



**CONVERSATION STARTER
OR FINAL WORD?
Using International Evaluations
to Drive Productivity in Education**

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Conversation Starter or Final Word?

Using International Evaluations to Drive Productivity in Education

By Dr Jim Watterston and Ms Natalie Swayn

A noticeable performance slump of Australian students in international evaluations such as the Programme for International Student Assessment (PISA), Trends in International Mathematics and Science Study (TIMSS) and Progress in International Reading Literacy Study (PIRLS) has prompted growing public concern about the comparative effectiveness and quality of our education systems (Australian Government, 2013; Gannicott, 2014; Grattan Institute, 2010; Przybylak, 2014). With school education reaching a record recurrent cost of \$47.9 billion in 2012-13 (Australian Government, 2015a), it is not surprising that the community—parents, politicians, academics, industry and the media—might question the return on this investment when Australian students appear to be stagnating against global measures. But this approach, we suggest, fails to appreciate both the weaknesses and the strengths of international evaluations—their weakness as a macro approach that cannot fully capture all aspects of local productivity, and their strength as an impetus for evidence-based reforms. Further, notwithstanding the undeniable value of international measures, we caution that a preoccupation with the international—both for comparison purposes and as a means of locating high-performing systems that we might emulate—is often to the exclusion of more relevant local intelligence about school improvement and student achievement.

In this paper, we seek to reintroduce some balance to the way in which international evaluations are used in the Australian context. First, we consider the tendency towards gloomy assessments of Australian educational performance, and the basis on which views are formed. We critically examine the concept of productivity, setting out what aspects of educational investment and performance we seek and claim to capture when we talk about educational performance data. We look at Australian students' performance in three international evaluations (PISA, TIMSS, and PIRLS) as well as local measures (the National Assessment Program: Literacy and Numeracy [NAPLAN], the Review of Government Service Provision [ROGS] and national benchmarking) to consider how the international and national data sets can jointly form a picture of how Australian students are faring. In doing so, we draw on examples that show how none of these data sets provides the sole or final assessment of Australian education productivity rather, they are of most value when used in combination with locally-

informed intelligence to motivate targeted, evidence-based education reforms. Finally, we propose a more strategic use of key features from the performance indicator framework to guide important national conversations about school improvement and student achievement. Under this approach, the focus of our forensic performance lens shifts from international to national data sets relevant to efficiency, effectiveness and equity measures as a way to connect productivity at the local level to school autonomy and accountability.

Admiring the problem: without evidence, and without purpose

The most pessimistic assessments of Australian educational performance fall largely into one of two categories: the first are based on outmoded ideas about curriculum and unsubstantiated claims of poor performance; the second are based only on large-scale quantitative measures and fail to account for more nuanced measures of local performance and improvement. Both are inherently deficit-based, and neither is conducive to driving evidence-based reform.

A familiar chorus of critics are predictably quick to trumpet opinions about the factors they believe are contributing to the poor 'health' of our Australian state and territory education systems (Hurst, 2013; Marginson, 2013) but few appear compelled to back their assertions with reference to any quality research (Palmer, 2012; Thomson, 2014). As a result, many critical public conversations about school and student performance are superficial and often narrowly framed as matters about the importance of teaching the basics, 'writing, reading and arithmetic' (Chilcott, 2014; McLaren, 2015). Constructive discussion is, arguably, further hampered by the disproportionate influence exercised by some prominent individuals and lobby groups who position themselves as experts in school reform (Baroutsis, 2014; Greene, 2014). Although the education system's responsiveness to public critique may indicate the health of modern Australian democracy, an unintended consequence is that responding to sweeping and sometimes uninformed critique detracts from sustained, strategic efforts in long-term, evidence-based reform.

Government efforts to lift Australian student performance in PISA, TIMSS, PIRLS and the NAPLAN

have been variously funnelled through contentious accountability and performance initiatives (e.g. National Partnerships), resource methodology reviews (e.g. Review of Funding for Schooling), and equity programs (e.g. Closing the Gap) (Australian Curriculum Assessment and Reporting Authority, 2013b; Council of Australian Governments, 2008; Gonski et al., 2011; Ross, 2014). These funnels can be viewed as representing the key dimensions of productivity (effectiveness, efficiency and equity) detailed in the Australian Government Productivity Commission’s performance indicator framework (Figure 1) (Australian Government, 2015a). Consequently, notions of effectiveness, efficiency (for example, recurrent expenditure per student, student to staff ratio) and equity (for example, attendance and participation) are inherent in the determination of how governments view performance (Australian Government, 2015a).

The decade-long expansion of the collection, analysis and reporting of data about Australian schools and students (e.g. My School, NAPLAN) is a direct result of successive federal government efforts to increase both transparency and accountability in school education (Australian Curriculum Assessment and Reporting Authority, 2013a; Council of Australian Governments, 2008). Public access to data about student performance, attendance and

achievement, as well as detailed information about school enrolment figures and financials are now at unprecedented levels (Australian Curriculum Assessment and Reporting Authority, 2015). Interested stakeholders have at their disposal a seemingly endless supply of school statistics and demographic details to trawl through in the search for significant patterns and trends in education (Gable & Lingard, 2013; Nghiem, Nguyen, Khanam, & Connelly, 2015). This convenience, however, arrives with an accompanying risk of parties getting lost in the data, particularly when data exploration begins without first considering what problem one aims to address, or question one aims to answer. This kind of open-ended exploration can lead us to become stuck ‘admiring the problem’ rather than using data to inform strategic initiatives—either by redirecting efforts or maintaining momentum on existing school improvement and student achievement efforts. The OECD itself acknowledges that PISA is ‘only one measure’ of educational performance, and that the variation between students within and between schools give ‘a much clearer indication of the extent to which the education system succeeds in offering a quality education to all of its students’ (OECD, 2013, para. 7).

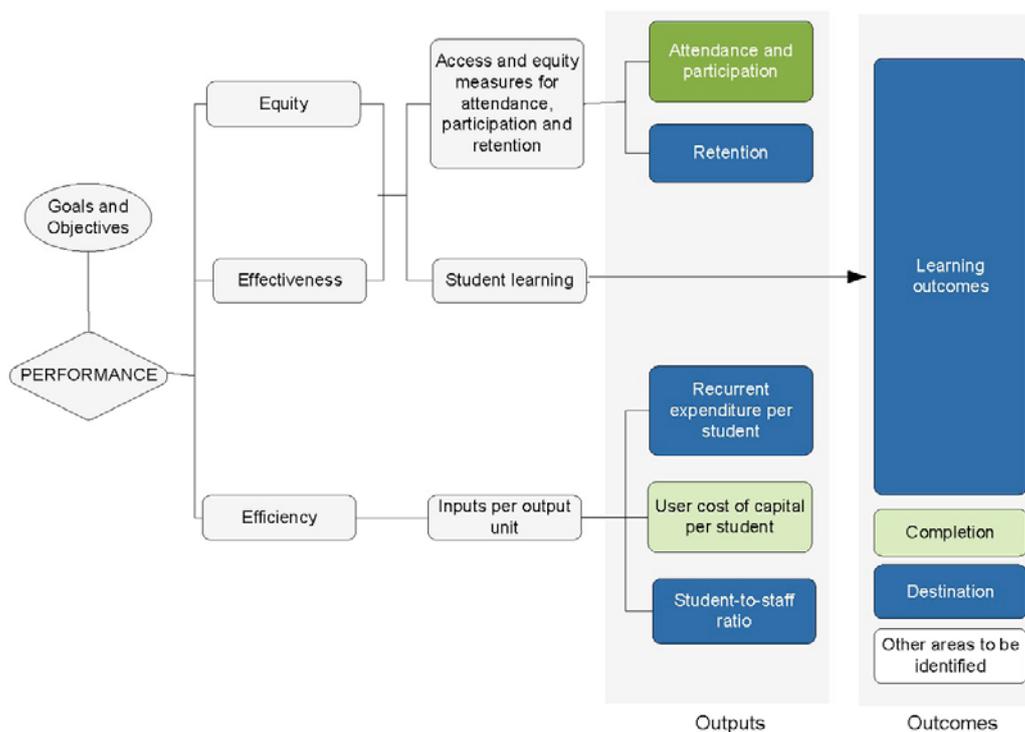


Figure 1: Australian Government School Education Productivity Performance Indicator Framework (PPIF)

Defining productivity in education

The macro-level view of education performance afforded through international testing programs, as well as the domestic regime, prompts questions about the relative performance of Australian students and the quality of the schooling they are offered. Why has achievement in these different evaluations stalled for our students? From a system improvement perspective, these may fundamentally be matters about productivity, and suggest that perhaps we need to more clearly define the meaning we attach to productivity in school education.

We argue there are three key dimensions to productivity in Australia’s school education systems, all of which align with the Australian Government’s Performance Indicator Framework used in the annual Report on Government Services (ROGS), as discussed in relation to Figure 1 (Australian Government, 2015b):

1. Effectiveness: student performance, as measured by international evaluations, NAPLAN, school completion, post-school destinations
2. Efficiency: return on investment, as measured by per-student recurrent expenditure, cost of capital, and staff-student ratios
3. Equity: dissimilarity in student outcomes, as reflected in access indicators such as attendance, enrolment, and apparent retention rates, as well as units of competency acquired. apparent retention rates.

Clearly, there are limitations associated with viewing the data through the different performance indicators’ lenses; for example, the definitions of effectiveness, efficiency and equity in the framework are arguably limited in scope. Further, there is a risk associated with applying a refined scientific measure to complex social, developmental factors, which are themselves contested. For example, can equity as currently defined in the performance indicator framework best be measured through outcomes such as attendance and retention rates? The strength of the performance indicator framework as a model for considering productivity in Australian education is perhaps of greatest value when viewed as a total model, leveraging the combined weight of each of the elements rather than the individual elements themselves.

Although the ROGS Performance Indicator Framework is presented as a connected and interdependent model, the presentation of data in the school education chapter of the report

is separate for each dimension (Australian Government, 2015b). That is, there is no attempt to present output and outcome data in a way that demonstrates or illustrates relationships between effectiveness, efficiency and equity as part of the whole national productivity picture. This is one of several limitations inherent in the current reporting format of ROGS School Education performance indicators. Further, when reflecting on efficiency measures it is important to consider what Grubb (2009, p. 5) describes as the ‘money myth’: that increased spending will necessarily achieve commensurate performance gains, and that ‘the solution to any educational problem requires increased spending’. Rather, multiple different factors—teacher qualities, mode of instruction, and climate, for example—each have moderate effects that, in combination, can lead to school improvement. These factors should not be omitted from any assessments of productivity or efficiency based on the following international evaluations.

Data sources: what they say, and cautions around their use

Programme for International Student Assessment (PISA)

The PISA survey is conducted every three years on behalf of the Organisation for Economic Co-operation and Development (OECD) to assess the extent to which students at the end of their compulsory education are able to apply knowledge to real-life situations and participate fully in society (Australian Council for Educational Research, 2015a). Administered to fifteen-year-old students from randomly-selected schools around the world, PISA measures reading literacy, mathematical literacy and scientific literacy (Australian Council for Educational Research, 2015b). In 2012, 14,481 Australian students in 775 schools participated in the PISA testing program (Thomson, De Bortoli, & Buckley, 2013). The results confirmed a disappointing continuation of the trend noted since the second PISA survey in 2003, that Australian student performance is in decline by score and international rank in all areas (Table 1).

	2000	2003	2006	2009	2012
Reading Literacy	4th	4th	7th	9th	14th
Mathematical Literacy	5th	11th	13th	15th	19th
Scientific Literacy	7th	6th	8th	10th	16th

Table 1: International Ranking Trend for Australian Students in PISA

The number of countries or economies participating in PISA has changed over time, from an initial group of 43 in 2000 to 65 in 2012 (OECD, 2014). There is value, therefore, in paring back the ranking model to a comparison of Australian students' performance against students from only those countries that have been a part of the testing regime since it began in 2000 (Table 2).

	2000	2003	2006	2009	2012
Reading Literacy	4th	4th	6th	6th	9th
Mathematical Literacy	5th	8th	9th	9th	11th
Scientific Literacy	7th	5th	5th	6th	9th

Table 2: Australia's rank against the same 30 countries included in 2000 PISA survey

While evidence of the degeneration is less dramatic in this revised analysis, the data still show Australia's rankings across all test areas have dropped since the baseline year of PISA in 2000. In the reading literacy domain, Australia ranked fourth in 2000 but by 2012 had fallen to ninth, and Australian students have lost ground in mathematical literacy (shifting from fifth in 2000 to eleventh by 2012) and scientific literacy (from seventh in 2000 to ninth by 2012). Interestingly, the 2012 survey showed that although Australian students from English speaking backgrounds outperformed those from non-English speaking backgrounds in reading and scientific literacy areas, the results were reversed for mathematical literacy. Further, first-generation Australians outperformed both Australian-born and non-Australian-born students in all areas.

The 2012 PISA survey also looked at the learning environment of different schools, surveying students about truancy and climate (for example, quality of teacher-student relations) (OECD, 2013). Concerning findings for Australian students included higher reported frequency of students not listening, noise and disorder; higher reported skipping days of school in the two weeks prior to the PISA assessment (but lower overall than the OECD average—suggesting some relationship between planned absence and scheduled assessments); and more than 20% of Australian students feeling that they did not belong, were not happy, or were not satisfied at school (Thomson, et al., 2013). The quality

of the relationship that students have with their school has been shown to affect their engagement in learning, and their performance (Gemici & Lu, 2014; Ockenden, 2014). Accordingly, an understanding of environment should be considered alongside curriculum and teaching quality if we are to improve performance and achievement.

Trends in International Mathematics and Science Study (TIMSS)

The TIMSS assessment is conducted every four years by the International Association for the Evaluation of Educational Achievement (IEA), 'an independent, international cooperative of national research institutions and governmental research agencies (that) conducts large-scale comparative studies of educational achievement' (International Association for the Evaluation of Educational Achievement, 2011; International Study Center, 2013; Thomson et al., 2012). TIMSS collects data about student performance in mathematics and science, with the assessment given to students in Years 4 and 8 to inform a benchmarking activity of achievement across 34 countries (International Study Center, 2013).

The fifth iteration of the TIMSS assessment was conducted in 2011, and delivered further evidence of comparative academic decline of Australian students. The Australian Year 4 cohort was represented by 6000 students from 280 schools and Year 8 by 7,500 students in 275 schools across the country (Thomson, Hillman, & Wernert, 2012; Thomson, Hillman, Wernert, et al., 2012). Australian students have participated in each TIMSS assessment since 1995, providing an excellent longitudinal data set through which to monitor performance trends and shifts in mathematics and science education over twenty years. One of the most notable findings from this extended snapshot of performance over time has been the revelation that very little statistical change has occurred for Australia over the last four (1999, 2003, 2007, 2011) TIMSS assessments (Thomson, Hillman, & Wernert, 2012; Thomson, Hillman, Wernert, et al., 2012).

In the 2011 round of TIMSS, the results for Australian students in Year 4 mathematics were of a 'significantly lower level than students in 17 countries, including Ireland and Northern Ireland, the United States and England, as well as the participating Asian countries Singapore, Korea, Hong Kong and Chinese Taipei' (Thomson, Hillman, Wernert, et al., 2012, p. vii). The performance

was, however, considerably better than 27 other countries, including New Zealand, Sweden and Norway (Thomson, Hillman, Wernert, et al., 2012, p. 38). In Science, Year 4 students from Australia fared slightly worse with results lower than students from 18 other countries, for example England and the United States (Thomson, Hillman, Wernert, et al., 2012, p. 57). Among the countries they outperformed were again New Zealand, Sweden and Norway.

For Australian Year 8 students in mathematics, countries like Korea, Singapore, Japan, Israel and the United States achieve significantly better results (Thomson, Hillman & Wernert, 2012). Overall, Australian students proved stronger in this 2011 assessment area than 27 countries, including again New Zealand and Sweden. Australian achievement for Year 8 science was significantly lower than that recorded for nine other countries, including as Singapore, Chinese Taipei, Korea, Japan and the United States (Thomson, Hillman, Wernert, et al., 2012). Australia’s score of 519 was higher than that of 26 countries including New Zealand, Italy and Norway.

National Assessment Program: Literacy and Numeracy (NAPLAN)

Turning to local measures of student performance, the annual NAPLAN assessment conducted in May each year across all Australian schools provides information about the literacy and numeracy skills of students at key stages of their schooling: Year 3, 5, 7 and 9 (Australian Curriculum Assessment and Reporting Authority, 2013b). In place since 2008, NAPLAN has permanently changed the school education landscape and is a focal point for robust national debates about the quality and effectiveness of different school systems (e.g. state, Catholic and independent), the content of the Australian Curriculum and quality of teachers (Gable & Lingard, 2013; Moran, Neri, & Rodgers, 2014; Pyne, 2012).

NAPLAN offers comparative data on student achievement within Australia (between states and territories) and allows for analysis of equity in schooling—a feature that neither PISA nor TIMSS can offer. NAPLAN’s more fine-grained data shows, for example, that narrowing of the gap between Indigenous and non-Indigenous students across all of the test domains is uneven year on year. Contrary to the dominant view that there is a flat skills gap between these student sub-groups, a thorough analysis of NAPLAN data demonstrates peaks and

troughs in different areas over time, offering new possibilities for directed attention in reform agendas and funding focus. In Year 5 numeracy, for example, the gap narrowed in 2009 between Indigenous and non-Indigenous students has fluctuated—alternately widening and narrowing year by year—between 2010 and 2014. The volatile pattern of results appears consistent across national minimum standard, Upper Two Bands (U2B) and Mean Scale Score (MSS) across all year levels and domains (see Table 3).

	2008	2009	2010	2011	2012	2013
Indigenous	69.2	74.2	71.4	75.2	69.2	73.0
Non-Indigenous	94.0	95.3	95.0	95.5	94.6	94.6

Table 3: Percentage of Year 5 Students At or Above National Minimum Standard in Numeracy by Indigenous status Australia, 2008–2013

In the face of the abundant data offered by the each of the sets—PISA, TIMSS and NAPLAN—it is easy to feel justified in making sweeping judgements about strengths and weaknesses of the Australian education system, and our media have certainly done so (Dodd & Mather, 2012; News.com, 2013). Parent interest in the launch of My School website was so great that the capacity of the site was quickly exceeded on its first release in early 2010 (Moses, 2010). But lifting school performance is best served by disengaging from the politics of distraction (Hattie, 2015) and using our collaborative expertise to combine measures of absolute performance as represented in school averages with more rounded assessments that also capture stories of student improvement.

Report on Government Services (ROGS)

The ROGS School Education performance indicator gives minimal reference to contextual factors such as unique programs and strategies that may influence differences in outcomes between states and territories. This silence in the presentation of the ROGS data has implications for how the information is likely to be perceived by its readers, and the subsequent interpretations they might make of raw data. In the most recent ROGS Annual Report for 2013, the Northern Territory and Western Australia (Table 4) have noticeably larger recurrent expenditure per student in their secondary schools than all of other states and territories (Australian Government, 2015a), but the report offers no suggestions about why this might be, or why Western Australia and Northern Territory expend

more per secondary student than the other states and territories. This is, we argue, a vitally important question to consider, and one that is as yet beyond the intended purpose of ROGS reports to explore.

	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
In-school secondary	15 367	14 628	15 897	21 680	15 324	15 983	20 045	23 349
Total secondary	15 810	15 316	16 729	22 677	16 401	16 548	21 289	25 630

Table 4: Real and nominal Australian, State and Territory government recurrent expenditure per student, government secondary schools in 2010-11 (\$ per FTE student)

In the absence of any measured discussion about possible structural, organisational or environmental elements unique to each jurisdiction, it is impossible to conclude whether Northern Territory and Western Australia are more or less efficient in the allocation of funding that other states and territories. For this reason the reliability and quality of judgments made using these ROGS data should be viewed with healthy caution.

National Benchmarking

With due acknowledgement to the intrinsic weaknesses of the ROGS data sets, an initial attempt to construct a scaffold for national benchmarking discussions is offered below. Using data from the ROGS Annual Report for 2014 a rank order table has been developed to enable a simple comparison of rank order NAPLAN Mean Scale Score (MSS) (as an indicator of effectiveness), Net Recurrent Income Per Student (NRIPS) (as a measure of efficiency) and Index of Community Socio-Educational Advantage (ICSEA) (as an equity factor).

State/Territory	Rank NAPLAN MSS 2012	Rank NRIPS 2012	Rank Average ICSEA
NSW	3	3	3
VIC	2	1	2
QLD	7	2	6
WA	4	7	5
SA	6	4	4
TAS	5	5	7
ACT	1	6	1
NT	8	8	8

Table 5: Framework for National Benchmarking

Converting this data into a scatter plot (Figure 2) to compare NRIPS and NAPLAN MSS we see a thought-provoking picture begin to emerge in relation to efficiency and effectiveness. For example, Victoria has a relatively low ranking on the NRIPS in relation to other states and territories (high efficiency) and a high ranking in NAPLAN MSS (high effectiveness). Further, when the size of the schools is large (eg. urban schools), then the NRIPS value decreases, by virtue of the fundamental costs of delivering schooling.



Figure 2: State and Territory NRIPS 2013 Compared to NAPLAN MSS 2014 (Year 9 Reading)

If we take this one step further and add state and territory ICSEA data, as a simple measure of equity using the average and variance of this data point, an argument could be advanced that the Northern Territory represents considerably more disadvantaged students, and the Australia Capital Territory significantly more advantaged students, than other areas (Figure 3). But rarely do such simplistic interpretations reflect the reality: it could instead be that the Northern Territory has predominantly smaller schools, and the Australian Capital Territory devote greater resourcing to their schools.

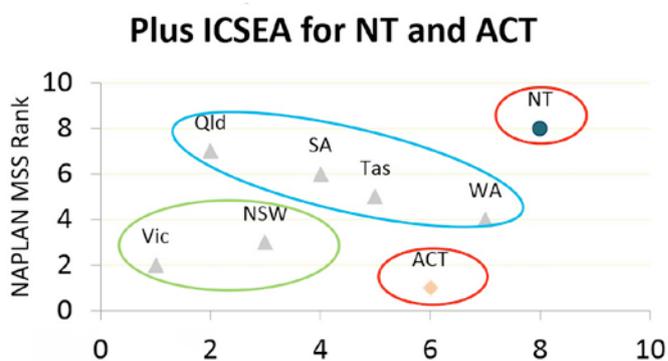


Figure 3: State and Territory NRIPS Compared to NAPLAN MSS 2012 plus ICSEA for NT and ACT

The visual presentation of the combined ROGS data sets also offers the opportunity to realise the suggestion of an interesting relationship between effectiveness and efficiency in four states (Queensland, South Australia, Tasmania, and Western Australia). Figure 3 shows spending per student increase as NAPLAN MSS scores increase, moving horizontally across the graph from Queensland to Western Australia. This could be interpreted as an indication that the more spent per student the stronger their performance, but further interrogation of the data reveals a far more complex relationship between expenditure and performance.

Based on the information presented in the Figure 3 scatterplot, several questions might be asked of Victoria and New South Wales in relation to their education productivity, such as whether these states outperform others (in terms of effectiveness, efficiency and equity) because they are further advanced in their reforms and strategic direction. We might also question what other dimensions might work better to unify the productivities suggested in the graph, and even whether state/territory comparisons of this sort are in fact a distraction from more salient issues of school impact and family/home impact. The proposed benchmarking framework does not suggest that three raw ranking scores might be an appropriate measure of school education productivity in Australia. Instead, we aim to promote different ways of combining and presenting the ROGS data to maximise its functional application and relevance to our national discussion and decision-making about state and territory performance.

In Figure 4, we attempt to demonstrate the relationship between ICSEA 2014 and NAPLAN, and see that doing so suggests some similarity in (on the line) performance between states and territories. Again, this relationship would be tested if we were to also introduce geographic distribution (Northern Territory with the highest NRIPS, Tasmania and Queensland with the lowest), and it could also be argued that the nature of ICSEA calculations automatically create a relationship with NAPLAN data. NAPLAN results, when analysed by ICSEA and NRIPS, become more similar than is suggested in the ranking data presented elsewhere in this paper. Clearly, the cost of schooling, while similar between metropolitan and provincial areas, increases in very remote areas, with surprisingly little difference in NAPLAN mean scale scores. That is, once the zone category is accounted for, major differences are observed in remote and very remote regions, but

are clearer in NRIPS terms than they are in NAPLAN terms.

In any case, there appears to be limited value in investigated minutiae of state-to-state variations using such high-level data, given the apparent lack of significant variation they show, and their inability to account for the distribution of schools that comprise each state or territory. The data raise questions around the efficiency and effectiveness of remote and very remote categories that define overall state/territory results, and for metropolitan and provincial categories, around whether there is any substantial difference between the nation's most populated areas.

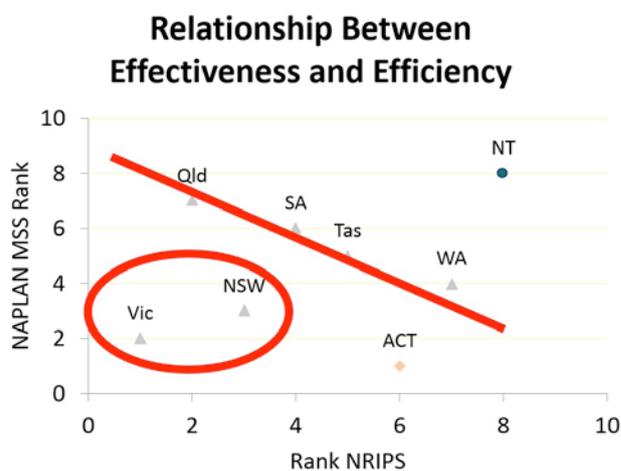


Figure 4: Relationship between Effectiveness and Efficiency in Australian States and Territories

We argue that the Australian Government Productivity Commission data sets are so poorly understood and underutilised by education jurisdictions that we are missing an important opportunity to leverage their statistical weight. Further, in order to look beyond the generalised, simplistic relationships they suggest, we need to delve further into the data and test the value of existing measures.

Using data sets to inform productivity and reform discussions

Education productivity remains a largely untested concept in Australia, despite it being a major budget impost and an economic driver for our economy. Perhaps the most serious criticism of macro-educational policies or approaches like ROGS is that we, as the primary consumers of such bureaucratic offerings, view these relatively coarse data sets devoid of contextual acknowledgements, which then

facilitates in the creation of unfair and unconstructive stories about education system performance. In this paper, we have aimed to demonstrate through deeper exploration and provocative comparisons of data sets, that international and national assessments can raise as many questions as they answer about educational performance.

Notwithstanding the inherent weaknesses of the various data sets, and the danger in relying upon as sole measures of our educational performance and productivity, they are undeniably valuable both to provide the impetus for reform and as tools to target our efforts. By being more specific in how we define and measure productivity, exploring the data in greater detail, and considering the various sets in combination with each other and with other local measures, we can provoke interest and inquiry into educational performance and better target our reform efforts to the areas of greatest need.

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Monograph 53

CONVERSATION STARTER OR FINAL WORD?

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