by cultural, racial, parental and schooling factors *i)* are related to individual productivity, *ii)* in this way they influence individual earnings and *iii)* indicate a causal influence in the growth relationship.

Even still detecting a positive relationship between years of schooling (*quantity* of schooling) and growth, Barro (2001) confirms that the effect of the *quality* of schooling, measured by the knowledge of the students, is substantially much more important for economic growth than the mere quantity of education. Bosworth and Collins (2003), Ciccone and Papaioannou (2005), Coulombe et al. (2004) and Coulombe and Tremblay (2006) also find that educational quality strongly dominates any effect of educational quantity on growth. On the basis of forthcoming works, Hanushek and Woessman (2007) anticipate that education could raise income levels mainly by speeding up technological progress, rather than shifting the level of the production function or increasing the impact of an additional year of schooling.

In any case, there is no doubt that education quality (and hence, the quality of the labor force) is just one of the factors that enter into the determination of growth. Simply providing higher-quality schooling may have a negligible effect on supporting a functioning modern economy in the absence of other elements, like appropriate market, legal and governmental institutions (Hanushek and Woessmann, 2007).

With this cultural background, "*school effectiveness*" became a central topic as regards scholastic behavior, by means of organizational choices and *output-assessments.* Also in Italy, the school autonomy encouraged the introduction of external performance assessments.[3] The early

[3] In general, we call "external" any assessment whose process is completely managed by persons outside the single schools. On the basis of motivation and learning theories, MacBeath (1999) suggests that each type of assessment has to be useful first of all for the single schools which are involved in the assessment. Some surveys evaluate not only the performance of the students, but also the quality of the *educational processes* within the schools, on the assumption that assessments do have positive effects on *"school improvement"* too (see for example the OECD *International School Improvement Project* (Reynolds and Stoll, 1996).

research of the OECD on educational quality indicators was in the middle of the 1980s, even though the outcomes were not fully reliable, because of statistical problems (Kane and Staiger, 2002).

In recent years, four important international assessments[4] have been measuring knowledge, abilities and skills in a wide number of countries: the *International Adult Literacy Survey* (IALS), conducted in three phases (1994, 1996 and 1998) by the OECD and Statistics Canada; the *Program for International Student Assessment* (PISA), conducted by the OECD in 2000, 2003 and 2006; the *Trends in Maths and Science Study* (TIMSS) and the *Progress in International Reading Literacy Study* (PIRLS), both organized by the International Study Center of Boston College and International Association for the Evaluation of Educational Achievement (IEA), the first in 1995, 1999, 2003 and 2007, the second in 2001 and 2006. The results of the final editions of PISA 2003, TIMSS 2003 and PIRLS 2001 are available to the public (**Table 1**).

The differences in the number and composition of participating countries, in the purpose of the assessments and in the target population make it impossible to consider one survey as "overwriting" or "replacing" another, as deriving from a single source, even if the subject is the same. Nevertheless, it is possible to compare their results.

At the international level, some authors (Micklewright and Schnepf, 2004; Brown et al., 2005) have already compared the surveys, finding them sufficiently correlated in terms of average country results and their variance. Hanushek and Woessmann (2007) find that the results of the most important international assessments are highly correlated at the country level. For example, the correlation coefficients between the TIMSS 2003 tests of 8th graders and the PISA 2003 tests of 15-year-olds across the 19 countries participating in both are estimated at 0.87 in maths and 0.97 in science. At the regional level, the correlations tend to be lower, due to higher measurement and sampling errors.

[4] There are other lesser known international surveys, which focus on a more restricted number of countries or which have been discontinued. Among them, the *Adult Literacy and Lifeskills* (ALL) survey was conducted by the OECD and Statistics Canada in 2003 to provide participating countries (Bermuda, Canada, Italy, Norway, Switzerland and United States) with information about the literacy and numeracy skills of their adult populations. It followed the pioneering IALS survey. The *Civic Education Study* (CivEd) was conducted by IEA in 1999; it provided information on what ninth-graders (14-year-olds) of 28 countries (seven of which are euro-area countries: Belgium, Finland, Germany, Greece, Italy, Portugal and Slovenia) know about democratic practices and institutions.

3. School performance gaps

This section will present the outcomes of the learning assessments conducted in Italy, in order to give a concise overview of the gaps across regions, types of program and ages. The outcomes of the national INValSI assessment will be discussed first; those of the international surveys will follow.

INValSI. – The INValSI, as part of the Ministry of the Education, conducted a wide survey on the scholastic system, involving a large part of the students in the periods 2004-05 and 2005-06 in the second and fourth primary school grades, in the first grade at the lower secondary school and in the first and third grades at the upper secondary school.[5] The type of achievement was "the ownership of knowledge and ability" in three subjects (reading, mathematics, and science).

Here, I will concentrate the analysis on just one part of the INValSI survey results. This is because there were many measurement errors in the primary school assessments, creating problems of reliability. In fact, according to the primary school scores, the proficiency levels in the South are shown to be far above average, drawing a geographical picture completely different from that for the secondary schools. At the provincial level, the correlation between primary and lower secondary school scores is extremely negative.[6] The lower and upper secondary schools outcomes are widely considered more reliable (**Charts 1-3**).

Even though the INValSI assessment is far less useful than the international surveys in providing information about the effects of different backgrounds on scholastic performance ("context information"), its results may help to draw a good picture of the geographical gaps in scholastic performance, due to the fact that it involved a large part of the Italian schools. For the lower and upper secondary school, the INValSI assessment confirms the existence of wide gaps in student proficiency across the Italian regions, with the South far behind the North and the Centre (**Charts 1-3**). The results are quite similar and correlated for the different subjects

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[5] In the school year 2005-06, the INValSI survey involved more than 364,000 students in the upper secondary school (160,000 in the 1st grade and 204,000 in the 3rd grade). Nearly 40 per cent of the students was enrolled in general programs ("licei").

[6] The Ministry of Education-INValSI, admitting that there had been some problems with the previous surveys, especially as regards primary schools, introduced a new survey in the 2006-07 school year, aiming to provide more reliable information on: what schools do in order to improve the learning level of the students; their effectiveness; their social context; and the social and demographic characteristics of the students.

(Italian language, mathematics and science) and grades. By comparing lower and upper secondary schools scores, the provinces of the North are persistently above the Italian average, while the majority of those of the Centre and South are below.

While some regions are firmly at the top of the ranking (i.e. Friuli-Venezia Giulia and Veneto), others obtained high scores in just one school grade (i.e. Umbria in the upper secondary school) or subject (i.e. Marche in mathematics; **Charts 1-3**). At the province level, Udine, Gorizia and Trieste obtained the highest score, while all the Sardinian provinces are at the bottom of the rank. As in PISA, the best performers are students enrolled in general academic programs ("licei"), while the poorest are enrolled in vocational programs ("istituti professionali"); the scores are particularly low in mathematics.

The geographical gaps are shown to be more mitigated as regards Italian language scores (here the type of achievement was quite similar to reading skills) than in mathematics and science. In the 11th grade (the 3rd grade of the upper secondary school), the null hypothesis of equality of the variances among all the subjects cannot be rejected (**Table 4**).[7] That is, at the end of compulsory schooling, the degree of dispersion in reading outcomes is similar to that in scientific subjects. The correlation coefficients among the subjects is high, as expected (about 0.80). What's more, performances in science seem interestingly to be more similar to those in reading than to those in maths.

OECD-PISA 2003. – The PISA survey is focused on 15-year-olds and involved all of the OECD partners. In 2003, 11,660 students from more than 400 schools in the Italian segment were assessed. The type of achievement under investigation was *scientific literacy* (ability to use knowledge and skills to meet real-life challenges), in four subjects: reading, mathematics, science and problem solving.[8] The survey was conducted by means of four types of

[7] In order to test the equality of means of different groups, I used the *Pooled* method (for equal variances) and the *Satterthwaite* method (for unequal variances); in order to test the equality of variances, I used the *Folded F* method instead. These are "parametric tests", which heavily rely on distributional assumptions, such as normality. When these assumptions are not satisfied, commonly used statistical tests often perform poorly, resulting in a greater chance of committing an error. When the data are obtained from a non-normal distribution or one containing outliers, a non-parametric test is often a more powerful statistical tool. In this case, on the basis of common statistical tests (i.e. Kolmogorov-Smirnov, Cramer-von Mises, Anderson-Darling), even though not all of the survey outcomes are "normally distributed", the majority of outcomes depending on subject, geographical area and age are. So I tested the null hypothesis of "equality of variances" using parametric tests.

[8] This paper will focus on all the subjects except *problem solving*, which is not being assessed in other surveys such as PIRLS and TIMSS. Nevertheless, the geographical gradients here are very similar to those for the other subjects.

questionnaires: *i)* assessment; *ii)* student background; *iii)* teacher and *iv)* school questionnaire. The outcomes for Italy are statistically significant at the macro area level (**Table 2**).

Here I analyze the PISA 2003 results, even though the results of the last edition (2006) are available to the public too. For Italy, results are quite disappointing, showing that its 15-year-olds' performances lag considerably behind those of other countries, sometimes by the equivalent of several years of schooling and despite investment in education. Moreover, the gaps between the best and the worst performers are wide and persistent in each percentile of the distribution (OECD, 2004). In each subject, roughly 7 per cent of the Italian students reach the top of the scale, below the OECD average (16 per cent), while 32 per cent of the students are below the two lowest levels, where the OECD average is 21 per cent. Finally, not only Italian education is behind other developed countries in terms of proficiency level, but also it shows wide differences across regions and types of programs (general, technical and vocational programs).[9]

In each subject, the 15-year-olds in the South obtained an average score[10] about 20 per cent lower than in the North, where results are similar to those of the best performing countries. Even though the outcomes should be considered statistically significant only at the level of geographical area (North West, North East, Centre, South and Islands), while at the regional level they are not statistically significant because of undersized samples (see for example Umbria, Marche, Abruzzo, Molise and Basilicata; **Table 2**), the scores of Campania, Puglia and Sicily tend to be lower than the Italian average by roughly 10 per cent. In the North, the students in Lombardy and Trentino-Alto Adige have the highest scores, while students in

[9] According to the PISA 2003 estimates, parental background seems to affect performance less than the OECD average. However, this result does not reveal a greater social equity of the education system, but is due to the fact that the scores for Italy are more concentrated in the lowest part of the distribution.

[10] The scores are obtained on the basis of the *plausible values* (PV). In the international assessment the computing methodology called Item Response Theory (IRT) is used. The scores are standardized so that the mean is equal to 500 and the standard deviation is equal to 100. This methodology allows us to compute performances independently from the nature and complexity of specific questions (see **Table 1**). The Item Response Theory (IRT) model estimates parameters for each item/record (each student in this case) in connection with relative *background* information. In this way, the IRT model generates some estimates of proficiency for each student, at the aggregate level and for each group. therefore, on a scale with a mean equal to 500 and a standard deviation equal to 100, each student has five ability scores, called *plausible values* (PV1-PV5). These values represent a set of *scores* for each student, randomly drawn from a student ability distribution with similar outcomes and similar backgrounds. In other words, the PV is estimated as the performance a student would have produced on the basis of a test with all the questions, since students cannot answer all the questions. We can obtain a group's average score (for example a school, a region, etc.), by calculating five weighted *plausible values* on the basis of as many students as those of the group, and then calculating the simple mean of the five PVs thus obtained.

the Centre are, quite surprisingly, below the Italian average (**Chart 4**).[11] Very interestingly, on the basis of the micro data relative to each student, not only is the proficiency level in the South below the average, but also the dispersion of scores within the Southern area is significantly wider, in terms of variation coefficients (**Table 3**).

The percentage deviation of the scores in the South from the national average is more mitigated in the general programs of the *licei* (roughly 5 per cent), while it is greater in the *istituti tecnici* (15 per cent) and especially in vocational programs in the *istituti professionali*, where the scores for the South are 25 per cent lower than for Italy as a whole (**Chart 4**). At the provincial level (simple and not weighted means), the correlation coefficients among subjects are very high, between 0.94 and 0.99.

PIRLS 2001 and TIMSS 2003. – PIRLS and TIMSS surveyed 9 and 10-year-olds (PIRLS) and students of the 4th and 8th grades (TIMSS), respectively, in almost 50 countries. The two surveys aimed to evaluate respectively *reading literacy* (PIRLS) and *competency* in mathematics and science (TIMSS). These surveys used four different questionnaires too. The outcomes for Italy are statistically significant at the macro area level (**Table 2**).[12] A more complete overview is provided by Montanaro (2007).

While PISA covers a wide range of subjects (reading, mathematics, science and problem solving), PIRLS is solely focused on *reading ability*. With respect to PISA, Italy's outcomes in PIRLS seem to be just a little better. It is worth noting that, even though the subject is the same (*reading for literary experience*; *reading to acquire and use information*), the two assessments involved students of different grades or ages (4th grade or 9 and 10-year-olds in PIRLS and 15-year-olds in PISA).

[11] The analysis of geographical gradients needs to previously state that international assessments did involve all the regions but the smallest, and that not all the provinces ("province") within regions are included in the sample (in PISA 2003 the provinces involved were 82 on 103). Moreover, in many provinces just a few students were tested. Even though just a few Italian regions (Provincia Autonoma of Bolzano, Provincia Autonoma of Trento, Lombardy, Piedmont, Tuscany, Veneto) in the 2003 had data adhering to the PISA sampling standards and thus internationally comparable, however this paper analyzes all the provinces' outcomes, to better understand the consistency of the surveys, with the acknowledgment that outcomes at the provincial level (in the majority of the cases also at the regional level) must be considered as merely approximate and not statistically significant at all, because of high standard errors. This is true not only for PISA, but also and all the more reason for the PIRLS and TIMSS surveys, whose samples are still shorter (**Table 2**).

[12] PIRLS 2001 involved about 3,500 Italian 9/10 year-old pupils, of whom 45 per cent in the South. TIMSS 2003 involved 4,280 students both in the 4th and the 8th grade (45 per cent in the South).

In PIRLS 2001, the average score of the Italian pupils was above the overall mean (almost 8 per cent), at about the 10th place in the ranking (of 40 participating countries). The average score was higher than that of Germany and France, but lower than that of the United States and England. Even though the differences across regions seem to be more mitigated than in PISA, PIRLS confirms that *i)* the performances in the South are poorer than in the North and *ii)* the dispersion in the scores in the South is wider than in the North, in terms of variation coefficients (**Table 3**). These differences are statistically significant. Contrary to PISA, the central regions obtained results that are slightly above average (**Chart 5**).

While PIRLS involves pupils in the 4th grade, TIMSS focuses on students in different years (4th and 8th grades), and looked at *mathematical and scientific literacy*. TIMSS assesses *knowledge* and *learning* in mathematics and science, in relation to *what do the students learn* ("contents") and *how do they learn it* ("teaching methods"). Thus, as far as maths is concerned, while PISA focuses on use of knowledge to address "quantitative" problems that arise in real-life settings, TIMSS measures seem to be more focused on the mastery of internationally agreed curricula.

By involving pupils in different years, TIMSS allows us not only to test geographical gaps, but also to see whether scholastic behavior changes with grade. In the international comparison, even though TIMSS tends to assess more developing or poor countries' pupils (only five euro-area countries in the 2003 edition), Italy is just above the international mean[13] (on average higher by 2-3 per cent in mathematics and 4-5 per cent in science), confirming findings already discussed in PISA. As in PISA and in PIRLS, while performance in the South is poorer, the dispersion in scores – in terms of variation coefficients – is higher. These differences are statistically significant (**Table 3**). It is important to note that at the 4th grade the variance in the outcomes across regions is very small, with a variation coefficient equal to roughly 2 per cent and no significant differences between mathematics and science. Passing from primary (4th grade) to secondary school (8th grade), the Italian average level of literacy decreases by 10 per cent in mathematics and 5 per cent in science (**Table 3** and **Charts 6-7**). The decrease is more marked in the South, while the degree of dispersion, expressed by the

[13] The international average scores at the 4th and at the 8th grade are equal to 495 and 467, respectively. They are obtained as means of all the countries participating (25 and 46, respectively), except for the Basque Country (SPA), Indiana State (USA), Ontario Province and Quebec Province (CAN). It is worth noting that, even though the scales are expressed with the same parameters, results at the different grades cannot be fully compared, to say whether the outcomes of a country are better or worse at the 8th grade with respect to the 4th grade. Thus the comparison is possible only in terms of relative performance across countries or regions.

variation coefficient variation, more than doubles (from 2 to 5 per cent). It follows that spreads across regions tend to widen, passing from primary to secondary school.

As in PISA, the correlation coefficients among subjects (maths and science) at the provincial level (simple and not weighted means) are very high (0.94 at the 4th grade and 0.96 at the 8th grade). What is interesting to note is that the correlation coefficients between scores at the provincial level and at different ages (4th and 8th grades) are null for mathematics (**Chart 8a** and **Table 6**) and very low for science (10 per cent; **Chart 8b** and **Table 6**). So TIMSS draws a geographical picture of proficiency in maths and science that is very different from one grade to another.

Having briefly reported what national and international assessments separately say about geographical divides, I will now compare their results, in order to understand whether their findings converge. Even with differences in methodology, subject, type of achievement and size of samples, all the international surveys agree that the skills and abilities of Italian students are far below the average level of the most developed countries. These findings are consistent with those of INValSI. For each subject, I compared INValSI outcomes (at the provincial level) with the corresponding surveys (i.e. with PISA in reading, mathematics and science; with TIMSS in mathematics and science). Plotting INValSI and PISA scores, the majority of the Northern provinces is in both cases above the Italian average, while provinces in the Centre and South tend to be in the area with poorer scores (bottom-left, with both scores below the Italian average; **Chart 9**). The differences across regions seem to be more mitigated in reading than in mathematics and science. At the provincial level, the correlation coefficient between INValSI and PISA scores is equal to 0.32 in reading, 0.37 in mathematics and 0.40 in science.[14] Similar results are obtained by comparing INValSI and TIMSS at the secondary school.

This paper sustains they all tell the same story. Checchi (2006) obtained similar correlation coefficients, concluding that the INValSI results are not reliable at all, neglecting the geographical variance in school performance that international surveys do reveal. Even though different methodologies and aims across surveys may justify different results, in any case it is important to note that the variation coefficients in the INValSI scores do not differ from those

[14] In order to compare INValSI with PISA (15-year-olds), I considered the simple mean of the INValSI scores in the 1st and 3rd grades of the upper secondary school (14 and 16-year-olds, respectively). In order to compare

of the international surveys, and that only a few provinces stand above the average in one of the two assessments and below the average in the other, suggesting an acceptable degree of consistency between the two surveys (**Charts 9-10**). Moreover, this correlation is quite similar to those among the international surveys (less than 40 per cent between PISA and TIMSS, and 47 per cent between PISA and PIRLS; **Charts 11-12**).

The INValSI assessment, which involves students at several grades, shows that the dispersion in scores across provinces is smaller at the lower secondary school level than at the upper secondary one. Using a simple statistical method of analysis, we are able to say that the geographical gaps effectively tend to increase grade by grade, for each subject. In fact, the H_0 hypothesis of equality of the variances from one grade to another is always rejected (**Table 5**). My findings were similar when comparing the international assessments results. In fact, the differences across regions are wide and increase grade after grade, from the primary (PIRLS and TIMSS at the 4th grade) to the secondary school (TIMSS at the 8th grade and PISA for 15-year-olds). Also in this case, the H_0 hypothesis of equality of the variances from one grade to another (that is, passing from 9/10-year-old to 14/15-year-old students) is rejected (**Table 7**).

In conclusion, even though *i)* INValSI does not provide information about context and background, *ii)* its results for the primary school are not as reliable as for the secondary school, and *iii)* its characteristics are very different from those of the international surveys, it does draw a sufficiently reliable picture about gaps across regions, due to the fact that it involved a very large number of schools and students. This picture is quite similar to that drawn by international surveys, whose samples are not as wide as necessary to provide outcomes that are always statistically significant at the regional level. All of the surveys suggest that *i)* the proficiency level in the South is significantly lower than in the North for all the subjects tested (*reading*, *mathematics*, *science, problem solving*); *ii)* the degree of dispersion in scores is higher in the South; and *iii)* the geographical differences increase grade after grade.

INValSI with TIMSS (8^{th} grade), I considered the simple mean of the INValSI scores in the 6^{th} (first grade in the lower secondary school) and 9^{th} grade (first grade in the upper secondary school).

4. Relationship between external assessments and scholastic marks

An interesting question is whether the external assessments are consistent with the scholastic marks, in this case the upper secondary schools' final grades ("voto di maturità"). Even using different methodologies and criteria, they should come to similar conclusions about school performance. Nevertheless, they do not. The administrative data of the "National Observatory on the Final High School Grades", reported here for the years 1999-2004 and following the reform of the 1997 (*ex lege* n. 425), reveal a geographical picture that is completely different from that of the external assessments. First, the dispersion in final grades at the provincial level appears extremely small (roughly 1 per cent of the overall mean), with respect to that of INValSI and other surveys. Second, the geographical gaps are not as wide as in the external assessments. Southern regions, which have very low average scores in the international surveys (Puglia, Calabria and Sicily), show higher final grades; on the contrary, there are regions in the North (e.g. Lombardy), where not only the final average grade, but also the share of graduates is lower than the average (**Chart 13**). Third, the correlation between final grades and INValSI scores[15] is very low (0.22; **Chart 14**). According to these findings, the evaluation system appears less selective in some cases and more selective in others, with serious problems in distinguishing good students from bad ones. What are the reasons?

This paper will not attempt to explore these questions in detail. Nevertheless, I suggest some possible explanations. First, some of the differences can be explained by the specific criteria for the formation of the examining committees. With the reform of the 1997 and following developments, for the school years under consideration, the weight of class teachers, who are likely to adopt less selective evaluation criteria, has increased. In general, these criteria strongly depend on the average proficiency level of the students in a class; teachers tend to "normalize" the marks on the same relative scale (from 60 to 100 at the final exams), independently of effective skills and knowledge. This can lead to bias compared with external exam results. Second, the differences between internal marks and external scores can be due to teachers' vocational training: a trained teacher is more likely to expect more from his students, also at the final exam. Finally, it is worth noting that different performance levels may also derive from students' taking a different attitude towards "external" tests (which have no tangible revenues for participants) and "internal" tests (which on the contrary do matter for

[15] A similar result is derived from the comparison with PISA.

their final certificate or advancement to the following grade). In other words, students may have a minor propensity to engage in without-revenue tests, which may explain part of this inconsistency.

PISA 2003 allows us to look more clearly at some of these reasons. On the basis of specific questions about self-concept in mathematics[16] (*whether* and *how much* students thought they had good abilities or good marks), the students' opinions on their own skills seem to be quite different from external survey assessments. At the microdata level, the correlation between students' mathematics scores and self-concept in mathematics is equal to 0.33, not very different from that calculated between scholastic final grades and INValSI scores (0.22). The correlation is equal to 0.30 in the Centre and South and to 0.39 in the North (0.39). If I control for school fixed effects in two simple regressions, where both score and self-concept in mathematics are functions of sex, parental background and type of programs ($R^2=0.53$; see next paragraph), the correlation coefficient between the residuals increases just a little (to 0.39), without differences across the geographical areas. This could suggest that the poor correlation between internal and external evaluations is mostly due to *within schools* factors, supporting the idea that teachers tend to "normalize" their marks on a relative scale, independently of the effective skills and knowledge of the students.

5. Relationship between performance and parental background

This last section will focus on the territorial gradient in the relationship between proficiency level and parental background, already analyzed *cross country* (Willms, 2006). In fact, it is widely acknowledged that different social and cultural conditions strongly affect cognitive ability as early as in pre-school children, in expressing themselves, in perceiving colors, in understanding space and shape, and in representing quantitative phenomena.

PISA 2003 provides several useful information about parental background. **Chart 15** reports an eight-classes-ordered socio-cultural and economic status index[17] on the *x*-axis (**Table 8**) and the average score in mathematics on the *y*-axis. It is shown that parental background is

[16] The PISA index used here of *self-concept in mathematics* is derived from students' level of agreement with the following statements: *i)* I am just not good at mathematics; *ii)* I get good marks in mathematics; *iii)* I learn mathematics quickly; *iv)* I have always believed that mathematics is one of my best subjects; and *v)* in my mathematics class, I understand even the most difficult work (see PISA 2003 Technical Report, *OECD*, *2004b*).
[17] The socio-cultural and economic status index is a synthesis of several variables: parental job, quantity of schooling and wealth.

strongly correlated with performances in PISA: the differences across background classes are nearly always statistically significant, at a confidence level of 0.95 (**Table 9**). On average, the score obtained in mathematics by a maximum-status student is roughly 25 per cent higher than that obtained by a minimum-status student, varying from the 18 per cent in the North East to the 31 per cent in the South. Moreover, students in the South are generally below the OECD average (500) even when benefiting from the most favourable socio-cultural and economic contexts. The gap between North and South is wider in the lower background classes and more mitigated in the upper ones (**Chart 15**).

However, parental background is just one of the factors driving scholastic performance, another being the type of school. Based on PISA 2003 results, the probability of enrolling in a general program as a maximum-status student, is seven times higher than as a minimum-status student. These findings are quite similar across geographical areas. While controlling for sex and type of school and taking residuals of simple OLS estimates, all the curves tend to flatten (**Charts 16a-16b**), spreads between North and South remaining unchanged. On average, more than 30 per cent of the proficiency revenue added by an increasing socio-cultural and economic status is actually explained by the type-of-school effect (**Table 10**).[18] The magnitude of this effect rises as the social status increases, reaching about the 40 per cent at the top of the socio-cultural and economic rank.

Do parental background effects persist even after taking into account specific school fixed effects, in addition to the type of program? Including school fixed effects in the regressions estimated here, the variance in maths performances explained by the model *(*$R^2=0.53$*)* is on average two times greater than in the model controlling only for sex and type-of-school effects (**Table 10**). First of all, this result suggests that school fixed effects are very relevant. Then, it is shown that, since the curves of the residuals by parental background become more flat, type of school being equal and taking into account school fixed effects, the differences in proficiency across socio-cultural and economic conditions generally vanish at a confidence level of 0.95, a difference persisting only between the lowest and the highest background classes (**Table 10** and **Charts 16a-16b**).

[18] It is important to note that these estimates include only individual variables and do not rely on variables for the school and local socio-economic environment. So they are just aimed to better understand how much the type of school affects the relationship between scholastic performance and parental background. However, isolating the factors which have causal effects on scholastic performance is not the goal of this paper.

It is not easy to identify causal relationships here. In other words, it is unclear whether being in a general program or being enrolled in good school does positively and directly affect scholastic performance, or on the contrary this is a merely spurious correlation due to the fact that the best students tend to enroll in the best schools, especially in the high schools.

So the question is: *when* and *how* does parental background affect scholastic performance the most? PISA 2003 shows that at the upper secondary school – type of school being equal and controlling for school fixed effects – students do not benefit *directly* from any parental background effect. At the beginning of the upper secondary school, thus the parental background seems to have effect on the scholastic performance only in the choice of the school (a rich student is probably enrolled in a good school). TIMSS 2003 allows us to test whether these effects are found at the previous scholastic grades, since it *i)* involves pupils enrolled in the 8th grade ("III media inferiore" in Italy) as well as in the 4th grade and *ii)* provides information on students' parental background as does the PISA survey. This latter information is not available for 4th grade pupils.

The aim here is to test the effect of parental background at the lower secondary school, before choosing different programs ("general", "technical" and "vocational"). Based on TIMSS information about parental background, I derived four ordered classes from the parents' education level. In each macro area, almost 80 per cent of the students are concentrated in the two middle classes; the fourth level (the highest) shows 13 per cent of the students in the North and 6 per cent in the South (**Table 11**). From one level to the following, the scores tend to increase by roughly 50 points on average for both mathematics and science (equal to 10-12 per cent more). Even at a confidence level of 0.99, these gaps are all statistically significant (**Table 12** and **Chart 17**). According to the TIMSS definitions, this means that while only a few students with the highest parental education level (level 4) *"can apply their understanding and knowledge in a wide variety of relatively complex situations"* (High International Benchmark), the rest of the Italian students *"can apply basic mathematical knowledge in straightforward situations"* (Intermediate International Benchmark) or *"have only some basic mathematical knowledge"* (Low International Benchmark). It is worth noting that even though TIMSS confirms wide gaps between the North and the South (at the 8th grade), the same is not valid for all the parental education levels. In fact, at a confidence level of 0.95, the scores in the North are significantly higher than those in the South only for the lower levels (levels 1 and 2), but not for the upper levels.

But do parental background effects persist in the 8th grade (lower secondary school) even after controlling for a single school's effects? As already done with the PISA data, taking residuals of simple regressions (with a only descriptive aim), where sex and school fixed effects are the only explanatory variables of scholastic performance in maths, parental background and performance remain strongly correlated, even if a little smoothed. Also in this case, school fixed effects seem to be relevant *(R^2=0.32)*. Moreover, controlling for school fixed effects, the differences in score between the upper and the lower classes shrink by 25 per cent in the Centre and North and by 50 per cent in the South and Islands (**Charts 18a-18b**). If school characteristics were the same, the TIMSS scores in maths in the South would increase especially for pupils with low and medium parental educational level (**Chart 18b**). That is, in the South these pupils are at a particular disadvantage on account of the single school's characteristics, while those with a high parental educational level only benefit a little by them. These negative fixed effects are probably correlated with the unfavourable social and economic conditions in which the single schools operate.

To sum up, by comparing the international surveys, which involve students of different ages, I found that parental backgrounds are strongly correlated with scholastic performance. This correlation seems to be particularly marked in the earlier grades (see TIMSS), while it vanishes in the upper secondary school (see PISA), when type-of-school and especially school fixed effects are more important. At the beginning of the upper secondary school, the parental background seems to have effect on the scholastic performance only in the choice of the school. In the earlier scholastic grades, the territorial gaps between North and South are more mitigated and concentrated among pupils with a low parental educational level. Nevertheless, I show the gaps are still mainly due to the specific school characteristics, particularly unfavorable in the South for pupils with a low parental background.

Tables and Charts

Table 1

The international achievement surveys: main characteristics

	PISA 2003 *(Programme for International Student Assessment)*	**PIRLS 2001** *(Progress in International Reading Literacy Study)*	**TIMSS 2003** *(Trends in International Mathematics and Science Study)*
Organizer	OECD	IEA - *International Association for the Evaluation of Educational Achievement*	IEA - *International Association for the Evaluation of Educational Achievement*
Rounds	2000 (*focus on reading*) 2003 (*focus on maths*) 2006 (*focus on science*)	2001 2006	1995 1999 2003 2007
Age groups	15-year-olds *(focus on age)*	4th grade students *(focus on class)*	4th and 8th grade students *(focus on class)*
Sample sizes (total)	10,162 schools 274,800 students	5,578 schools 146,600 students	**4th grade:** 4,642 schools, 127,900 students **8th grade:** 7,762 schools, 237,800 students
Sample sizes (euro area)	2,484 schools almost 71,400 students	967 schools almost 24,300 students	**4th grade:** 624 schools, 15,000 students **8th grade:** 743 schools, 18,400 students
Participating countries	**30** OECD Countries + **11** Non-OECD Countries	**40** countries, of which **6** in the euro area (France, Germany, Greece, Italy, Netherlands, Slovenia)	**49** countries, of which **4** in the euro area (Belgium, Italy, Netherlands, Slovenia)
Subject	Reading Maths Science Problem solving	Reading	Maths Science
Type of achievement	**Scientific literacy:** ability to use knowledge and skills to meet real-life challenges	**Reading literacy:** ability to understand and use the written shapes of the language	Curricular knowledge and learning ("contents" + "teaching methods").
Means of survey	Assessment questionnaire Student background questionnaire Teacher questionnaire School questionnaire	Assessment questionnaire Student background questionnaire Teacher questionnaire School questionnaire	Assessment questionnaire Student background questionnaire Teacher questionnaire School questionnaire
Form of testing	Multiple-choice, Complex multiple-choice, Closed constructed-response, Open constructed-response, Short response.	Multiple-choice, Closed response, Open response	Multiple-choice, Closed response, Open response
Item response model	*Item Response Theory (IRT Scaling),* with international mean=500 and st.dev.=100	*Item Response Theory (IRT Scaling),* with international mean=500 and st.dev.=100	*Item Response Theory (IRT Scaling),* with international mean=500 and st.dev.=100

Sources: OECD-PISA (*Programme for International Student Assessment*), IEA-PIRLS (*Progress in International Reading Literacy Study*) and IEA-TIMMS (*Trends in International Mathematics and Science Study*).

Table 2

Students involved in the international surveys

(units)

Regions	PISA 2003	PIRLS 2001	TIMMS 2003	
			Fourth grade	Eighth grade
Piedmont	1,565	190	203	301
Valle d'Aosta	-	-	18	-
Lombardy	1,545	506	614	550
Trentino Alto Adige	2,088	50	39	60
Veneto	1,538	235	297	266
Friuli Venezia Giulia	153	48	66	77
Liguria	203	72	103	48
Emilia Romagna	174	208	251	227
Tuscany	1,509	176	180	229
Umbria	64	42	43	47
Marche	131	61	132	108
Lazio	428	313	361	427
Abruzzi	30	71	92	90
Molise	-	18	22	21
Campania	521	499	606	650
Puglia	540	329	488	366
Basilicata	-	39	41	111
Calabria	257	142	157	135
Sicily	441	403	501	480
Sardinia	220	100	68	85
North West	3,313	768	938	899
North East	3,953	541	653	630
Centre	2,132	592	716	811
South and Islands	2,009	1,601	1,975	1,938
N.C.	*253*	-	-	-
Italy	**11,660**	**3,502**	**4,282**	**4,278**

Sources: OCSE-PISA 2003, PIRLS 2001, TIMMS 2003.

International survey scores, by geographical area and subject

(scores and units)

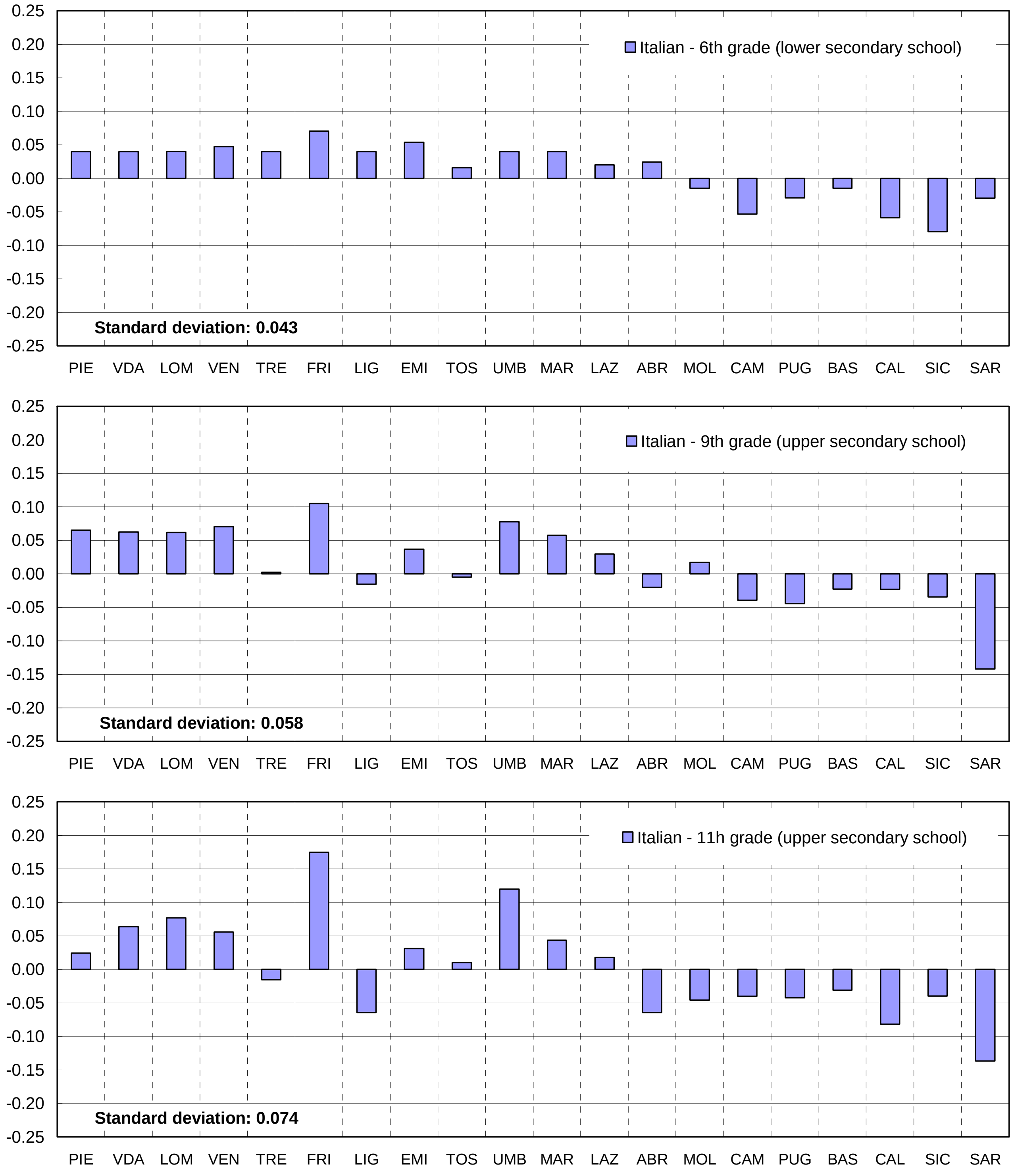
	North			Centre			South and Islands			Italy		
	Average score	Std. Dev.	Coeff. Var.	Average score	Std. Dev.	Coeff. Var.	Average score	Std. Dev.	Coeff. Var.	Average score	Std. Dev.	Coeff. Var.
PIRLS 2001												
Reading	555	64.1	11.5	548	61.4	11.2	526	68.9	13.1	541	67.3	12.4
number of students		*1,309*			*592*			*1,601*			*3.502*	
TIMSS 2003												
Maths – 4th Grade	531	68.8	12.9	514	70.2	13.7	515	87.7	17.0	521	78.8	15.1
Science – 4th Grade	527	70.9	13.5	503	71.3	14.2	508	86.8	17.1	514	79.1	15.4
number of students		*1,591*			*716*			*1,975*			*4,282*	
Maths – 8th Grade	491	68.1	13.9	473	65.9	13.9	447	75.8	17.0	468	73.1	15.6
Science – 8th Grade	510	70.4	13.8	493	68.9	14.0	471	77.7	16.5	489	75.0	15.3
number of students		*1,529*			*811*			*1,938*			*4,278*	
PISA 2003												
Reading	515	83.1	16.1	486	91.9	18.9	434	88.9	20.5	476	90.8	19.1
Mathematics	510	84.4	16.5	472	81.8	17.3	423	82.0	19.4	466	89.8	19.3
Science	533	89.0	16.7	497	95.9	19.3	440	90.3	20.5	486	96.6	19.9
Problem Solving	513	85.0	16.6	476	87.2	18.3	428	89.1	20.8	469	91.5	19.5
number of students		*7,266*			*2,132*			*2,009*			*11,407*	

Sources: Based on PISA 2003, PIRLS 2001 and TIMSS 2003 data.

Chart 1

INVALSI scores at secondary school by region, school year 2005-06 – Italian *(Reading)*

(as a percentage of Italian average)

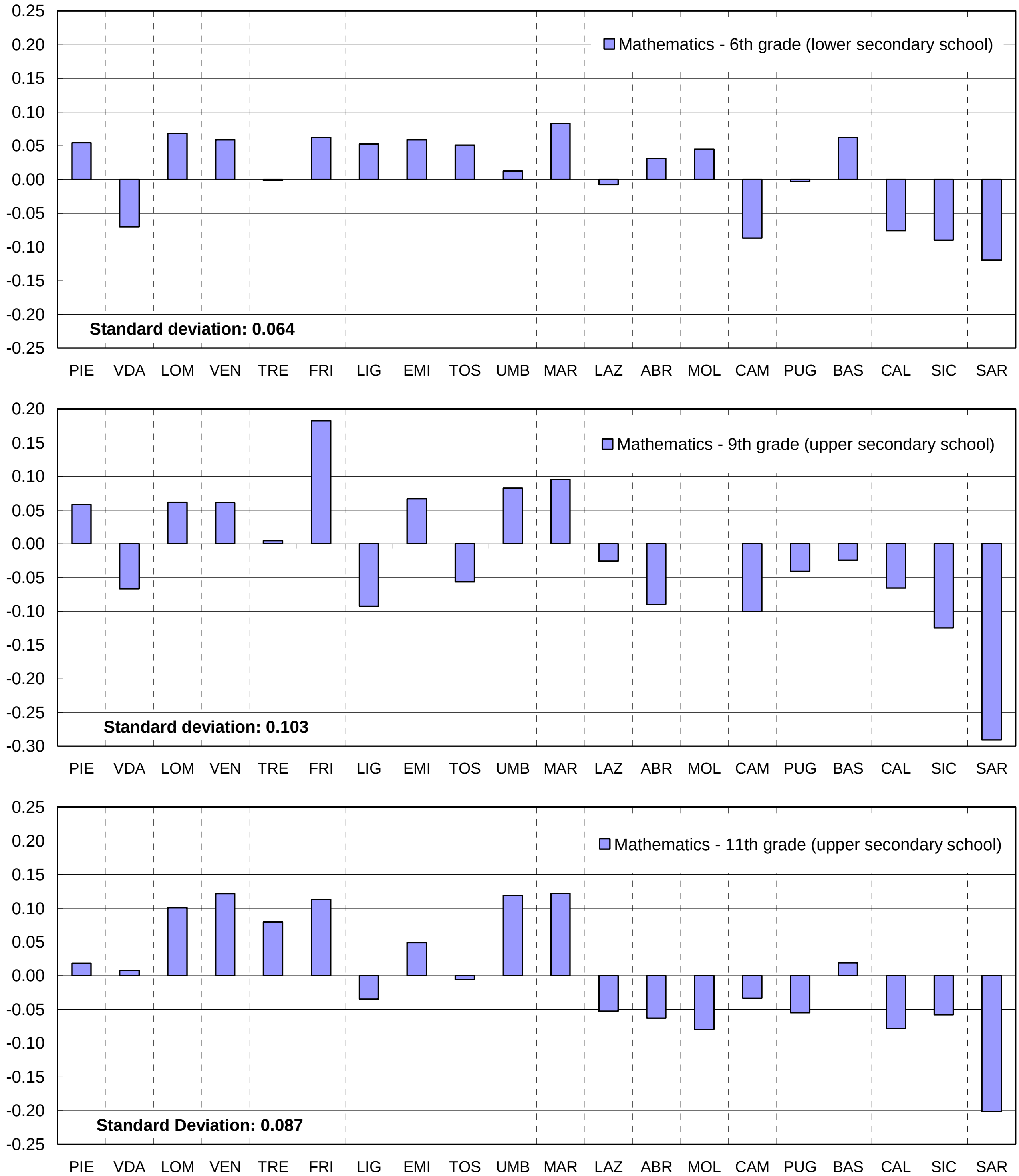


Source: Based on INVALSI data.

Chart 2

INValSI scores at secondary school by region, school year 2005-06 - Mathematics

(as a percentage of Italian average)

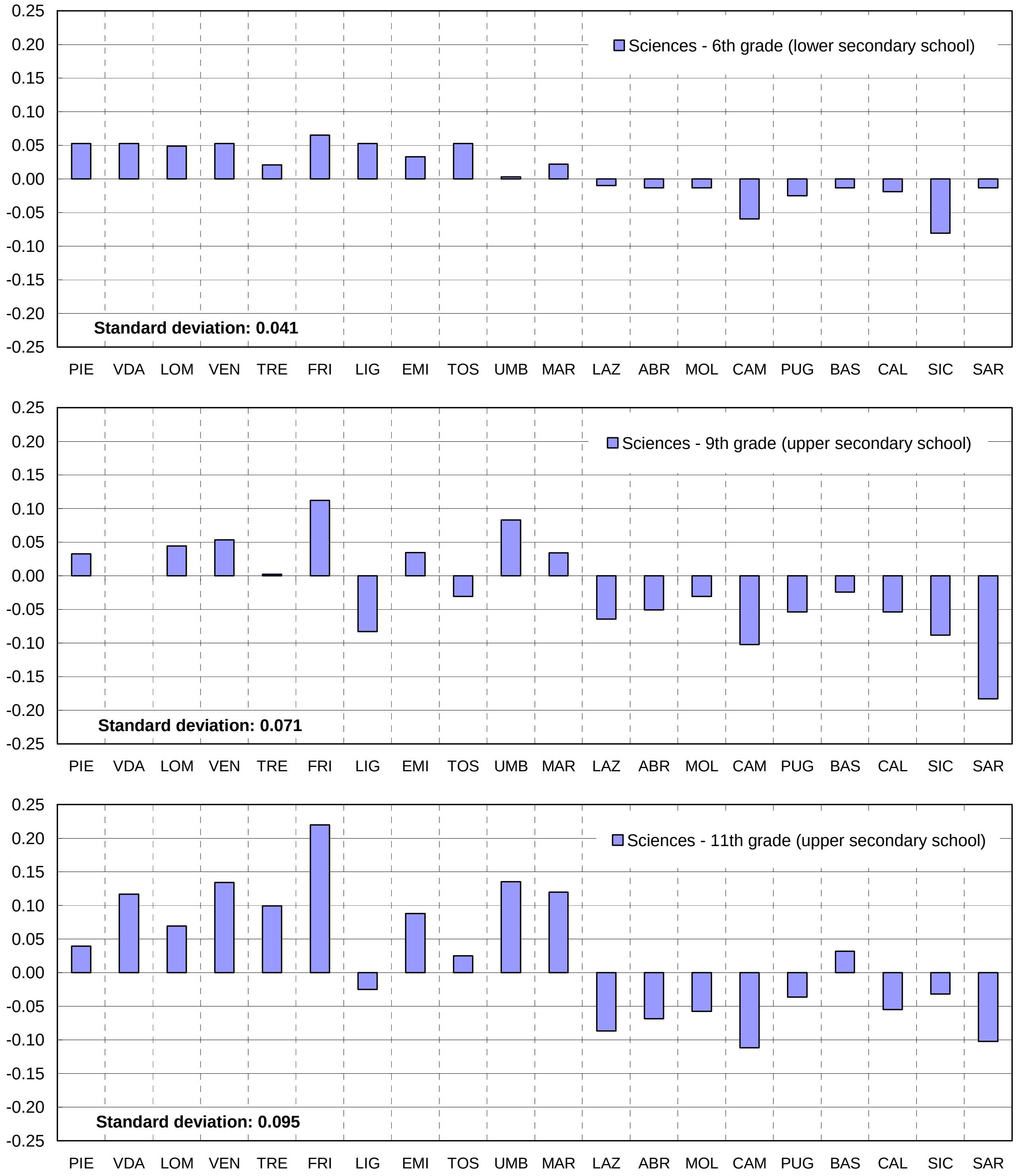


Source: Based on INValSI data.

Chart 3

INValSI scores at secondary school by region, school year 2005-06 - Science

(as a percentage of Italian average)



Source: Based on INValSI data.

Table 4

Equality of variances test on INValSI scores at the provincial level, by subject and grade (1)

(percentages)

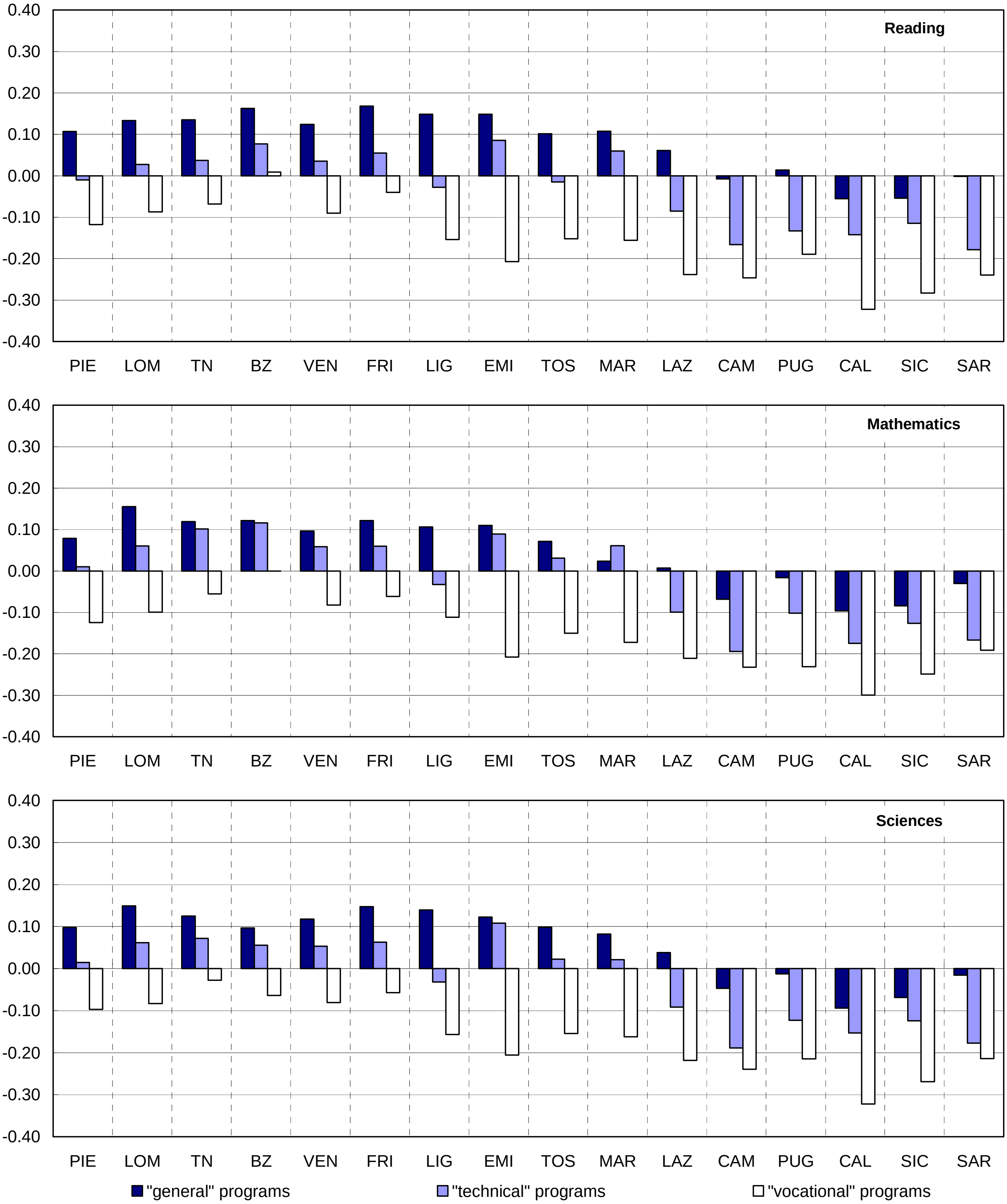
	Coefficients of variation (%)	Maths 6th grade	Maths 9th grade	Maths 11th grade	Science 6th grade	Science 9th grade	Science 11th grade
Coefficients of variation (%)		*0.0669*	*0.1268*	*0.1106*	*0.0500*	*0.0816*	*0.1055*
Italian – 6th grade	*0.0531*	Pr. > F 0.0173			Pr. > F 0.4796		
Italian – 9th grade	*0.0787*		Pr. > F <.0001			Pr. > F 0.6749	
Italian – 11th grade	*0.1095*			Pr. > F 0.4289			Pr. > F 0.6408
Maths – 6th grade	*0.0669*				Pr. > F 0.0021		
Maths – 9th grade	*0.1268*					Pr. > F <.0001	
Maths – 11th grade	*0.1106*						Pr. > F 0.7454

Source: Based on INValSI data.
(1) The test of equality of variances used the Folded F method.

Chart 4

OECD-PISA 2003 scores by region, subject and type of school (1)(2)

(as a percentage of Italian average)

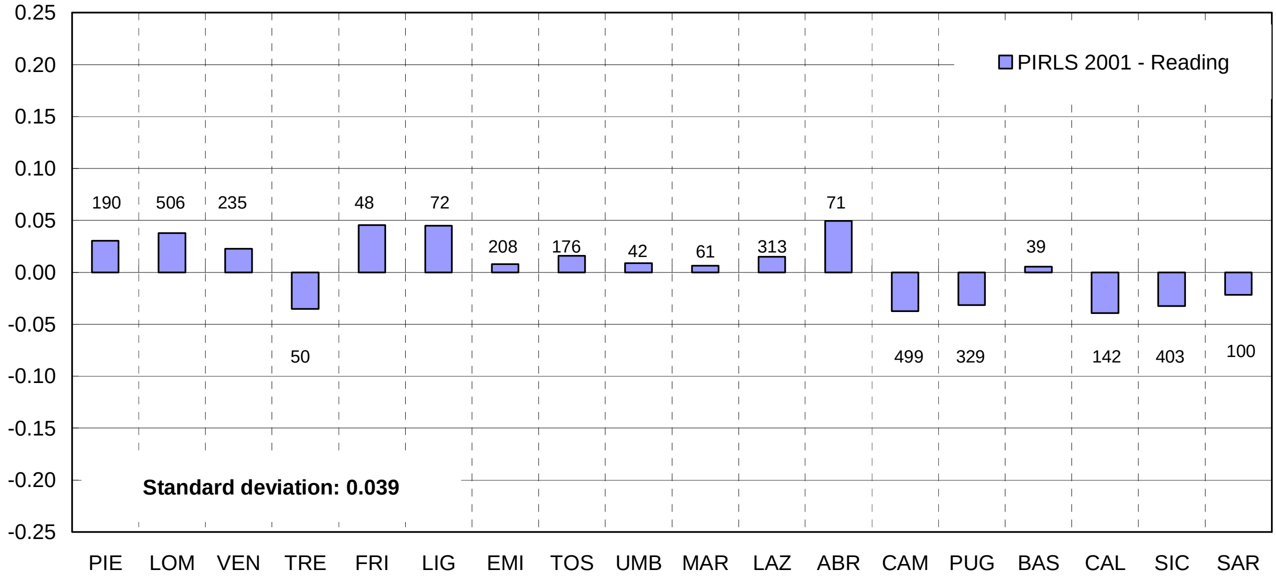


Source: Based on OECD-PISA 2003 data. (1) Non-weighted scores. The regions of Valle d'Aosta, Umbria, Abruzzo, Molise and Basilicata were excluded because of small-sized samples. (2) For each subject, the percentage gaps are expressed with respect to the overall average across types of school.

Chart 5

IEA-PIRLS 2001 scores by region (1)(2)

(as a percentage of Italian average)

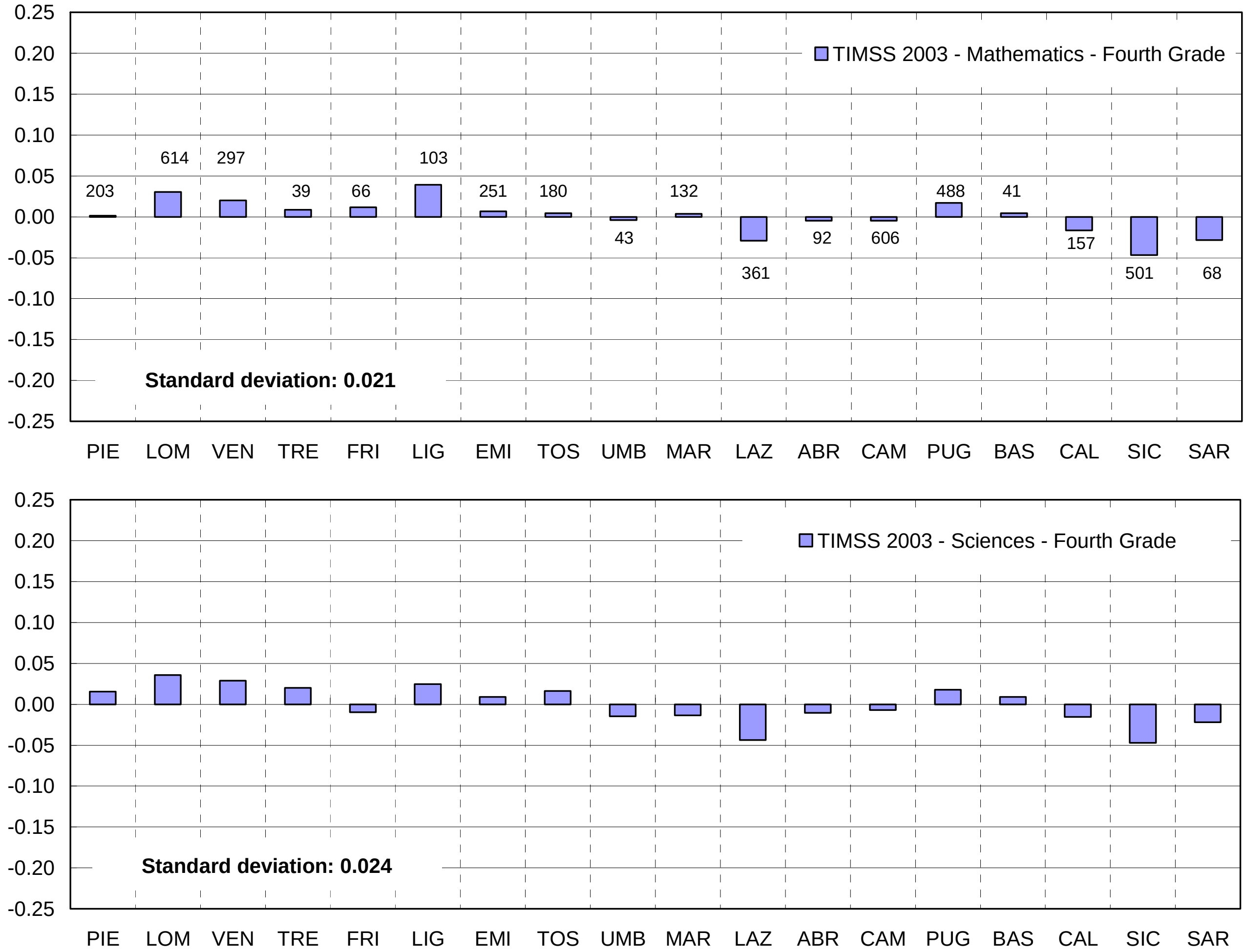


Source: Based on PIRLS 2001 data.
(1) Non-weighted scores. The regions Valle d'Aosta and Molise had no students in the Italian sample. Sizes of regional samples are reported. (2) The survey involved 9/10-year-old pupils.

Chart 6

IEA-TIMSS 2003 scores by region and subject - 4th grade (1)

(as a percentage of Italian average)

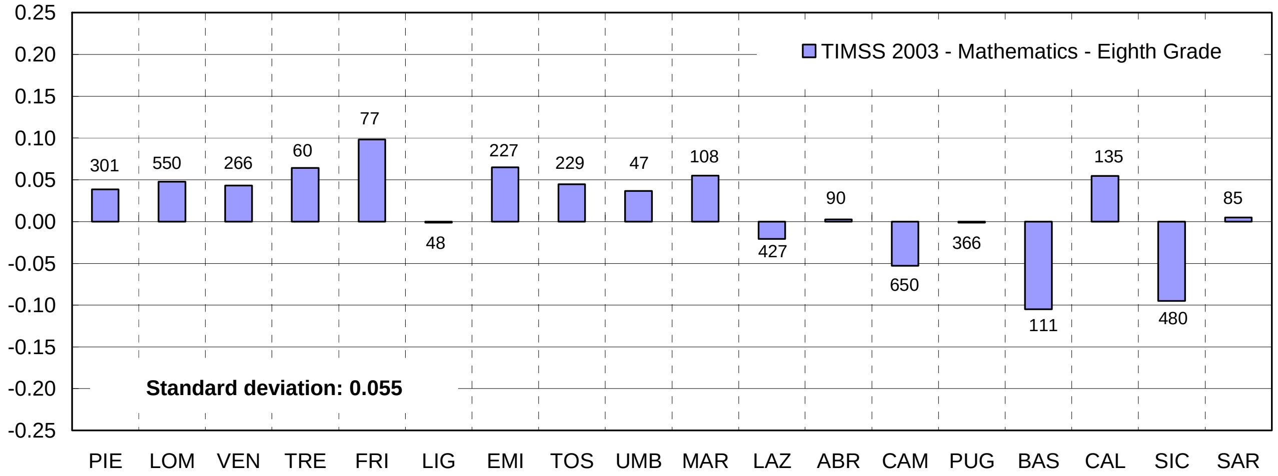


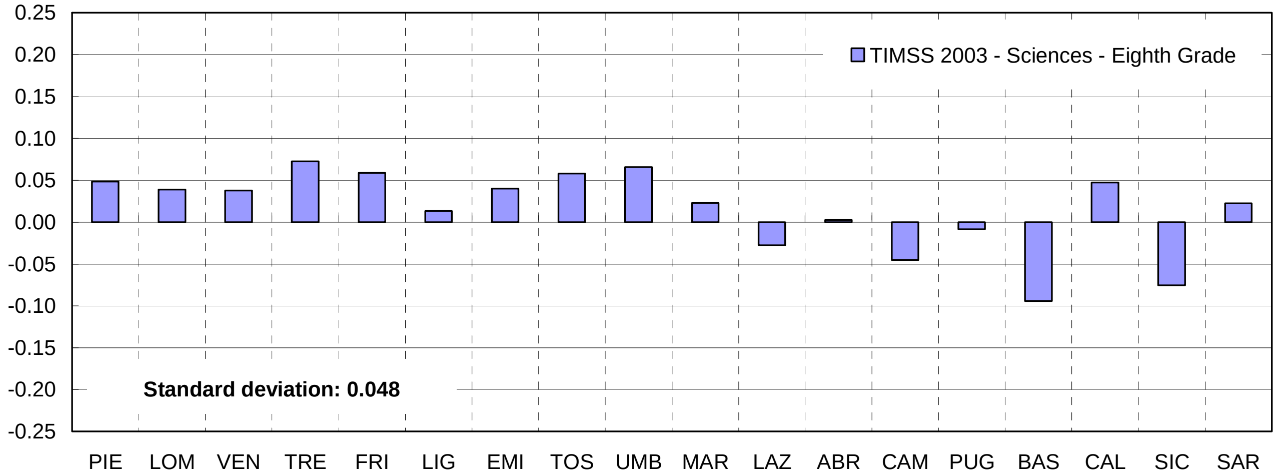
Source: Based on TIMSS 2003 data.
(1) Non-weighted scores. The regions Valle d'Aosta and Molise had no students in the Italian sample. Sizes of regional samples are reported.

Chart 7

IEA-TIMSS 2003 scores by region and subject - 8th grade (1)

(as a percentage of Italian average)



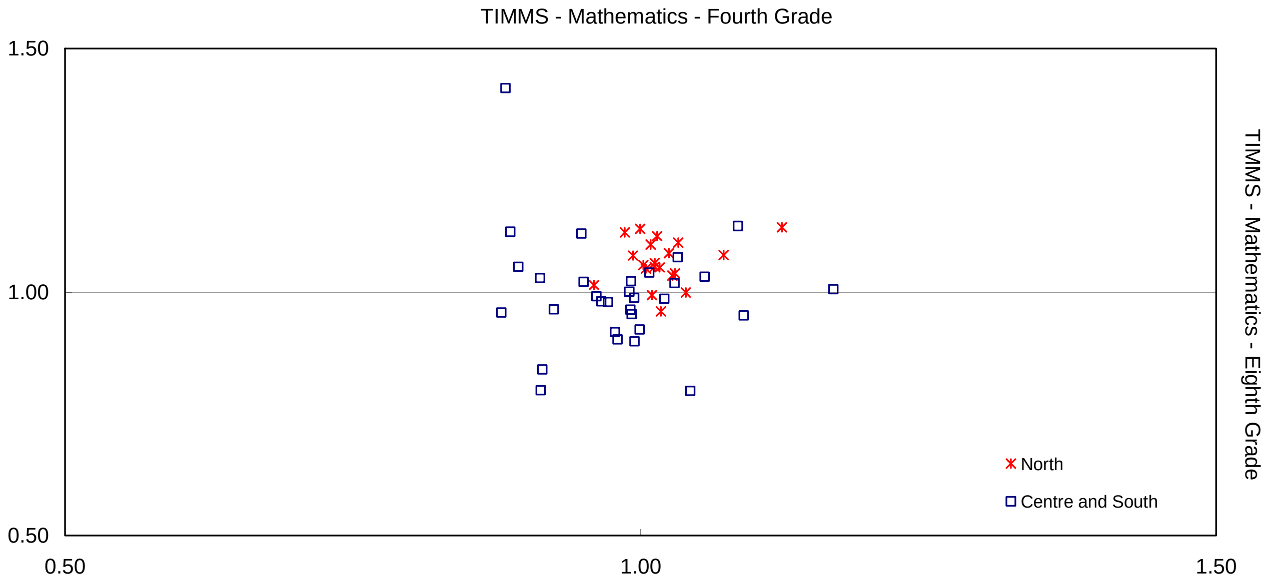


Source: Based on TIMSS 2003 data.
(1) Non-weighted scores. The regions Valle d'Aosta and Molise had no students in the Italian sample. Sizes of regional samples are reported.

Chart 8a

Comparison of TIMSS scores in Mathematics between 4th and 8th grade, by province (1)

(as a percentage of Italian average)

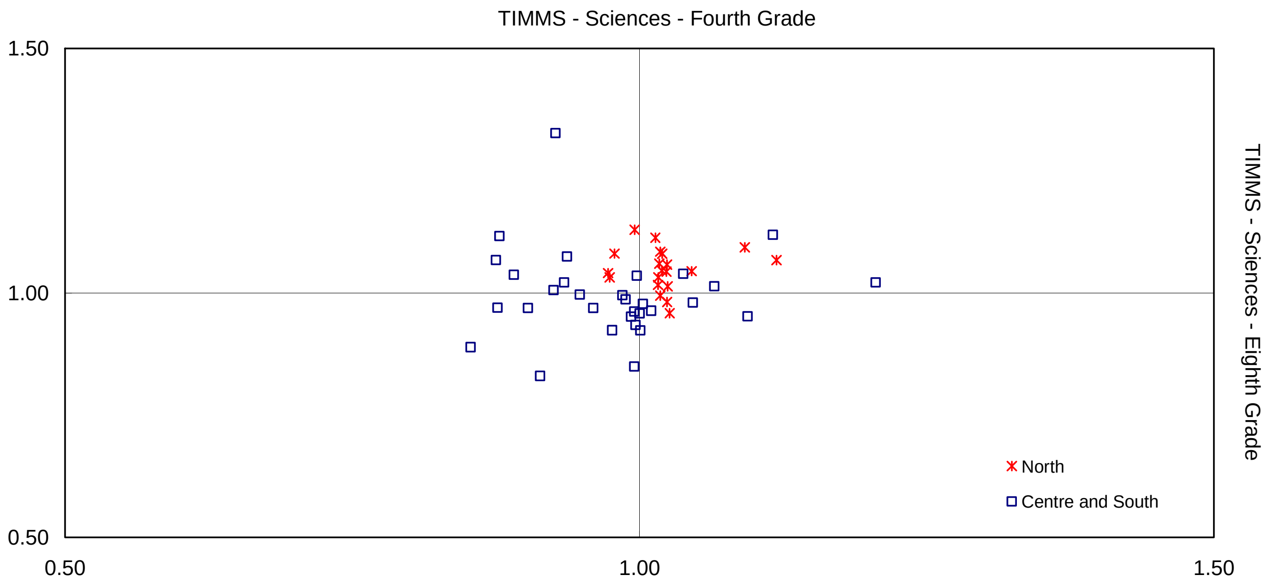


Source: Based on TIMSS 2003 data. (1) Non-weighted scores.

Chart 8b

Comparison of TIMSS scores in Science between 4th and 8th grade, by province (1)

(as a percentage of Italian average)

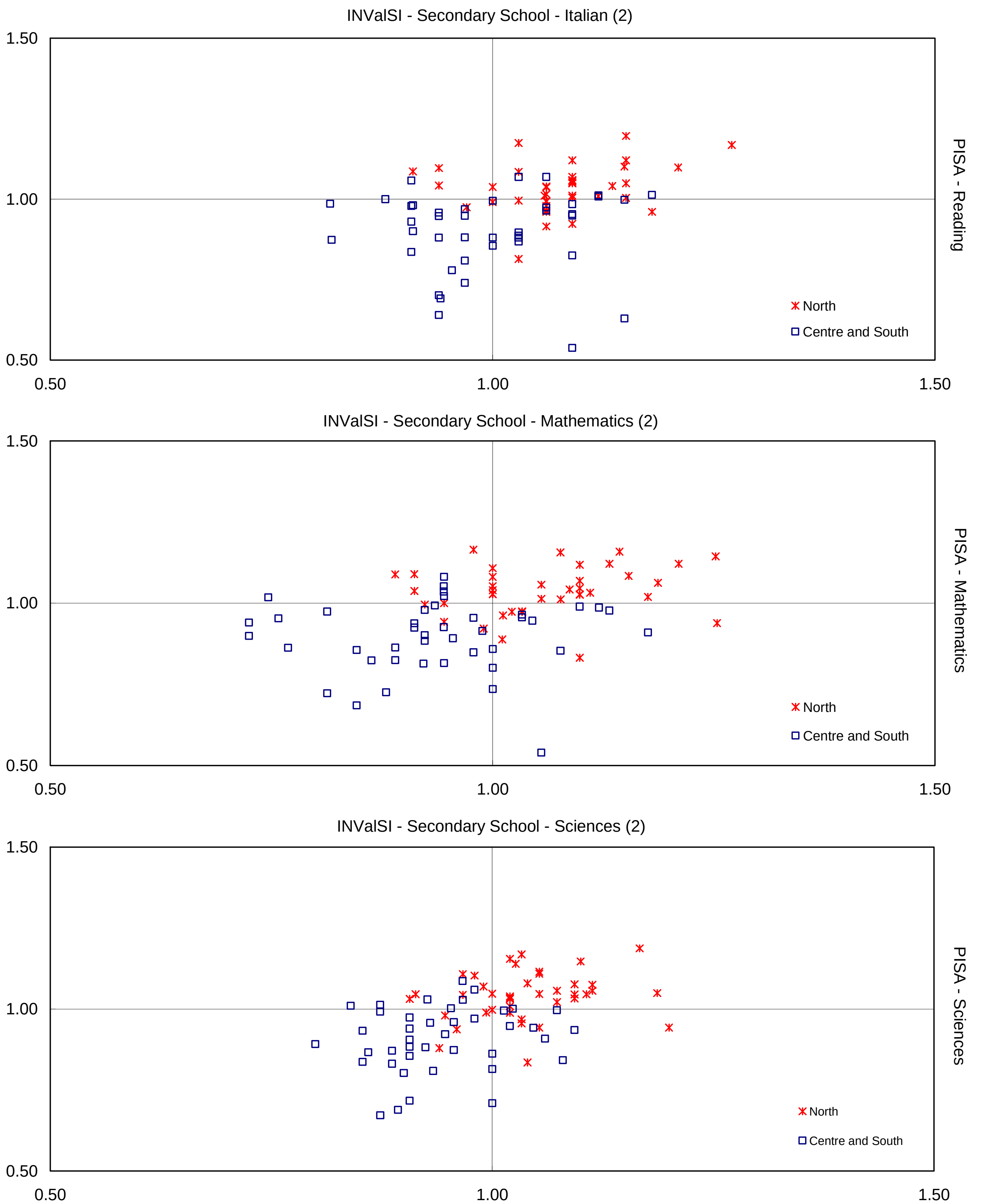


Source: Based on TIMSS 2003 data. (1) Non-weighted scores.

Chart 9

Comparison of PISA 2003 and INVAlSI scores at secondary school, by province and subject (1)

(as a percentage of Italian average)

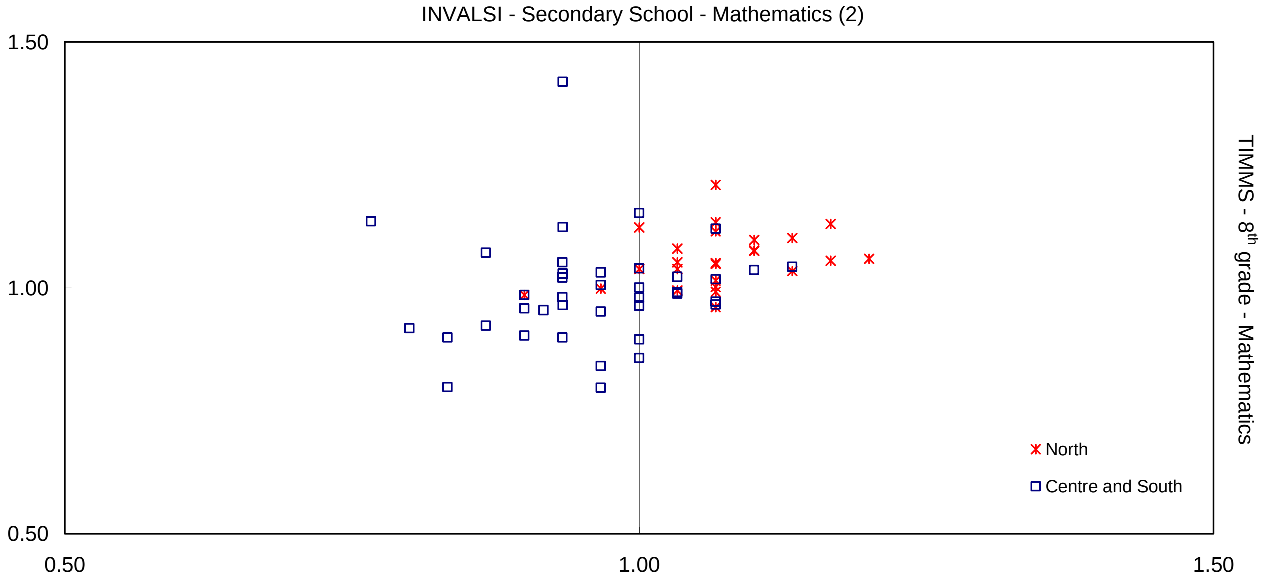


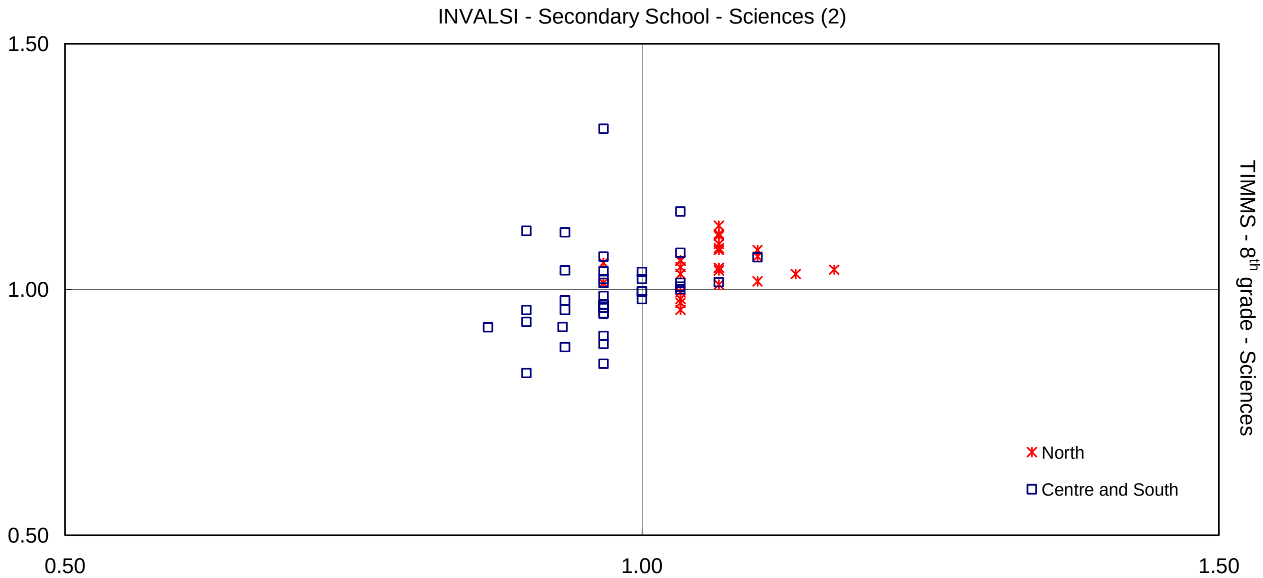
Source: Based on PISA 2003 and INValSI 2005-06 data. (1) PISA data are not weighted. (2) INValSI scores were obtained as simple means of scores at 6th ("I Media") and 9th ("I Superiore") grades.

Chart 10

Comparison of TIMSS 2003 and INValSI scores in maths and science, by province (1)

(as a percentage of Italian average)



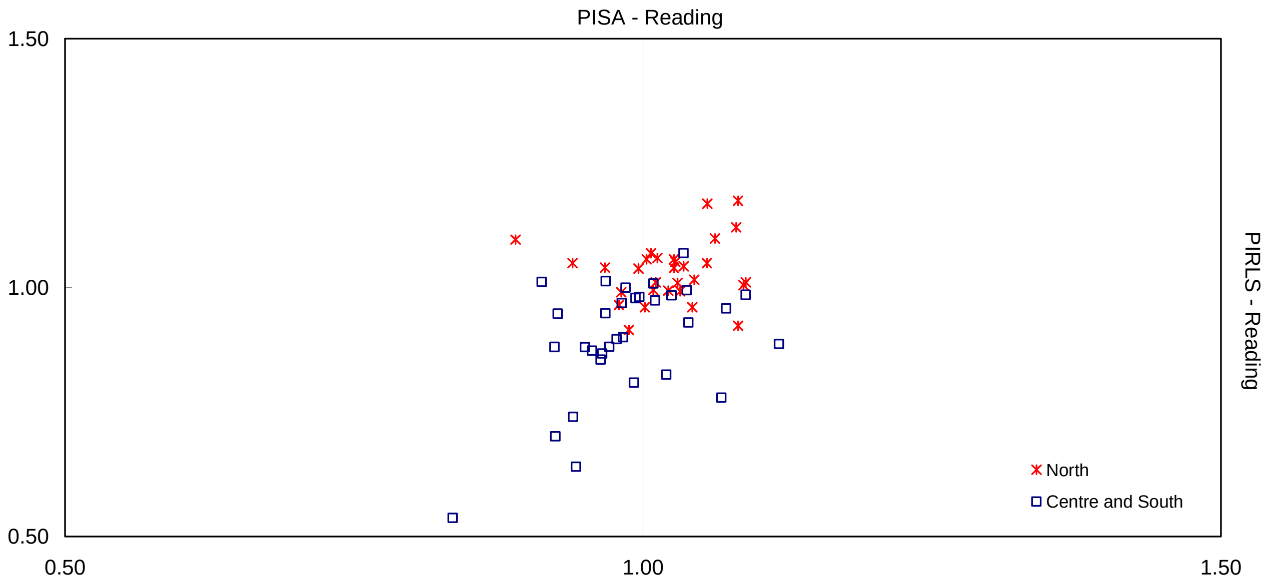


Source: Based on TIMSS 2003 and INValSI 2005-06 data. (1) TIMSS data are not weighted. (2) INValSI scores were obtained as simple means of scores at 6th ("I Media") and 9th ("I Superiore") grades.

Chart 11

Comparison of PIRLS 2001 and PISA 2003 scores in reading, by province (1)

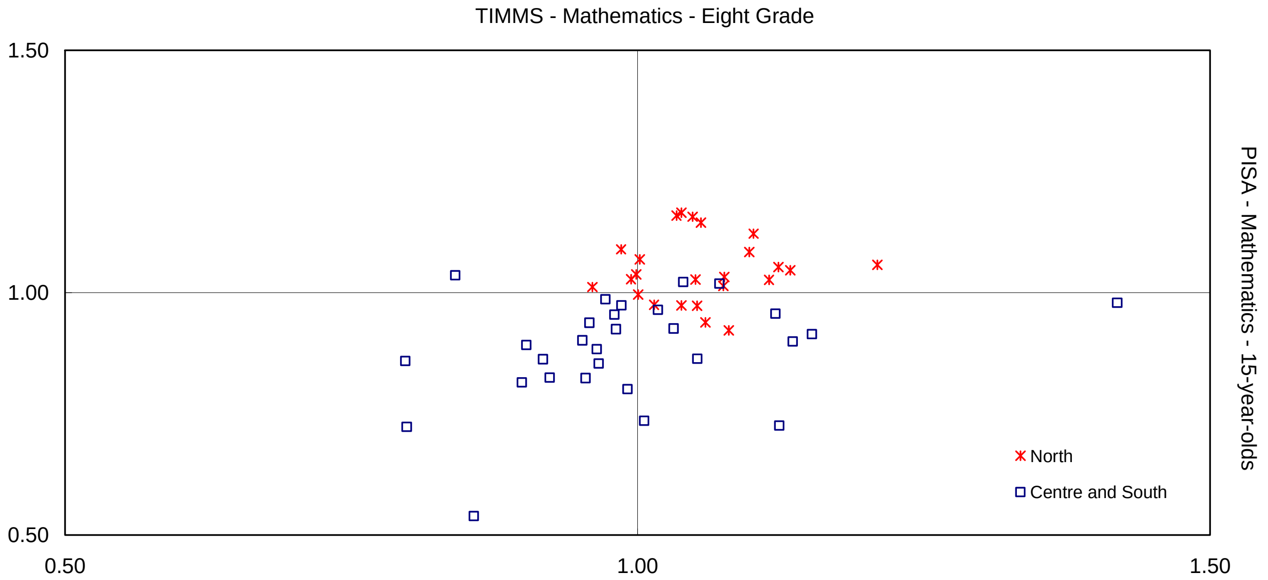
(as a percentage of Italian average)

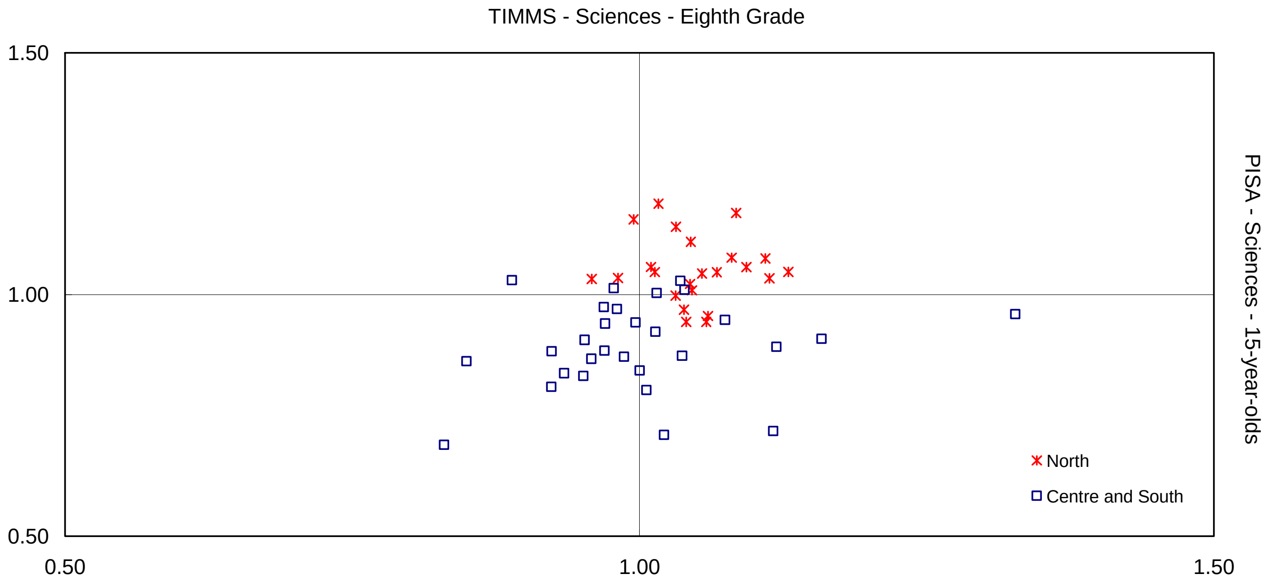


Source: Based on PISA 2003 and PIRLS 2001 data. (1) Non-weighted scores.

TIMSS 2003 (8th grade) and PISA 2003 (15-year-olds) scores in maths and science, by province (1)

(as a percentage of Italian average)





Source: Based on PISA 2003 and TIMSS 2003 data. (1) Non-weighted scores.

Table 5

Equality of variances test on INVAlSI scores, by subject and grade

(percentages)

11th grade / 6th grade		Coefficients of variation (%)	Italian INValSI	Mathematics INValSI	Science INValSI
Coefficients of variation (%)			*0.1095*	*0.1106*	*0.1055*
Italian	INValSI	*0.0531*	Pr. > F <.0001		
Mathematics	INValSI	*0.0669*		Pr. > F <.0001	
Science	INValSI	*0.0500*			Pr. > F <.0001

Sources: Based on INValSI data.
(1) The test of equality of variances used the Folded F method.

Table 6

Correlation coefficients between PISA, PIRLS and TIMSS scores, at the provincial level, by subject and grade

(percentages)

14/15-year-olds / 9/10-year-olds		Reading	Mathematics		Science	
		PISA	TIMSS	PISA	TIMSS	PISA
Reading	PIRLS	0.474				
Mathematics	TIMSS		0.018	0.213		
Science	TIMSS				0.101	0.207

Sources: Based on PISA 2003, PIRLS 2001 and TIMSS 2003 data.

Table 7

Equality of variances on PIRLS, PISA and TIMSS scores, by subject and grade

(percentages)

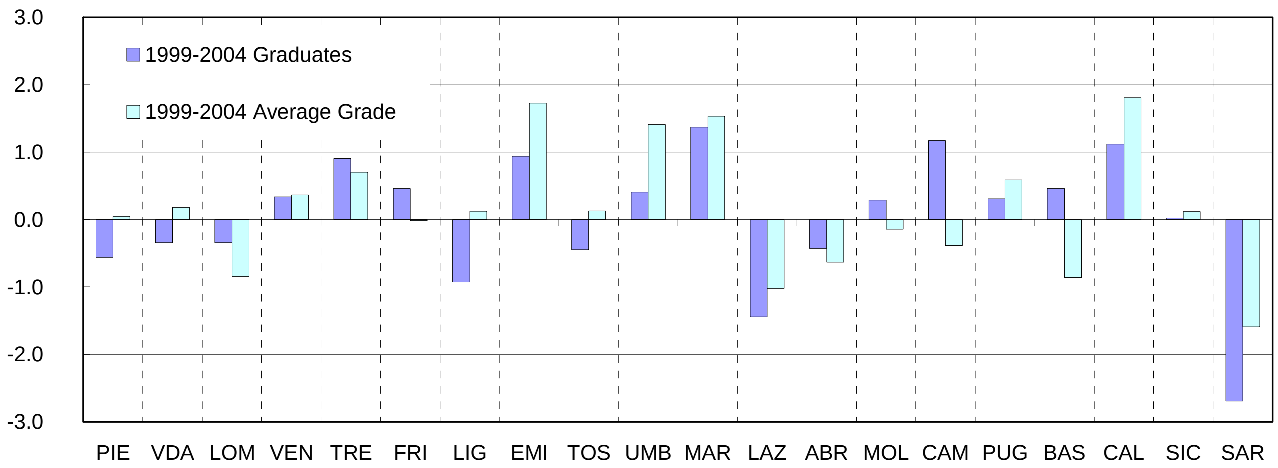
14/15-year-olds / 9/10-year-olds		Coefficients of variation (%)	Reading	Mathematics		Science	
			PISA	TIMSS	PISA	TIMSS	PISA
Coefficients of variation (%)			*0.1812*	*0.1605*	*0.1812*	*0.1506*	*0.1873*
Reading	PIRLS	*0.1245*	Pr. > F <.0001				
Mathematics	TIMSS	*0.1382*		Pr. > F 0.0026	Pr. > F <.0001		
Science	TIMSS	*0.1571*				Pr. > F <.0001	Pr. > F <.0001

Sources: Based on PISA 2003, PIRLS 2001 and TIMSS 2003 data.
(1) The test of equality of variances used the Folded F method.

Chart 13

Shares of graduates and final upper secondary school grades, by region, years 1999-2004 (mean)

(gaps with respect to the Italian average; percentage points and marks)

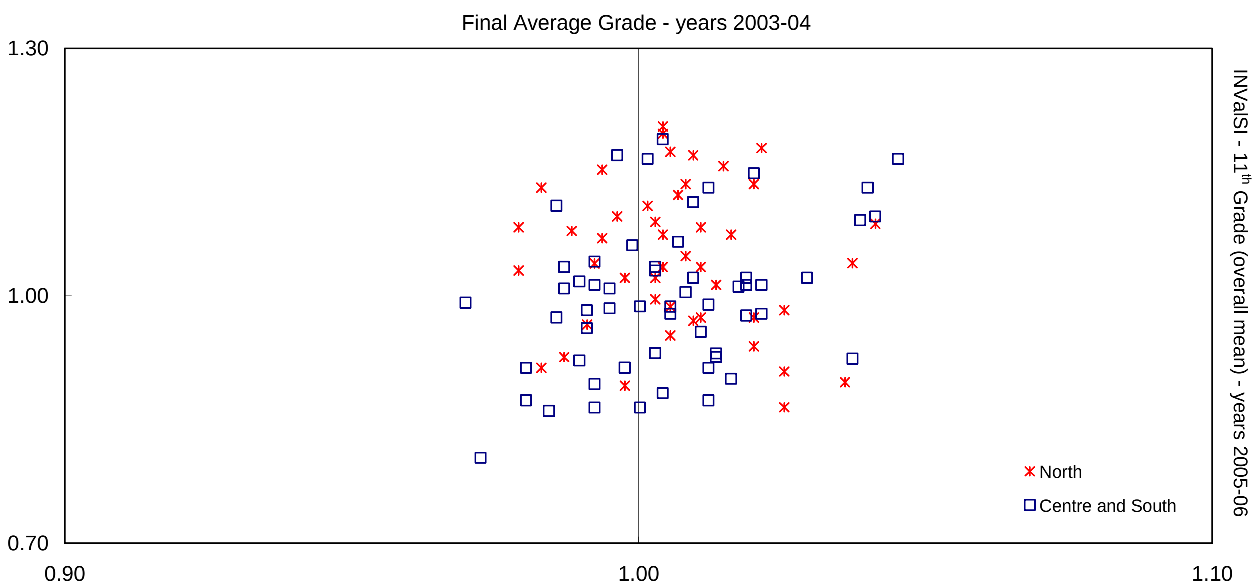


Source: Based on *Osservatorio nazionale sugli esami di Stato* data.

Chart 14

Comparison of INVAlSI scores and final upper secondary school grades, by province (1)

(as a percentage of Italian average)



Source: Based on INValSI and *Osservatorio nazionale sugli esami di Stato* data.
(1) INValSI scores are calculated as simple meanof scores in three subjects: Italian language (Reading), Maths and Science.

Table 8

PISA 2003 – Student distribution, by geographical area and parental socio-cultural and economic status
(units)

Parental social and cultural status	North West	North East	Centre	South and Islands	Italy
Status 1	163	153	102	281	699
Status 2	362	402	226	349	1,339
Status 3	466	634	298	394	1,792
Status 4	611	806	348	362	2,127
Status 5	675	806	444	361	2,286
Status 6	477	494	326	220	1,517
Status 7	295	334	206	143	978
Status 8	266	328	186	142	922
Total	**3,315**	**3,957**	**2,136**	**2,252**	**11,660**

Source: Based on OECD-PISA 2003 data.

Table 9

PISA 2003 – Average scores and standard errors, by geographical area and parental socio-cultural and economic status

(scores)

Parental social and cultural status	North West		North East		Centre		South and Islands		Italy	
	Mean	*Std. Err.*	Mean	*Std. Err.*	Mean	*Std. Err.*	Mean	*Std. Err.*	Mean	*Std. Err.*
Status 1	432	*6.7*	475	*6.9*	416	*7.2*	384	*4.5*	420	*3.3*
Status 2	476	*4.3*	495	*4.2*	450	*5.0*	412	*4.1*	461	*2.3*
Status 3	487	*3.9*	517	*3.2*	464	*4.6*	424	*4.1*	480	*2.1*
Status 4	499	*3.2*	521	*2.8*	478	*4.2*	445	*4.3*	495	*1.8*
Status 5	519	*3.1*	531	*2.8*	497	*3.7*	457	*4.6*	509	*1.8*
Status 6	521	*3.6*	532	*3.6*	508	*4.5*	469	*5.7*	515	*2.1*
Status 7	547	*4.4*	549	*4.1*	507	*4.9*	476	*6.4*	529	*2.5*
Status 8	556	*5.6*	558	*4.2*	527	*5.5*	504	*7.5*	543	*2.8*
Total	**507**	***1.5***	**525**	***1.3***	**486**	***1.8***	**438**	***1.8***	**496**	***0.8***

Source: Based on OECD-PISA 2003 data.
(1) Non-weighted scores.

Table 10

PISA 2003 – Revenues in scores, by geographical area and parental socio-cultural and economic status
(scores)

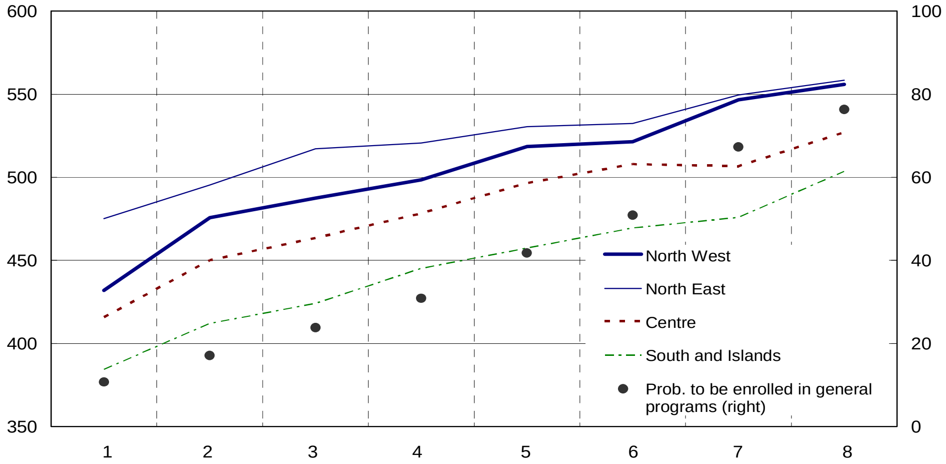
Independent variables	North West			North East			Centre			South and Islands			Italy		
	Without program and school's fixed effects	With program effects	With program and school's effects	Without program and school's fixed effects	With program effects	With program and school's effects	Without program and school's fixed effects	With program effects	With program and school's effects	Without program and school's fixed effects	With program effects	With program and school's effects	Without program and school's fixed effects	With program effects	With program and school's effects
Female	-13.8	-20.8	-21.3	-22.6	-29.4	-23.3	-18.1	-27.6	-20.0	-17.0	-32.0	-24.6	-18.1	-27.2	-22.3
Status 2	44.4	23.9	16.0	20.7	11.6	7.4	34.0	21.5	19.7	27.8	21.3	9.8	40.9	29.9	12.1
Status 3	55.6	32.3	18.8	43.8	30.5	15.7	46.3	29.9	25.5	39.9	28.8	8.8	60.3	45.5	16.5
Status 4	67.1	34.5	22.3	46.2	28.3	14.5	62.3	34.1	26.5	60.5	43.5	17.0	74.7	53.1	19.0
Status 5	86.7	43.9	26.1	56.7	31.7	13.6	81.3	42.1	31.3	71.8	48.0	18.7	89.0	59.5	20.9
Status 6	88.7	41.8	24.8	57.3	28.6	12.7	91.5	41.9	27.1	83.4	54.4	21.9	93.7	58.9	19.9
Status 7	114.2	53.6	28.3	74.8	39.5	18.4	90.4	36.7	23.9	90.0	49.2	15.9	108.3	65.2	21.4
Status 8	122.6	60.1	38.1	83.1	43.1	22.3	109.9	49.0	34.4	118.4	71.8	36.2	122.3	74.6	30.7
Program effects	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
School fixed effects	no	no	yes	no	no	yes	no	no	yes	no	no	yes	no	no	yes
Constant	439.2	417.0	504.4	486.1	453.8	520.2	425.4	398.5	451.7	393.8	386.0	437.2	429.5	404.0	479.8
Prob. F	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
R^2	*0.119*	*0.304*	*0.482*	*0.072*	*0.224*	*0.423*	*0.122*	*0.330*	*0.481*	*0.142*	*0.235*	*0.532*	*0.118*	*0.247*	*0.536*

Source: Based on OECD-PISA 2003 data. The reference groups are: "Male" and "Status 1".

Chart 15

PISA scores in maths and likelihood of enrolment in a general secondary school, by geographical area and parental socio-cultural and economic status (1)(2)

(scores, OECD average=500 and percentages)

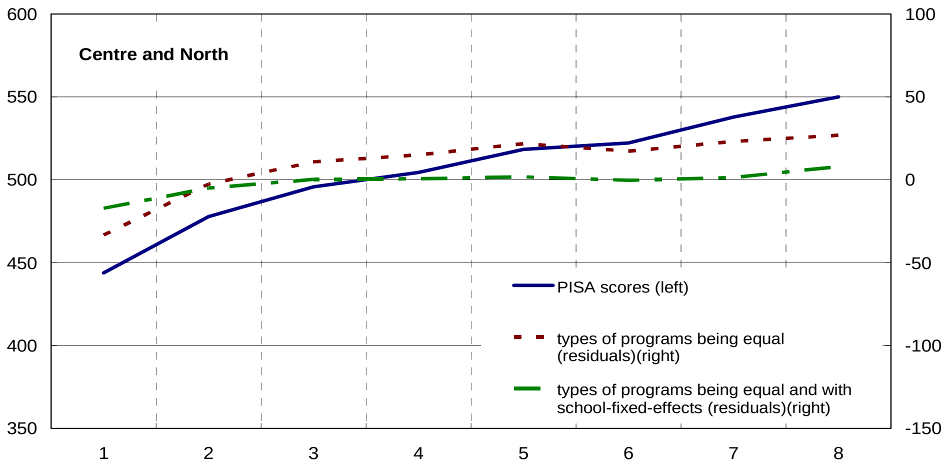


Source: Based on PISA data. (1) Non-weighted scores. (2) The socio-cultural and economic status index is a synthesis of several variables referred to parental job, quantity of schooling and wealth.

Chart 16a

PISA scores in maths, after controlling for types of programs and for schools, by parental socio-cultural and economic status, in the Centre and North (1)(2)(3)

(scores, OECD average=500)

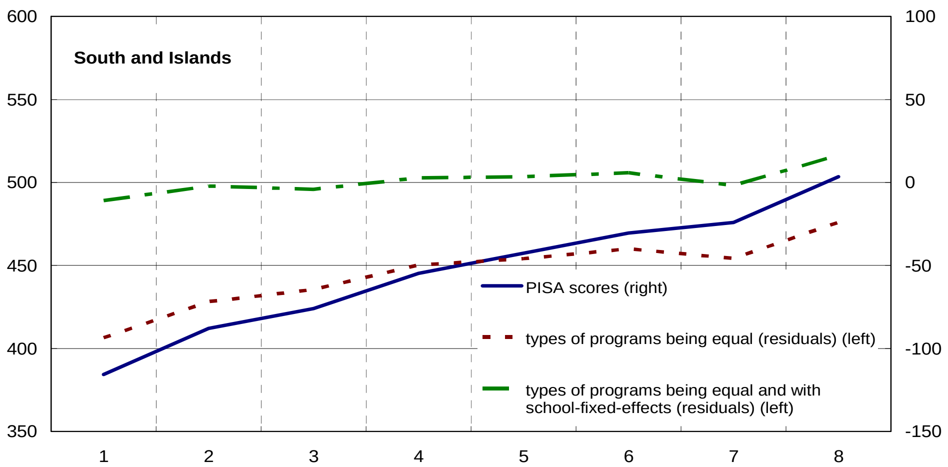


Source: Based on PISA data. (1) Non-weighted scores. (2) The socio-cultural and economic status index is a synthesis of several variables referring to parental occupation, quantity of schooling and wealth. (3) The scores are calculated as residuals of regressions with sex, types of programs and school fixed effects as explanatory variables.

Chart 16b

PISA scores in maths, after controlling for types of programs and for schools, by parental socio-cultural and economic status in the South and Islands (1)(2)(3)

(scores, OECD average=500)



Source: Based on PISA data. (1) Non-weighted scores. (2) The socio-cultural and economic status index is a synthesis of several variables referring to parental occupation, quantity of schooling and wealth. (3) The scores are calculated as residuals of regressions with sex, types of programs and school fixed effects as explanatory variables.

Table 11

TIMSS 2003 – Student distribution, by geographical area and parental educational level
(units)

Parental Highest Education Levels	North	Centre	South and Islands	Italy
Level 1	102	77	350	529
Level 2	505	309	821	1,635
Level 3	729	336	651	1,716
Level 4	193	89	116	398
Total	**1,529**	**811**	**1,938**	**4,278**

Source: Based on TIMMS 2003 data.

Table 12

TIMSS 2003 – Average scores and standard errors, by geographical area and parental educational level
(units)

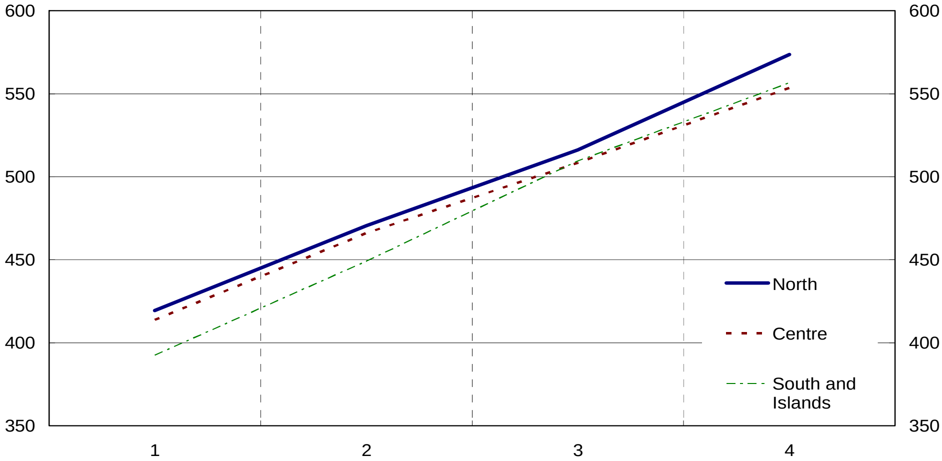
Parental Highest Education Levels	North		Centre		South and Islands		Italy	
	Mean	*Std. Err.*	Mean	*Std. Err.*	Mean	*Std. Err.*	Mean	*Std. Err.*
Level 1	419	*5.2*	414	*6.2*	393	*2.8*	401	*2.4*
Level 2	471	*2.6*	466	*3.3*	449	*2.1*	459	*1.5*
Level 3	516	*2.1*	508	*2.9*	510	*2.4*	512	*1.4*
Level 4	574	*3.7*	554	*5.9*	557	*5.9*	564	*2.8*
Total	**502**	***1.7***	**488**	***2.3***	**466**	***1.7***	**483**	***1.1***

Source: Based on TIMMS 2003 data.

Chart 17

TIMSS scores in maths at 8th grade,
by geographical area and parental years of schooling (1)(2)

(scores, overall average=500)

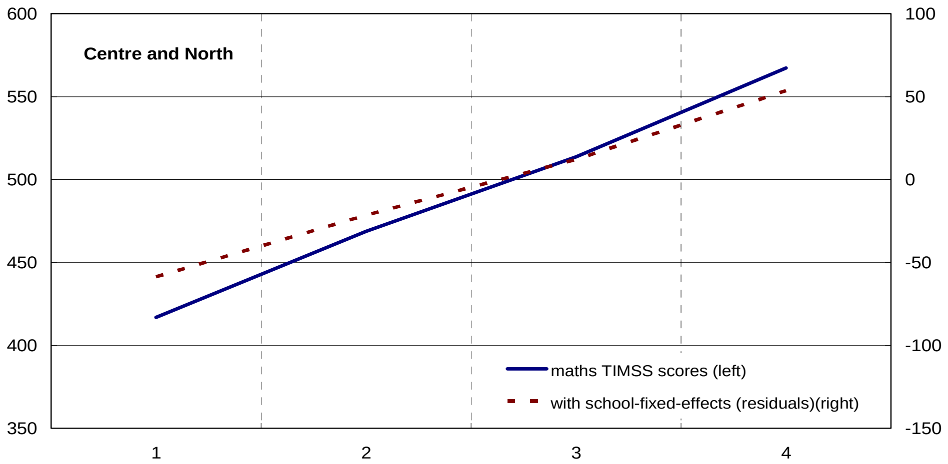


Source: Based on TIMSS data. (1) Non-weighted scores. (2) The parental educational level is the highest reported by students themselves.

Chart 18a

TIMSS scores in maths at 8th grade, after controlling for schools, by parental years of schooling, in the Centre and North (1)(2)

(scores, overall average=500)

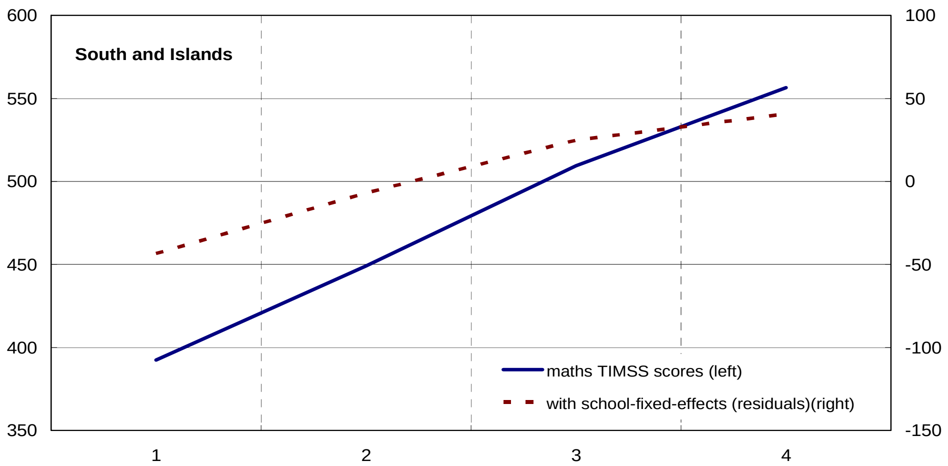


Source: Based on TIMSS data. (1) Non-weighted scores. (2) The parental educational level is the highest reported by students themselves.

Chart 18b

TIMSS scores in maths at 8th grade, after controlling for schools, by parental years of schooling, in the South and Islands (1)(2)

(scores, overall average=500)



Source: Based on TIMSS data. (1) Non-weighted scores. (2) The parental educational level is the highest reported by students themselves.

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