RESEARCH NOTE

Educational Performance and Funding in New Zealand: Are our children getting the education they deserve?

THE NEW ZEALAND INITIATIVE

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Introduction

A well-functioning education system that delivers good outcomes for all is essential to New Zealand's future prosperity and the wellbeing of its people. However, there have been a number of recent reports highlighting our declining educational performance.

Arresting this trend will require a better understanding of the problem and potential causes. To that end, this report takes a closer look at the evidence on New Zealand students' educational achievement and examines whether a lack of funding may be playing a role.

In particular, this report examines the recent performance of New Zealand's education system through the lens of three international education surveys: PIRLS, TIMSS and PISA. These surveys cover the mid-1990s to 2019 and provide snapshots of primary and secondary students' performance in reading, mathematics and science every three to five years. The results help us track the performance of New Zealand students and make comparisons with other countries.

Education funding in New Zealand over time and relative to other countries is then examined using OECD data on average annual per-pupil education spending for primary and secondary students. The purpose is to see whether a lack of funding, or poor value for money from that funding, is a likely key driver of New Zealand's education outcomes. Further analysis explores the relationship between per-pupil spending and achievement across countries, and how that relationship differs between high and low education spending countries.

The analysis shows that both primary and secondary students' performance has declined over recent decades. As a result, our international rankings in reading, maths and science have slipped, in some cases markedly. At the same time, New Zealand's per-pupil education spending on primary and secondary students has increased substantially, both in absolute and relative terms.

It appears our additional investment has not borne fruit, and we should not necessarily expect it will in the future. Indeed, OECD analysis suggests there is virtually no relationship between per-pupil spending and achievement beyond a certain level of spending, a level New Zealand has surpassed.

Educational performance

The three international education surveys used in this report to study and discern patterns in New Zealand's educational performance are the Progress in International Reading Literacy Study (PIRLS); the Trends in Mathematics and Science Study (TIMSS); and the Programme for International Student Assessment (PISA).

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PIRLS is conducted every five years and measures trends in reading literacy among middle-primary school students. In the latest survey, in 2016, 41 countries participated.

TIMSS is conducted every four years and measures both maths and science among middle-primary and lower-secondary students. The latest survey year was in 2019: 58 countries participated at the middle-primary level, and 39 countries at the lower-secondary level.

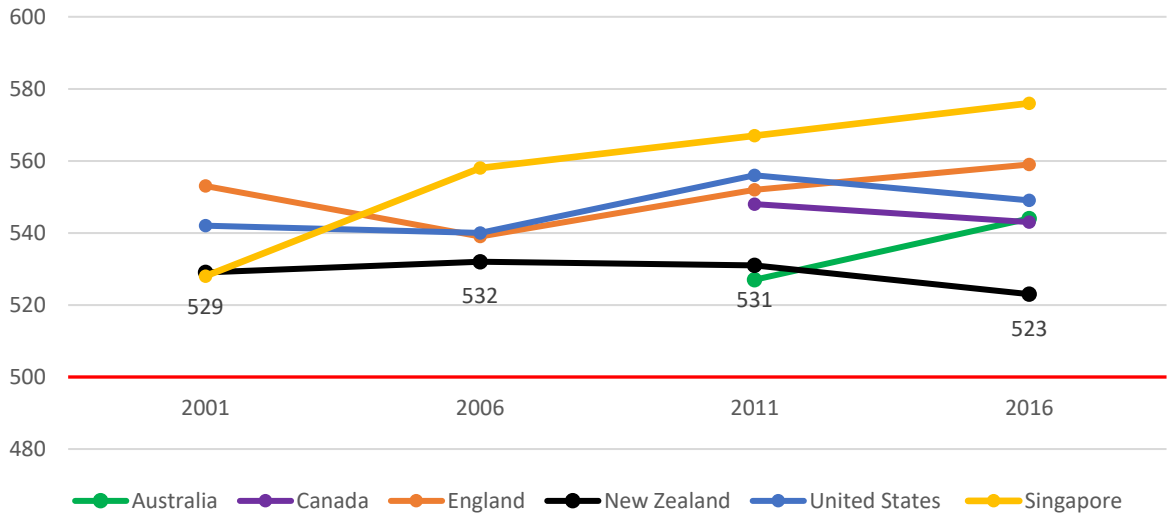
PISA is administered by the OECD and conducted every three years. It focuses on OECD member countries but also covers several partner countries. Around 80 countries now participate. PISA has the widest coverage among the three surveys in terms of subject skills and knowledge, covering reading, maths and science near the end of compulsory education (Year 11). In particular, PISA assesses the extent to which students have acquired the knowledge and skills required for full participation in society.

Performance in PIRLS

The black line in Figure 1 shows the reading literacy of Year 5 students in New Zealand based on four PIRLS surveys between 2001 and 2016. While our reading literacy score increased slightly between 2001 and 2006, from 529 to 532, it has declined since. By 2016, New Zealand's Year 5 reading literacy score had fallen to 523.

New Zealand's performance was above the PIRLS scale centre point, an average that is scaled to 500 every year, for reading literacy among participating countries for the entire period (the red line). This scaling of achievement scores means that, for example, if the average absolute achievement score among countries were falling, an individual country's scaled score could remain the same while its absolute score fell, and vice versa.

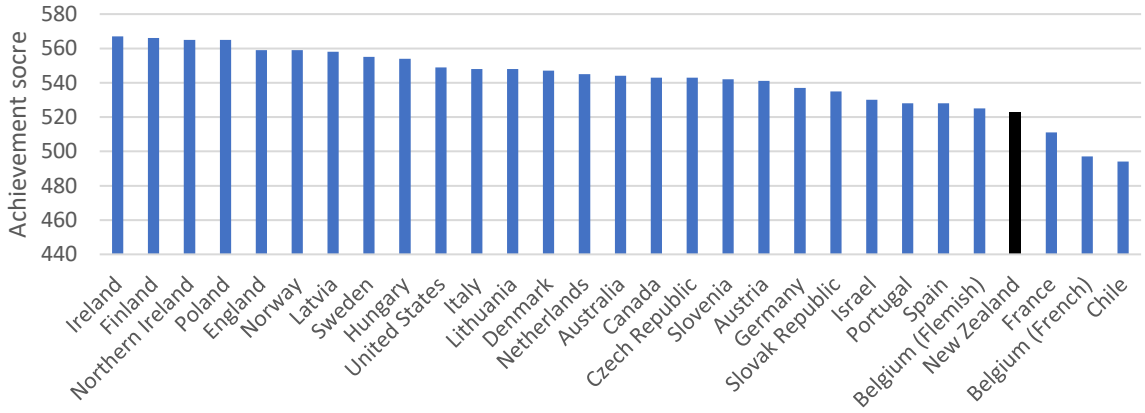
Figure 1: PIRLS Year 5 reading literacy score for New Zealand and comparator countries (2001–16)



Source: Ministry of Education, "PIRLS 2016 New Zealand's Achievement" (Wellington: New Zealand Government, 2017), Figure 1.2, 9.
Note: The red horizontal line represents the PIRLS scale centre point for reading literacy among participating countries. See Ina V.S. Mullis and Caroline O. Prendergast, "Methods and Procedures in PIRLS 2016," Chapter 13 (Chestnut Hill, Massachusetts: TIMSS & PIRLS International Study Center, 2017), 13.1, for more detail on the PIRLS scale centre point.

The distribution of reading literacy across countries is somewhat skewed, masking important details. While New Zealand may be above average for PIRLS, our performance is well below that of many of the countries to which we usually compare ourselves. For instance, the reading literacy scores for Australia, Canada, England and the U.S. were all well above that of New Zealand in 2016. In 2001, Singapore's score was below that of New Zealand but is now the second highest out of participating countries in PIRLS. Indeed, New Zealand was ranked only 26 out of 29 observations on OECD countries in 2016 (see Figure 2).

Figure 2: PIRLS Year 5 reading literacy across OECD countries (2016)



Source: Ministry of Education, "PIRLS 2016 New Zealand's Achievement" (Wellington: New Zealand Government, 2017), Figure 1.1, 8.

Our current PIRLS ranking is even more disappointing given that in 2001, only 15 years earlier, New Zealand ranked 12 out of 24 observations among OECD countries. This pattern of relative decline is similar when considering the full sample of participating countries in PIRLS as opposed to only OECD member countries. New Zealand's ranking in reading literacy fell from 13 to 30 out of 41 countries between 2001 and 2016 (see Table 1).

Table 1: PIRLS Year 5 reading literacy ranking for New Zealand (2001 and 2016)

	2001	2016
Full PIRLS sample	13 out of 37	30 out of 41
OECD sub-sample of observations	12 out of 24	26 out of 29

Source: Ministry of Education, "PIRLS 2016 New Zealand's Achievement" (Wellington: New Zealand Government, 2017), Figure 1.1, 8; Ina V.S. Mullis, Michael O. Martin, Eugene J. Gonzalez, and Ann M. Kennedy, "PIRLS 2001 International Report" (Chestnut Hill, Massachusetts: International Study Center, 2003), Exhibit 1.1, 26.

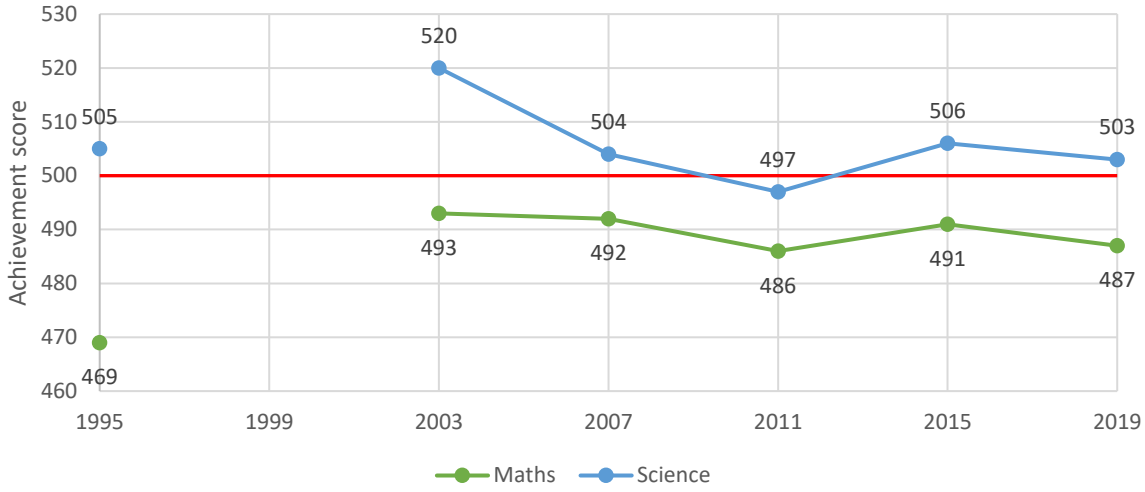
Furthermore, our average reading literacy score and ranking in 2016 provide little information about the distribution of student performance within New Zealand. Compared to other countries our distribution of student performance is wide, equal to 300 score points, and ranges from approximately 360 (the 5th percentile) to 660 (the 95th percentile). Of all participating English-speaking countries, only Trinidad and Tobago have a wider distribution of reading literacy scores in PIRLS.[1]

Performance in TIMSS

Figure 3 shows the maths and science achievement of Year 5 students in New Zealand according to six TIMSS surveys between 1995 and 2019. Both science and maths achievement increased between 1995 and 2003, but our ranking decreased from 520 and 493 in 2003 to 503 and 487 in 2019, respectively. Our maths performance has also been below the international average (scaled to 500 in each survey) in TIMSS for the entire period. After falling significantly from the peak in 2003, our science performance is also in danger of falling below the TIMSS international average by the time Year 5 students are tested in 2023 in New Zealand.

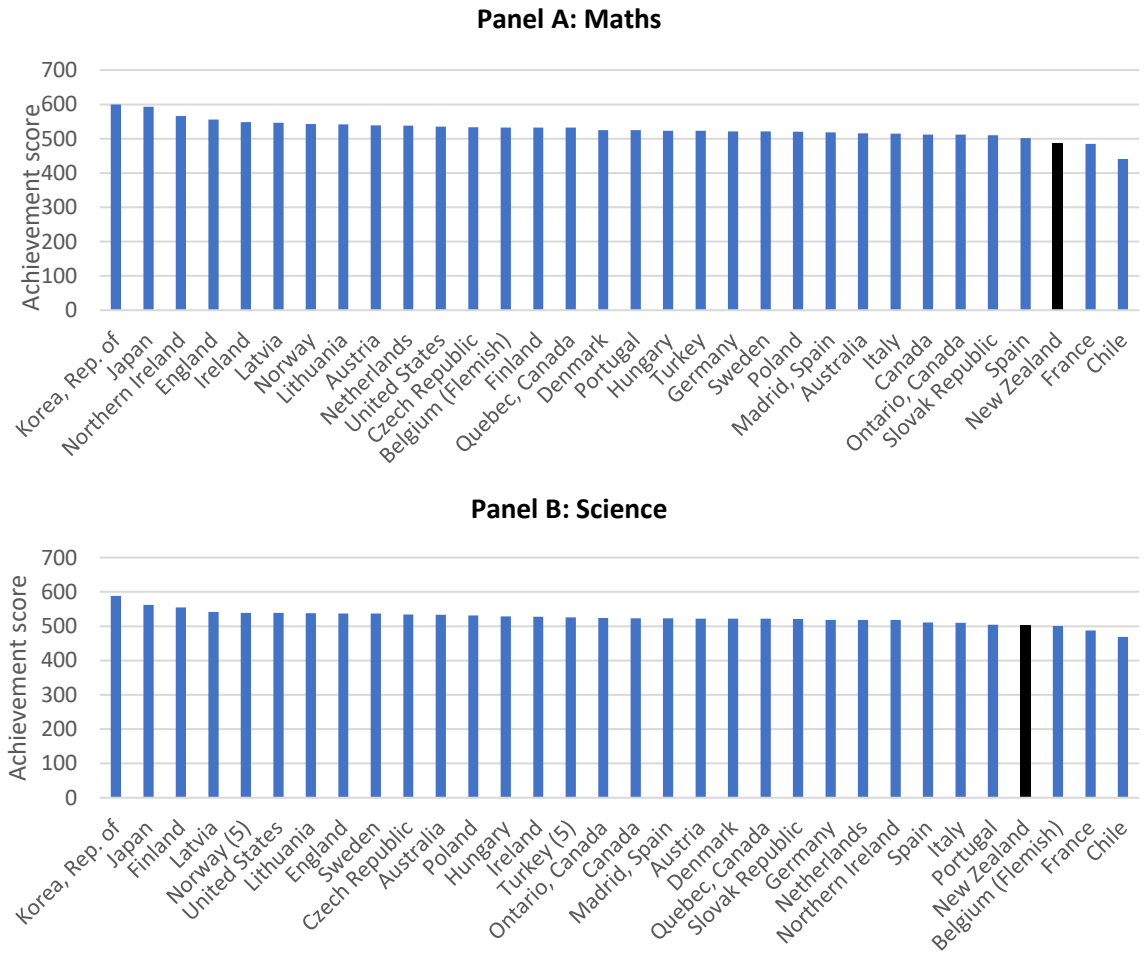
New Zealand is lagging well behind our OECD peers in TIMSS Year 5 maths and science. In particular, our maths achievement in 2019 ranked 30 out of 32 observations on OECD countries (see Figure 4, Panel A). With a ranking of 29 out of 32 OECD countries, our relative science achievement was similarly poor (see Figure 4, Panel B).

Figure 3: TIMSS Year 5 maths and science achievement in New Zealand (1995–2019)



Source: Ina V.S. Mullis, Michael O. Martin, Pierre Foy, Dana L. Kelly, and Bethany Fishbein, "TIMSS 2019 International Results in Mathematics and Science" (Chestnut Hill, Massachusetts: TIMSS & PIRLS International Study Center, 2020), Exhibit 1.3, 16, Exhibit 2.3, 87.
Note: The red horizontal line represents the TIMSS scale centre point for maths and science achievement among participating countries. See Ina V.S. Mullis and Caroline O. Prendergast, "Methods and Procedures in TIMSS 2015," Chapter 14 (Chestnut Hill, Massachusetts: TIMSS & PIRLS International Study Center, 2016), Exhibit 14.1, for more detail on the TIMSS scale centre point.

Figure 4: TIMSS Year 5 maths and science achievement across OECD countries (2019)



Source: Ina V.S. Mullis, Michael O. Martin, Pierre Foy, Dana L. Kelly, and Bethany Fishbein, "TIMSS 2019 International Results in Mathematics and Science" (Chestnut Hill, Massachusetts: TIMSS & PIRLS International Study Center, 2020), Exhibit 1.1, 9, Exhibit 2.1, 80.

Table 2 provides further indications of how the relative performance of New Zealand's Year 5 students in maths and science has evolved over time. Consistent with Figure 3, relative performance in maths has remained similar between 2003 and 2019 in TIMSS, after accounting for the increased number of participating countries. Our maths performance was consistently in the bottom third of the sample. Also consistent with Figure 3, our relative performance in science declined from 12 out of 25 participating countries in 2003 to 34 out of 58 in 2019.

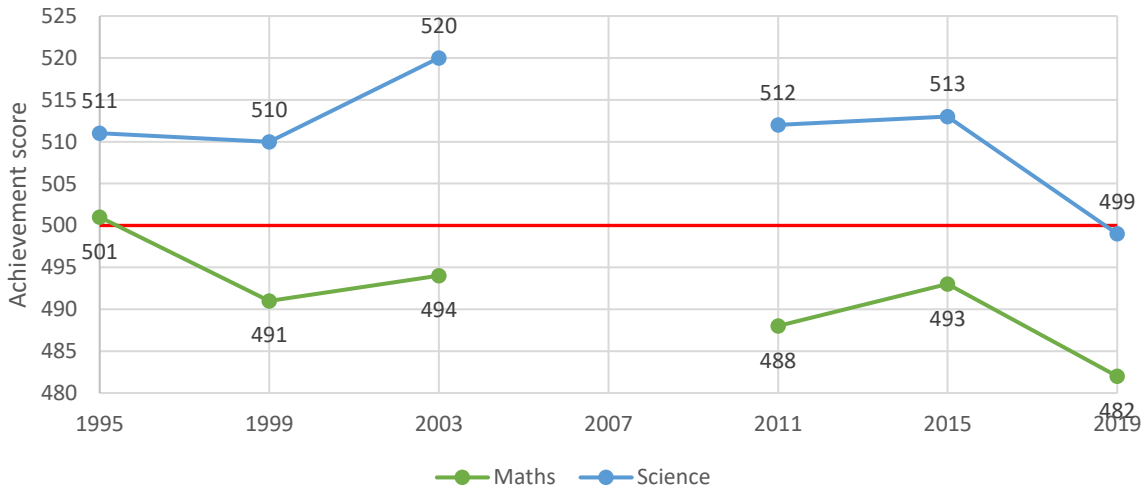
Table 2: TIMSS Year 5 maths and science ranking for New Zealand (2003 and 2019)

	2003	2019
Year 5 Maths (full sample)	17 out of 25	40 out of 58
Year 5 Science (full sample)	12 out of 25	34 out of 58

Source: Ina V.S. Mullis, Michael O. Martin, Pierre Foy, Dana L. Kelly, and Bethany Fishbein, "TIMSS 2019 International Results in Mathematics and Science" (Chestnut Hill, Massachusetts: TIMSS & PIRLS International Study Center, 2020), Exhibit 1.1, 9, Exhibit 2.1, 80.

Our declining TIMSS Year 9 results in maths and science in New Zealand from 1995 to 2019 also give cause for concern (see Figure 5). Although performance in both subject areas was above average at the beginning of the period, this was no longer the case by 2019. The science score fell from 511 in 1995 to 499 in 2019 (the average is scaled to 500 in each survey) and the maths score fell from 501 to 482.

Figure 5: TIMSS Year 9 maths and science achievement in New Zealand (1995–2019)



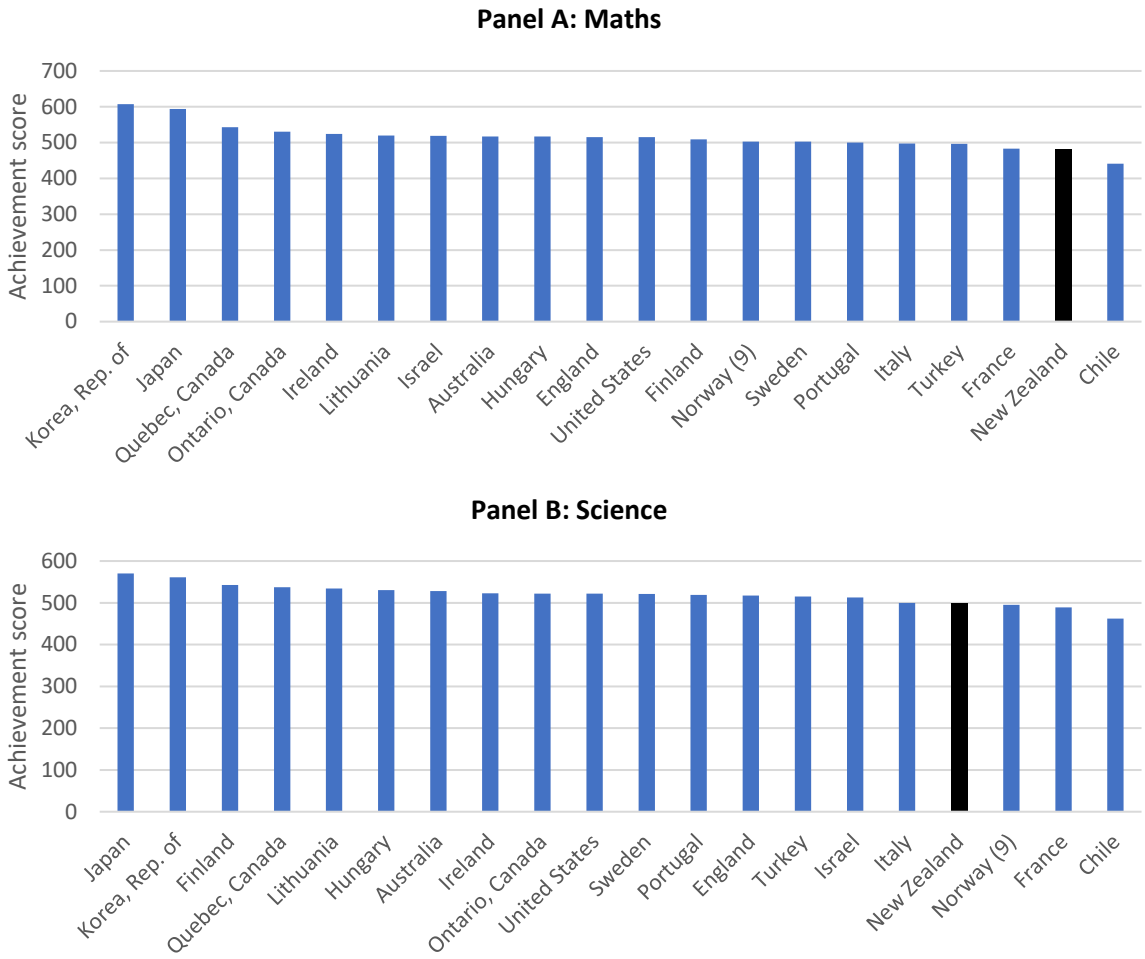
Source: Ina V.S. Mullis, Michael O. Martin, Pierre Foy, Dana L. Kelly, and Bethany Fishbein, "TIMSS 2019 International Results in Mathematics and Science" (Chestnut Hill, Massachusetts: TIMSS & PIRLS International Study Center, 2020), Exhibit 3.3, 154, Exhibit 4.3, 220.
Note: The red horizontal line represents the TIMSS scale centre point for maths and science achievement among participating countries. See Ina V.S. Mullis and Caroline O. Prendergast, "Methods and Procedures in TIMSS 2015," Chapter 14 (Chestnut Hill, Massachusetts: TIMSS & PIRLS International Study Center, 2016), Exhibit 14.1 for more details on the TIMSS scale centre point.

The story of our declining relative performance in maths and science for Year 9 compared with our OECD peers is similar to what it was for Year 5 over the past 24 years. New Zealand ranked 19 out of 20 OECD observations for maths in 2019 (see Figure 6, Panel A) and 17 out of 20 for science (see Figure 6, Panel B).

The evolution of Year 9 students' relative performance in maths and science can be seen by comparing New Zealand with the full sample of participating countries in TIMSS (see Table 3). New Zealand's relative performance in maths has remained well below that of the median country for the entire period between 2003 and 2019. On the other hand, our relative performance in science declined

markedly. In 2003, we ranked 13 out of 46, well above the median country, but declined to 19 out of 39 by 2019.

Figure 6: TIMSS Year 9 maths and science achievement across OECD countries (2019)



Source: Ina V.S. Mullis, Michael O. Martin, Pierre Foy, Dana L. Kelly, and Bethany Fishbein, "TIMSS 2019 International Results in Mathematics and Science" (Chestnut Hill, Massachusetts: TIMSS & PIRLS International Study Center, 2020), Exhibit 3.1, 148, Exhibit 4.1, 214.

Table 3: TIMSS Year 9 maths and science ranking for New Zealand (2003 and 2019)

	2003	2019
Year 9 Maths (full sample)	31 out of 46	23 out of 39
Year 9 Science (full sample)	13 out of 46	19 out of 39

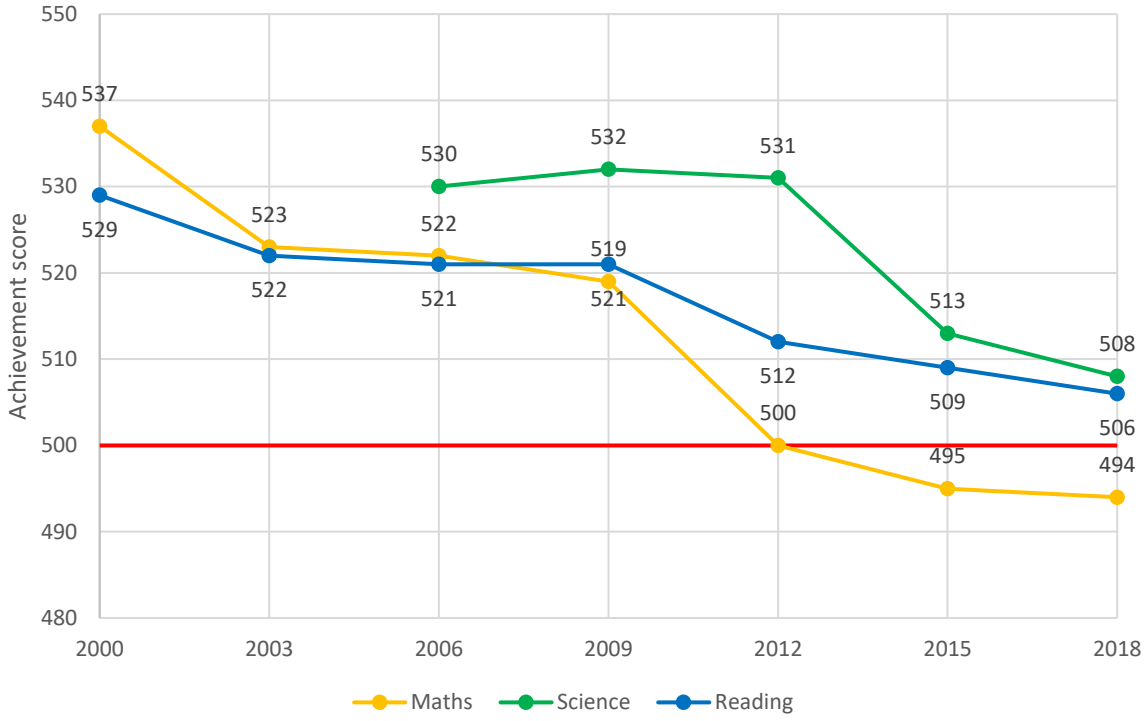
Source: Ina V.S. Mullis, Michael O. Martin, Pierre Foy, Dana L. Kelly, and Bethany Fishbein, "TIMSS 2019 International Results in Mathematics and Science" (Chestnut Hill, Massachusetts: TIMSS & PIRLS International Study Center, 2020), Exhibit 3.1, 148, Exhibit 4.1, 214.

Performance in PISA

PISA surveys are administered by the OECD and cover the reading, maths and science achievement of Year 11 students. OECD member countries, as well as a number of partner countries, are included.

Figure 7 shows the marked declined in the achievement of Year 11 students in New Zealand between 2000 and 2018 in all three subject areas, particularly in maths. In 2000, our maths score (537) was among the highest in the OECD. By 2018, New Zealand was well below the average for OECD countries with a score of 494, a fall of 43 points.

Figure 7: PISA Year 11 reading, maths and science achievement in New Zealand (2000–18)

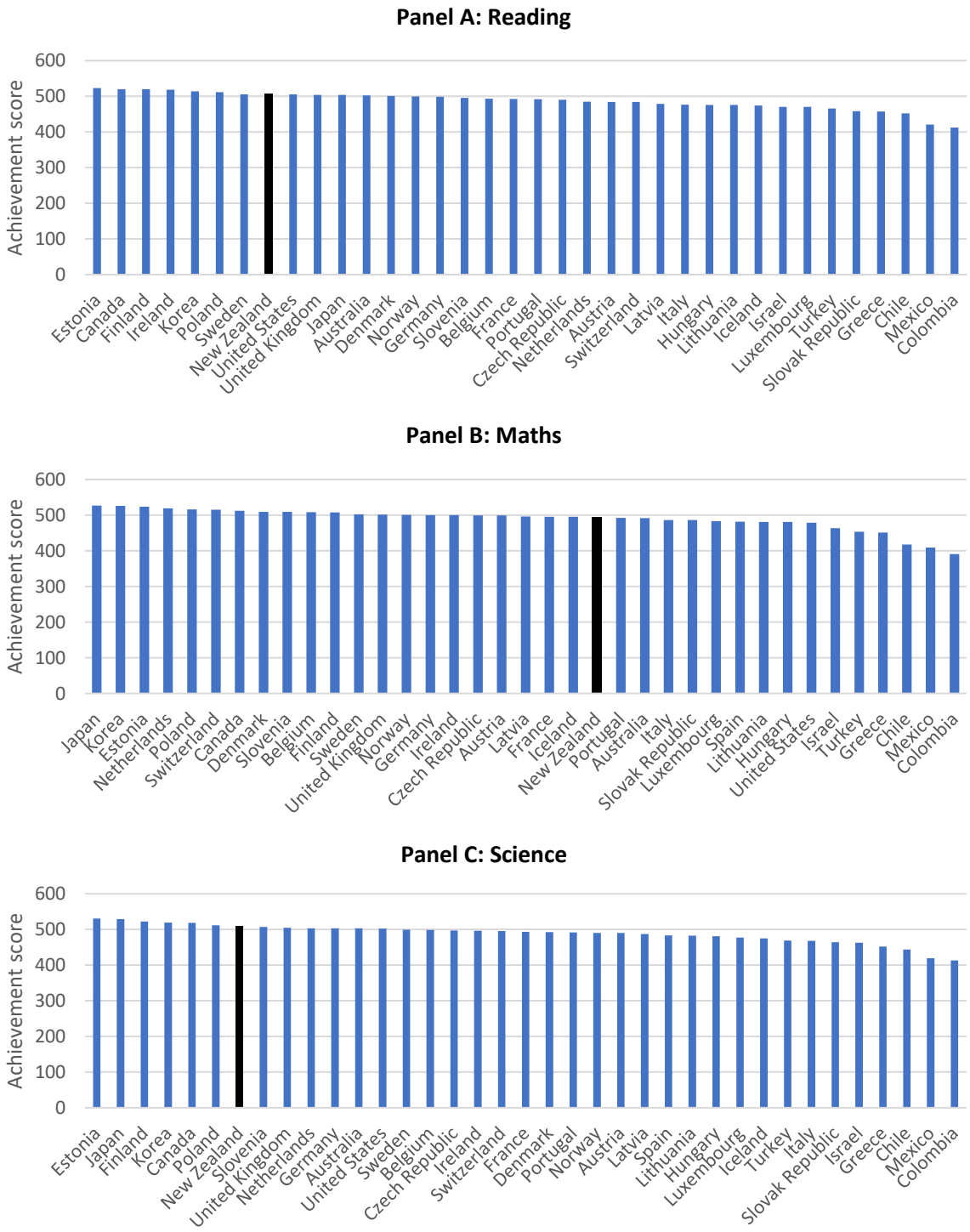


Source: Steve May, Adam Jang-Jones and Alexandra McGregor, "PISA 2018 New Zealand Summary Report System Performance and Equity" (Wellington: New Zealand Government, 2018), Figure 1.2, 8, Figure 2.2, 13, Figure 3.2, 18.
Note: The red horizontal line indicates the PISA scale centre point for reading maths and science achievement among participating countries. See OECD, "PISA 2015 Technical Report," Chapter 12 (Paris: OECD Publishing, 2017), 225, for more details on the PISA scale centre point.

Our science and reading scores also fell by 22 and 23 points, respectively. Despite this decline, our performance in both subject areas remained above the OECD average in 2018 (see Figure 8, Panels A and C). In reading, we ranked 8 out of 36 OECD countries, and 7 in science. Unfortunately, the steep decline in maths achievement placed us only 22 out of 37 OECD countries (see Figure 8, Panel B).

Table 4 shows the evolution of Year 11 students' relative performance in reading, maths and science based on the full sample of OECD and partner countries in PISA. As expected from Figure 7, our relative performance in all three subject areas deteriorated between 2000 and 2018. However, our ranking in maths deteriorated by the most significant margin, from 4 out of 41 to 27 out of 78 participating countries.

Figure 8: PISA Year 11 reading, maths and science achievement across OECD countries (2018)



Source: Steve May, Adam Jang-Jones and Alexandra McGregor, "PISA 2018 New Zealand Summary Report System Performance and Equity" (Wellington: Ministry of Education, 2018), Figure 1.1, 7, Figure 2.1, 12, Figure 3.1, 17.

Table 4: PISA Year 11 reading, maths and science ranking in New Zealand (2000 and 2018)

	2000	2018
Math (full sample)	4 out of 41	27 out of 78
Science* (full sample)	7 out of 57	12 out of 78
Reading (full sample)	3 out of 41	12 out of 77

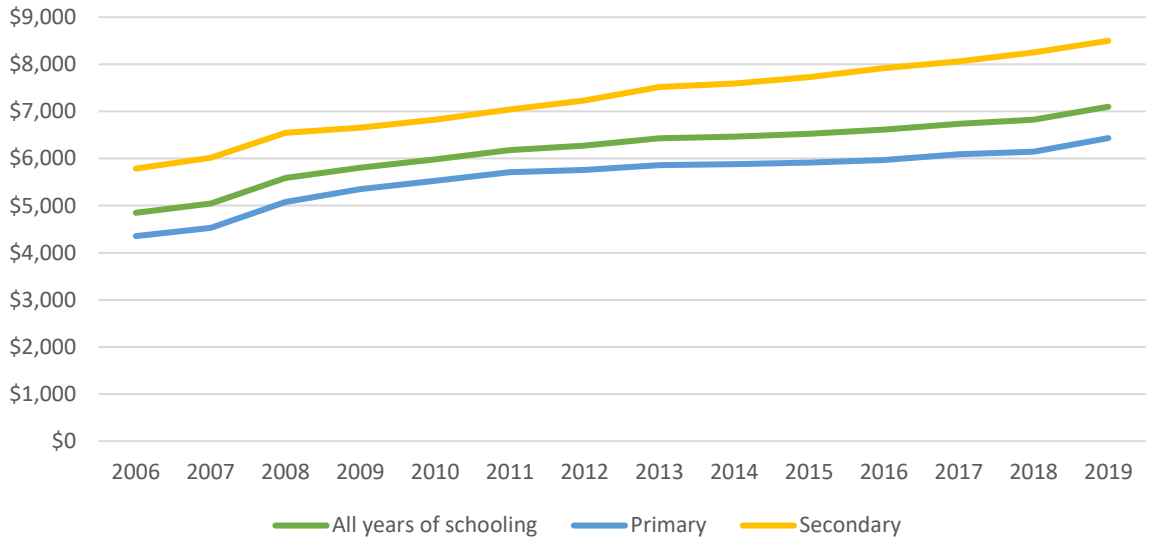
Source: Steve May, Adam Jang-Jones and Alexandra McGregor, "PISA 2018 New Zealand Summary Report System Performance and Equity" (Wellington: Ministry of Education, 2018), Figure 1.1, 7, Figure 2.1, 12, Figure 3.1, 17.
Note: *The earliest science result for New Zealand is in 2006.

Value for money in education

Using three well-regarded international surveys, the previous section showed how our international rankings in reading, maths and science have slipped, markedly in some cases. To arrest this decline, we need to understand the key factors driving these trends. To that end, this section examines education spending per pupil in New Zealand and across OECD countries. More broadly, the extent to which our students get value for money from our education spend is also analysed.

Figure 9 shows nominal per student government funding for both primary and secondary schools between 2006 and 2019. The increase in spending has been substantial. Per-pupil spending increased by approximately $2,100 for primary students and $2,700 for secondary students over the period, which equates to real increases of approximately 16% and 15% respectively.

Figure 9: Average annual per-pupil education expenditure in New Zealand (2006–19)

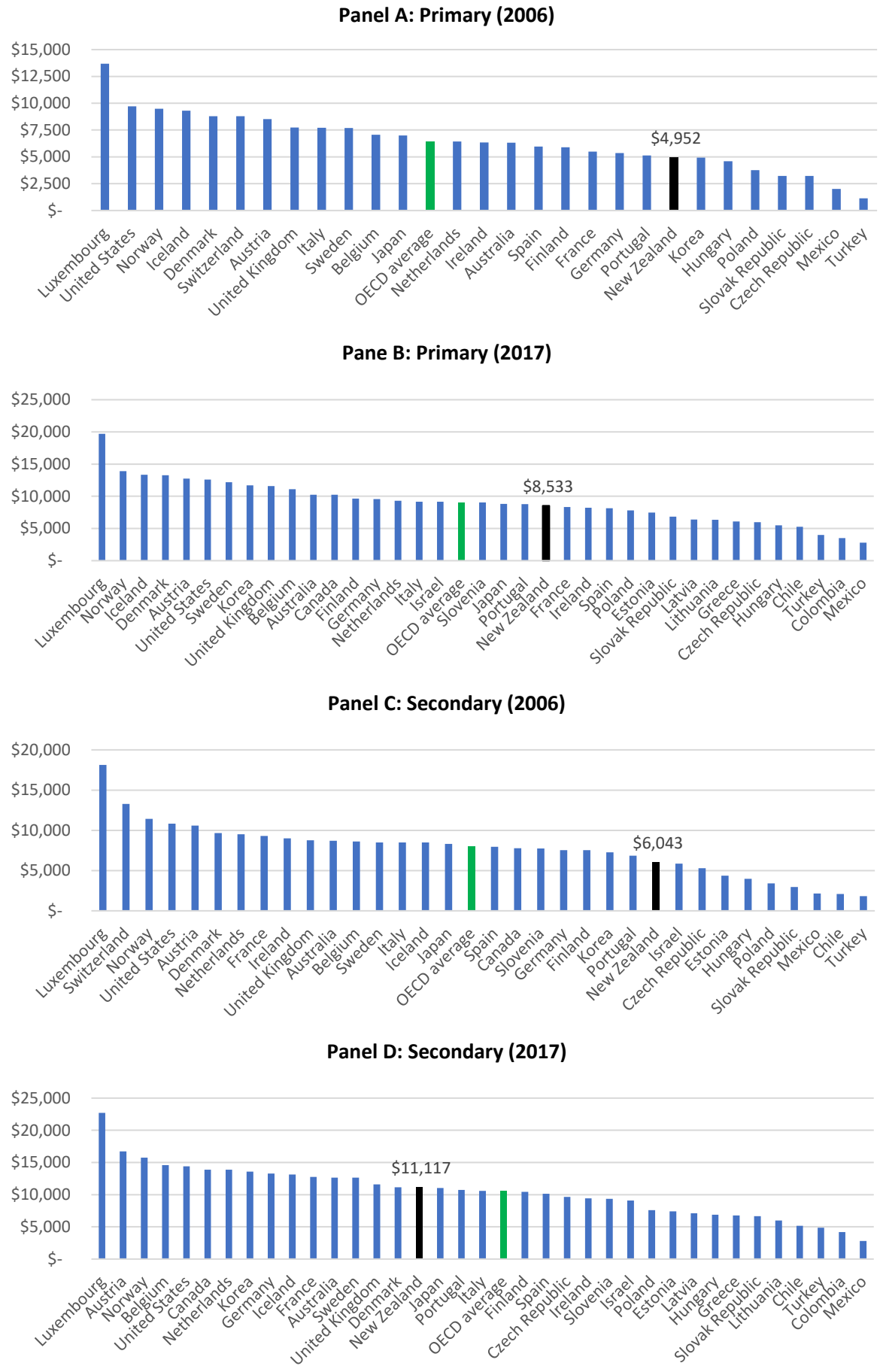


Source: Education Counts, "Per Student Funding for Schools," Website.
Note: Per-pupil education expenditure includes funding for salaries and operational costs but excludes property. Figures exclude GST and cover state and state-integrated schools only.

New Zealand has increased its per-pupil education spending over recent years at a faster rate than many of its OECD peers (see Figure 10). On this measure, primary students in New Zealand ranked 21 in the OECD in both 2006 and 2017 (out of 28 and 36 countries, respectively), but spending was much closer to the OECD average by 2017.

Relative growth in per-pupil education spending for secondary students in New Zealand has been stronger. In 2006, our spending ranked 24 out of 33 OECD countries for which data was available. By 2017, New Zealand's spending was above the OECD average and ranked 16 out of 36 countries.

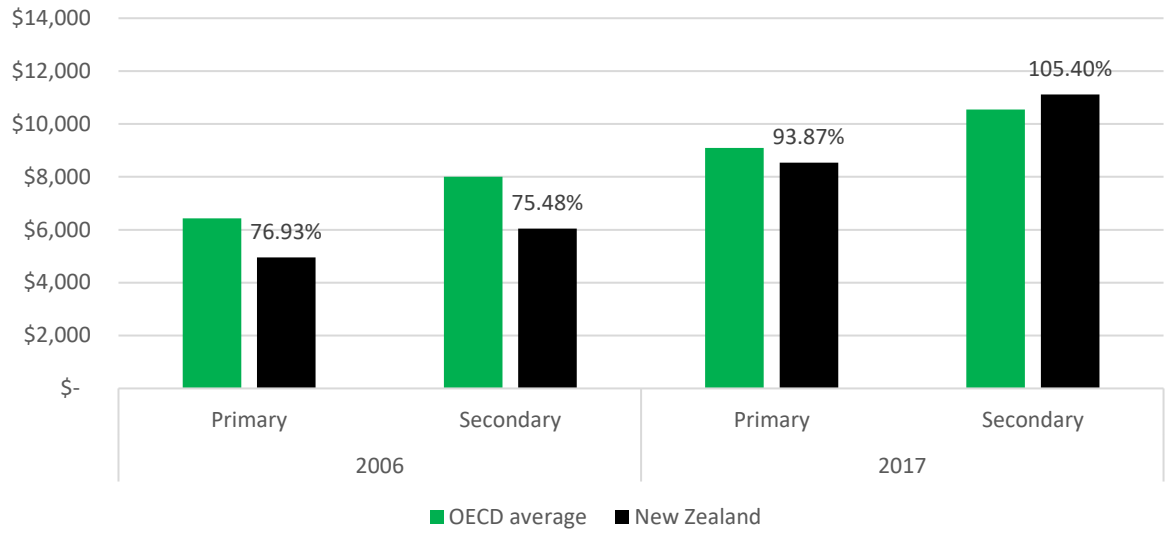
Figure 10: Per-pupil education expenditure across OECD countries (2006 and 2017)



Source: OECD, "Programme for International Student Assessment PISA Data," Website.

The extent of New Zealand's growth in relative per-pupil education spending between 2006 and 2017 is even more evident in Figure 11. Per-pupil spending for primary students increased from 76.9% to 93.9% of the OECD average in just 11 years. For secondary students, spending increased from 75.5% to 105.4% of the OECD average over the same period.

Figure 11: Per-pupil education expenditure, New Zealand vs OECD average (2006–17)



Source: OECD, "Education at a Glance 2020: OECD Indicators" (Paris: OECD Publishing, 2020); OECD, "Education at a Glance 2008: OECD Indicators" (Paris: OECD Publishing, 2008).

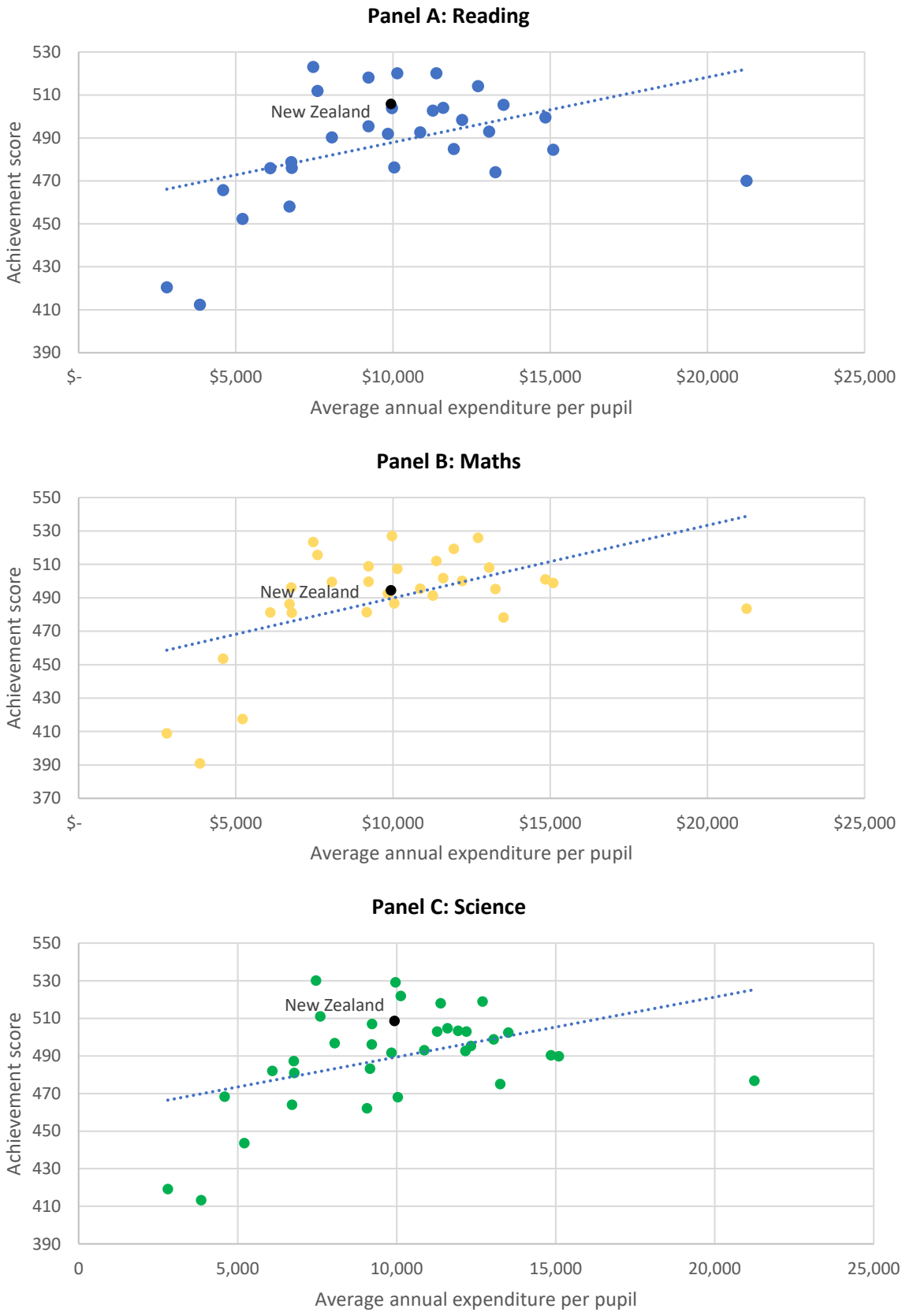
As New Zealand's absolute and relative per-pupil education spending increased markedly, a troubling decline in primary and secondary student achievement also appeared over a similar period. New Zealand students do not seem to have received much value for money from this additional spending. Nevertheless, given our relatively strong starting position in education achievement, at least on some measures, the total benefit New Zealand students are getting from our education spending may not necessarily be an outlier.

Figure 12 plots the most recent achievement scores from PISA against the 2017 annual average per-pupil education spending for reading, maths and science separately. In all cases, the relationship between spending and achievement is estimated using a simple OLS regression and plotted. The purpose was to discern whether New Zealand outperforms the OECD in terms of the educational achievement score our average annual expenditure per pupil buys us.

The plotted lines in each panel of Figure 12 show the estimated achievement score for any given level of per-pupil spending, on average, across the OECD sample. If the achievement-spending observation for New Zealand lies above any one of the regression lines, this means our score in that subject area is higher than what one might expect given our level of spending, based on the relationship observed across OECD countries. It turns out that this is the case in all three educational performance areas.

Figure 12 also shows a positive estimated relationship between per-pupil education spending and achievement scores in reading, maths and science achievement. That is an increase in spending is correlated with an increase in achievement. Given the concerns about New Zealand's declining educational achievement, it is therefore reasonable to ask whether we should simply increase our financial investment in the education of our children.

Figure 12: Per-pupil education expenditure in 2017 vs PISA score in 2018



Source: Steve May, Adam Jang-Jones and Alexandra McGregor, "PISA 2018 New Zealand Summary Report System Performance and Equity" (Wellington: Ministry of Education, 2018); OECD, "Education at a Glance 2020: OECD Indicators" (Paris: OECD Publishing, 2020).

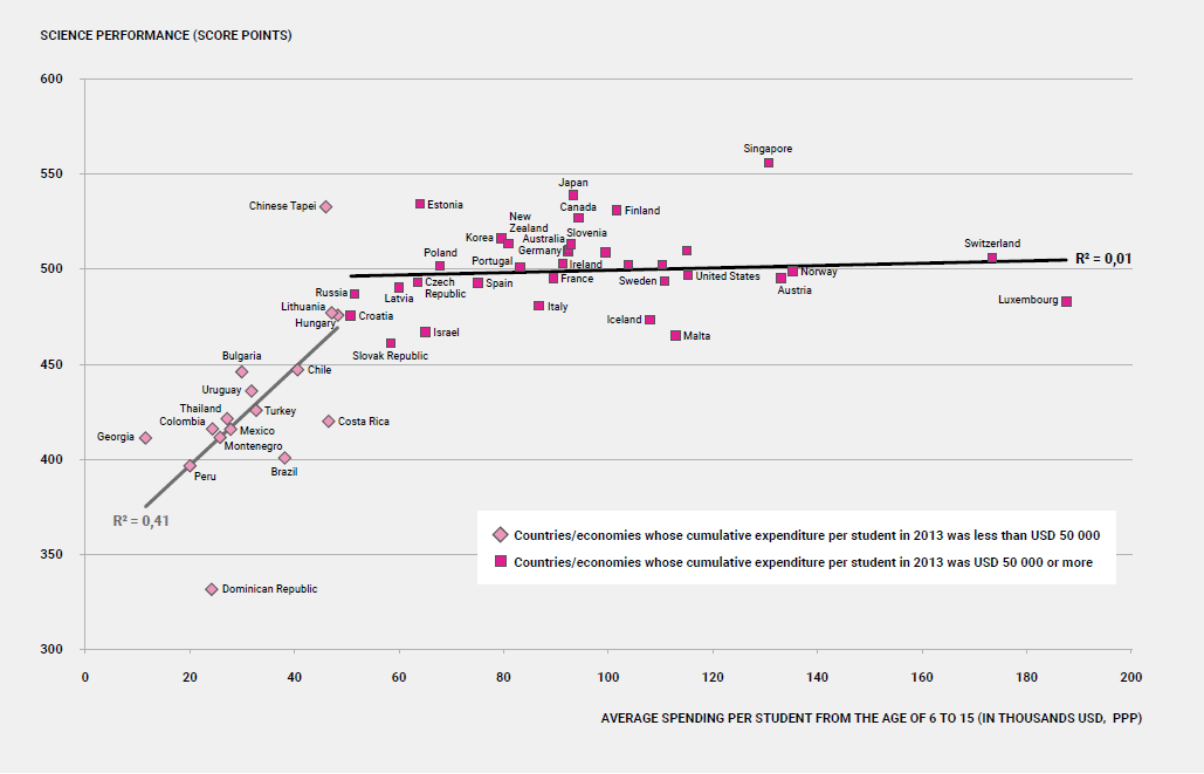
Unfortunately, the analysis so far has shown that our decline in educational performance in recent years has been associated with significantly more per-pupil educational spending, both in absolute

and relative terms. Indeed, the OECD points out that beyond a certain point, the relationship between student achievement and spending is very weak.

This is illustrated in Figure 13, where the OECD separates countries into two groups: those where cumulative per-pupil spending on education between the ages of 6 and 15 is below US$50,000 and those where cumulative spending is above this level. New Zealand belongs to the latter group.

For relatively low levels of per-pupil cumulative spending, increases in spending are associated with relatively large increases in educational achievement. Further, among this group, cumulative per-pupil spending can explain a substantial proportion in the variation of educational outcomes (41%).[2] On the other hand, for the group of countries to which New Zealand belongs, increases in spending are associated with very little increase in educational achievement, and spending explains virtually none of the variation in educational outcomes (1%).[3]

Figure 13: Relationship between per-pupil education spending and achievement weakens significantly as spending increases



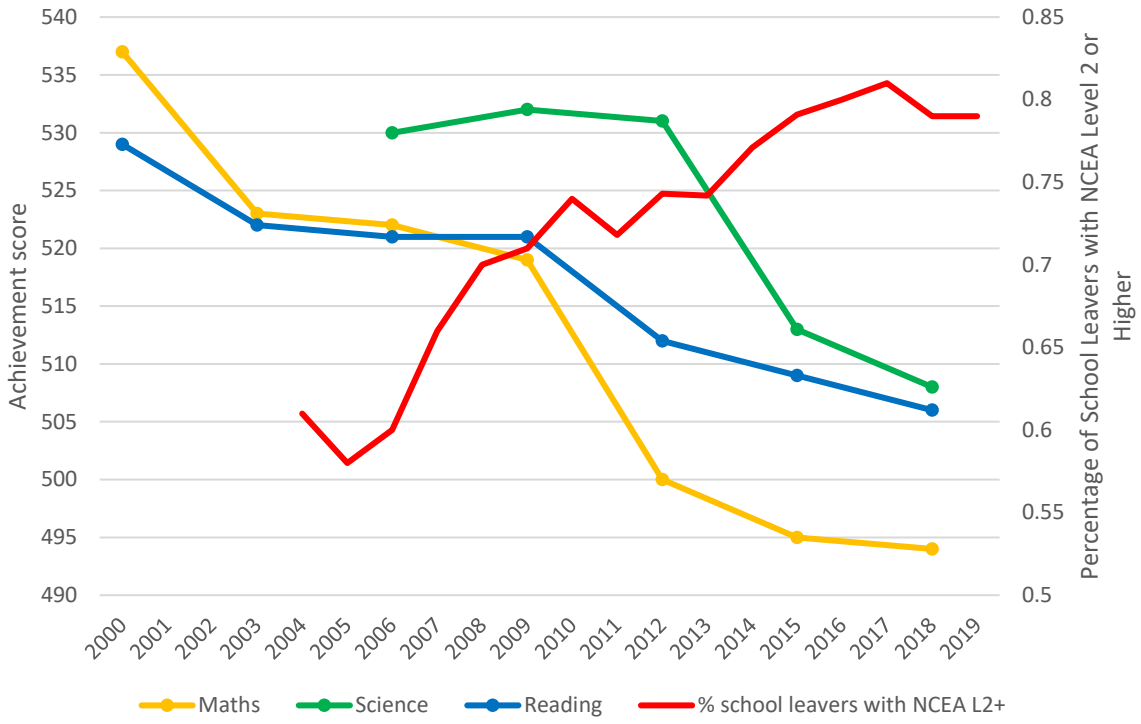
Source: Andreas Schleicher, "World Class: How to Build a 21st Century School System" (Paris: OECD Publishing, 2018), Figure 2.3, 49.

Other causes of New Zealand's educational decline

Based on the previous two sections, it appears unlikely that simply increasing spending on education will improve student performance. If not a lack of spending, what is causing our worsening educational achievement?

One important factor might simply be a lack of awareness. Our education decline would not be apparent to those who only focus on domestic measures of success, such as NCEA pass rates. Indeed, while New Zealand's PISA scores have declined in all areas between 2000 and 2019, the proportion of students leaving school with at least NCEA level 2 has increased markedly (see Figure 14).

Figure 14: New Zealand's educational achievement, international versus domestic measures



Source: Steve May, Adam Jang-Jones and Alexandra McGregor, "PISA 2018 New Zealand Summary Report System Performance and Equity" (Wellington: Ministry of Education, 2018); Education Counts, "School Leavers with NCEA Level 2 or above," Website.

Previous work by The New Zealand Initiative, particularly *New Zealand's Education Delusion: How bad ideas ruined a once world-leading school system* by Briar Lipson, also sheds some light. Lipson argues that the child-centred philosophy that has taken root within New Zealand's education system has contributed significantly to our decline in educational achievement.

The current teaching philosophy says students should be leading their own learning and teachers only facilitating rather than leading and instructing directly from the front of the classroom. Lipson suggests this is at odds with the consensus on cognitive science about how children learn. The Ministry of Education must move away from a child-centred learning philosophy and towards an evidence-based teacher-led instruction. This change should be supported by mandatory standardised national assessment and a new national curriculum based on disciplinary knowledge, not competencies.

Conclusion

The challenges our young people will face in the future are immense. The nature of work is changing thanks to factors such as globalisation, technological change, and population ageing. A well-functioning education system is vital if our children are to overcome these challenges. However, it is not clear that the status quo is serving our children as well as it should.

This report has examined the performance of New Zealand's education system by tracking students' achievement in reading, maths and science over time in international education surveys. Spending on education over time and relative to other countries was also examined to see whether a lack of funding, or poor value for money from that funding, is likely to have been a key driver of New Zealand's education outcomes.

The performance of our primary and secondary students in international education surveys has declined over recent decades. As a result, our international rankings in reading, maths and science

have slipped, in some cases markedly. For instance, between 2000 and 2018 our ranking in maths deteriorated significantly, from 4 out of 41 to 27 out of 78 participating countries in PISA (the OECD's survey of Year 11 students).

On the other hand, per-pupil education spending on primary and secondary students has increased substantially in New Zealand. In particular, per-pupil spending on primary students increased from 76.9% to 93.9% of the OECD average between 2006 and 2017. For secondary students, spending increased from 75.5% to 105.4% of the OECD average over the same period.

The observation that New Zealand students' education achievement has been in decline at the same time as per-pupil education expenditure has been growing is surprising. However, although basic correlations suggest that there is a strong positive association between per-pupil education spending and achievement, more careful analysis from the OECD suggests that a positive relationship between spending and educational performance might not be universal across countries.

In particular, for countries that cumulatively spent over $US 50,000 on the education of 6- to 15-year-olds, a group to which New Zealand belongs, increases in spending were associated with very little increase in educational achievement. In fact, spending explains virtually none of the variation in educational outcomes across countries (1%).

Not only does it appear that our additional investment in education has not borne fruit in terms of greater achievement, but it also seems as though we should not necessarily expect that it will in the future. Fortunately, there are other promising avenues to explore if we want future generations to be well served by the New Zealand education system.

For instance, past work from The New Zealand Initiative suggests that NCEA is masking our decline and contributing to a lack of awareness of our predicament. The prevalence of child-centred philosophy in New Zealand's education system has also contributed significantly to our decline. A move towards more evidence-based teacher-led instruction supported by mandatory standardised national assessment and a new national curriculum based on disciplinary knowledge, not competencies, is desirable.

Endnotes

[1] Ministry of Education, "PIRLS 2016 New Zealand's Achievement" (Wellington: New Zealand Government, 2017), 11.
[2] Andreas Schleicher, "World Class: How to Build a 21st Century School System" (Paris: OECD Publishing, 2018), Figure 2.3, 49.
[3] Ibid. Figure 2.3, 49.

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