What Price the Gap?

Education and Inequality in Australia

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Issues Paper

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Contents

Executive Summary

The question of inequality has permeated recent public debate in Australia. From stagnating wages to CEO salaries, from retiring boomers to renting millennials, the widening gaps in our society have come under intense scrutiny. A less scrutinised gap is widening in our education system.

This Issues Paper sheds light on this educational inequality and its cost to Australia. It analyses the costs of students at the bottom falling further below those at the top and estimates that over the six years from 2009-15 alone, this growing inequality has cost Australia around $20.3 billion, equivalent to 1.2% of GDP. The longer-term cost to Australia is even bigger, because the gap was widening well prior to 2009.[1*]

Educational inequality is increasing across a wide range of dimensions. The Australian evidence indicates that:

- inequality is found in access to teachers, access to resources, access to curriculum and test performance;
- inequality for new student cohorts is worsening over time;
- inequality increases as students move through their school years;
- socioeconomic status and parental education are the main drivers for educational inequality, while Australia performs relatively well on gender and migrant status which are problematic in other countries; and
- inequality exists within sectors, as well as between them, with the public sector arguably more unequal due to its more representative coverage.

It is widely understood that Australia's school performance (as measured by international test scores) has been falling. What's less understood is that this headline buries a stark, unpalatable fact: our international test results show that kids at the bottom of the performance distribution are falling faster and further than kids at the top.

The paper builds a picture of the changing distribution over Australia's performance in the international PISA tests. We recognise the limitations of standardised testing, but one advantage is that it does provide comparable time-series data for evaluation across a host of countries. From 2009 to 2015 (where the data is consistently comparable), the average performance across all subjects of students at the 10th percentile of the distribution (10 percent from the bottom) fell by 21.3 points, while the performance of those at the 90th percentile fell by only 14.4 points. While all cohorts have fared worse, the performance of those at the bottom has fallen by almost 50% more than those at the top, exacerbating inequality between the two ends. Those at the bottom include a disproportionate number of students from disadvantaged groups, such as indigenous children and newly arrived migrants.The OECD calculates that a 50 point fall in test scores leads to a decline in long-term GDP growth of 0.87% per year. Based on this, we have estimated the net present value of the economic loss to Australia of our falling educational performance. We calculate the loss attributable to the 2009-15 fall in performance to be $118.6 billion.

Further, we have valued the cost to Australia of students at the bottom falling further than those at the top, i.e. what if all students had only fallen at the level of the top decile students? In this scenario, all students would have fallen by an equal number of points with inequality remaining constant.

We find that, of the $118.6 billion cost of declining performance, the cost to Australia attributable to the increase in inequality is $20.3 billion. As an estimate of the long-term trend, this figure is conservative as it does not include the earlier increases in PISA inequality (due to changes in the PISA test formats). The paper concludes by offering a set of recommendations for addressing this inequality, including:

- targeted teaching approaches;
- the randomisation of a share of enrolments to selective public schools;
- the introduction of second classroom teachers to support underperforming students outside the classroom, especially in disadvantaged communities;
- alternative learning programs; and of course,
- firm commitment to needs-based funding for schools.

These ideas will form the basis of a future PEF Issues Paper.

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April 2018

1 *Although performance gaps were increasing prior to 2009, we do not use the pre-2009 period as a consistent comparator for valuation due to changes in test methodologies.

Introduction

With each passing year, the inequality drumbeat grows louder. What began as a distant ripple from Athens and Zuccotti Park in the years immediately after the financial crisis has transformed into a defining national debate. Australia was sheltered by the commodities boom from the worst distributional effects of neoliberalism, but as that boom has faded, the growing gap between haves and have-nots has become starker.

There have been many analyses of the causes of this gap, which range from a less equitable tax system to the decline of the union movement. One which has been less explored is the relationship between education and economic inequality – whether changes in our education system have contributed to the growing wealth and income divide. Given that education is acknowledged as the critical determinant of future earning potential (Quiggin, 1999), it's reasonable to ask how changes in education achievement may be affecting inequality.

This short paper is an examination of educational inequality in Australia. The paper charts the recent history of educational inequality, and considers how educational and economic inequality interact with one another. It seeks to evaluate how inequality is changing over time and to measure the costs to Australia of these changes. It offers an analysis of the economic impacts of falling educational achievement as measured by PISA testing, including the value of the 'inequality effect' caused by a widening distribution of Australian students' performances.

The rise of educational inequality in Australia

While the average Australian student is showing declining performance, those at the bottom are falling faster than those at the top: educational inequality is growing.

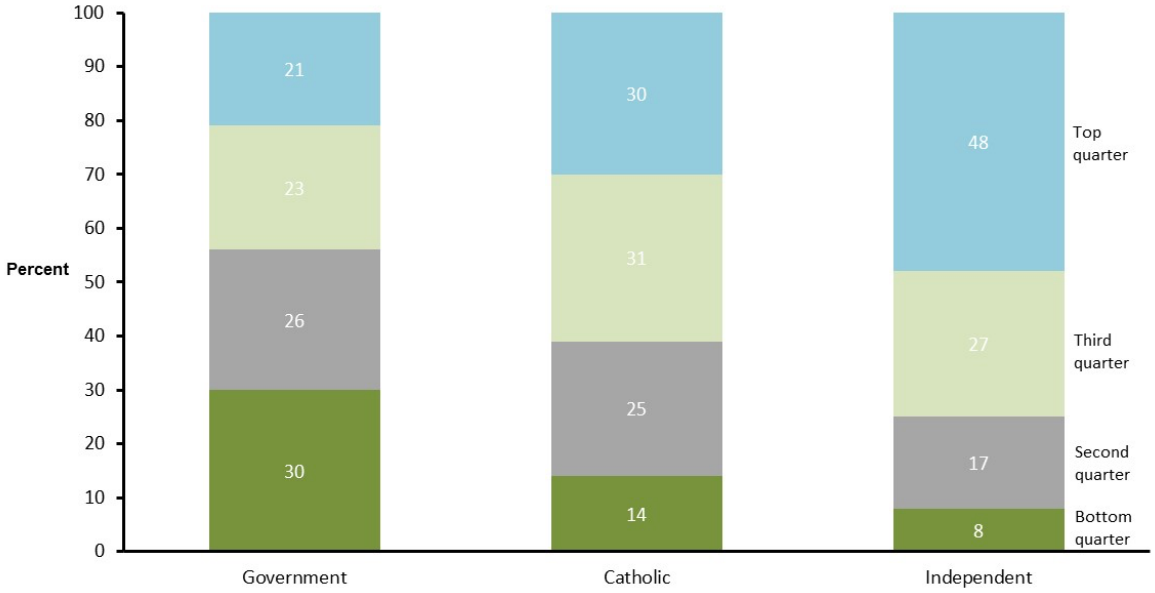
Let's begin by clarifying exactly what we mean by educational inequality. There are many possible interpretations. We might want to explore inequality in educational inputs: funding, teachers, classroom resources, access to curriculum. Or we might consider inequality in outputs: test scores, Year 12 completion rates, future income levels. Of course, neither approach is fully satisfactory. Both miss the notion that there is a fundamental aspect of education - the accumulation of learning - that is inherently valuable and can't be easily measured, and all children should have equal access to this learning.

All of these measures – both inputs and outputs – are legitimate. What is worrying is that on almost all of them, our educational inequality is poor and worsening.

Let's begin with inequalities that exist before examining how inequality overall is worsening. Sullivan, Perry and McConney (2013) have shown that there is significant inequality in access to resources and in teacher shortages between schools with high and low socio-economic status (SES). Australia's PISA results show that Australia's bottom quartile SES schools fare dramatically worse that top SES schools on lack of teaching and assistant staff, and the number of poorly qualified teaching and assistant staff. The same PISA results show that low SES schools fall far behind high SES ones on quality of and access to educational materials and infrastructure (Thomson et al., 2017).

Non-government schools typically have higher average SES enrolments than public schools (see Figure 1) and multiple Australian studies have shown that these schools are more likely to provide a curriculum that facilitates high tertiary entrance scores. This is notwithstanding the facts that some

Figure 1:
Distribution of SES enrolments by school sector (2016)



Source: Bonnor & Shepherd (2017)

Once socio-economic background is accounted for, there is essentially no difference in performance between public and non-government schools.

public schools do offer wide curriculum choice and that students from government schools perform better on average at university (Cobbold, 2015).

Non-government schools achieve this in many ways: by offering advanced subjects that receive a higher ATAR weighting, by offering smaller classes and additional tutoring (Lamb et al, 2001; Teese and Polesel, 1999). This difference between sectors remains the case even in schools with similar SES.

Turning to educational outputs, we focus firstly on test scores. It is well documented that Australian students' performance is declining relative to global peers (OECD, 2016; Riddle and Lingard, 2016). In the latest PISA tests of Year 9 students conducted by the OECD, Australia is ranked 20th internationally in maths (down from 6th in 2000), 12th in reading (down from 4th in 2000) and 10th in science (down from 8th in 2000).[2*] Australian performance has declined not only in relative terms, but in absolute terms too. Since 2003, maths performance has deteriorated by the equivalent of one year's schooling. Since 2000, reading performance has declined by 10 months of schooling. And since 2006, performance in science has declined by seven months' schooling equivalent (OECD, 2016).

What is less well understood, however, is that within this deteriorating performance, the gap between top performing and bottom performing students has grown. Between 2006 and 2015, the science scores of Australian boys at the 90th (top) percentile fell by 11 points, while those at the 10th (bottom) percentile fell by 23 points. Scores of girls at the 90th percentile declined 18 points compared with 22 points for those at the 10th percentile (OECD, 2016: 331). While the average Australian student is showing declining performance, those at the bottom are falling faster than those at the top: educational inequality is growing.

Another feature of Australian education is that inequality widens as children move through their school years. A 2016 report by the Grattan Institute found that low achievers in Year 3 are two years and eight months behind high achievers, a gap which grows to three years and eight months by Year 9. It observes that the middle three-fifths of students are working within a two-and-a-half year achievement range in Year 3 which grows to a five-and-a-half year range by Year 9 (Goss and Sonnemann, 2016: 2).

This trend is particularly pronounced amongst children whose parents have low educational achievement. Students of parents with no post-secondary education lag students of parents with a degree by ten months in Year 3. By Year 9, this gap has grown to thirty months.

In a separate study, education academic Richard Teese has observed that schools, which mainly enrol children from low income or poorly educated families, produce reading scores that are about two years behind average scores from high SES schools. He too notes that this gap widens as students progress through school years (Teese, 2011: iii).

Even when students show the same ability in Year 3, those from disadvantaged schools, disadvantaged backgrounds or disadvantaged areas fall behind (Goss and Sonnemann, 2016: 25). So the Australian education system exacerbates inequality as children progress through school, and this works along spatial, economic and parental achievement lines.

Educational inequality presents itself in other ways too. In addition to economic disadvantage and parental education, the OECD has examined how gender and immigrant status affect a child's risk of poor performance in different countries (2012: 17). It found that Australia performs poorly on socio-economic status where we are the 10th lowest out of 37 countries studied.

On all other dimensions, Australia performs better than the OECD average. While some migrant groups do better than others, our performance on immigrant status is generally outstanding – Australia is the second highest in the sample group, and migrant status barely appears to affect risk of underachievement. This is likely to be because Australia runs tightly targeted immigration programs: Australian immigrants are more skilled than the existing population, whereas (for example) US immigrants are less skilled than the existing population.

2 * Note: There were 41 countries in the 2000 study and 72 countries in the 2015 round.

On gender and parental education, we are a middle-of-the-road performer: while they are not terrible by international standards, there are persistent inequalities which weigh against boys and children of parents with limited education.

A final important point on educational inequality in Australia is that it is entrenched within sectors as well as across them. Much commentary around educational divides in Australia focuses on public versus private schools. However, the empirical evidence shows clearly that it is the socioeconomic background rather than school sector that affects results. Once socio-economic background is accounted for, there is essentially no difference in performance between public and non-government schools (Firth and Huntley, 2014: 15). This discussion is a distraction which masks an important fact: there is considerable inequality *within* the different sectors, caused by socioeconomic status.

This is particularly noticeable amongst selective public high schools operated by numerous Australian states. In 2015, 74% of students in Sydney's selective schools were drawn from the most advantaged socioeconomic quartile while only 2% of students were from the bottom quartile (Ho, 2017). Over half of Sydney's selective schools had no students at all from the bottom quartile. In Victoria, albeit with a much smaller group of selective schools, 62% were drawn from the top quartile and only 5% from the lowest in 2015.

What's more, these inequalities have become markedly more pronounced. The share of Sydney selective students in the highest quartile has jumped 14 percentage points since 2010, while the lowest quartile share has fallen by seven points. In Victoria, the top quartile share has jumped by 11 points while the bottom one has similarly shrunk by seven points.

Notably, socioeconomic spreads are actually lower *within* non-government schools because their enrolments are concentrated amongst higher SES households. Perry's 2016's study uses a nationally representative dataset of 14,000 students at 350 schools. Only 5% of non-government students are enrolled in schools whose mean SES enrolment is in the bottom 40% of the sample, while 74% are enrolled schools whose mean SES enrolment is in the top 40% (Perry et al, 2016: 179).

Teese describes how these relative concentrations occur:

> *"…In poor urban areas, public schools "over-reflect" the social profile of the area. They have a disproportionate share of the poorest families, but also of children who are most educationally disadvantaged (not necessarily by socio-economic status). Local community after local community displays a characteristic pattern in which non-government schools—whether Catholic or private non-Catholic—"under-reflect" the social profile of the area, though not invariably. They recruit a disproportionate share of socially and also academically advantaged children."* (2011: vii)

Since we know that test performance by sector is statistically similar once we account for SES background, the relatively high concentration of non-government students amongst higher SES bands means that test score inequality is lower within that sector.

Taken together, the assembled evidence points to several firm conclusions about educational inequality in Australia:

- **Inequality is found in access to teachers, access to resources, access to curriculum and test performance**
- **Inequality for new student cohorts is worsening over time**
- **Inequality increases as students move through their school years**
- **Socioeconomic status and parental education are the main drivers for educational inequality, while Australia performs relatively well on gender and migrant status which are problematic in other countries**
- **Inequality exists within sectors, as well as between them, with the public sector arguably more unequal due to its more representative coverage**

But how are we to relate these findings to inequality more broadly?

Economic and educational inequality

The basic relationship between education and income is well documented: more years of schooling lead to higher lifetime incomes. In Australia, Leigh and Ryan (2005) have calculated that the rate of return to an additional year of schooling after nine years of education is around 10% in lifetime income. (Returns for additional education actually decline as people move through undergraduate and postgraduate degrees.) Given this, we can say that large variances in school years completed will translate to greater income inequality over time. However, this is a measure of quantity of schooling and in this context, recent moves by state governments to raise school leaving ages and institute 'earn or learn' policies should act to reduce gross inequalities due to differences in years of schooling completed.

Quality of schooling matters for economic inequality too. In addition to years of schooling, Checci and Van de Werfhorst assess the distributions of school quality (as measured by test scores) across 20 countries and find that wider distributions lead to greater income differentials. They state that, "Our results indicate that inequality in education (measured both at quality and quantity levels) affect earnings inequality." (2014: 5)

So yes, educational inequality flows through to economic inequality. But there's another dynamic at play here too. The causation also works in reverse: *economic inequality reinforces educational inequality*. They operate in a mutually reinforcing cycle. Carmen Lawrence, a member of the original Gonski Review, writes,

> *"As economic inequality has risen, so has educational inequality; each feeds off the other in a cycle of ever-decreasing social mobility… Until relatively recently, Australian governments of all stripes exhibited a strong commitment to a superior public education system, open to all and good enough to inspire the confidence of all parents and citizens, regardless of their wealth... In the last 20 years, this commitment has looked increasingly fragile and the system more fragmented…. As a result, more parents have withdrawn their children from government schools and the schooling system has become more segregated, especially on the basis of parents' wealth and occupation."* (2012)

How should education respond to these challenges in the face of economic inequality? I would hazard that the first goal of education with regards to inequality should be to narrow the gap between top and bottom performing students by lifting the ones at the bottom up, without suppressing those at the top.

Why should this concern us? If education and income are so closely related, is it possible that the growth in economic inequality that has become so prominent is in part driven by rising inequality in education? What might this cost us? The next section of the paper examines these questions.

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The cost of growing educational inequality

There are multiple ways one could estimate the cost of growing educational inequality in Australia. Any attempt, though, is likely to depend on standardised test scores which as noted above are only one indicator of inequality.

We could derive a mathematical relationship between educational achievement and incomes and apply the changes in the educational inequality to a future income distribution. However, this approach is heavily theoretical and relies on many simplifying assumptions.

In this paper I will use a second approach which, while also dependent on theory and assumptions, is more intuitive and easier to understand.

Numerous studies estimate the impact of a change in educational achievement on a country's long-term economic growth. The approach we will take here involves constructing a picture of the distribution of Australia's educational achievement (as measured by PISA) and assessing how changes in different parts of the distribution will affect economic growth. It is then possible to ascribe a net present value to these changes to estimate the cost to Australia of growing educational inequality.

The questions I will seek to answer include:

- What is the cost of failing to maintain the performance of the bottom quartile?
- How is this distinct from the overall fall in performance, i.e. if inequality had not changed?
- What would the result be if we lifted the bottom performing students to the median?

Evaluation of inequality impact of Australia's falling educational performance

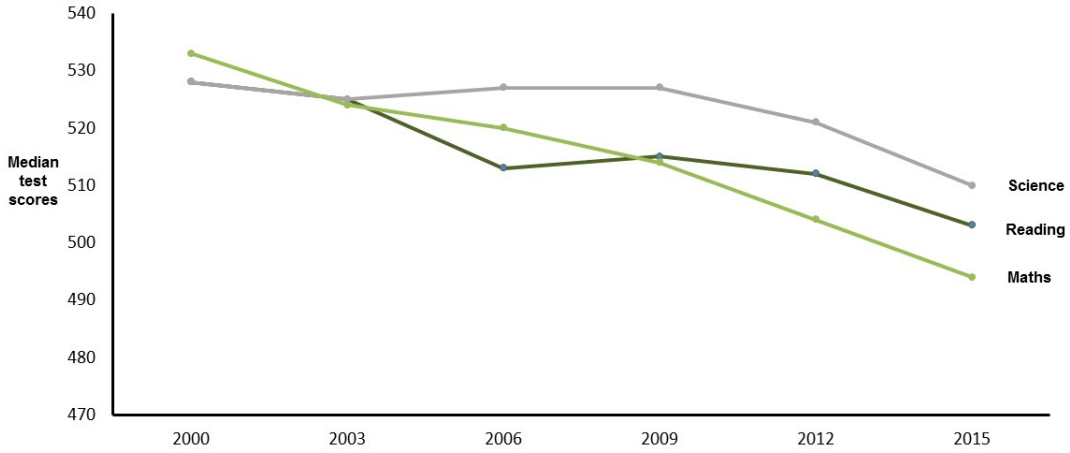
The basis for this evaluation is an examination of Australia's PISA test scores. While the merits of standardised testing are widely debated (Fernandez-Cano, 2016), these scores offer us the longest available time series of measurable change in educational performance.

The approach for the evaluation is two-fold. Firstly, to build a picture of the distribution of the aggregate fall in performance and secondly to measure the economic cost to Australia of changes in different parts of this distribution. As test scores of lower performing students have fallen by more than those of higher performing ones, we can assess the economic cost to Australia of this greater inequality in test scores.

Let's begin by examining various measures of the fall in performance across time and across subjects. The three subjects tested by PISA are maths, reading and science and the PISA tests have been implemented on a triennial basis since 2000, with the most recent round taking place in 2015. The median scores for Australian students for each subject since the first PISA round are shown in Figure 1.

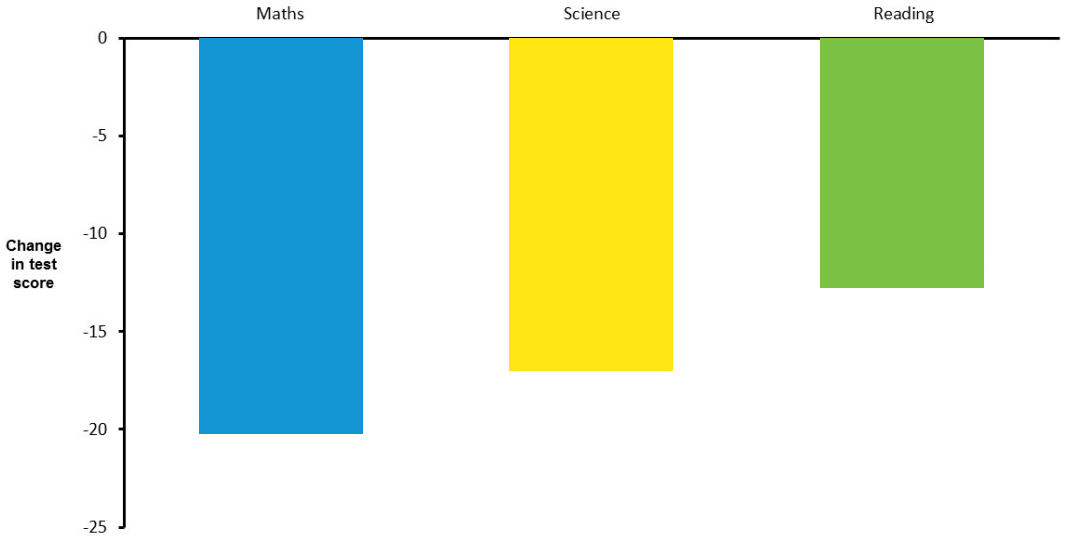
As described above, median Australia scores have fallen consistently in all three subjects since 2000, by a total of 39 points in maths, 25 in reading and 18 in science. However due to alteration to the test formats since 2000, most recently in reading, it is more reliable to focus on changes in scores since 2009. The fall in median scores for each subject since then is presented in Figure 2.

Figure 2:
Australia median PISA scores by subject (2000-15)



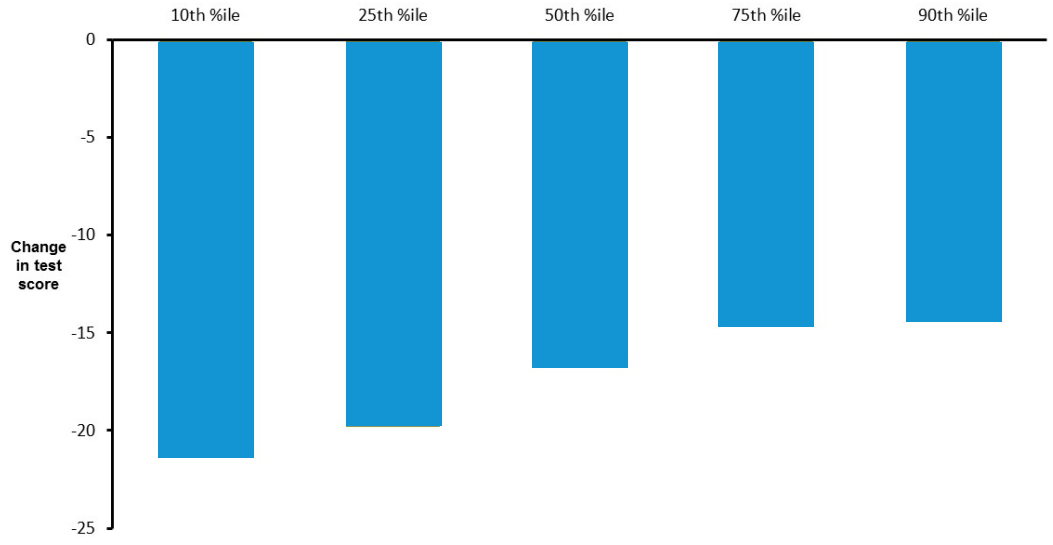
Source: OECD, "PISA 2015 Results Volume I"

Figure 3:
Fall in median Australia PISA scores by subject (2009-15)



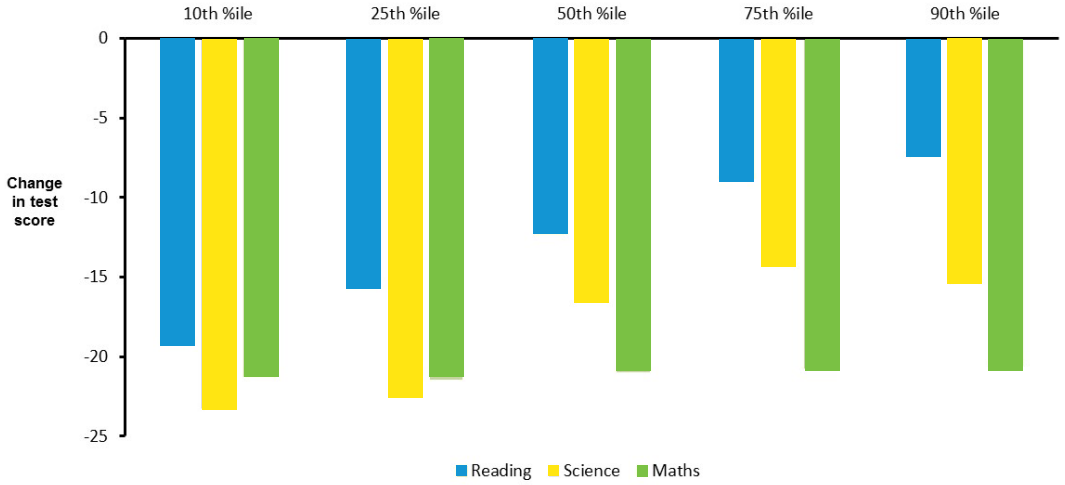
Source: OECD, "PISA 2015 Results Volume I"

Figure 4:
Average fall in Australia PISA scores by percentile (2009-15)



Source: OECD, "PISA 2015 Results Volume I", PEF analysis

Figure 5:
Fall in Australia PISA scores by subject and percentile (2009-15)



Source: OECD, "PISA 2015 Results Volume I", PEF analysis

Since 2009, the median score in maths has fallen by 20 points, in science by 17 points and in reading by 12 points. The changes here are smaller than in Figure 1 as they are over a shorter time period, but the *rate of fall is actually greater* with the average fall at 2.7 points per year over 2009-15 compared with 2.3 points per year from 2000 to 2015.

Using the same period 2009-15, we now turn to the distribution of the falls across higher- and lower-performing students. The OECD publishes percentile breakdowns of test results which we will use as the basis for our distribution analysis (2016). Figure 4 shows the average fall across all tests by percentile since 2009.

This is a critical picture. It shows us that the average performance of students at the 10th percentile of the distribution fell by 21.3 points over six years, while the performance of those at the 90th percentile fell by only 14.4 points. While all cohorts have fared worse, *the performance of those at the bottom has fallen by almost 50% more than those at the top*, exacerbating inequality between the two ends.

When we analyse these distributions by subject, we see more nuance in the picture. Figure 5 shows the decline in scores by subject and percentile over the six years from 2009.

We see that although reading has seen the lowest overall fall in scores, it exhibits the highest increase in inequality with the gap between 10th percentile and 90th percentile students growing by 11.8 points. Maths has shown the largest average fall in performance, but with no statistically significant change between the top and the bottom of the distribution. This is because the top-performing students have fallen by considerably more in maths that in science, and especially in reading. Science exhibits the single biggest percentile fall (23.3 points at the 10th percentile), and an eight-point increase in inequality between 10th and 90th percentile students.

Another way to look at changes in inequality is to examine the share of students who are considered low-achieving and high-achieving in the PISA tests. PISA results are divided into six levels numbered 1-6, although some students do not achieve Level 1 adequacy. Low-achieving students are those below

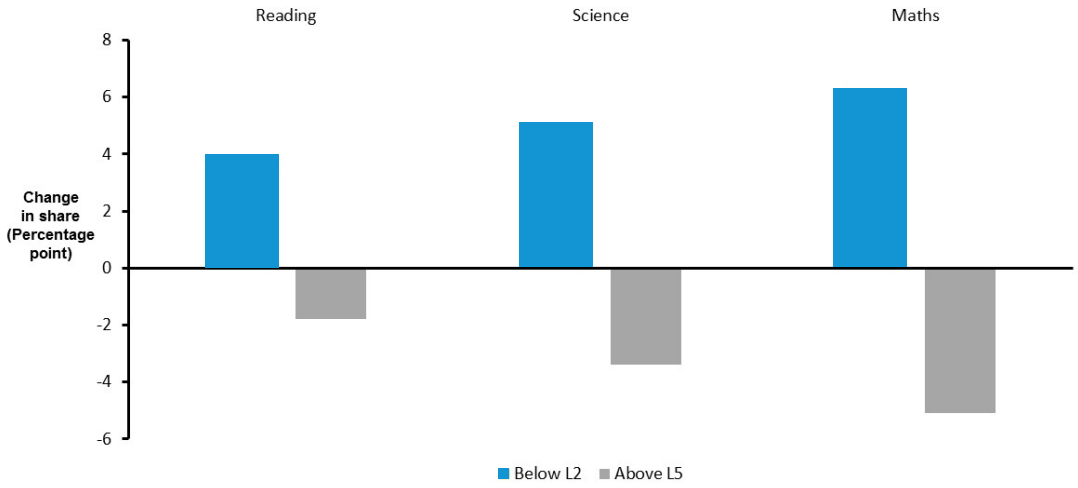
Level 2, and high-achieving ones those above Level 5. Figure 6 shows the changes in shares of low- and high-achieving students by subject between 2009 and 2015.

Here again we see an increase in inequality. If performance had fallen equally across the distribution, we would expect to see the decline in share of those performing above Level 5 equal to the gain in share of those performing below Level 2. Instead we see that in every subject, the increased share of low-achieving students has outpaced the fall in share of high-achieving ones: the higher concentration of students at the bottom of the PISA scoring range is even greater than the reduced concentration at the top.

The best way to summarise these trends is to show the estimated baseline distribution of the falls in Australia's PISA scores since 2009. Using actual data on falls at various percentile points, we have estimated the average fall within different percentile bands. This is shown in Figure 7.

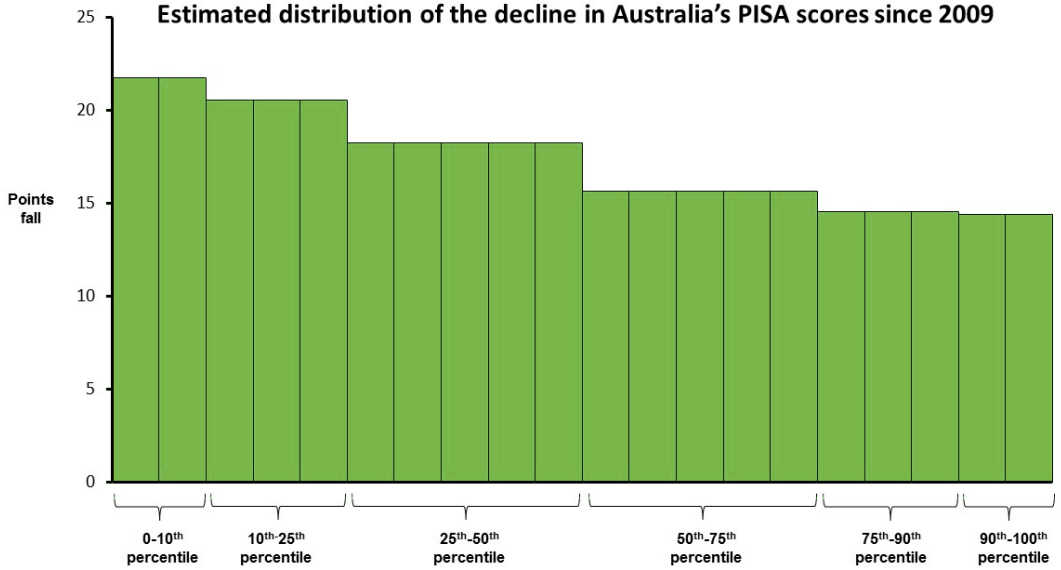
This picture shows that the estimated average decline over 2009-15 is 21.7 points in the lowest decile and 14.4 points in the highest decile, while the falls in the second and third quartiles are 18.2 and 15.6 points respectively. Having established the changing distribution of PISA scores, we now turn to measuring the economic cost of these changes.

Figure 6:
Change in share of high- and low-achieving Australian students by subject (2009-15)



Source: OECD, "PISA 2015 Results Volume I", PEF analysis

Figure 7:
Estimated distribution of the decline in Australia's PISA scores since 2009



Source: OECD, "PISA 2015 Results Volume I", PEF analysis

Measuring the economic cost of increased inequality

As described in the first section of this paper, it is well established that higher educational performance creates economic benefits and conversely that falling performance incurs economic costs. By extension, if we are letting the performance of our top students fall, but that of our bottom students fall further still, we are increasing inequality which produces an additional cost above what would have been incurred had everyone fallen at the same rate as top students.

How are we to measure this inequality effect? The OECD has produced an estimate of the effect of a change in PISA scores on long-term economic performance. It finds that a 50 point change in a country's PISA scores is associated with a change in long term GDP growth of 0.87% per year (OECD, 2010: 21). With the caveat that is an estimated relationship rather than a precise mechanical one, we will use this estimate as the basis for measuring the inequality effect in this paper.

This approach for modelling the economic cost of our changing economic performance requires a series of assumptions. Firstly, we assume that the change between any PISA test rounds is evenly apportioned across the period so that annual changes are constant, known as the 'straight line' method. Secondly, we assume that it takes ten years for changes in PISA test scores to influence GDP outcomes. This is the time which it takes the 15 year old test sitter to finish school and post-secondary education, and begin full-time work by the age of 25. Next, we assume that this worker stays in the workforce until the age of 70, after which the impact of the change in test scores begins to decline as the share of workers whose career has been affected by the pre-2015 changes in educational performance falls. Finally, we use a social discount rate of 3% to convert future economic benefits/costs into current values – this is consistent with the social rate of time preference (SRTP) used by the Commonwealth Department of Finance and Administration (Commonwealth of Australia, 2006). These assumptions are summarised in Table 1.

Once we incorporate these assumptions into an economic model, we can evaluate the economic cost of the fall in Australia's PISA performance from 2009 to 2015. The mean fall of the distribution presented in Figure 7 is 17.3 points. Once we run this figure through our model, we arrive at an estimate of economic loss to Australia of $118.6 billion. This is the net present value of the economic loss in each year from 2019, when the impact starts to take effect, until 2070 when the 2015 PISA cohort leaves the workforce.

Based on the fall from 2009 to 2015 only (excluding earlier falls and assuming no further decline takes place, Australia has suffered an economic loss of almost seven percent of its 2017 GDP and over 23 percent of its Commonwealth debt as at June 2017. Clearly this is an enormous cost by any standards, albeit one that will be borne incrementally over coming decades.

However, this $119 billion figure represents the economic loss due to the aggregate fall in performance – it is measured by the mean of the decline in scores of 17.3 points. It does not break out the specific cost of inequality.

To do that we need to examine the costs of the lowest-performing students falling by more than others in the distribution. A scenario analysis allows us to consider what costs would have been avoided had the lowest performing students 'only' fallen by as much as those in the middle and at the top. We have prepared three

Table 1: Modelling assumptions

Issue	Assumption
Long-term impact on annual GDP growth of 50 point fall in mean PISA scores	(0.87%)
Apportionment of annual change between PISA test years	Straight line
Time for full GDP impact of annual points decline to take effect	10 years
Working age	25-70 years
Social discount rate	3%

Sources: OECD, Commonwealth Department of Finance and Administration, PEF

Figure 8: Economic cost to Australia of declining educational performance since 2009

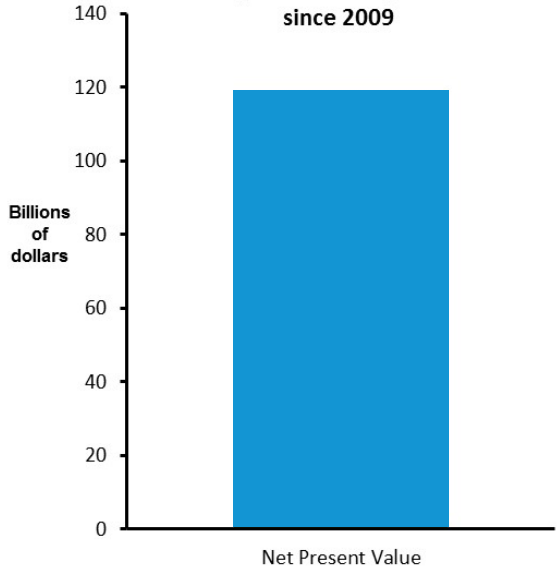
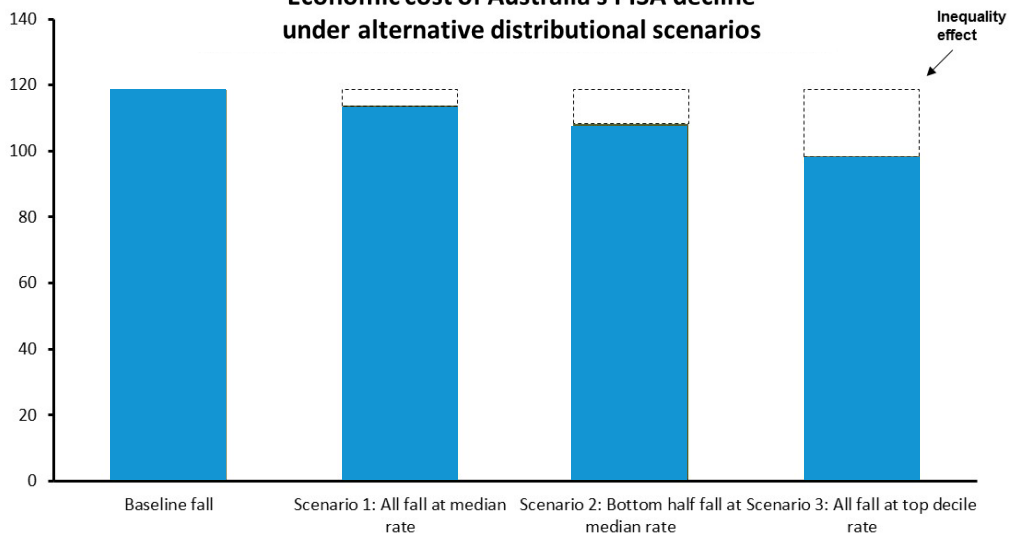


Table 2:
Distributional Scenarios

Scenario	Economic cost to Australia (NPV $billion)	Inequality effect (NPV $billion)
Baseline: Actual performance	118.6	N/A
Scenario 1: All students fall by median level (16.6 pts)	113.7	3.9
Scenario 2: Bottom 50% of fall by median level (16.6 pts)	108.3	10.3
Scenario 3: All students fall by level of top decile (14.4 pts)	98.3	20.3

Source: PEF analysis

Figure 9:
Economic cost of Australia's PISA decline under alternative distributional scenarios



Source: PEF analysis

scenarios with different hypothetical distributions for comparison with the baseline loss of $119 billion.

In the first of these scenarios, the fall of all students in the 2015 PISA cohort is set at the level of the median (50th percentile) student, with a fall of 16.6 points. In Scenario 2, the bottom half of the cohort only falls by as much as the median student, so that their fall is restricted to 16.6 points. In the final scenario, the fall of all students is restricted to the level of the students in the top decile at 14.4 points. These scenarios are outlined in Table 2.

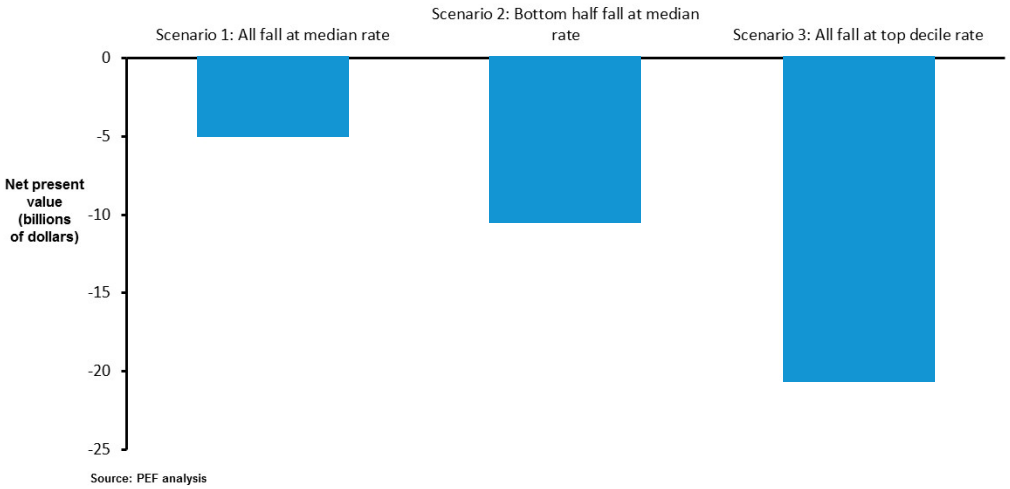
By comparing the economic cost of each scenario against the baseline of actual performance, we can estimate an 'inequality effect': the cost to Australia of having our educational performance falls concentrated disproportionately amongst lower-achieving students. This comparison is show in Figure 9.

The inequality effect of setting all students at the actual median is $3.9 billion. This assumes that the performance of the entire 2015 cohort fell by the same amount (16.6 points) relative to the 2009 cohort, with no net change in inequality. Of course, this implies that the performance of the students in the top half of the 2015 distribution fell by more under this hypothetical scenario than it did in reality.

Scenario 2 assumes that we restrict the fall in performance of the bottom half of students to the level of the median student. The inequality impact here is $10.3 billion. Effectively this is saying that if we were able to keep the bottom 50% of students from falling by more than the median student, the benefit to Australia would be over $10 billion. This seems a very modest aspiration – we are conceding falls in performance but simply managing to restrict the falls of lower-achieving students to the mid-ranking student.

Scenario 3 is somewhat more ambitious, as performance falls for all students are restricted to the 14.4 point fall of the top decile. This would be the ideal outcome if we are forced to accept that Australia's educational performance is slipping: given that we must accommodate falls, at least ensure that these are limited to the minimum possible. The

Figure 10:
Inequality effect of Australia's PISA decline under alternative distributional scenarios



Source: PEF analysis

benefit (or cost avoided) of restricting falls to this level is $20.3 billion. The inequality effect of each scenario is shown in Figure 10.

Thus, of an overall decline in educational performance which will cost Australia around $120 billion in coming decades, over $20 billion can be attributed to the inequality effect of letting kids at the bottom fall by more than kids at the top. This $20 billion is equivalent to 1.2% of GDP, which is roughly half the size of our electricity and gas, IT, or accommodation and food sectors. It's one and a half times the size of our arts and recreation services sector.

It should be said that these estimates are conservative. Due to changes in methodology of the PISA tests, it is not possible to compare all subjects across earlier years. However, if we take the decline since 2003 in mathematics (where methodology has remained consistent) and applied it across all disciplines, the economic loss to Australia would be approximately $203 billion.

That an economic loss of $120 billion, including $20 billion attributable to inequality, can be described as conservative should be of grave concern to education policymakers.

Conclusion

This paper has set out to examine inequality within Australian schools to understand its dimensions, how it changes over time and the cost to Australia of bearing that inequality.

We have seen that educational inequality in Australia is extensive and manifests in a variety of ways, from funding and teacher coverage through to access to learning resources and curriculum. Inequality is worsening over time, and increases for each cohort as they move through their school years. The major determinants of inequality are parental education levels and socioeconomic status, although Australia performs relatively well on equality due to gender or ethnic background. While school sector is correlated with inequality, it is likely this is a function of socioeconomic status rather than sector itself. Curiously though, there is considerable inequality *within* the public school sector as it reflects local disadvantage more strongly than the non-government sector.

To measure the cost of Australia's educational inequality, we have examined Australia's declining PISA results. The results show that students in the bottom decile fell by nearly one and half times those in the top decile between 2009 and 2015, a stark indicator of growing inequality. Further, the paper has modelled the economic impact of falling PISA scores. The results indicate that the present value of the cost of the fall in Australia's educational performance from 2009 to 2015 was almost $120 billion, of which $20 billion is attributable to the fact that students at the bottom were allowed to fall more than those at the top. These numbers almost certainly understate the cost of Australian educational decline since the introduction of PISA in 2000, as changes in methodology prevent a full comparison between then and now.

This paper has sought to shine a light on inequality rather than propose specific recommendations to redress it. What is clear is that education inequality is costing Australia dearly. There are a range of recommendations that have been made by others towards improving the performance of our lowest-achieving students, thus implicitly reducing inequality. These include:

- targeted teaching approaches;
- the randomisation of a share of enrolments to selective public schools;
- the introduction of second classroom teachers to support underperforming students outside the classroom, especially in disadvantaged communities;
- alternative learning programs; and,
- a firm commitment to needs-based funding for schools.

All these ideas deserve ongoing consideration and it is our hope that the examination of educational inequality provided here offers further stimulus to those debates.

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