Confusion in the Ranks:

how good are England's schools?

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Foreword

Understanding how well English education performs compared with other countries is a valuable exercise. It can help us to learn from successful systems. We can see where we need to improve, and our progress over time on consistent international measures can be a useful corrective where there is grade inflation in domestic exams.

But our ranking in global league tables has become something of a political football in recent years. In part, this is because different tables produce apparently very different results. Where we find ourselves sixth in the world on one table, we sink to the mid-20s in another. Politicians trade insults and plaudits depending on the message they wish to convey.

But league table rankings are not always what they seem, hence the see-sawing in the rankings that we have seen in recent years. In this report, Professor Alan Smithers, of the Centre for Education and Employment Research at the University of Buckingham, shows that these apparently different results owe more to the composition of the tables than to any significant difference in our performance.

One simple explanation lies in which countries participate in the alphabet soup of surveys – PISA, TIMSS, PIRLS or, more recently, that produced by Pearson and the Economist Intelligence Unit, which sought to marry the other tables with graduation and adult literacy data. Put simply, a lot of the difference in ranking is down to which countries are included – or choose to take part – in different surveys.

Professor Smithers also shows that we can place too much weight on relatively small differences in test scores and that the different nature of the different tests can place some countries ahead of us on one table and behind us on another table.

None of this is to deny the importance of these surveys. Indeed, there are two important groups of countries that may offer us valuable lessons, once we strip away the apparent differences between the tables.

For a start, there is an extremely successful group of East Asian countries and territories – Hong Kong, Taiwan, Singapore, Japan – where they do well across the board. Maybe this is a cultural issue – after all, Chinese students outperform their classmates in Britain – but these are the countries that set the pace in the global economy too. So we need to see whether we can learn from them so we can compete more successfully as a nation.

There is a second group of countries which may be culturally closer to us – Germany, Belgium, Switzerland, Canada and the Netherlands – that do better than us, particularly on PISA, and there may be useful lessons we can learn from how they organise their education systems.

But whatever England's ranking, there are two fundamental issues that remain. The first is that our education system is, with exception of a couple of countries, the most socially segregated in the developed world, and we need to do much more to address this. The second is that we have far fewer young people achieving the highest grades on PISA maths tests, and we need to ensure that we have more able mathematicians.

Comparing like with like is vital. I hope that as these tables develop in the years ahead, they will improve our understanding of the effectiveness of different education systems, and enable us to make more valid comparisons between nations.

Sir Peter Lampl
Chairman
The Sutton Trust

Executive Summary

The most recent international league tables of pupil performance differ considerably. England languishes well down the list in PISA 2009, stars in the Pearson Global Index 2012, and lies somewhere in-between in TIMSS 2011. This report seeks to explain the differences and highlight some underlying consistencies.

There are three main reasons for the different rankings:

- Countries are ranked on scores which may not be different;
- Different countries are involved;
- The tests differ and some countries are ahead on one but not the other.

There is a further reason for the difference between the Pearson Index and the tests:

- The Index uses additional data.

Secondary School Pupils

We can see how these differences play out if we look in detail at the maths performance of secondary school pupils as an example. PISA 2009 has England joint 27 out of 65 countries and TIMSS 2011 tenth out of 42.

If we want to be at least 95% sure that a country has performed above England, then there are 20 above England in PISA and six in TIMSS.

Of those countries, five are above in both: Japan, Hong Kong, Singapore, South Korea and Taiwan.

Eleven countries were above England in PISA, but did not take part in TIMSS: Belgium, Canada[1], Denmark, Estonia, Germany, Iceland, Liechtenstein, Macao, the Netherlands, Shanghai, and Switzerland.

Four countries were above in PISA, but not in TIMSS: Australia, Finland, New Zealand and Slovenia.

Russia was above England in TIMSS, but not PISA.

Primary School Pupils

The differences between TIMSS 2011 for primary school pupils and PIRLS 2011 are not so sharp since they are from the same stable.

Five of the countries doing better than England on at least two out of maths, science and reading have a familiar ring to them: Japan, Hong Kong, Singapore, South Korea and Taiwan.

To them can be added Russia which tends to do well in TIMSS-type tests and Finland which does better at TIMSS primary than secondary.

[1] Canadian provinces used for benchmarking only in TIMSS 2011.

Pearson Global Index

England is sixth in the world for education according to the new Global Index published by Pearson. But this is derived mainly from PISA 2009[2] where the combined reading, maths and science scores place it joint 18th.

One-third of the Pearson ranking is contributed by graduation rates from upper secondary school and university, where England is second behind South Korea. These data, however, are incomplete, based on different definitions, come from different sources, and are more a matter of policy than educational attainment.

If we discount these data[3], England ranks 12th in the Pearson Index. The difference from PISA is explained almost entirely by the fact that five countries above England in PISA are not included in the Index.

Changes over Time

While England's performance in PISA maths appears to have declined markedly since 2000, there seems to have been a dramatic improvement in TIMSS maths. However, these are artefacts explainable in terms of participation and response rates.

The number of countries significantly above England in maths increased from two in PISA 2000 to 20 in PISA 2009. England's sample in 2000, however, was biased to high performing schools through a poor response rate. The OECD has declined to use it as a baseline. Without it, we are left with PISA 2006 and PISA 2009 where there is a difference of only two countries due to two top performers taking part for the first time in 2009.

The number of countries above England in TIMSS maths fell from 14 in 1999 to six in 2011. The difference is largely explained by five of the countries on the first occasion not taking part on the second. England did, however, appear to improve relative to three countries: Finland, Hungary and Malaysia.

A Long Tail of Under-Performance?

England is often charged with having a long tail of underachievement. TIMSS/PIRLS 2011 do show that there were more poorly performing primary school children in England than in the leading countries and there was a wider spread of scores. In this sense, there was underachievement, but fewer also reached the highest benchmark, in spite of the inclusion of independent and grammar schools.

The spread of scores in the top-performing countries, except Finland, increased in secondary education to become more like that in England. But England still had fewer at the highest level, a lower mean, and more at the lowest level. This would indicate that bringing England's performance up to the best requires improvement across the piece, not just levering up from the bottom.

[2] Many of countries had missing data for TIMSS and PIRLS. For example, of the 34 countries in the OECD in 2009 only 13 had participated in TIMSS 2007, which is the year used in the Index. The scores of other OECD countries, plus others missing from TIMSS, were derived by regression from PISA 2009.

[3] Use of these data was questioned by the Project's Advisory Panel (*The Learning Curve, 2012* Report, page 47), but the Economist Intelligence Unit and Pearson decided to go ahead.

Political Spin

Although it looks from media coverage as though there are big discrepancies in the results of PISA, TIMSS and the Pearson Index, there is, in fact, an underlying consistency. It is, however, the differences which have been highlighted. This is because league tables are popular. But there is also the spin that has been put upon them by politicians of all parties.

When the results of the 2000 round of PISA became available in 2001 the Labour Government was looking for evidence that its reforms were succeeding. England's unusually high position led the Government to attach greater importance to the results than they deserved given the disappointing response rate.

The current Coalition Government has been seeking justification for the changes it wishes to make to the education system. It has offered a gloomy interpretation of the results even when, as in the TIMSS/PIRLS 2011, England, on the surface, appears to have done quite well.

The value of the international comparisons risks being lost if the findings are continually subsumed into convenient political narratives.

Interpretation

Cutting through the spin, there are five Asian countries (Hong Kong, Japan, Singapore, South Korea, and Taiwan) which have consistently performed above England in PISA, TIMSS and PIRLS. Other Asian countries are prominent when they take part. The tests are designed to enable education systems to be compared, and it is easy to assume that the differences reflect the quality of the education. But this is not necessarily the case.

There are other possible explanations. Among the suggestions that have been made are: a culture of hard work and effort[4]; a trait of quiet persistence[5]; and parenting style[6]. The success of Chinese children is portable since they also shine in England's education system. Besides cultural and personal differences, there are many other factors that could come into play, for example, the importance of the results to a country, and the extent of preparation and practise for the tests.

This is not to say that the schools in these countries are not of high quality; only that there may not be a magic bullet which can be incorporated into England's education system.

There is a group of countries, more culturally similar to England, that consistently do better on PISA. Some, New Zealand and Australia for example, do significantly worse than England on TIMSS. Whether we wish to follow them will depend on whether we value the 'literacies' of PISA tests more than the 'knowledge and understanding' of TIMSS.

Many of those above England on PISA were absent from TIMSS. Among them were some of our nearest neighbours. Belgium, Germany, the Netherlands and Switzerland were all above us in maths. Their approaches should be examined closely to see if there

[4] Gladwell, M. (2008). *Outliers*. London: Allen Lane, page 248.
[5] Cain, S. (2012). *Quiet.* London: Penguin, page 201.
[6] Chua, A. (20110. *Battle Hymn of the Tiger Mother*. London Penguin Group.

is anything that can be learned from them to improve our pupils' grasp of maths, which is in urgent need of attention. It is where England's record is poorest.

If there is a lesson to be drawn from these analyses it is: don't leap to conclusions based on a country's apparent ranking in league tables. As presented, the messages are decidedly mixed. Any differences do not have to be mainly to do with the schools. The data could be invaluable, but they need to be interpreted with great care.

1. Introduction

1.1. How successful are England's schools? Systematically comparing their performance with schools in others countries would seem to be the ideal way of answering the question. Such studies have been conducted since 1964[7], settling down in recent years to rolling programmes. There are two major players. The OECD and the International Association for the Evaluation of Educational Achievement (IEA) based in Boston.

1.2. Secondary school pupils are tested in the OECD's 'Programme for International Student Assessment' (PISA) and the IEA's 'Trends in International Mathematics and Science Study' (TIMSS). PISA tests 15 year-olds (autumn term of Year 11) and TIMSS, 14 year-olds (towards the end of Year 9). PISA has tested every three years since 2000, and TIMSS every four years since 1995.

1.3. For primary school pupils there is the IEA's 'Progress in International Reading Literacy' (PIRLS) and a junior version of TIMSS. Both test children aged 10 (Year 5). PIRLS has run on a five-year cycle since 2001.

1.4. Recently Pearson has commissioned the Economist Intelligence Unit to amalgamate the various tests with some additional data into what it calls a Global Index of Cognitive Skills and Educational Attainment[8]. 'Cognitive Skills' is the name given to a combination of PISA 2009, TIMSS 2007 and PIRLS 2006 (with missing data derived from PISA), which contributes two-thirds of the Index. 'Educational Attainment' refers to a combined score derived from data for adult literacy, successful completion of upper secondary education and graduation from tertiary education, which provides the other third.

1.5. We should, therefore, you might think, be well on our way at arriving at an answer to our question. But, confusingly, the different studies appear to give different answers and the same programme different answers at different times. They, nevertheless, appear to have been very influential in the making of education policy.

1.6. Introducing the 2010 Schools White Paper, David Cameron and Nick Clegg wrote:

> What really matters is how we're doing compared with our international competitors. The truth is, at the moment we are standing still while others race past. In the most recent OECD PISA survey in 2006 (the 2009 results had not been released at the time the White Paper was issued) we fell from 4th in the world in the 2000 survey to 14th in science, 7th to 17th in literacy , and 8th to 24th in mathematics. The only way we can catch up, and have the world-class schools our children deserve, is by learning the lessons of other countries' success.[9]

1.7. Commenting on the release of the 2009 survey figures[10] in December 2010, Michael Gove as Secretary of State said: "Today's PISA report underlines the urgent need to

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[7] Husén, T (Ed.) *International Study of Achievement in Mathematics: a comparison of twelve countries*. Volumes I and II. Stockholm: Almquist and Wiksell.

[8] Pearson (2012). *The Learning Curve: lessons in country performance in education*. *2012 Report*. http://thelearningcurve.pearson.com/the-report/.

[9] Foreword by the Prime Minister and Deputy Prime Minister to *The Importance of Teaching.*, The Schools White Paper 2010, Cm 7980. London: The Stationery Office.

[10] http://www.education.gov.uk/inthenews/inthenews/a0070008/secretary-of-state-comments-on-pisa-study-of-school-systems.

reform our school system". He followed this up with an article[11] in the *Times Educational Supplement* expressing concern that, "we have slipped in the PISA rankings down to 25th in reading, 28th in maths and 16th in science". In a speech to Policy Exchange[12] he interpreted the PISA results as showing: "British 15-year-olds' maths skills are now more than two whole academic years behind 15-year-olds in China". Poor results in international tests compared with other countries have been a recurring theme in Michael Gove's speeches.

1.8. The current pessimism contrasts sharply with the mood of celebration with which the Labour government greeted the findings of the first PISA round of testing in 2000. The Permanent Secretary, David Normington, sounded a confident note in the *Education Journal* in June 2002:

> For those doubters who constantly seek to run down (our educational performance), we now have the OECD PISA study – the biggest ever international study of the comparative performance of 15-year-olds in 32 countries – which shows UK fourth in science, seventh in literacy and eighth in maths.[13]

1.9. The Minister of State, David Miliband put the point across strongly in the annual conference of the Association of Teachers and Lecturers in April 2003:

> International studies show our ten-year-olds achieving more than every other country in the industrialised world except Sweden and the Netherlands. At 15, students achieve in the top quartile in international comparisons.[14]

1.10. Charles Clarke, Secretary of State, lent his voice at another teachers' union annual conference that year, that of the National Association of Schoolmasters and Union of Women Teachers:

> The result of the commitment of your profession is that standards are rising. Recent international reports show that this country is third out of 35 developed nations for literacy standards at age 9, and seventh and eighth respectively for literacy and maths at age 15.[15]

1.11. The two rounds of PISA are nine years apart so some change relative to other countries could be expected, but the apparent major slump in performance is hard to accept at face value. Moreover, the parallel programme of international testing, TIMSS, presents an altogether different picture. According *The Times* report on the release of the most recent results from TIMSS and PIRLS in December 2012:

> School standards in England are among the highest in the world, according to new international tests published today. Achievements in maths and science by English teenagers put them in the top ten across the globe, while reading levels among most younger children are on par with the world's best. [16]

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[11] Gove, M. (2010).'PISA slip should put a rocket under our world-class ambitions and drive us to win the education space race'. *TES*, 21 December.

[12] http://www.education.gov.uk/inthenews/speeches/a0077948/michael-goves-speech-to-the-policy-exchange-on-free-schools.

[13] Normington, D. (2002). 'Transforming secondary education'. *Education Journal*, 62, June 2002.

[14] Miliband, D (2003). Speech to ATL Conference, Blackpool, 15 April 2003.

[15] Clarke, C. (2003). Speech to NASUWT Conference, Bournemouth, 24 April 2003.

[16] Hurst, G. (2012) 'Gove's attack on school standards cast in doubt by new top-ten ranking'. *The Times*, 11 December 2012.

1.12. The BBC headed its story[17]: "England's pupils in maths global top ten". The *Times Educational Supplement*[18] interpreted the TIMSS and PIRLS results as showing: "English schools are among the best in the world". The Government's interpretation has been more cautious. In a speech giving an initial view of the TIMSS and PIRLS results, Elizabeth Truss, Parliamentary Under Secretary of State, commented:

> The rise in performance in reading is encouraging but there is too long a tail of underperformance. The lack of progress in maths and the decline in science, linked to the removal of compulsory tests for all 11-year-olds is a real concern. [19]

1.13. The Global Index of Cognitive Skills and Educational Attainment[20] published by Pearson in November 2012 has attracted a great deal of attention, becoming the second most read education story on the BBC's website in 2012[21]. It aroused such interest because it announced that England's education was sixth in the world – a cheering contrast to all the recent bad news from the other education international rankings.

1.14. What then is the message of these findings? What are the comparisons with other countries telling us about the performance of the pupils in our schools? PISA appears to be saying all is not well. TIMSS seems to be showing us improving. The Pearson Index has us among the best in the world. They cannot all be right. In this report we drill down in an attempt to find where the truth lies. Are the apparent differences real, has something gone awry, or is it the way the findings have been spun?

[17] http://your247news.net/england-in-maths-global-top-10.
[18] *Times Educational Supplement*, 11 December 2012.
[19] http://www.education.gov.uk/inthenews/speeches/a00218356/education-minister-gives-speech-on-international-evidence.
[20] Pearson (2012). *The Learning Curve: lessons in country performance in education, 2012 Report*. http://thelearningcurve.pearson.com/the-report/.
[21] Coughlan, S. (27 December 2012). '*2012's most read education stories*'. http://www.bbc.co.uk/news/education-20838038/.

2. Reading Performance of Secondary School Pupils

2.1. Remarkably, all the widely divergent interpretations of England's ranking in PISA and TIMSS in Chapter 1 more or less fit the facts. Chart 2.1 shows the rankings for secondary school pupils. In PISA they have fallen sharply since the first round in 2000, as Michael Gove has emphasized[22]. In the year 2000, England was fourth in science, seventh in reading and equal seventh in maths, as both the Secretary of State and Permanent Secretary of the time, Charles Clarke and David Normington, accurately conveyed. England does emerge in the global top ten for science and maths in TIMSS 2011 as *The Times* and the BBC reported. The picture for primary age pupils discussed in Chapter 5 is similarly confirmatory. Yet, the results point in opposite directions. In maths, for example, PISA appears to be showing that England's performance has worsened, while TIMSS suggests quite the contrary. How can this be?

Chart 2.1: England's Rankings

Survey	Reading	Maths	Science
PISA 2009	=23/65	=27/65	16/65
PISA 2006	16/56	=24/57	=13/57
PISA 2000	7/31	=7/31	4/31
TIMSS 2011		10/42	9/42
TIMSS 2007		7/50	5/50
TIMSS 2003		18/46	7/46
TIMSS 1999		20/38	9/38
TIMSS 1995		16/25	6/25

2.2. To discover whether the rankings make any sense we have to dig deeper. And the first thing to say is that although league tables based on raw scores are the most common way in which the findings of PISA and TIMSS are presented, they are misleading. Educational measurement is riddled with error so that a point or two between mean scores may not be a real difference, and one country is placed above another on chance variation. It is possible to test statistically whether there are differences of which we can be 95 per cent confident. In this way, it is possible to identify the countries in which the pupils genuinely outperformed those in England, those in which they were on par, and those in which they did less well. In this and the next two chapters we look in turn at the performance of secondary school pupils in reading, maths and science. We follow, in Chapter 5, with a similar analysis of primary school pupils.

2.3. It must always be borne in mind that a higher test score does not mean a country's education system is better. The difference could be due to any number of factors: the tests were treated more seriously; the pupils were specifically prepared for the tests; the actual questions were closer to the curriculum of the country; the pupils were more adept at test-taking; the pupils were more familiar with the particular kind of test set by PISA or TIMSS. Or the difference could lie outside schools in the culture, society, the economy, parenting or personal characteristics. For the moment it is enough to look for patterns.

[22] There are slight differences in the actual ranks since those in this report are for England not the UK. We also do not use decimal places to avoid tied ranks.

2.4. Chart 2.2 shows how many countries did significantly better in reading in each of the three rounds of PISA. There are no results for 2003 since the UK was disqualified for not meeting the required response rates. In 2000 there were only two countries above England, in 2006, seven, and in 2009, 12, so it does appear that, as the Secretary of State has frequently claimed, England has been slipping back in reading relative to other countries. This does not, of course, mean that reading standards have been declining; it could be that other countries have been improving faster.

Chart 2.2: Ranks and Distribution in Secondary School Reading

Survey	Rank	Comparison with England					
		Above		Similar		Below	
		N	%	N	%	N	%
PISA 2009	=23/65	12	18.5	14	21.5	38	58.5
PISA 2006	16/56	7	12.3	18	31.6	30	52.6
PISA 2000	7/31	2	6.5	7	22.6	21	67.7

2.5. We can learn more from identifying the actual countries[23]. In Chart 2.3 we can that see the results from 2006 and 2009 are rather similar, though a few more countries do perform better in 2009.

Chart 2.3: Countries Above England in Reading[1]

Country[2]	PISA		
	2009	2006	2000
Australia	**A**	**A**	S
Belgium	**A**	S	**B**
Canada	**A**	**A**	**A**
Finland	**A**	**A**	**A**
Hong Kong	**A**	**A**	x
Japan	**A**	S	S
Netherlands	**A**	S	d
New Zealand	**A**	**A**	S
Norway	**A**	S	**B**
Shanghai	**A**	x	x
Singapore	**A**	x	x
South Korea	**A**	**A**	S
Ireland	S	**A**	S

1. Key to symbols: **A** = above England; S = similar; **B** = below; x = did not participate; d = disqualified.

2. Countries above England in 2009 listed alphabetically followed by those above in previous rounds.

2.6. Five more countries were ahead of England in 2009 than 2006. The increase comes from two high performing jurisdictions - Shanghai and Singapore - taking part in PISA for the first time in 2009 and four countries - Japan, the Netherlands, Belgium and Norway - overtaking England. Meanwhile, one country, Ireland, which had been ahead in 2006, was on par with England in 2009.

[23] We are well aware that not all the jurisdictions in the international comparisons are countries, but it is a convenient shorthand.

2.7. The pattern of results, however, was very different in 2000, underlining the impression from Chart 2.1 that it is anomalous. Only two countries – Finland and Canada – were above England in 2000, as they continued to be in 2006 and 2009. Of the other ten above England in 2009, two countries - Belgium, Norway - actually rose from being significantly below England in 2000, four moved up from on par to above, and four took part in 2009 but not in 2000.

2.8. PISA results for the year 2000 have been pivotal in ministerial statements about performance. When used as a baseline, it justifies Michael Gove's claim of a sharp decline in performance in the past decade. It was also highly publicised by Labour ministers at the time. But can those unusual figures be accepted as accurate? England's results did not form part of the main PISA analysis in 2003, because the minimum response rates had not been met. Neither were they in 2000, but on this occasion the scores were allowed to stand at first and were included in the initial analyses.

2.9. The Department for Education and Skills, as it was, commissioned the University of Southampton[24] to consider the possibility of response bias in the 2000 and 2003 PISA samples. It found that, "low achievers were under-represented in England's PISA data in both 2000 and 2003", and "the pupils who actually took the tests had higher mean scores than the overall target population". A working paper from the Department of Quantitative Social Science at the Institute of Education[25] found further reasons why the 2000 data were not comparable with those from 2006 and 2009. The age of testing, for example, had been reduced by five months by moving the administration from March-May to November-December in an attempt to improve the response rate.

2.10. In reporting the results of the 2009 survey, OECD PISA[26] looked to see how reading scores had changed since 2000, the previous round in which reading had been the major area for study. It decided, however, it could not include the United Kingdom:

> In PISA 2000, the initial response rate for the United Kingdom fell 3.7% short of the minimum requirement. At that time, the United Kingdom had provided evidence to the PISA Consortium that allowed for an assessment of the expected performance of the non-participating schools. On the basis of that evidence, the PISA Consortium concluded that the response bias was likely negligible and the results were included in the international report. In PISA 2003, the United Kingdom's response rate was such that sampling standards had not been met, and a further investigation by the PISA Consortium did not confirm that the resulting response bias was negligible. Therefore, these data were not deemed internationally comparable and were not included in most types of comparisons. For PISA 2006 and PISA 2009, more stringent standards were applied, and PISA 2000 and PISA 2003 data for the United Kingdom are therefore not included in comparisons.[27]

[24] Micklewright, J. and Schnepf, S.V. (June 2006). *Response Bias in England in PISA 2000 and 2003.* Research Brief RB 771. London: Department for Education and Skills, page 2, Key Findings.
[25] Jerrim, J. (December 2011). *England's "Plummeting" PISA Test Scores between 2000 and 2009: is the performance of our secondary school pupils really in relative decline?* page 19, London: Institute of Education, Department of Quantitative Social Science.
[26] OECD (2010). *PISA 2009 Results: Learning Trends; changes in student performance since 2000*. Volume V. Paris: OECD.
[27] Ibid, note 3, page 30.

2.11. The blunt statement by the OECD that the UK had failed to meet the PISA response-rate standards and other evidence led Andrew Dilnot, as Chair of the UK Statistics Authority, to put on record his concerns:

> Given these various published caveats and advice, my own view is that those commenting on data in this area should take particular care to avoid making comparisons which could be interpreted as statistically problematic, or otherwise might be misunderstood by the audience. I was concerned to review the Department for Education's press release of 7 December 2010 in which headline results for England from the PISA study, alongside relative international rankings, were not accompanied by detailed advice or caveats to help the reader in making comparisons over time, nor were the statistical implications of an increase in the number of reporting countries in later PISA studies noted. While I understand that some users of these data would like to make comparisons between the first PISA study in 2000 and the most recent in 2009, the weaknesses relating to the response-rate standard in earlier studies should not be ignored. The validity of comparisons of national rankings as a result of an increase in the number of countries covered by the PISA study, and the degrees of uncertainty in country scores attributed to sampling and measurement error are also important in this regard.[28]

2.12. The strong words from PISA, itself, and the Chair of the UK Statistics Authority have led us to decide to omit as unreliable the PISA 2000 results for England from the rest of our report. Doing so removes many of the contradictions pointed to in Chapter 1. No longer can it be claimed, as the government of the day did, that England's pupils were highly successful in 2000, nor as the present government does that results have plunged in the decade since. On the other hand, it does not remove all the discrepancies. Have results really been improving as the TIMSS data would appear to suggest and, if so, why is England so low down in PISA 2009? If its performance there is so poor, how come in the Pearson Global Index England is placed sixth in the world. We will explore these issues further in the next chapter when we turn to the maths results.

Résumé

2.13. It was decided to drop PISA 2000 from the comparisons of this report because of the evidence that the UK's poor response rate had rendered the information unreliable.

2.14. In 2009, 12 jurisdictions scored significantly higher than England in reading, five more than in 2006. Countries scoring higher in both 2006 and 2009 were Australia, Canada, Finland, Hong Kong, New Zealand and South Korea,. Two tested for the first time in 2009 outscored England: Shanghai and Singapore. Belgium, Japan, the Netherlands, and Norway improved relative to England to join the top scorers, while Ireland fell back.

2.15. The twelve which were significantly ahead of England in 2009 comprised five Asian jurisdictions, three members of the British Commonwealth, and four European neighbours. There is no immediately obvious common factor in their education systems.

[28] Letter from Andrew Dilnot CBE, Chair of the UK Statistics Authority to Rt Hon David Miliband MP, 3 October 2012, *Programme for International Student Assessment (PISA) Statistics.*

3. Maths Performance of Secondary School Pupils

3.1. Leaving out the PISA 2000 results for England as unreliable removes much of the apparently disastrous drop in reading performance. But the reading scores do not allow us to compare the findings of PISA and TIMSS since the reading skills of secondary school pupils are not covered in TIMSS. The maths results do provide that opportunity.

3.2. Chart 3.1 shows the maths results on the same basis as for reading, but with PISA 2000 relegated to italics. TIMSS 2003 is in italics also because England was disqualified from this survey too for not meeting the required minimum response rate. The 20 countries above England in maths in PISA 2009 compares with the 12 in reading. Once again maths emerges as the subject in which England's pupils do particularly poorly. The picture from TIMSS 2011, however, is more encouraging with England below only six countries. We begin by first comparing the recent results for PISA and TIMSS, and then at how they apparently have changed over time.

3.1: Ranks and Distribution in Secondary School Maths

Survey	Rank	Comparison with England					
		Above		Similar		Below	
		N	%	N	%	N	%
PISA 2009	=27/65	20	30.8	12	18.5	32	49.2
PISA 2006	=24/57	18	31.6	12	21.0	26	45.6
PISA 2000[1]	*=7/31*	*2*	*6.5*	*7*	*22.6*	*21*	*67.7*
TIMSS 2011	10/42	6	14.2	8	19.0	27	64.3
TIMSS 2007	7/50	5	10.0	6	12.0	38	76.0
TIMSS 2003[1]	*18/46*	*9*	*19.6*	*12*	*26.1*	*24*	*52.2*
TIMSS 1999[2]	20/38	14	42.1	6	15.8	15	39.5
TIMSS 1995[3]	16/25	14	56.0	4	16.0	6	24.0

1. England did not satisfy the response rate requirements in either PISA 2000 or TIMSS 2003 for secondary school pupils, and while they are included for information they do not feature in the subsequent analysis.

2. Australia and Slovenia also scored significantly higher in 1999 but were disqualified by the IEA for not satisfying the guidelines in one or more of response rate, age/grade specification or classroom sampling procedures.

3. Australia, Austria, Belgium (French-speaking), Bulgaria, the Netherlands and Slovenia scored higher than England in 1995 but were disqualified.

TIMSS 2011 Compared with PISA 2009

3.3. There were only six countries above England in TIMSS 2011 maths compared with the 20 above in PISA 2009 maths. But country for country England's relative performance amounts to much the same thing. That bears repeating: the 20 countries above England in PISA 2009 tell much the same story as the six above England in TIMSS 2011. The key to the conundrum is that eleven of those above England in PISA 2009 did not take part in TIMSS 2011.

3.4. The two sets of results fit together in this way::

- five countries did well in both - Hong Kong, Japan, South Korea, Singapore and Taiwan;
- 11 countries taking part in PISA 2009 did not in TIMSS 2011 - Belgium, Denmark, Estonia, Germany, Iceland, Liechtenstein, Macao, the

Netherlands, Shanghai, and Switzerland, and Canada was used only for benchmarking;

- four countries do better in PISA than TIMSS - Australia, Finland, New Zealand and Slovenia.

3.5. The six above England in TIMSS 2011 comprise the five above in PISA 2009 plus Russia which performs much better in TIMSS than PISA. Chart 3.2 shows that it was significantly below England in both PISA 2009 and 2006.

Chart 3.2: Countries Above England in Secondary School Maths[1]

Country	PISA		TIMSS[2]			
	2009	2006	2011	2007	1999	1995
Australia	**A**	**A**	S	**B**	d	d
Belgium[3]	**A**	**A**	x	x	**A**	**A**
Canada	**A**	**A**	x[4]	x[4]	**A**	**A**
Denmark	**A**	**A**	x	x	x	d
Estonia	**A**	**A**	x	x	x	x
Finland	**A**	**A**	S	x	**A**	x
Germany	**A**	S	x	x	x	d
Hong Kong	**A**	**A**	**A**	**A**	**A**	**A**
Iceland	**A**	**A**	x	x	x	**B**
Japan	**A**	**A**	**A**	**A**	**A**	**A**
Liechtenstein	**A**	**A**	x	x	x	x
Macao	**A**	**A**	x	x	x	x
Netherlands	**A**	**A**	x	x	**A**	d
New Zealand	**A**	**A**	**B**	x	S	S
Shanghai	**A**	x	x	x	x	x
Singapore	**A**	x	**A**	**A**	**A**	**A**
Slovenia	**A**	**A**	S	**B**	d	d
South Korea	**A**	**A**	**A**	**A**	**A**	**A**
Switzerland	**A**	**A**	x	x	x	**A**
Taiwan	**A**	**A**	**A**	**A**	**A**	x
Czech Republic	S	**A**	x	S	**A**	**A**
Russia	**B**	**B**	**A**	S	**A**	**A**
Hungary	S	S	S	S	**A**	**A**
Slovak Republic	S	S	x	x	**A**	**A**
Malaysia	x	x	**B**	**B**	**A**	x
France	S	S	x	x	x	**A**
Ireland	S	S	x	x	x	**A**
Sweden	S	S	**B**	**B**	x	**A**

1. Key: **A** = above England; S = similar; **B** = below; x = did not participate; d= disqualified.
2. England did not meet the participation requirements in 2003.
3. Flemish Belgium only in TIMSS.
4. Canadian provinces used in benchmarking, but not part of the main analysis.

Contrasting Trends?

3.6. Not only are the most recent results for TIMSS and PISA very different, but they appear to have been moving in opposite directions. There were just two countries above England in PISA 2000, but 14 in TIMSS 1999.

3.7. England's apparent decline in PISA maths is, however, an illusion dependent on using the results of PISA 2000. The OECD has warned against this because the poor response rate gives a biased sample. We are left with PISA 2009 and PISA 2006 which show little change. Two more were above England in 2009 but this was due to Shanghai and Singapore participating for the first time. Other than that the only changes are Germany moving above England and the Czech Republic falling below.

3.8. The apparent improvement in England's position in TIMSS maths from 14 above in 1995 to six in 2011 can be explained in the same terms as the difference between PISA 2009 and TIMSS 2011:

- five countries did well in both 1995 and 2011 - Hong Kong, Japan, South Korea, Singapore and Russia;
- seven countries above England in TIMSS 1995 did not figure in the TIMSS 2011 rankings - Belgium, Canada (provinces used for benchmarking) Czech Republic, France, Ireland, Slovak Republic, and Switzerland;
- two countries do less well in TIMSS 2011 than TIMSS 1995 - Sweden which falls from above England to significantly below it; and Hungary above in 1995 but similar in 2011.

3.9. In addition to the five countries which outperformed England in both TIMSS 1995 and 2011, one non-participant in the earlier year – Taiwan – scores above England in 2011. The fall off between 1995 (and 1999) and 2011 may not be unconnected with the OECD programme coming on stream in 2000 since the dropout from TIMSS primary was less. Countries may have withdrawn because they were not able to fit in two surveys and the OECD's PISA is treated as if it had official status.

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3.10. The results of the PISA and TIMSS surveys of maths performance in secondary schools are mainly consistent. Five Pacific Rim jurisdictions outscored England in maths across all the rounds of PISA and TIMSS in which they participated: Hong Kong, Japan, South Korea, Singapore and Taiwan. This does not mean that their education systems are better: the differences could lie outside schools.

3.11. The apparent contradiction between PISA and TIMSS, with the former indicating deterioration in England's performance and the latter improvement, is an artefact. What appears to be a trend in PISA is associated with bias in the 2000 sample, and that in TIMSS with the non-participation of higher performing countries in 2011. The fact that PISA 2009 finds three times as many countries as TIMSS 2011 performing above England is also attributable to the absence of leading countries from TIMSS.

3.12. Some countries do fare better in either PISA or TIMSS, notably Russia in TIMSS and Australia and New Zealand in PISA, so the tests do appear, to some extent, to be capturing different aspects of maths performance.

4. Science Performance of Secondary School Pupils

4.1. The pattern of results for science is similar to that for maths, though with fewer countries above England in both PISA and TIMSS, indicating a relatively better performance in this subject. Chart 4.1 shows that there were 10 countries above in PISA 2009 compared with five in TIMSS 2011. Leaving aside PISA 2000, there are no major differences over the years.

Chart 4.1: Ranks and Distribution in Secondary School Science

Survey	Rank	Comparison with England: Above		Similar		Below	
		N	%	N	%	N	%
PISA 2009	16/65	10	15.4	9	13.8	45	69.2
PISA 2006	=13/57	7	12.3	14	24.6	36	63.2
PISA 2000[1]	*4/31*	*1*	*3.2*	*5*	*16.1*	*24*	*77.4*
TIMSS 2011	9/42	5	11.9	5	11.9	31	73.8
TIMSS 2007	5/50	4	8.0	5	10	40	80.0
TIMSS 2003[1]	*7/46*	*4*	*8.7*	*4*	*8.7*	*37*	*80.4*
TIMSS 1999[2]	9/38	1	2.6	15	39.5	21	55.3
TIMSS 1995[3]	6/25	4	16.0	6	24.0	14	56.0

1. England did not satisfy the guidelines for participation rates in either PISA 2000 or TIMSS 2003, and while they are included for information they do not feature in the subsequent analysis.

2. Australia and Slovenia also scored significantly higher in 1999, but were disqualified by the IEA for not satisfying the guidelines in one or more of response rate, age/grade specification or classroom sampling procedures.

3. Austria, Australia, and Belgium (French-speaking), Bulgaria, the Netherlands, and Slovenia also scored significantly higher than England in 1995, but were disqualified.

4.2. Chart 4.2 shows that, as in the maths comparisons, the PISA results for science in 2009 and 2006 are similar.

Chart 4.2: Countries Above England in Secondary School Science[1]

Country	PISA 2009	PISA 2006	TIMSS[2] 2011	TIMSS 2007	TIMSS 1999	TIMSS 1995
Australia	**A**	S	**B**	**B**	S	d
Canada	**A**	**A**	**x**[3]	x[3]	S	**B**
Estonia	**A**	**A**	x	x	x	x
Finland	**A**	**A**	**A**	x	**S**	x
Hong Kong	**A**	**A**	S	S	**x**	**B**
Japan	**A**	**A**	**A**	**A**	S	**A**
New Zealand	**A**	**A**	**B**	x	**B**	**B**
Shanghai	**A**	x	x	x	x	x
Singapore	**A**	x	**A**	**A**	S	**A**
South Korea	**A**	S	**A**	**A**	**S**	**A**
Taiwan	S	**A**	**A**	**A**	**A**	x
Czech Republic	**B**	S	**x**	S	**S**	**A**

1. Key: **A** = above England; S = similar; **B** = below; x did not participate; d= disqualified.

2. England did not satisfy the guidelines for participation rates in 2003.

3. Canadian provinces used in benchmarking.

4.3. The increase in the number of countries above England from seven in 2006 to ten in 2009 is largely due to Shanghai and Singapore taking part in PISA for the first time in 2009, while Australia and South Korea overtake England. Taiwan falls from 'above' to 'similar'.

4.4. Ten countries were above England in PISA 2009 compared with five in TIMSS 2011. Again the difference is mainly due to non-participation. Three higher scoring countries in PISA 2009 science – Canada, Estonia and Shanghai – are not in the TIMSS 2011 league table. The sharp contrast in the maths performance of Australia and New Zealand on PISA (above) and TIMSS (below) is also evident in the science results. The science results in TIMSS are relatively stable from 1995 to 2011. Japan, South Korea and Singapore are above England on both occasions. In 1995 they were joined by the Czech Republic, which did not take part in 2011, and in 2011 by Finland and Taiwan, neither of which participated in 1995.

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4.5. The science results bear out those in maths. They are mainly consistent between PISA and TIMSS when unreliable samples are dropped and non-participation taken into account. Japan, South Korea, Singapore, Taiwan and Finland again emerge as the countries which perform significantly above England. Considering all three subject areas, England achieved its best position in science, followed by reading, with maths some way behind.

5. Performance of Primary School Pupils in Maths, Science and Reading

5.1. As well as testing pupils in Year 9, the International Association for the Evaluation of Education Achievement (IEA) also tests children in primary schools in Year 5 in maths and science as part of TIMSS, and reading in the parallel, Progress in International Reading Literacy (PIRLS). In this chapter we consider how many of the countries are ahead of England, and whether the results for primary schools point in the same direction as those for secondary schools.

Maths

5.2. Chart 5.1 shows that the maths results for primary school pupils, as did those for secondary school pupils, suggest that England has made considerable improvement since 1995. In that round of testing 47.1 per cent of countries performed above England compared with just 11.3 per cent in the latest round.

5.1: Ranks and Distribution in Primary Maths

Surveys[1]	Rank	Comparison with England					
		Above		Similar		Below	
		N	%	N	%	N	%
TIMSS 2011	9/53	6	11.3	6	11.3	40	75.5
TIMSS 2007	7/36	4	11.1	4	11.1	27	75.0
TIMSS 2003[2]	10/25	6	24.0	4	16.0	14	56.0
TIMSS 1995[3]	10/17	8	47.1	4	23.5	4	23.5

1. TIMSS 1999 was for secondary school pupils only.

2. Unlike England's secondary school pupils, its primary pupils were included in the TIMSS 2003 analysis.

3. Australia, Austria, Hungary, Israel, Kuwait, Latvia, the Netherlands, Slovenia, and Thailand were disqualified for not satisfying one or more guidelines relating to sample participation rates, age/grade specification or classroom sampling procedures.

Chart 5.2: Countries Above England in Primary Maths[1]

Country	TIMSS[2]			
	2011	2007	2003	1995
Belgium (Flemish)	S	x	**A**	x
Canada	x[3]	x[3]	x[3]	**A**
Czech Republic	**B**	**B**	x	**A**
Hong Kong	**A**	**A**	**A**	**A**
Ireland	**B**	x	x	**A**
Japan	**A**	**A**	**A**	**A**
Netherlands	S	S	**A**	d
Northern Ireland	**A**	x	x	x
Singapore	**A**	**A**	**A**	**A**
South Korea	**A**	**x**	**x**	**A**
Taiwan	**A**	**A**	**A**	x
United States	S	B	**B**	**A**

1. Key: **A** = above England; S = similar; **B** = below; x = did not participate; d= disqualified.

2. Primary pupils were not part of TIMSS 1999.

3. Canadian provinces used in benchmarking.

5.3. The actual number of countries above England had, however, only fallen from eight to six. A large part of this impression of improvement comes, therefore, from the addition in the most recent survey of 36 new entrants of which all but one did worse than England (Northern Ireland was the exception).

5.4. The countries which perform above England are listed in Chart 5.2. There is again a core of countries that do consistently well. They are the same countries that stood out in the Year 9 comparisons: Hong Kong, Japan, South Korea, Singapore and Taiwan (Finland is on par with England). There are, however, some signs of an improvement by England. The Czech Republic and Ireland, which performed above England in 1995, fell below it in 2011; the United States, which was above in 1995, was on par in 2011. The rest of the difference is accounted for by Canada, included in the league table in 1995 but used for benchmarking in 2011, and Northern Ireland entering for the first time in 2011 and coming above England.

Science

5.5. The interpretation of England's relative performance over time in the four science rounds of the TIMSS Year 5 tests depends on the criterion adopted. Chart 5.3 shows that England holds its own in 2011 in terms of the percentage of countries achieving above it compared with 1995 (with a dip in-between). But its ranking drops from fifth to 15th as some of the extra 36 countries participating in 2011 score higher. The actual number of countries significantly ahead rises from three in 1995 to eight in 2011.

5.3: Ranks and Distribution in Primary Science

Surveys[1]	Rank	Comparison with England					
		Above		Similar		Below	
		N	%	N	%	N	%
TIMSS 2011	15/53	8	15.1	10	18.9	34	64.2
TIMSS 2007	=6/36	3	8.3	7	19.4	25	69.4
TIMSS 2003	5/25	2	8.0	3	12.0	19	76.0
TIMSS 1995[2]	5/17	3	17.6	5	29.4	8	47.1

1. Attainment in primary schools was not tested in TIMSS 1999.

2. Australia, Austria, Hungary, Israel, Kuwait Latvia, the Netherlands, Slovenia, and Thailand were disqualified for not satisfying one or more guidelines relating to sample participation rates, age/grade specification or classroom sampling procedures.

5.6. Chart 5.4 shows that three countries – Japan, Korea, United States - performed above England in primary science in both 1995 and 2012. Three countries coming out significantly ahead of England in 2011 had not take part in 1995 – Finland, Russia and Taiwan. Both the Czech Republic and Singapore improved relative to England, moving up from 'similar' to 'above'.

5.7. Results in science, however, were more variable than in primary maths or secondary science, with big swings between successive testings. The Czech Republic, for example, went from on par with England in 1995, to significantly below in 2007, to significantly above in 2011. Hong Kong and Russia varied similarly. South Korea, Singapore and Taiwan were the most consistent high performers in primary science, with Finland above England in its one appearance.

Chart 5.4: Countries Above England in Primary Science[1]

Country	TIMSS[2] 2011	2007	2003	1995
Czech Republic	**A**	**B**	x	S
Finland	**A**	x	x	x
Hong Kong	S	**A**	S	**B**
Japan	**A**	S	S	**A**
Russia	**A**	S	**B**	x
Singapore	**A**	**A**	**A**	S
South Korea	**A**	x	x	**A**
Taiwan	**A**	**A**	**A**	x
United States	**A**	S	S	**A**

1. Key: **A** = above England; S = similar; **B** = below; x = did not participate; d= disqualified.

2. Canadian provinces used in benchmarking.

5.8. It is hard to conclude from these figures, as it was from those for secondary schools, that there has been the major decline in England's science performance highlighted by Elizabeth Truss[29], the junior education minister, in commenting on the release of the 2011 TIMSS results in December 2012. England's relative standing is much affected by which countries take part, and participation in TIMSS varies considerably from round to round.

Reading

5.9. It is difficult to make much sense of the IEA's reading results as they apply to England. Chart 5.5 shows there was only one country ahead in 2001, but in 2006 there were eleven, and in 2011 just five.

5.5: Ranks and Distribution in Reading

Surveys[1]	Rank	Comparison with England: Above N	Above %	Similar N	Similar %	Below N	Below %
PIRLS 2011	11/49	5	10.2	8	16.3	35	71.4
PIRLS 2006	15/40	11	27.5	6	15.0	22	55.0
PIRLS 2001	3/35	1	2.9	2	5.7	31	88.6

1. Attainment in primary schools was not tested in TIMSS 1999.

5.10. Chart 5.6 shows that the one country that was ahead of England in 2001 – Sweden – fell to significantly below in 2011. The five ahead in 2011 comprise four which did not participate in 2001 (Finland, Hong Kong, Northern Ireland and Singapore), plus Russia where the scores were higher in reading, as they were in science.

5.11. The apparent improvement in England's position from 2006 to 2011 is largely accounted for by six countries reverting to where they stood in 2001. Italy, Germany and Hungary were below on both occasions, but not in 2006. The Netherlands was on par with England in both years, but ahead in 2006. Flemish Belgium and Luxembourg

[29] http://www.education.gov.uk/inthenews/speeches/a00218356/education-minister-gives-speech-on-international-evidence.

did not take part in 2001 or 2011, but did so in 2006. The only other changes among the top performers from 2006 to 2011 were Denmark and Sweden falling back relative to England, and Northern Ireland, participating for the first time, scoring higher. Hong Kong, Russia and Singapore were ahead in both 2006 and 2011.

Chart 5.6: Countries Above England in Reading[1]

Country	PIRLS 2011	2006	2001
Belgium (Flemish)	x	**A**	x
Denmark	S	**A**	x
Finland	**A**	x	x
Germany	**B**	**A**	**B**
Hong Kong	**A**	**A**	x
Hungary	**B**	**A**	**B**
Italy	**B**	**A**	**B**
Luxembourg	x	**A**	x
Netherlands	S	**A**	S
Northern Ireland	**A**	x	x
Russia	**A**	**A**	**B**
Singapore	**A**	**A**	x
Sweden	**B**	**A**	**A**

1. Key: **A** = above England; S = similar; **B** = below; x = did not participate; d= disqualified.

5.12. It is difficult to see these results as an "encouraging" rise in England's performance in reading as claimed by the Department for Education[30]. The performance in 2006 looks to have been particularly poor compared with 2001 and 2011. The comparisons are further weakened by the different countries participating.

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5.13. Five countries performed consistently above England in primary school maths: Hong Kong, Japan, South Korea, Singapore and Taiwan. As we saw in Chapter 3, these five were also among the top countries in secondary school maths. Four were significantly ahead in 2011 in primary science too (Hong Kong was on par with England). As we have cautioned before, this does not necessarily indicate that their education systems are superior.

5.14. The 2011 TIMSS and PIRLS results have been interpreted as showing that England's performance in science has been declining while that in reading has been improving. Neither is warranted. In science only two countries – the Czech Republic and Singapore – significantly improved relative to England from 1995 to 2011. There looks to have been more because countries outscoring England in 2011 were absent in 1995.

5.15. England's apparent improvement in reading can be accounted for in terms of its particularly poor performance in 2006 from which it has recovered somewhat. It is still well down on its position in 2001.

6. Global Index of Cognitive Skills and Educational Attainment

6.1. The Economist Intelligence Unit (EIU), commissioned by Pearson[31], has attempted to bring together PISA, TIMSS and PIRLS and some additional data to form what it calls the Global Index of Cognitive Skills and Educational Attainment. It has attracted a lot of interest since it placed England sixth in the world[32]. This positive finding contrasts sharply with the prevailing narrative, strongly endorsed by the Coalition Government, that England's education system has been failing, and is in urgent need of reform. The narrative is fuelled mainly by the findings of the 2009 round of PISA which, as we saw in Chapter 2, had England equal 23rd in reading, equal 27th in maths and 16th in science out of 65 countries, well down on its positions in 2000.

Chart 6.1: PISA and Pearson Ranks

Country[1]	PISA Combined Score	PISA Rank	Pearson Index Combined Z Score[2]	Pearson Index Rank[3]
Shanghai	1731	1		omitted
Hong Kong	1637	2	0.9	3
Finland	1631	3	1.26	1
Singapore	1630	4	0.84	5
South Korea	1623	5	1.23	2
Japan	1588	6	0.89	4
Canada	1580	7	0.54	10
New Zealand	1572	8	0.56	8
Taiwan	1558	9		omitted
Australia	1556	=10	0.46	13
Netherlands	1556	=10	0.59	7
Liechtenstein	1555	12		omitted
Switzerland	1552	13	0.55	9
Estonia	1541	14		omitted
Germany	1530	15	0.41	15
Belgium	1528	16	0.35	16
Macao	1523	17		omitted
England	1503	=18	0.60	6

1. Countries ranked above England on PISA reading maths and science scores combined. Iceland and Poland also in 18th position.

2. Standard deviations above or below mean.

3. Ireland ranked 11th (0.53) and Denmark 12th (0.50).

6.2. In this chapter we investigate how it is that in one league table England can be so low, while in another up in sixth place. In Chart 6.1 we show the ranking of the combined PISA scores for reading, maths and science. On this scale, England is equal 18th with Poland and Iceland. The chart reveals immediately one reason for the discrepancy

[30] http://www.education.gov.uk/inthenews/speeches/a00218356/education-minister-gives-speech-on-international-evidence.

[31] Pearson (27 November 2012). *Pearson Launches The Learning Curve: new global education research from Pearson identifies key lessons for education reform.* http://www.pearson.com/news/2012/november/pearson-launches-the-learning-curve.html

[32] Actually 39 nations plus Hong Kong.

between PISA and the Index: five jurisdictions above England in the PISA ranking are omitted from the Index: Shanghai, Taiwan, Liechtenstein, Estonia, and Macao. If they were to be omitted from PISA also, England would, at a stroke, move up five places to joint 13th.

6.3. But this cannot be the only reason for the difference since this excision still leaves England joint 13th in PISA rankings against sixth in Pearson. To understand what is involved in England's elevation and the poorer positions of countries like Canada and Australia we need to look in detail at the construction of the Pearson Global Index. It is derived from PISA 2009, TIMSS 2007 (the 2011 results had not been published when it was compiled), and PIRLS 2006, plus data on adult literacy, successful upper secondary school completion (dubbed graduation), and graduation from tertiary education.

Chart 6.2: Composition of Pearson Index

Component	% Weight By Subject	% Weight By Variable
PISA 2009		26.6
Reading	13.30	
Maths	6.65	
Science	6.65	
TIMSS 2007 (secondary)		13.3
Maths	6.65	
Science	6.65	
PIRLS 2006		8.9
TIMSS 2007 (primary)		17.8
Maths	8.9	
Science	8.9	
Adult Literacy[1]		11.1
Graduation from Upper Secondary[2]		11.1
Graduation from Tertiary[3]		11.1
Total		99.9

1. Defined as percentage of people aged 15 and over considered as literate, sourced from the UNESCO Institute for Statistics.

2. Defined as the percentage of the age cohort that will complete education to this level, sourced from the OECD. It is different from the completion rate as usually defined. The denominator is the age cohort, not entry to upper secondary education as it would be for completion.

3. Net graduation rate calculated by dividing the number of graduates at each single year of age, by the population at that age, and summing these over all the years. It only includes Tertiary-type A programmes (ISCED 5A), those that are theory-based and designed to provide sufficient qualifications for entry to advanced research programmes and professions with high skill requirements. They have a minimum cumulative theoretical duration of three years full-time equivalent.

6.4. Chart 6.2 sets out the details of the composition[33]. The percentages in the chart have been arrived at from the proportions specified in Appendix 1 of *The Learning Curve*:

[33] These percentages are calculated from the description in Appendix 1 of *The Learning Curve*, page 47. The details are not fully set out there, but *The Learning Curve* has confirmed these percentages, personal communication.

- PISA, TIMSS and PIRLS together contribute two-thirds of the Index;
- the secondary and primary school tests are weighted 60:40;
- reading, maths and science are counted equally;
- one-third of the Index is contributed by adult literacy, upper secondary graduation rate and tertiary graduation rate[34].

The gist is that PISA 2009 contributes just over a quarter of the Index (26.6 per cent); TIMSS 2007, 31.1 per cent; PIRLS 2006, 8.9 per cent; and adult literacy and graduation rates together, 33.3 per cent. If England lies joint 13th out of Pearson's 40 countries on PISA and sixth on the Index itself, then the difference must be in TIMSS, PIRLS, the literacy and graduation rates, or some combination.

6.5. Chart 6.3 sets out the scores and ranks for the countries ranked above England in PISA 2009 together with the Pearson scores and ranks for the two strands of its Index: (1) a combination of PISA, TIMSS and PIRLS; and (2) data on adult literacy and graduation rates.

Chart 6.3: PISA Ranks Compared with the Two Strands of Pearson's Index

Country[1]	PISA		PISA, TIMSS & PIRLS		Adult Literacy and Graduation Rates[1]	
	Total Score	Rank	z score	Rank[3]	z score	Rank
Hong Kong	1637	1	1.26	3	0.20	17
Finland	1631	2	1.50	1	0.79	3
Singapore	1630	3	1.39	2	-0.26	33
South Korea	1623	4	1.24	4	1.21	1
Japan	1588	5	1.04	5	0.59	8
Canada	1580	6	0.72	=6	0.18	20
New Zealand	1572	7	0.61	9	0.47	9
Australia	1556	=8	0.54	11	0.31	12
Netherlands	1556	=8	0.72	=6	0.32	11
Switzerland	1552	10	0.71	8	0.22	13
Germany	1530	11	0.56	10	0.12	23
Belgium	1528	12	0.43	13	0.20	17
Poland	1503	=13	0.26	14	0.77	4
England	1503	=13	0.50	12	0.81	2

1. For definitions see footnotes to Chart 6.2.

6.6. Comparing the rank orders it is evident that England's rise is due almost entirely to the strand derived from data on adult literacy and graduation rates. England is placed second here, behind only South Korea. On the other hand, the rankings for PISA alone, and combined with TIMSS and PIRLS, are rather similar, with England joint 13th on PISA alone and 12th on the combined score. This is partly due to the inclusion of PISA, but also, as we shall be exploring later in this chapter, the fact that only about half the countries in the Index took part in TIMSS 2007 and PIRLS 2006, and the data for them has had to be calculated from PISA.

[34] For definitions see footnotes to Chart 6.2.

Literacy and Graduation Rates

6.7. Chart 6.4 sets out the actual literacy and graduation rates. It shows that the literacy data will have made almost no contribution to the difference in rankings from PISA. All the leading countries, except Singapore, reported the literacy rate for people aged 15 and over as 99.6 or 99.5 per cent. Singapore's figure falls not far short, but given the closeness of the other scores its standardised score may have been depressed and contributed to its coming 33rd.

Chart 6.4: Literacy and Graduation Rates[1]

Country[1]	% Adult Literacy	%School Graduation	% HE Graduation	Combined Rank
Hong Kong	99.6	nk	nk	=17
Finland	99.6	93.3	48.9	3
Singapore	95.9	nk	nk	33
South Korea	99.6	94.0	63.0	1
Japan	99.6	95.6	40.4	8
Canada	99.6	80.5	36.3	20
New Zealand	99.6	nk	47.4	9
Australia	99.6	67.3	50.0	12
Netherlands	99.6	nk	41.9	11
Switzerland	99.6	89.7	31.3	13
Germany	99.6	86.6	29.9	23
Belgium	99.6	nk	nk	=17
Poland	99.5	83.5	55.4	4
England	99.6	91.6	50.8	2

1. For definitions see footnotes to Chart 6.2. When no data are available, the country has been given the average score for the indicator. This can bring a country's score right down, as the joint 17th place for Hong Kong and Belgium shows, in spite of having nearly complete adult literacy. In the case of Singapore the impact is even greater.

6.8. The effect on the Index rankings is thus mainly due to the reported graduation rates. South Korea and England have been scored high on both upper secondary and higher education graduation and are placed first and second. Countries that normally rank near the top, for example Singapore and Hong Kong, come well down the list, it seems because they did not provide any data on graduation rates and were credited with only average scores. Those averages will have included some very low performing countries.

6.9. Inserting averages for missing data is likely to seriously underestimate the actual position in some high performing countries. Some of the graduation rates for upper secondary education are as low as 45.5 per cent (Indonesia), 47.0 per cent (Mexico) 54.2 per cent (Turkey). For tertiary education the rates reported included 13.5 per cent (Indonesia), 19.8 per cent (Mexico) and 23.0 per cent (Turkey). We can see the impact of inserting averages in Chart 6.4 where both Hong Kong and Belgium record the highest adult literacy rate, but provide no information on graduation rates and are jointly down in 17th place.

6.10. Insertion of averages is, however, not the only reason for unexpectedly low rankings. Australia and Canada have relatively low percentages for upper secondary graduation and Germany, Switzerland and Canada, tertiary graduation. These figures turn on the

definitions adopted. Successful completion of upper secondary education is defined by each country and it can mean passing examinations, certification or merely the completion of a requisite number of course hours[35]. In the case of tertiary education only graduation from Type A courses is counted. These are theory-based and designed to provide sufficient qualifications for entry to advanced research programmes and professions with high skill requirements. Type B courses, those which focus on practical, technical and occupational skills for direct entry into the labour market, are not taken into account. Countries that are strong in their vocational provision, like Germany and Switzerland are not, therefore, likely to come out well in the tertiary graduation rate as defined.

6.11. Even so the percentages for England are surprising. The upper secondary education graduation rate of 91.6 per cent is very different from the 37.2 per cent of the age cohort achieving at least one A-level by the age of 19[36]. A possible explanation lies in the way the OECD characterises upper secondary education. England is exceptional in that it is shown as having a graduation age of 16[37]. In all other OECD countries it extends into the equivalent of sixth form studies. 'Upper secondary education' is not a familiar term in England and it is possible that some confusion has arisen. It would have seemed more appropriate to base the rate on successful completion of A-level or equivalent studies. It does underline the potential weaknesses in using these as comparative data.

6.12. The higher education graduation rates are similarly open to question. The OECD figure[38] of 51.6 per cent for England, used in the Global Index, is not so different from the HEIPR (Higher Education Initial Participation Rate) calculated by the Department for Business, Innovation and Skills[39] of 46.5 per cent in 2010/2011. But the definitions are very different. Besides the obvious difference between participation and completion, the OECD is counting only programmes of at least three years duration, whereas the HEIPR includes students who have participated for at least six months on a course expected to last for at least six months. It seems difficult enough to get an accurate useful figure for your own country let alone for others, and to compare them.

6.13. Some members of the Global Index's distinguished Advisory Panel warned against the use of the literacy and graduation data, but they were resisted by the compilers, the Economist Intelligence Unit[40]. That seems to us to have been a mistake. These data detract from the international comparisons. We have already discussed their limitations, but there is also the issue of missing data. Chart 6.5 shows that data for each country were incomplete in a large number of cases. Inserting averages for missing data exaggerates the performance of some countries and under estimates that of others. Drawing in data from different sources further weakens their comparability.

6.14. There is also the more fundamental question of whether the data can be considered measures of educational attainment. The size and nature of tertiary graduation is very much a matter of policy and the provision. England's high percentage, in so far as it is

[35] *Education at a Glance 2012*, OECD: Paris, Glossary available at http://www.oecd.org/edu/EAG%20Glossary.pdf/.
[36] DfE/BIS (April 2012) Research and Gateway Statistics. *Level 2 and 3 Attainment by Young People in England Measured by Using Matched Administrative Data: attainment by age 19 in 2011*, Table 3.
[37] *Education at a Glance 2012*. Paris: OECD, Annex 1, Table X1.1a (1/2), page 536.
[38] *Education at a Glance 2012*. Paris: OECD, Table A3.1, page 67.
[39] BIS (March 2012), SFR *Participation Rates in Higher Education*, Table 4, page 7.
[40] *The Learning Curve, 2012* Report, page 47.

justified, reflects the massive expansion of higher education in response to government policies. Upper secondary graduation rates will be considerably affected by whether attendance is compulsory or not. Rather than adding to the information from the international tests, the literacy and graduation data only serve to mask it.

Chart 6.5: Data Available for Pearson Index

Component	Countries	
	Available	Missing
PISA 2009		
Reading	40	0
Maths	40	0
Science	40	0
TIMSS 2007 (secondary)		
Maths	20	20
Science	20	20
PIRLS 2006	22	18
TIMSS 2007 (primary)		
Maths	19	21
Science	19	21
Adult Literacy	39	1
Graduation from Upper Secondary	29	11
Graduation from Tertiary	29	11

PISA, TIMSS and PIRLS

6.15. The other strand of the Index is the amalgamation of the PISA 2009, TIMSS 2007 and PIRLS 2006 results. Rather curiously, it is called the Cognitive Skills component when the tests were devised to measure educational achievement. (But this label had been pre-empted, not entirely accurately, for the literacy and graduation rates.)

6.16. Again, there is a lot of missing data. Many of the countries which took part in PISA did not participate in one or both of TIMSS primary and secondary, or PIRLS. Chart 6.5 shows that about half of the 40 countries in the Pearson Index did not take part in TIMSS or PIRLS. Chart 6.6 shows the details for the top performers. There were missing data for eight at the secondary level and six at the primary level.

6.17. The compilers attempted to fill the gaps by calculating from PISA 2009 what the scores would have been. Finland which did not take part in TIMSS 2007 or PIRLS 2006 was credited with top scores on all dimensions. This may not have been entirely appropriate. In Chart 3.2, page 9, we saw that some countries did markedly better in PISA than TIMSS. Finland did take part in TIMSS 2011 and its maths performance then was not as good as its PISA 2009 results projected them to be.

6.18. It is not surprising that the rankings for PISA 2009 alone and PISA, TIMSS and PIRLS combined in the Pearson Index should be so close (Chart 6.3, page 20). Apart from its direct contribution, when there were missing data it could have contributed up to two-thirds of the overall score.

6.19. Countries, like Australia and New Zealand, which took part in at least some of the TIMSS/PIRLS tests, but were less good at them than they were at PISA will have been disadvantaged by the regressions from PISA.

Chart 6.6: Scores on TIMSS and PIRLS[1]

Country	Secondary		Primary		
	TIMSS 2007 Maths	TIMSS 2007 Science	TIMSS 2007 Maths	TIMSS 2007 Science	PIRLS 2006 Reading
Hong Kong	572	530	607	554	564
Finland	np	np	np	np	np
Singapore	593	567	599	587	558
South Korea	597	553	np	np	np
Japan	570	554	568	548	np
Canada	np	np	np	np	np
New Zealand	np	np	492	504	532
Australia	496	515	516	527	np
Netherlands	np	np	535	523	547
Switzerland	np	np	np	np	np
Germany	np	np	525	528	548
Belgium	np	np	np	np	524[2]
Poland	np	np	np	np	519
England	513	542	541	542	539

1. Key: np = did not participate. Where country did not take part a score was estimated by regression on PISA.

2. Average of Flemish and French Belgium.

6.20. In *England's Education*[41] we were able to compare the scores of 14 countries where samples from the same cohort of children had taken the TIMSS maths test in 1999 and the PISA maths test of 2000. Chart 6.7 shows there were marked differences. New Zealand was fourth among the 14 countries in PISA 2000, but only 13th on TIMSS 1999. Finland was fifth on PISA, but joint eighth on TIMSS. England also emerges higher on PISA, but, as we have discussed already, the sample was dodgy.

6.21. Hungary, Russia and Latvia were among the countries to fare much better on TIMSS than PISA. Hungary was fourth against 11th; Russia was sixth against 12th; and Latvia tenth compared with 13th.

Résumé

6.22. On a PISA 2009 scale combining the reading, maths and science scores England emerges in joint 18th place; on the Pearson Global Index published in 2012 it is placed sixth. Five of the jurisdictions that took part in PISA 2009 (Shanghai, Taiwan, Liechtenstein, Estonia, and Macao) are not included in the Pearson Index.

6.23. In the graduation data incorporated into the Pearson Index, England comes second behind South Korea, enabling it to overtake eight countries (Canada, New Zealand, Australia, the Netherlands, Switzerland, Germany, Belgium and Poland). We found the graduation data to be unhelpful because there was evidence that the definitions

[41] Smithers, A. (May 2004). *England's Education: what can be learned by comparing countries?* London: Sutton Trust, Table 2, page 4.

(themselves contestable) had been interpreted differently and the data were incomplete. Further, they appeared to reflect policy and provision rather than educational attainment.

Chart 6.7: Maths Rankings

Country	TIMSS 1999[1]		PISA 2000[2]	
	Score	Rank	Score	Rank
South Korea	587	1	547	2
Japan	579	2	557	1
Belgium (Flemish)	558	3	543	3
Hungary	532	4	488	11
Canada	531	5	533	6=
Russia	526	6	478	12
Australia	525	7	533	6=
Finland	520	8=	536	5
Czech Republic	520	8=	498	9
Latvia	505	10	463	13
USA	502	11	493	10
England	496	12	529	8
New Zealand	491	13	537	4
Italy	479	14	457	14

1. *TMISS 1999 International Student Achievement in Maths* http://www.iea.nl, Exhibit 1.1.

2. OECD (2001) *Knowledge and Skills for Life, First Results from PISA 2000.* Paris: OECD, Table 3.1, except for Belgium (Flemish) from Table B2.1 and England from *First Release International Student Assessment 2000*, London: DfES, 2001, Table 2.

6.24. Although PISA contributed 26.6 per cent of the Pearson Index score, TIMSS primary and secondary together contributed 31.1 per cent. In more than half the cases the TIMSS results had no bearing because the country had not participated and its scores were derived from PISA by regression. But some of the countries which did take part in TIMSS, notably Australia and New Zealand, performed much less well there (where the tests are different) than they had on PISA. This will have played a part in England overtaking them on the Pearson Index.

6.25. The rather unexpected conclusion is that when omissions, the distorting effect of including graduation rates, and differences in the aims of the tests are taken into account, PISA 2009 and the Pearson Index 2012, despite appearances, give more or less the same result. It is not so surprising when it is realised what a large contribution the PISA scores make to the Index, accounting for two-thirds of the score when the country did not take part in TIMSS or PIRLS. The Global Index places Hong Kong, Japan, Singapore and South Korea together with Finland above England. Apparent differences beyond this core can be reconciled, as we show in the next chapter.

7. Reconciling PISA, TIMSS/PIRLS and Pearson Rankings

7.1. The latest PISA and TIMSS/PIRLS league tables send mixed messages about England's educational standing. In PISA, England is well down the list and all is gloom and doom; in the TIMSS/PIRLS England looks to be moderately successful; and in the Pearson Global Index England is close to the top. Can these widely divergent results be reconciled? In fact, they can without too much difficulty.

Secondary School Pupils

7.2. Chart 7.1 identifies the countries that perform significantly above England. In PISA 2009, it was respectively 12, 20 and 10 countries in reading, maths and science. In TIMSS 2011 it was six for maths and five for science. In the Pearson Index it was again five.

Chart 7.1: Performance of Secondary School Pupils[1]

Country	PISA 2009			TIMSS 2011		Pearson Index 2012
	Reading	Maths	Science	Maths	Science	
Australia	**A**	**A**	**A**			
Belgium[2]	**A**	**A**		np	np	
Canada	**A**	**A**	**A**	np[2]	np[2]	
Denmark		**A**		np	np	
Estonia		**A**	**A**	np	np	np
Finland	**A**	**A**	**A**		**A**	**A**
Germany		**A**		np	np	
Hong Kong	**A**	**A**	**A**	**A**		**A**
Iceland		**A**		np	np	np
Japan	**A**	**A**	**A**	**A**	**A**	**A**
South Korea	**A**	**A**	**A**	**A**	**A**	**A**
Liechtenstein		**A**		np	np	np
Macao		**A**		np	np	np
Netherlands	**A**	**A**		np	np	
New Zealand	**A**	**A**	**A**			
Norway	**A**					
Shanghai	**A**	**A**	**A**	np	np	np
Singapore	**A**	**A**	**A**	**A**	**A**	**A**
Slovenia		**A**				np
Switzerland		**A**		np	np	
Taiwan		**A**		**A**	**A**	np
Russia				**A**		
Total Above	12	20	10	6	5	5
Non-Participants	0	0	0	11	11	7

1. Key: **A** = above, np = non participation, blank = either similar to or below England.
2. Provinces used in benchmarking not in main analysis.

Maths

7.3. How does the fact that there are 20 countries ahead in PISA maths square with the six in TIMSS maths? Chart 7.1 shows it is mainly due to over half the countries ahead in

PISA not participating in TIMSS. If we look at it country by country we can see that the two listings fit together in the following way:

- five countries perform above England in both PISA and TIMSS (Hong Kong, Japan, Singapore, S Korea and Taiwan);
- 11 above England in PISA 2009 did not take part in TIMSS 2011 (Belgium, Canada, Denmark, Estonia, Germany, Iceland, Liechtenstein, Macao, Netherlands, Shanghai, Switzerland);
- four countries performed relatively better in PISA 2009 than TIMSS 2011 (Australia, Finland, New Zealand, and Slovenia);
- one country performed relatively better on TIMSS 2011 than PISA 2009 (Russia).

Science

7.4. In science 10 countries were ahead in PISA compared with five in TIMSS. Chart 7.1 shows:

- four countries were above in both PISA and TIMSS (Finland, Japan, Singapore, S Korea);
- three above England in PISA 2009 did not take part in TIMSS 2011 (Canada, Estonia, and Shanghai);
- three countries performed relatively better in PISA 2009 than TIMSS 2011 (Australia, Hong Kong and New Zealand);
- one country performed relatively better on TIMSS 2011 than PISA 2009 (Taiwan).

Pearson Index

7.5. The Pearson Index incorporates both PISA and TIMSS results so it is to be expected that those ahead on both should also lead the Index. That is indeed the case with Finland, South Korea, Hong Kong, Japan, Singapore, in that order, ranked above England (though not necessarily significantly). Taiwan which might also have come out above England was not included, along with four other countries that were significantly above England in PISA 2009.

7.6. As we saw in Chapter 6, England moves up the order in the Pearson Index mainly because of its high placing for the graduation rates from secondary school and higher education. But, as we have already discussed, there have to be considerable doubts about the usefulness of these data.

Primary School Pupils

7.7. Fewer countries came above England in the primary school tests because the reading, maths and science positions reflected the limited range of top-performing countries participating in the PIRLS/TIMSS studies. Leaving aside the PISA results, the outcomes for the secondary and primary phases are broadly similar.

7.8. Chart 7.2 shows there is a core of countries where primary pupils do better than England on at least two out of the reading, maths and science tests. Again Finland, Hong Kong, Japan, Singapore, South Korea and Taiwan emerge as top performers.

They are joined in TIMSS/PIRLS 2011 by Russia. Five of these jurisdictions also come above England in the Pearson Index, the exceptions being Taiwan, which was not included in the Index, and Russia, which does poorly in PISA. The United States performs significantly above England in primary science.

Chart 7.2: Performance of Primary School Pupils[1]

Countries[2]	PIRLS	TIMSS 2011		Pearson
	Reading	Maths	Science	Index
Finland	**A**		**A**	**A**
Hong Kong	**A**	**A**		**A**
Japan	-	**A**	**A**	**A**
S Korea	-	**A**	**A**	**A**
Singapore	**A**	**A**	**A**	**A**
Taiwan	**A**	**A**	**A**	np
Russia	**A**		**A**	
United States			**A**	
Total Above	4	6	8	5

1. Key: **A** = above, np = non participation, blank = either similar to or below England.

2. Northern Ireland also participated in TIMSS and PIRLS and scored above England in reading and maths, but below in science. Other countries in the UK have been omitted from this report.

Résumé

7.9. The seemingly very different pictures emerging in the latest rounds of PISA, TIMSS/PIRLS and Pearson can be reconciled by taking into account four things.

There is a core of six jurisdictions - five Asian, Hong Kong, Japan, Singapore, South Korea, and Taiwan and one European, Finland - where the pupils perform consistently above England.

While there is some overlap, different countries are involved in PISA, TIMSS/PIRLS and Pearson. Twice as many countries are ahead of England in PISA maths as TIMSS maths, but half those countries did not take part in TIMSS.

The comparisons in the Pearson Index are distorted by the inclusion of data on graduation rates from schools and higher education (adult literacy makes little difference since almost all the top performers are recorded as 99.6%). England does well out of the incorporation of these data, but as we saw in Chapter 6 there are good reasons for doubting their accuracy. The inclusion of the graduation data does not affect England's standing vis-à-vis the very top performers, but enables it to overtake a number of countries that were ahead in PISA.

The nature of the PISA and TIMSS tests are different[42.] Broadly speaking, PISA aims to test the capacity to apply knowledge and understanding; TIMSS is more directed to what is known and understood. Some countries do much better on one than the other.

[42] Discussed in detail in Smithers. A. (May 2004). *England's Education*. London: Sutton Trust.

7.10. In seeking to learn from successful countries, there are thus four groups to be considered: those which did well across the tests; those that did well in PISA but not in TIMSS; those that did well in PISA but did not take part in TIMSS; and countries which did well in TIMSS but not PISA. We consider what pointers they provide in the final chapter, Chapter 9.

8. A Long Tail of Under-Performance?

8.1. Differences in means are only part of the story. It is also important to consider the spread of scores. This could indicate that an education system was tilted towards the potentially top performers or those who struggle, or achieve good average performance at the expense of the ends of the spectrum.

8.2. It is often said that in England there is a wider range of performance than in other countries with a long tail of underachievement. The claim was given substance by a review[43] of international studies published in 1996 which concluded: "English children have a very wide range of achievements, and a greater proportion of low achieving children". That has been repeated many times since, most recently by Elizabeth Truss, a junior minister in the Department of Education, who on the release of the TIMSS and PIRLS 2011 results commented[44]: "the rise in performance in reading is encouraging but there is too long a tail of underperformance".

Primary School Pupils

8.3. In Chart 8.1 we compare the performance of primary school pupils in England with those of all other countries participating in PIRLS/TIMSS 2011 in terms of mean scores, standard deviations, and percentages of highest and lowest achievers. It can be seen that, in all cases, England performed above the mean with a lower standard deviation. There were more pupils in England at the highest level and fewer at the lowest level or below. There were more at the lowest level than the highest in maths and science, but since this is true generally it probably reflects where the benchmarks are pitched. In reading, where the minister expressed concern at the long tail of underperformance, the percentages at the highest and lowest levels were about the same.

Chart 8.1: Distribution of Scores of England's Primary Pupils

Test	Mean	Standard Deviation	% Highest Level	%Lowest Level or Below
PIRLS Reading				
England	552	82	18	17
Mid Points[1]	500	100	8	20
TIMSS Maths				
England	542	89	18	22
Mid Points[1]	500	100	4	31
TIMSS Science				
England	529	82	11	24
Mid Points[1]	500	100	5	28

1. The IEA sets the mid-point to 500 and the standard deviation to 100 and records the median percentage reaching each benchmarked level.

8.4. A very wide range of countries participate in PIRLS and TIMSS, including some with very low educational achievement. It could be argued that England should not be comparing itself with the averages so derived, but with the countries achieving the level

[43] Reynolds, D. and Farrell, S. (1996). *Worlds Apart? a review of international surveys of educational achievement involving England*. London: HMSO.

[44] http://www.education.gov.uk/inthenews/speeches/a00218356/education-minister-gives-speech-on-international-evidence.

of performance to which it aspires. In Chart 8.2 we compare England's mean scores and standard deviations with those of the six top-performing countries. As to be expected, England falls below those countries on means. But, tellingly, the standard deviations are higher.

Chart 8.2: Standard Deviations of Primary School Pupils

Country[1]	PIRLS 2011 Reading		TIMSS 2011 Maths		TIMSS 2011 Science	
	Mean	SD	Mean	SD	Mean	SD
Singapore	567	80	606	78	583	82
South Korea	-	-	605	68	587	66
Hong Kong	571	61	602	66	535	74
Taiwan	553	67	591	73	536	74
Japan	-	-	585	72	559	64
Finland	568	64	545	68	570	67
England	552	82	542	89	529	82
Average	500	100	500	100	500	100

1. Top performing countries.

8.5. Chart 8.3 shows that both the highest and lowest benchmarks are involved in England's wider spread of scores. In maths and science about twice as many in the top countries as in England reach the highest benchmark and about half as many are down at the lowest level. This neat pattern is disrupted somewhat by the results for reading, but the percentage of highest achievers here is affected by the absence of Japan and South Korea and the relatively poor performance of Taiwan.

Chart 8.3: Highest and Lowest Benchmarks - Primary

PIRLS/ TIMSS	England %Highest	England %Lowest or Below	Top Countries[1] %Highest	Top Countries[1] %Lowest or Below
Reading	18	17	18	10
Maths	18	22	33	10
Science	11	24	20	11

1. Finland, Hong Kong, Japan, Singapore, South Korea and Taiwan. Japan and South Korea did not take part in PIRLS 2011.

8.6. It seems reasonable to see these results as indicating not so much a long tail as too many at the lowest level but also not enough at the highest level.

Secondary School Pupils

8.7. In Chart 8.4 we compare the performance of England's secondary school pupils with the OECD averages in PISA 2009 and the TIMSS 2011 mid-points. It can be seen that, in all cases, England again scores above the mean with a lower standard deviation. In terms of the PISA benchmarks England has fewer at the lowest levels than the OECD average, but only has more at the highest level in science. There is no great evidence here of a long tail. Rather it shows that the potential top performers are not doing well enough. The impression of a long tail of underachievement could come from the levels at which the benchmarks are pitched. Many fewer reach the top level than are at the bottom across the OECD countries and TIMSS participants. In reading, for example,

the OECD average is for 20 times as many to be at the lowest levels as reach the top. This imbalance is borne out by TIMSS where the ratio of low performers to high performers is 18:1.

Chart 8.4: Distribution of Scores of England's Secondary Pupils

Test	Mean	Standard Deviation	% Highest Level	%Lowest Level or Below
PISA Reading				
England	500	94	1.0	18.4
OECD[1]	492	98	1.0	19.7
PISA Maths				
England	493	87	1.7	19.8
OECD[1]	488	97	2.8	24.8
PISA Science				
England	515	99	1.9	14.8
OECD[1]	496	100	1.1	15.0
TIMSS Maths				
England	507	85	8	35
Mid Points[2]	500	100	3	54
TIMSS Science				
England	533	85	14	24
Mid Points[2]	500	100	4	48

1. Treated as one OECD sample.

2. The IEA sets the mid-point at 500 and the standard deviation at 100, and gives the median percentages reaching each benchmarked level.

8.8. In Chart 8.5, as with the primary phase, we show the results for the six countries whose pupils consistently perform significantly above England.

Chart 8.5: Standard Deviation of Scores of Secondary Pupils

Country[1]	PISA 2009						TIMSS 2011			
	Reading		Maths		Science		Maths		Science	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Singapore	526	103	562	104	542	104	611	84	590	97
South Korea	542	87	546	89	538	82	613	90	560	77
Hong Kong	530	94	555	95	549	87	586	84	535	75
Taiwan	495	86	543	105	520	87	609	106	564	84
Japan	530	110	529	94	539	100	570	85	558	76
Finland	532	99	541	82	554	89	514	65	552	65
England	500	94	493	87	533	99	505	85	533	85
Average	492	98	488	97	496	100	500	100	500	100

1. Countries listed in order of total scores across the five dimensions: Singapore (2,831), South Korea (2,799), Hong Kong, (2,755), Taiwan (2731), Japan (2726), and Finland (2693). England's score is 2,564, and the average is 2,476.

8.9. It can be seen that the spread of scores in England is no greater than in these top performing countries. Its average standard deviation is 90 compared with an average of 89.5 for the top six. The TIMSS standard deviations for England are no higher than those for primary school pupils, but with the notable exception of Finland those for the

other countries have risen, in some cases taking them beyond England. It appears that while there is a wider spread of scores in England's primary schools than in the top performing countries, this does not increase in the secondary phase. But in top performing countries, other than Finland, it does.

8.10. In Chart 8.6 the comparison focuses on the percentages of the highest and lowest performers. England does have more poor performers than the top countries. It also has fewer high scorers. This is particularly the case in maths where in PISA over five times as many in the top countries reach the highest benchmark while in TIMSS the difference is more than fourfold.

Chart 8.6: Highest and Lowest Performers- Secondary

PISA/ TIMSS	England		Top Countries[1]	
	%Highest	%Lowest or Below	%Highest	%Lowest or Below
PISA				
Reading	1.0	18.4	1.4	12.3
Maths	1.7	19.8	9.4	10.0
Science	1.9	14.8	2.4	8.7
TIMSS				
Maths	8	35	35	13
Science	14	24	21	15

1. Finland, Hong Kong,, Japan, Singapore, South Korea, Taiwan.

Résumé

8.11. A claim that is often made is that England has a long tail of underachievement. Among primary school pupils in PIRLS/TIMSS 2011 the dispersion was greater than for the top performing countries, but this was associated with fewer high achievers as well as more low achievers. Most countries participating in PISA and TIMSS had many more at the lowest levels than the highest, even some of the top performers in PISA. Thus England is not alone in having poor performers.

8.12. While the spread of scores for England's secondary school pupils in TIMSS remains much the same as in the primary phase, in the top performing countries, with the notable exception of Finland, it grows wider. The dispersion in some top performing countries becomes greater than that in England. England continues to have fewer reaching the highest benchmark and more down at the lowest benchmark or below, most obviously in maths. If there is a lesson to be draw from these figures, it is that for England to rival the top performing countries it has to enable all children to develop to the fullest extent; not just try to lever up from the bottom.

9. What Do International Comparisons Tell Us?

9.1. The purpose of this report has been to investigate why international testing programmes designed to compare education systems apparently produce such different results. For secondary school pupils, in PISA 2009 England came joint 27th in maths, but in TIMSS 2011 it was tenth. In PISA science England ranked 16th, but ninth in TIMSS science. In the Pearson Global Index, which combines PISA and TIMSS and adds in some other data, England is up in sixth place.

9.2. On close scrutiny, however, it emerges that there is a coherent picture underlying these apparently contradictory league tables. A group of Asian jurisdictions do outstandingly well, particularly in maths. When they take part, Hong Kong, Japan, Macao, Shanghai, Singapore, South Korea and Taiwan occupy the top positions. They are often joined by Finland.

Why do the League Tables Differ?

9.3. Beyond the core of top performers there are countries that come out above England in some international comparisons but not others. There are three main reasons for the different results from PISA and TIMSS and a further one that is at the heart of the difference between the PISA/TIMSS and the Pearson Global Index.

9.4. The PISA and TIMSS rankings differ because:

- they are based on raw scores which can make it appear that a country has done better when it has not;
- not all the top performing countries take part in both programmes;
- some countries do better at PISA than TIMSS or vice versa.

Let us look in detail at how at each contributes to the different maths placings. The explanation for the different science league positions is similar.

Raw Scores

9.5. A difference of a point or two in the mean score can have a disproportionate effect on the ranking. But raw scores are subject to random variation, and an apparent difference may not be real. In this report when considering PISA and TIMSS (Pearson provides only rankings), we count countries as doing better than England only if we can be at least 95 per cent sure that we are dealing with an actual difference.

9.6. When we apply this statistical razor to the PISA 2009 and TIMSS 2011 league tables, the number of countries achieving above England in PISA maths falls from 26 to 20 and in TIMSS maths from nine to six. The number outscoring England in PISA science falls from 15 to 10 and in TIMSS science from eight to five. The countries above England in TIMSS maths are essentially the core countries, with others joining them in PISA.

Non-Participation

9.7. The following 15 countries did better in PISA 2009 maths than TIMSS 2011 maths: Australia, Belgium, Canada, Denmark, Estonia, Finland, Germany, Iceland, Liechtenstein, Macao, the Netherlands, New Zealand, Shanghai, Slovenia, and Switzerland. The main reason why these countries did not similarly shine in the TIMSS test is that they did not take part. Eleven of the 15 were absent (there was a

Canadian presence but only for benchmarking). The other four - Australia, Finland, New Zealand and Slovenia - took part in both but did not do as well in TIMSS as PISA.

Tests are Different

9.8. A third reason for the discrepancy is that the PISA and TIMSS tests are different[45]. PISA began with the intention of testing 'literacy', the capacity to apply knowledge and understanding, rather than the subjects themselves. TIMSS is more concerned with testing knowledge and understanding. The two sets of tests can produce very different results. TIMSS 1999 and PISA 2000 sampled the same age cohort in 14 countries[46.] The rank orders were rather different with Hungary and Russia doing much better on TIMSS than PISA, and New Zealand much worse. This reversal is borne out in the latest rounds of PISA and TIMSS, with Australia and New Zealand above England on PISA, but below in TIMSS. Having grown used to being among the top performers in PISA both countries have found the results of TIMSS 2011 hard to take[47]. Finland and Slovenia also did relatively better in PISA 2009 than TIMSS 2011. Russia was among the top performers in TIMSS 2011 maths, but below England in PISA 2009 maths.

Changes over Time

9.9. Taking the results from PISA and TIMSS at their face value, they appear to give diametrically opposed pictures of how England's education system is progressing. In PISA maths performance seems to have declined markedly since 2000, but in TIMSS maths it appears to have shown considerable improvement since 1999. But, as we have already discussed, the results cannot be taken at their face value. The poor response rate in PISA 2000 means that it is not safe to use as baseline, even indicatively. The results from PISA 2006 and 2009 are broadly similar with new entrants in 2009 pushing England down a couple of pegs.

9.10. The apparent improvement in the TIMSS rankings from 20th in 1999 to 10th in 2011 can be explained in similar terms. Five of the 19 countries placed above England in 1999 were there as a results of a slightly higher score which did not signify a real difference. Of the other 14, five did not take part in TIMSS 2011 and six continued to outscore England, leaving only three where the position changed.

9.11. The trends which seem to shout out from the rankings are thus an artefact. Strictly speaking, in any case, it is wrong to discern trends from cross-sectional studies. Although it would be difficult to implement, consideration should to be given to designing some longitudinal international studies.

Primary School Pupils

9.12. There is not such a sharp contrast in the rankings of the performance of primary school pupils because there is no PISA. TIMSS and PIRLS come from the same IEA stable and embody the same philosophy and approach. Six of the countries which were significantly ahead of England in at least two of the subject areas in 2011 have a familiar ring to them: Finland, Hong Kong, Japan, Singapore, South Korea and

[45] Smithers, A. (May 2004). *England's Education; what can be learned from other countries*? London: The Sutton Trust.
[46] Ibid.
[47] http://theconversation.edu.au/latest-tests-show-pms-2025-education-goal-is-in-doubt-11292/.; http://www.news.com.au/national/australian-students-lagging-behind-rest-of-world-in-reading-maths-and-science/story-fndo4dzn-1226534847368; http://www.stuff.co.nz/dominion-post/news/politics/8070279/NZ-education-under-performing-Parata/.

Taiwan. Russia with its predilection for TIMSS-type tests joins them, as does a new entrant – Northern Ireland.

Pearson Global Index

9.13. Having grown used to being fed a diet of England's declining educational performance, there was general surprise in December 2011 to hear that England was actually sixth in the world. In PISA three years previously it had fallen as low as 27th. But, when we unpack how the league tables have been put together, it turns out that the difference is a matter of calculation rather than educational performance.

9.14. As we showed in Chapter 6, scores in the Global Index are made up of 26.6 per cent PISA 2009, 31.1 per cent TIMSS 2007, 8.9 per cent PIRLS 2006, 11.1 per cent adult literacy, 11.1 per cent successful completion of upper secondary education, and 11.1 per cent graduation from tertiary education. That was the intention, but about half the countries included in the Index did not take part in either TIMSS 2007 or PIRLS 2006 or both, and their scores were derived from PISA. In these cases PISA could contribute as much as two-thirds of the whole index.

9.15. No surprise then that there should be a close correspondence between the order of countries in what the compilers call the Cognitive Skills strand of the Index and the PISA results since they are essentially the same thing. The main reason why England comes 18th on the combined PISA results and 12th on 'Cognitive Skills is that five of the eighteen ahead in PISA were not included in the Index.

9.16. England rises from 12th on the 'Cognitive Skills' strand to sixth in the Index overall because it is placed second on the 'Educational Attainment' strand. Adult literacy does not contribute much to the differentiation since nearly all the countries above and around England score the same as England, so its high placing comes from the completion and graduation data. There are, however, strong reasons for doubting their accuracy. There was evidence that the definitions (themselves contestable since countries with well developed and popular vocational pathways miss out) had been interpreted differently and the data sets were incomplete, with averages being inserted to the disadvantage of some countries. It is also reasonable to question how far these rates reflect educational achievement and how much they are a consequence of policy and the provision of places.

9.17. When the absent countries, the distortions arising from the use of completion and graduation rates, and differences between the tests are taken into account, PISA, TIMSS and the Pearson Index produce much the same result: there is a core of Asian countries which consistently perform above England. Finland is also frequently ahead. Does this necessarily mean that their education systems are better?

Superior Education Systems?

9.18. Daniel Kahneman[48] is rather good on how the human brain erroneously leaps to causal explanations. Since the OECD's PISA and the IEA's TIMSS and PIRLS were set up to enable us to judge the effectiveness of education systems, it is easy to assume than any differences in educational performance must reflect the quality of education provided.

[48] Kahneman, D. (2012). *Thinking Fast and Slow*, London: Penguin, chapter 10.

9.19. But this does not follow. The root causes of the differences could lie outside the schools. A number of people have been fascinated by the success of the Asian countries in international tests, particularly in maths. Gladwell[49] ascribes it to national cultures which "place the highest emphasis on effort and hard work". Cain[50] puts it down to the personality trait of "quiet persistence". Chua[51] singles out 'tiger mothers', the belief that "academic achievement reflects successful parenting". It is true that the Asian success in education is portable and not confined to the education systems of their countries. Chinese pupils are the highest attaining ethnic group in England[52].

9.20. Speculation about the causes of the undoubted success of the Chinese and other Asians does not exhaust the possible reasons why one country does better than another in international tests, unconnected with the quality of its education. The tests could be taken a lot more seriously in some countries than others, a matter of national pride even. The consequences of succeeding or failing at school may be much greater when, for example, there is no generous welfare state. There could be differences in the gene pool. Even where the differences are school-related it may not tell us much about how good the system is. The pupils might be better prepared and practised in the techniques for taking the particular tests of reading, maths and science - a special case of teaching to the test[53]. The question content and/or the style of questioning may be more suited to some countries. The tests might fit better into the rhythm of school year. The extent and nature of immigration has a big effect on a country's scores.

A Long Tail of Under-Performance?

9.21. A causal link to education systems could be inferred if links to particular patterns of performance could be identified. England's education system is thought to be weak because it has a long tail of underachievement. This was reiterated most recently by Liz Truss[54], a minster at the Department of Education. Our analysis finds that a higher proportion of children in England do poorly on PISA than in the top performing countries, and among primary school children it has a wider spread of scores. So there are low achievers who should be doing much better. But there are also fewer children reaching the highest benchmarks.

9.22. Apart from Finland, the performance of the pupils of the top countries becomes more dispersed in secondary education, so that England is no longer different in this respect. It does, however, have fewer at the highest level and more at the bottom. To rival the best-performing countries, the whole distribution has to be educated upward, not just those who struggle. In Finland, the scores are more tightly bunched than elsewhere.

Spin

9.23. We have been able to show how some of the misconceptions about the international standing of England's education system have arisen. But there is no doubt that the difficulties in making sense of the outcomes have been exacerbated by the ways in

[49] Gladwell, M. (2008). *Outliers*. London: Allen Lane, page 248.
[50] Cain, S. (2012). *Quiet.* London: Penguin, page 201.
[51] Chua, A. (20110. *Battle Hymn of the Tiger Mother*. London Penguin Group.
[52]DFE (December 2012) *National Curriculum Assessments at Key Stage 2 in England 2011/2012.* SFR33/2012; DfE/BIS (9 February 2012). *GCSE and Equivalent Attainment by Pupil Characteristics 2010/11.* SFR 03/2012/.
[53] Mansell, W. (2007). *Education by Numbers: the tyranny of testing.* London: Politico's.
[54] http://www.education.gov.uk/inthenews/speeches/a00218356/education-minister-gives-speech-on-international-evidence.

which the findings have been spun. The early results from PISA were talked up by the Labour Government of the day, seemingly because they were looking for evidence to support the reforms they had introduced. The present Government tends to take a gloomy view which is not unhelpful in its desire to find a justification for changes it wishes to make. This is not confined to England; politicians in many other countries like to put a spin on their results[55]. International comparisons pose many interesting questions, but they cannot bear all the weight that is being put upon them.

Lessons

9.24. England's position in international education league tables depends on which other countries take part and what is taken into account. Cutting through the spin, there are three groups of countries which perform above England: those which consistently do better; those that perform better in one or other set of tests, usually PISA; and a large group of high performers in PISA which are absent from TIMSS.

Top Performers

9.25. Five Asian countries (Hong Kong, Japan, Singapore, South Korea, Taiwan) do better than England across PISA, TIMSS and PIRLS. Other Asian countries are prominent when they take part. The tests are designed to enable education systems to be compared, and it is easy to assume that any differences in pupil performance are due to the education system. But this is not necessarily the case.

9.26. The success of Asian countries in the international comparisons has been variously attributed to a culture of hard work and effort, personality, or parenting style. The success of Chinese children is portable since they also shine in England's education system. Besides cultural and personal differences, there are many other factors that could come into play, for example, the importance of the results to a country and the extent of preparation and practise for the tests.

9.27. This is not to say that the schools of those countries that consistently perform above England are not of high quality; only that there may not be a magic bullet which can be incorporated into England's education system.

9.28. Finland is the other country that regularly emerges in the leading group. It has a distinctive pattern of performance with a high mean and low standard deviation. It reduced its percentage of low performers, but it has fewer reaching the highest benchmark than might have been expected. In fact, it does better than England only in primary science[56]. Finland's results are likely to have been an education system effect, though Cain suggests that "Finland is a famously introverted nation", which could have contributed to its success in tests[57]. But is it a pattern we could, or would wish to, emulate in its entirety? Finland is, itself, concerned at its failure to produce sufficient numbers of really high-fliers[58].

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[55] Wiseman, A.W. (December 2010*). The Impact of International Achievement Studies on National Education Policymaking*. Bingley: Emerald Group Publishing.
[56] http://giftedphoenix.wordpress.com/2013/01/
[57] Cain, S. (2012). *Quiet.* London: Penguin, page 14.
[58] Private communication; see also Savolainen, H. (2009) 'Responding to diversity and striving for excellence', *Prospects*, 39, 281-92. http://users.jyu.fi/~makaku/Article2.pdf/.

Success in PISA

9.29. The differences in the PISA and TIMSS results are not surprising since the tests have different intentions. In the case of PISA, the aim is to test the capacity to apply knowledge, signalled by the early tests being designated tests of 'literacy' in reading, maths and science. In TIMSS, the emphasis is more on directly testing knowledge and understanding. Many of the countries performing above England in PISA did not take part in TIMSS so we do not know whether their results are generally good or particular to PISA.

9.30. What can we learn from the countries that performed above England in PISA, whether or not we have information from TIMSS? The answer will depend on the extent PISA tests are thought to embody the purposes of education and measure attainment accurately. Such is the importance attached to the results by governments that there is the danger that they will come to define education. The education minister, Elizabeth Truss, has declared that England's performance in PISA must be improved[59]. This is almost rendering the tests as important nationally as the accountability measures are to schools. If we are not careful, the consequences will be the same: teaching to the test. The shortest and surest way of raising England's scores on PISA is to train the pupils to take the tests. Wales, shocked at its failure in PISA, is already proposing to do so[60].

Conclusion

9.31. If there is a lesson to be drawn from the analyses of this report it is: don't leap to conclusions based on a country's apparent ranking in league tables. The messages are decidedly mixed, the scores arise in many different ways, with perhaps the schools playing only a small part. The international comparisons are yielding masses of data which could prove invaluable. But they need to be interpreted cautiously and sensitively.

[59] http://www.education.gov.uk/inthenews/speeches/a00218356/education-minister-gives-speech-on-international-evidence.

[60] http://wales.gov.uk/topics/educationandskills/publications/guidance/pisaguide/?lang=en/.