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Abstract

We use quasi-experimental variation in the timing of national standardized test-score reports to estimate the causal impact of giving parents objective information about children's academic achievement. Releasing test scores leads to more modest perceptions of academic achievement and reduced school satisfaction. The use of private tutoring is increased, while extracurricular activities are reduced. Examining the underlying mechanisms, we show that it is public-school parents and parents of children receiving unexpectedly "bad" test scores who alter their perceptions. Learning that a child scores above the national average raises perceived academic achievement and time devoted to education, while reducing leisure time.

JEL classification: I21, J13, D10, D90

Keywords: Parental investments; test-score information; parental perceptions; overconfidence

1. Introduction

Parents are particularly consequential in shaping children's intellectual, emotional, and social development. Their decisions affect children's cognitive and noncognitive skill development by determining pre-school learning environments (e.g., Bono et al. 2016; Cunha & Heckman 2007; Delaney & Doyle 2012; Feinstein 2003; Heckman & Cunha 2010) and by reinforcing (or undermining) the educational investments children receive once they enter school (e.g., Bonesrønning 2004; Fredriksson et al. 2016; Gelber & Isen 2013; Pop-Eleches & Urquiola 2013).[1] The investment strategies that parents adopt depend not only on what they want for their children (i.e., their preferences) and the resources they have available to them (i.e., their constraints), but also on how well they understand their children's existing capabilities and the best options for extending them (Cunha 2015). Some parents have incorrect beliefs about their children's achievement and misallocate their investments as a result (Dizon-Ross 2019). Importantly, misinformation appears to be worse among more disadvantaged families, opening the door for heterogenous beliefs about children's achievement to help explain socio-economic disparities in human capital investments (Boneva & Rauh 2018; Dizon-Ross 2019). The provision of objective information on academic performance is a natural way to close any information gaps; whether this also mitigates the disparity in child investments depends on how parents respond to the information they receive.

Our aim is to estimate the causal impact of objective information about children's academic achievement on the investments (i.e., time spent with children, books, tutoring, pocket money, extracurricular activities, and parenting style) that parents make in them. Identification comes from quasi-random variation in the timing of the release of national standardized test scores relative to interview dates in Growing Up in Australia: The Longitudinal Study of Australian Children (LSAC). The LSAC is a representative longitudinal study designed to provide an in-depth understanding of children's development. Importantly, the LSAC data can be linked to standardized test scores from the National Assessment Program - Literacy and Numeracy (NAPLAN) which assesses all Australian students in grades 3, 5, 7, and 9 using a standardized test administered nationwide on the same dates. Once available, NAPLAN reports provide parents with objective information about their child's individual test

[1] If human capital is multidimensional, parents may simultaneously choose to compensate along some dimensions while reinforcing along others (Yi et al. 2015). Becker and Tomes (1976) note that parents' decisions to either compensate or reinforce any human capital disparities between children have the potential to undermine the public investment made in them.

results in several domains (e.g., literacy, numeracy, writing). Interviews occur in the same years as NAPLAN tests for most families in the LSAC. Some parents are interviewed before they know their child's NAPLAN results (the control group) while others are interviewed afterwards (the treated group). We show that this treatment assignment is as good as random, providing us with quasi-experimental variation that can be used to identify the causal effect of test-score information on parents' investment decisions using an event-study design.

When asked directly, Australian parents are generally optimistic about their child's school achievement; only 5.1 percent of parents in the LSAC report that their child is either below or well below average, while fully 60 percent believe that their child is above or well above average. The receipt of NAPLAN results, however, leads parents to be more modest in their views of their child's relative achievement. We also show that parents are overwhelmingly positive about their child's school and that receiving NAPLAN reports lowers their school satisfaction. Both these results are consistent with recent evidence of parents holding inaccurate beliefs about their child's school performance and their child's school quality, but then updating those beliefs in the face of new information (see Dizon-Ross 2019; Greaves et al. 2019).

We find that the release of NAPLAN results leads to a 44 percent increase in the use of private tutoring and a 22 percent reduction in the number of extracurricular activities (e.g., community groups, sports, religious activities) that children participate in. These results are confirmed in estimates that rely on children's time-use data. Parents' receipt of their child's NAPLAN report leads to children spending 21 minutes less in leisure time each week, which are mostly reallocated to educational activities. At the same time, NAPLAN results have no effect on the number of activities that parents and children do together; whether children have access to a lot of books at home or receive an allowance; nor do they affect parental monitoring and warmth.

Conceptually, parents' responses to their children's NAPLAN reports will depend on the information that test-score reports provide to parents. We explore the implications of this information content in three separate exercises. First, we estimate how parental responses depend on parental information at baseline and the availability or not of school-level test results. Specifically, we estimate the heterogeneous effects of NAPLAN reports across public- vs. private-school sectors and in low- vs high-income families. We find that public-school parents alter their perceptions of their child's academic achievement more in response to receiving a NAPLAN report, suggesting that they may have less information about their children's achievement than do private-school parents. At the same time, their investment

responses are not statistically different to those of private-school parents. Nor do we find any heterogeneity in investment responses across the income distribution. We also estimate the heterogenous effects of NAPLAN reports in jurisdictions that do and do not report average test results at the school level. It is only parents who do not receive school-level performance information who respond to the availability of NAPLAN information by altering their child's time use, increasing time in educational activities and reducing leisure time.

Second, we test whether responses differ when parents receive good, bad, or no news regarding their children's test performance. We investigate this by predicting each child's NAPLAN test score using their prior NAPLAN test score, parents' subjective reports of their child's achievement level and other predetermined characteristics. Based on their predicted NAPLAN test scores (and the standard errors of the predictions), we then categorize each child's NAPLAN report as "good news", "bad news" or "no news" for their parents. We find that children's NAPLAN reports increase tutoring and decrease the time their children spend in extracurricular activities regardless of whether the news is good or bad. Bad news alone, however, is at the heart of parents' increased pessimism about their child's achievement level. Together, these results suggest that while parental perception of their child's school achievement do react to the news embedded in NAPLAN reports, changes in these perceptions are not linked to changes in tutoring and extracurricular activities. Instead, changes in these investments are likely the result of a priming effect from receiving the NAPLAN report rather than the test-score information included in them.

Finally, we estimate whether parents use national averages as benchmarks by exploiting the fact that NAPLAN reports show student and national average scores in a salient way that makes for a natural comparison. We show that when children score above the national average in their test scores, parents are more optimistic about their child's school achievement, and children's time is reallocated towards educational activities and away from leisure. These results reveal very intentional and targeted parental investments in education in response to positive signals regarding children's academic ability, providing new evidence that parent's investments reinforce disparities in children's human capital (see Becker & Tomes 1976; Yi et al. 2015).

Our research represents an important extension of the existing literature on parental responses to new information. Previous researchers find that parents alter their child investments when they receive information about: i) school inputs (e.g., Das et al. 2013; Greaves et al. 2019); ii) the child development production function (Attanasio, Boneva, et al., 2019; Attanasio, Cunha, et al., 2019; Boneva & Rauh 2018; Carneiro et al. 2019); and iii) their

child's achievement levels (Andrabi et al. 2017; Bergman 2021; Dizon-Ross 2019; Kinsler & Pavan 2021). Our results demonstrate the impact of providing parents in advanced economies with easily understandable information about children's academic achievement, extending what is known in developing countries (Andrabi et al. 2017; Dizon-Ross 2019). The fact that the release of children's standardized test scores shifts parental investments and perceptions in our context—where parents have every oportunity to be well informed about their children's achivement—is remarkable and highlights the widespread importance of information frictions even in advantaged settings with well developed educational institutions. Methodologically, our identification strategy mirrors that of Greaves et al. (2019) who use exogeneity in the timing of school inspection reports to estimate the causal impact of good news about school quality in reducing parental investments. One key difference is that we exploit information about both child and school test performance, and that we are able to link these information shocks to parents' perceptions of their children's school achievement as well as their self-reported school satisfaction.

Our findings are particularly timely in light of the current debate about the value of standardized testing. Some stakeholders argue that tests have become "high stakes" leading to a distortion in schools' teaching and learning programs; others point to their role in making judgements about school and school system performance (Louden 2019). Notwithstanding this debate, Australia is among those countries making school-level test results public as part of a broader attempt to hold schools accountable for the educational outcomes their students achieve.[2] Our results show that parents do act on this information when making their decisions about how best to support their children's human development.

2. Data

2.1 The Longitudinal Survey of Australian Children (LSAC)

Our data come from the LSAC, a nationally representative study of Australian children and their families. The study is designed to provide detailed biennial information about the development of two cohorts of children. We restrict our analysis to the kindergarten or "K"

[2] School-level student achievement data are available on publicly searchable website in many international jurisdictions. In some cases, public access is supported through legal requirements (United States) or government websites (Singapore, Canada, Australia), while in other cases access is restricted (Hong Kong) or has been discontinued (Wales, New Zealand). See Louden (2019) for a review.

cohort which sampled 4,983 children aged 4-5 years old in 2004, when the survey began (Soloff et al. 2005).[3]

Our data are extremely rich. They include linked information from i) detailed longitudinal interviews with children's parents, teachers, and later children themselves; ii) 24-hour time-use diaries with extremely granular data on how children spend their time; and iii) NAPLAN tests for both children and in some cases the school they attend. The K cohort typically enters third grade in 2008 (LSAC wave 3) when they become old enough to take the NAPLAN test for the first time. Our core analysis relies on waves 3 to 6 of the LSAC which coincide with all NAPLAN test years through grades 3, 5, 7, and 9.

2.2 Educational Achievement: NAPLAN Test Scores

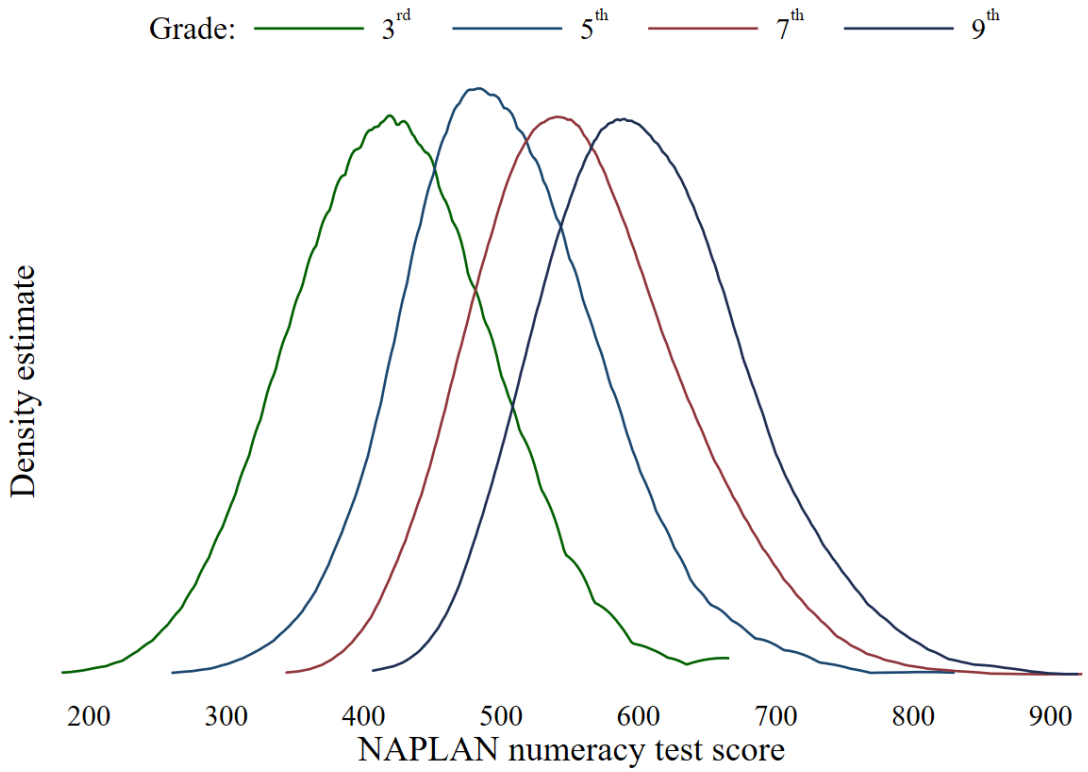
The NAPLAN test is a national assessment designed to test essential skills. It was first introduced in 2008 and since then has been administered annually to all Australian students in grades 3, 5, 7, and 9. The NAPLAN test assesses skills in numeracy and in three areas of literacy (reading, writing, and language conventions) using a common test administered nationwide on the same dates.

NAPLAN test scores are designed to track student achievement levels and progress over time, and across cohorts, on a scale ranging from zero to 1,000.[4] Student achievement is benchmarked using a 10-band scale that spans across all grades; bands 1 through 6 are provided as benchmarks for grade 3 scores, bands 3 through 8 are provided for grade 5 scores, and so on. NAPLAN results are therefore very useful for monitoring the level of, and gain in, student achievement in each domain across cohorts and over time. Consequently, state and Commonwealth education departments, teachers, and parents use NAPLAN results to ensure academic standards are being met. The distribution of NAPLAN numeracy test scores across different grade levels are shown in Figure 1. The within-grade variation and the natural grade progression in scores can be clearly seen in the figure.

All Australian students in the relevant grades take the NAPLAN test on the same three days in May each year. Once graded, individual NAPLAN reports with test results are then sent to schools for every student in August and September. Schools generally inform parents

[3] The LSAC birth or "B" cohort sampled 5,107 children aged 0-1 years old when the survey began. We do not use B cohort data in our analysis because those children do not begin to take NAPLAN tests until wave 5 of the LSAC.
[4] For an in-depth description of the way NAPLAN assessment scales are constructed see Appendix A.

Figure 1. Distribution of NAPLAN Numeracy Scores Across Grades



Kernel density estimates of NAPLAN numeracy test scores for waves 3 through 6 of the LSAC K cohort, corresponding to grades 3, 5, 7 and 9 for the typical schooling progression of children in this cohort. The figure combines data from 4,476 children and 15,990 child test score observations.

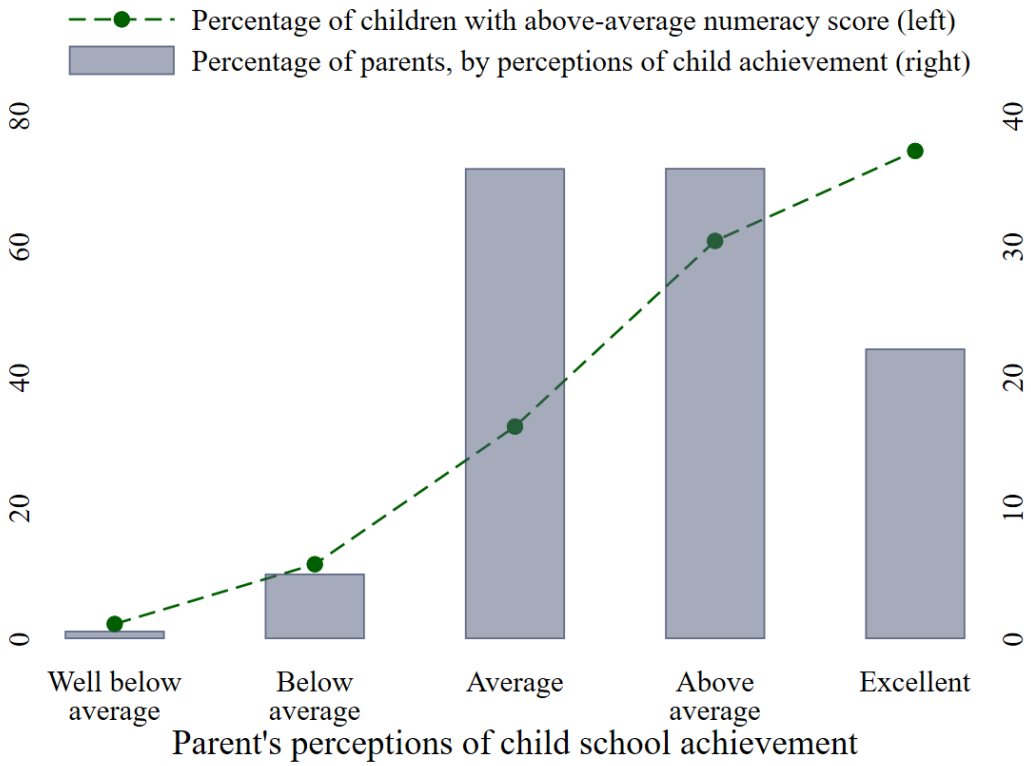
about the date they should expect the reports and then, when available, hand each child their NAPLAN report to take home to their parents.[5]

NAPLAN reports present children's test results in an intuitive way along with guidance on interpretation.[6] Specifically, test performance is shown for four assessment domains: reading, persuasive writing, language conventions (with spelling and grammar & punctuation subcomponents), and numeracy. Performance in each domain is shown using diagrams for the portion of the assessment scale that is relevant for each student's current grade level (e.g., in grade 5 diagrams only show assessment bands 3 through 8). In each diagram indicators show the student score, the national average, and the 20th – 80th percentile score range. In the states of Queensland, Western Australia and South Australia, the report also shows the average result

[5] The NAPLAN tests are centrally managed by the Australian Curriculum, Assessment and Reporting Authority (ACARA), an independent authority. Specifically, ACARA works with individual test administration authorities in each state and territory to ensure that NAPLAN tests are administered in each jurisdiction in accordance with national protocols. This way, consistency across Australia is achieved, in each stage of the NAPLAN test, from testing through to the provision of results (ACARA 2021).

[6] For more details on the NAPLAN student reports received by parents and several example cards, see https://www.nap.edu.au/results-and-reports/student-reports.

Figure 2. Children With Above-Average NAPLAN Numeracy Test Scores, by Parental Beliefs of Child Achievement Relative to School Average



Child achievement and the distribution of parents across parental perceptions of child achievement for the sample of 4,126 children and 13,206 child-wave observations with available data on numeracy test scores and parental perceptions of child achievement.

across the child's school for each assessment component; in other states and territories information about school-level test results can be obtained online in the first quarter of the year following the test.[7]

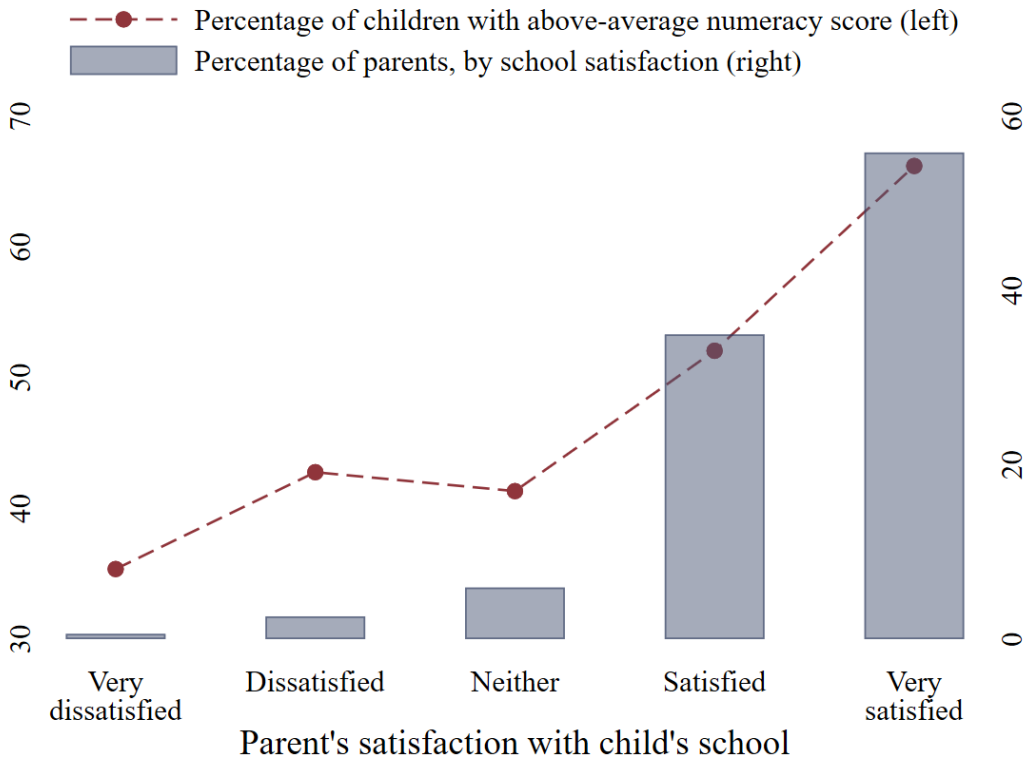
2.3 Parents' Perceptions of Child Achievement, School Satisfaction, and Investments

The LSAC asks parents to describe their child's school achievement using a 5-point scale. We use this information to create a scale that is increasing in achievement with 1 corresponding to "well below average" and 5 corresponding to "excellent". On average, parents rate their children's achievement to be 3.77, between "average" and "above average".

Parents' perceptions of their child's relative school achievement are strongly correlated with children's actual NAPLAN test performance. Figure 2, for example, shows the proportion

[7] This information can be obtained through the *My School* website, which has been publishing school-level test data, including average test results, for every school in Australia since 2010. The website also allows parents to track the progress of their child's school cohort over time, benchmarked against all other Australian students in the same age cohort, and against students in the same age cohort and of a similar background—a measure that takes into account parental education and occupation, geographic location, and Indigenous status.

Figure 3. Children With Above-Average NAPLAN Numeracy Test Scores, by Parental Satisfaction With the Child's School



Child achievement and the distribution of parents across parental satisfaction with the child's school for the sample of 4,127 children and 13,222 child-wave observations with available data on numeracy test scores and parental satisfaction with the child's school.

of children with NAPLAN numeracy test scores above the national average for their grade level relative to parents' perceptions of their child's relative school achievement (dashed line). At the same time, it seems that parents tend to be overly optimistic about their child's achievement in school. This is most easily seen in the proportion of parents believing that their child is "well below average", "below average", "average", etc. (grey bars). Approximately 94 percent of parents believe their child is performing at or above their school average—a distribution that out of step with the bell-shaped distribution of NAPLAN test scores (see Figure 1) and the random sampling used in the LSAC. In fact, at least one fifth of children whose parents believe they are performing well above the school average actually have below-school-average NAPLAN numeracy test scores. This pattern is very similar when measuring child academic achievement via reading scores (see Figure 3).

The LSAC also surveys parents about their satisfaction with their child's school. We use this information to create a five-point scale that is increasing in school satisfaction with 1 indicating "very dissatisfied" and 5 indicating "very satisfied". On average, parents rate their level of school satisfaction as 4.44, between "satisfied" and "very satisfied". Children's

numeracy test scores are also correlated with school satisfaction and over 90 percent of parents are either "satisfied" or "very satisfied" with their child's school (see Figure 3).

In addition, the LSAC data allow us to construct several measures of parental investments, including the style of parenting itself which is increasingly regarded as a key input in home production models of child development (e.g., Cobb-Clark et al. 2019; Cunha 2015; Doepke & Zilibotti 2017). We broadly categorize our measures of parental investments as investments in time, money, and parenting style, using the LSAC's detailed information about parent-child interactions to construct several measures in each category.[8]

Our three measures of parents' time investments combine: i) the total time parents spend with each child in a day (derived from time-use diary data), ii) seven items capturing common parent-child activities at home, such as reading to the child or playing music together (measured in number of days in the previous week when each activity was done); and iii) four items capturing activities outside of the home, such as going to a swimming pool or library (measured in number of days in the previous month when each activity was done). We construct the cumulative daily time each child spends with either parent, as well as summary measures of the cumulative time spent in at-home and out-of-home activities. On average, parents spend 211 minutes per day with their child. They do 9.11 at-home activities per week and 1.64 out-of-home activities per month with their child.

In addition, time-use diary data are used to construct measures of the way children allocate their time across various activities. These are particularly interesting since the activities that children participate are likely to be directly influenced by parents. Specifically, the LSAC includes 24-hour time-use diaries that are completed by each study child, describing how they spent their time on the day before their LSAC interview.[9] Each child is asked to record their daily activities as well as the start and end times for each activity, from the moment they wake up in the morning to the moment they go to bed at night. In each wave, the list of activities that children can choose from includes: eating, doing chores, doing homework, listening to music, playing sports, etc. We aggregate these activities into four distinct categories: i) education-related; ii) leisure; iii) sleep and personal care; and iv) other.[10] We then construct a measure of the cumulative time spent each day on all activities within each category. On average, children

[8] Details of the construction of each outcome and control measure are provided in Appendix Tables B1 and B2.
[9] In waves 1, 2, and 3, each study child's family were asked to complete two time-use diaries for "a typical weekday and weekend day". However, beginning in wave 4, each study child was asked to fill out a time-use diary "the day immediately before the interview took place". We utilize data from waves 4, 5, and 6 in our analysis.
[10] Appendix Table B2 describes the categorization of the activities.

spend 229 minutes per day on educational activities; 321 minutes on leisure activities; 642 minutes on sleeping and personal care; and 219 minutes on other activities.

We characterize parents' financial investments in their children using four separate measures of money-intensive investments: i) having more than 30 books at home; ii) having a private tutor; iii) providing a weekly allowance; and iv) the number of days when the child participates in extracurricular activities (e.g., team sports or art classes)—most likely financed by parents. We analyze the first three indicators and the continuous measure of cumulative weekly extra-curricular activities separately. Fully, 74 percent of the children in our sample have more than 30 books in their home; 37 percent receive pocket money from their parents; and 15 percent participate in private tutoring. On average, children participate in 1.42 extracurricular per week.

Finally, we consider two key dimensions of parenting style: i) warmth and ii) control.[11] Parental warmth is assessed using five items that measure whether parents display acceptance and affection towards their children. Each item is answered on a 5-point scale (from "never" to "almost always"). Parenting control combines six items (also ranked on a 5-point scale) assessing how much parents know about, and engage with, their child's friends, whereabouts, and life. Summative scales of both dimensions are left-skewed and right-censored. We consider high-warmth parents to be those who score 20 or more points across the five warmth items, and strict-monitoring parents as those who score 24 or more points across the six control items. Among the parents in our sample, 72 percent are characterized as being high warmth, while 75 percent are strict monitors of their children.

2.4 Estimation Sample

Our estimation sample includes all children and parents in the LSAC's K cohort for whom we have complete information in waves 3 through 6, with two important exceptions. First, we exclude children who do not take their NAPLAN test in the same year that the LSAC interviews are conducted—i.e., predominantly children who take the test one year ahead or one year behind their expected grade. Second, we exclude children whose parents are interviewed for

[11] Baumrind (1966) initially proposed a typology of three parenting styles — "permissive", "authoritarian" and "authoritative" — which are distinguished mainly in terms of the relative importance parents attach to control of versus freedom for their children. Today it is common for parenting style to be characterized by two underlying processes: i) the number of demands made by parents; and ii) the contingency of parental reinforcement. These are often referred to as demandingness (control) and responsiveness (warmth) (see Darling & Steinberg 1993; Spera 2005 for reviews).

the LSAC in September. Both restrictions improve our ability to assign children to our quasi-experimental "control" and "treatment" groups, as described in Section 3.2.

We report summary statistics for our key outcome and control variables in Appendix Table B3 separately for our estimation sample and for all NAPLAN test-takers in the LSAC. The last column of Table B3 displays results from unpaired two-sample t-tests of mean differences between the two groups. We find some statistically significant differences between the two samples, but none of them are economically large, indicating that the sample restrictions we impose do not affect the generalizability of our results to the LSAC population.

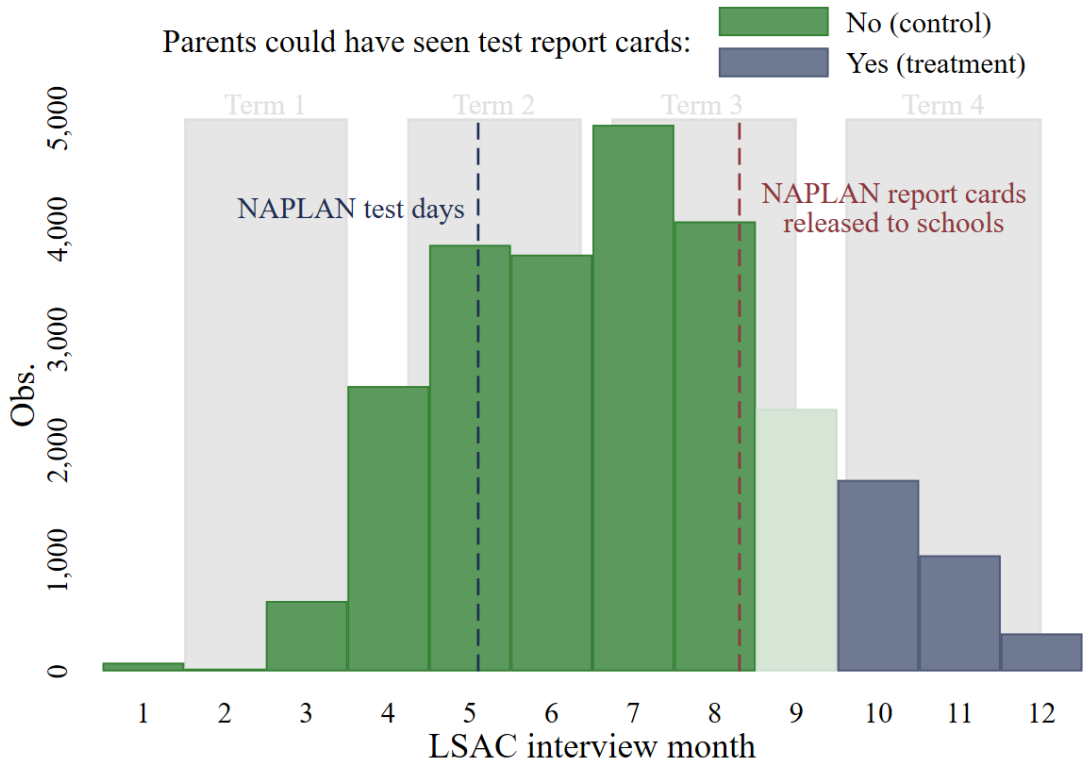
3. Empirical Strategy

We use the exogenous timing in the release of NAPLAN reports relative to the LSAC interview dates to estimate the causal effect of receiving information about children's academic achievement on parents' perceptions of children's educational achievement, school satisfaction, and investments in their children Our research design exploits the fact that, while LSAC interviews are conducted throughout the year, NAPLAN results are released to schools in August and September by each state and territory's test administration authority. Schools subsequently send students' NAPLAN results to their parents. This implies that some parents are interviewed prior to the release of their child's NAPLAN results (the control group), while some are interviewed post-release (the treated group). In Section 3.3 we show that, conditional on a few key covariates, these two groups are as good as randomly assigned.

While we do not know exactly when parents receive NAPLAN results from their child's school, we do know that NAPLAN results only become available to schools in mid-August to September and there is likely some administrative delay as NAPLAN results are collated and analyzed by the teaching and administrative staff, and a process for giving students their individual reports to take home is established.[12] Consequently, we assume that schools do not work quickly enough to provide NAPLAN results to parents before the end of August. This implies that parents responding to the LSAC in January through August have not yet received their child's NAPLAN results at the time of interview. Parents interviewed in October through December are assumed to have had access to their child's NAPLAN results before being interviewed. We drop all September interviews from our estimation sample since it is unclear whether these parents have received their child's NAPLAN reports. Our identifying variation is illustrated in Figure 4.

[12] See https://www.nap.edu.au/information/faqs/naplan--results-reports-performance for details.

Figure 4. LSAC Interview Month Relative to NAPLAN Report Release Dates



Illustrative figure of the timing of NAPLAN test and test score release relative to the LSAC interview months and the school academic calendar in our sample years. The figure combines data from our estimation sample of 2,894 children and 8,648 child-wave observations.

There is of course no guarantee that all students deliver their NAPLAN reports to their parents as intended. As we do not observe which parents receive a NAPLAN report and which do not, our results are best interpreted as intention-to-treat estimates.

3.1 Identification

Our quasi-experimental design results in causal estimates so long as two key identifying assumptions hold. The first is that the timing of LSAC interviews is unrelated to the date that individual schools release their students' NAPLAN reports to parents and to other determinants of parental investments. The sampling design of the LSAC gives us confidence that this is likely to be the case. Sampling is not reliant on anything related to the NAPLAN test itself, and in fact, the sampling design was implemented years before the NAPLAN test existed.[13] In their field work, however, LSAC interviewers were likely to geographically cluster their face-to-face interviews, beginning in larger cities before moving towards more rural and remote areas.

[13] The LSAC sampled children into their study in a stratified two-stage cluster design based on postcodes and children. For details on the LSAC sampling design and its implementation see Soloff et al. (2005).

This is a cost-effective interviewing strategy that is, of course, unrelated to the dates that schools complete the in-school review of their overall NAPLAN results and release student reports to parents. At the same time, launching the interviewing process in urban areas may result in more advantaged families being interviewed earlier in the calendar year. We see some evidence of this in our data, and account for it flexibly using geographical region fixed effects.[14]

The second identifying assumption is that parental investments and other outcomes would not have evolved in a different way for pre- and post-September interviewed parents in the absence of NAPLAN reports. Long-run differences in parental investments will be accounted for by wave fixed effects, but pre- and post-September differences could still occur, for example, if the time that parents spend with their children doing outdoor activities (e.g., going to the park, playing sports) is markedly different towards the end of the calendar year. One important consideration here could therefore be the weather. In Australia, spring begins in September which means that the activities children engage in may systematically change in the later months of the year as the summer weather sets in. To account for this, we include monthly weather data at the state level (the average daily max temperature and number of rainy days in the interview month, and their 1-month lags) as controls in our specification.

With these controls in place, parents—within the same calendar year, within the same geographical region, and exposed to the same weather—interviewed in January through August act as our control group, while parents interviewed in October through December form our treatment group.

We investigate the empirical validity of our maintained identifying assumptions by estimating a series of balancing regressions to assess whether our treatment and control groups are similar in their pre-determined characteristics (C_{iw}). Specifically, we estimate the following model:

$$C_{iw} = \theta Post_{iw} + \gamma' Weather_{iw} + \delta_w + \delta_{Region} + \varepsilon_{iw} \quad (1)$$

where *i* indexes individuals, *w* indexes LSAC waves, and $Post_{iw}$ is our treatment indicator that takes the value 1 if parents are interviewed in the post-September period (October through December) and 0 if they are interviewed in January through August. In these balancing tests C_{iw} are either i) pre-determined characteristics such as child gender or birthweight, or ii) pre-determined parental investment (i.e., parental investments in waves 1 and 2 when the NAPLAN

[14] We define region at the Statistical Area Level 3 (SA3) level. This classification, defined in the Australian Statistical Geography Standard, divides Australia in 358 regions. The Australian Bureau of Statistics defines SA3 regions as areas that "[…] generally have a population of between 30,000 and 130,000 people [designed to] reflect regional identity. These are areas with both geographic and socio-economic similarities." See the Australian Statistical Geography Standard for further details (Australian Bureau of Statistics, 2016).

test has yet to take place). We expect both to be unrelated to $Post_{iw}$. Additionally, $Weather_{iw}$ is a vector of weather controls, whereas δ_w and δ_{Region} capture unobserved time-invariant heterogeneity at the wave and region levels, which we account for via two-way fixed effects. We vary the controls included across specifications of our balancing regressions to illustrate their importance in isolating our identifying variation. Our interest is in $\hat{\theta}$ which captures the disparity in the pre-determined characteristics of parents interviewed pre- and post-September; small and insignificant disparities indicate that our treatment and control groups are balanced.

Balancing test results are reported in Table 1, with each cell in the three rightmost columns corresponding to a $\hat{\theta}$ from a different specification of equation (1). The top seven rows of the table considers a range of pre-determined characteristics measured in waves 3 to 6 and finds significant differences between the treatment and control groups in only two characteristics: student age and household gross income. As expected, the disparity in household income across treatment and control groups disappears once we include region fixed effects that account for the spatial clustering affecting the timing of the LSAC fieldwork. Student age remains unbalanced even after including wave and region fixed effects. On average, children whose parents are interviewed post-September are 3 months older than children whose parents are interviewed earlier. This is purely mechanical, however: post-September interview children are older simply by virtue of the fact they are interviewed later in the calendar year. We will nevertheless account for these small age-at-interview differences by adding fixed effects for age in months to our preferred specification. A standard F-test fails to reject the null of no mean differences in our six pre-determined characteristics once we exclude child age (p-value = 0.572).

In the bottom six rows of Table 1, we consider whether there are any significant differences in the investments that treated and control parents make in waves 1 and 2, before children begin taking the NAPLAN test. We also test for pre-NAPLAN test differences in parents' perceptions of their child's school achievement relative to their school peers, and on parents' satisfaction with their child's school. Although there are some differences in pre-NAPLAN test parental investments, perceptions, or school satisfaction (see Table 1), once we control for wave and region fixed effects an F-test also fails to reject the null of no mean differences across these six pre-NAPLAN test measures (p-value = 0.588).

Table 1. Balancing Regressions of Having a Post-September LSAC Interview on Pre-Determined Characteristics and Parental Investments

	Mean	Effect of post-September LSAC interview:		
Pre-determined characteristics:				
Waves 3-6				
Child's age (months)	138	12.275***	4.520***	3.041***
		(1.079)	(0.163)	(0.161)
Female child	0.49	0.021	0.021	-0.011
		(0.028)	(0.028)	(0.027)
Child birth weight (kilograms)	3.42	-0.047	-0.049	0.011
		(0.031)	(0.031)	(0.030)
2 biological parents in household	0.84	0.067	0.051	-0.109
		(0.112)	(0.110)	(0.177)
HH gross income (AUD/week)	2,168	-241.184***	-314.610***	-79.123
		(85.451)	(86.208)	(88.443)
University-educated parent(s)	0.46	-0.034	-0.043	-0.030
		(0.027)	(0.028)	(0.025)
Migrant parent(s)	0.32	0.228	0.225	-0.024
		(0.146)	(0.149)	(0.180)
Placebo outcomes:				
Waves 1-2				
At-home activity (days/week)	15.97	-1.817***	-0.477	-0.154
		(0.319)	(0.315)	(0.361)
Out-of-home activity (days/month)	2.29	-0.068	0.046	0.032
		(0.059)	(0.061)	(0.068)
30+ books at home	0.85	-0.036	-0.038*	-0.019
		(0.022)	(0.022)	(0.024)
High warmth parent(s)	0.87	-0.037*	-0.024	-0.026
		(0.021)	(0.022)	(0.024)
Perceptions of child achievement	3.86	0.084	0.084	-0.058
		(0.062)	(0.062)	(0.099)
Parent's satisfaction with school	4.54	-0.026	0.010	0.005
		(0.043)	(0.044)	(0.052)
Weather controls		✓	✓	✓
Wave fixed effects			✓	✓
Region fixed effects				✓

OLS coefficients estimated using Correia's (2017) reghdfe *Stata package. Each row represents an outcome variable, and each cell shows an estimate from a different regression, estimated with all available data in our estimation sample of 2,894 children and 8,648 child-wave observations. Cluster-robust standard errors at the child level in parentheses. ***, ** and * mark estimates statistically different from zero at the 90, 95 and 99 percent confidence level.*

Taken together, the administrative arrangements behind the release of NAPLAN reports, the timing of LSAC interviews, and the empirical results of our balancing tests provide strong evidence that our treatment assignment is as good as random, validating our quasi-experimental design.

3.2 Empirical Model

We use the following empirical model to estimate the causal effect of parents receiving their child's NAPLAN test-score information:

$$Y_{iw} = \beta Post_{iw} + \tilde{\gamma}' X_{iw} + \tilde{\delta}_w + \tilde{\delta}_{Region} + \tilde{\delta}_{Age} + \tilde{\varepsilon}_{iw} \quad (2)$$

where *i* indexes parents, *w* indexes waves, and Y_{iw} corresponds to: i) parents' perceived child achievement; ii) school satisfaction; and iii) investments in their children. In addition to the region and wave fixed effects discussed above, we account for child age differences $\tilde{\delta}_{Age}$ with fixed effects for child age in months. This ensures that our results are not confounded by differences in the age at which children are tested.[15] In addition to $Weather_{iw}$, the term X_{iw} includes several characteristics of children (birth weight, gender, and age in months) and their families (household gross income, number of children and indicators for two biological parents in the household, parents' foreign-born and non-English background status, and at least one parent with a university education).[16] While not central for our identification strategy, these additional controls increase the precision of our estimates. Our interest is in $\hat{\beta}$ which we interpret throughout as the casual effect of releasing NAPLAN test-score reports to parents.[17]

4. Parental Responses to Children's Achievement Test Scores

4.1 Parents' Perceptions of Child Achievement and School Satisfaction

Parents' views about their child's academic achievement and the quality of their school are key determinants of the investments that they make (Bergman 2021; Greaves et al. 2019; Kinsler & Pavan 2021). These investments may either compensate for or reinforce educational disparities. Parents who believe their child is performing better than their peers may reinforce this academic advantage by investing additional resources in encouraging even higher achievement. At the same time, parents who believe that their child is under-performing relative to their peers may seek to ameliorate this disparity by investing more educational resources as a way of compensating. These additional resources may come at the cost of a

[15] Prior to 2017, for example, the Queensland educational system did not have a compulsory preparatory school year (i.e., Kindergarten); students starting their formal schooling directly entered first grade. This results in Queensland students being one year younger on average—and at a different stage of development—when they take the NAPLAN test than are the rest of Australian children. Most of these differences would be accounted for by region fixed effects, since regions are nested within states, yet the additional age in months fixed effects accounts for any differential developmental age trends within state non-parametrically.

[16] Missing values for these variables are imputed and we include additional dummies to account for observations with imputed missing values when necessary.

[17] An alternative, but similar approach, following Bond et al. (2018) would be to interact NAPLAN test scores with $Post_{iw}$ and interpret the coefficient on that interaction as the extent to which the newly released test scores are upweighted in parents' perceptions of child achievement, school satisfaction, and parental investments. Estimation of this specification leads to broadly similar conclusions, though there is a loss in statistical precision.

Table 2. The Effect of Releasing Test-Score Reports on Parental Beliefs About Child School Achievement and on Parental Satisfaction With School

	Effect of Post-September LSAC interview	Mean	Children	Obs.
Outcomes:				
Perceived child school achievement	-0.086*	3.76	2,852	8,444
	(0.051)			
Satisfaction with child school	-0.109**	4.44	2,853	8,456
	(0.046)			

OLS coefficients estimated using Correia's (2017) reghdfe *Stata package. Each row represents an outcome variable measured on a different 5-point scale (see figures 3 and 4). All regressions include fixed effects for survey wave, region and child age in months, and controls for weather, child and family characteristics (see equation 2). We use all available data in our estimation sample of 2,894 children and 8,648 child-wave observations. Cluster-robust standard errors at the child level in parentheses. ***, ** and * mark estimates statistically different from zero at the 90, 95 and 99 percent confidence level.*

reduction in other non-educational investments (Quadlin 2015). New information allows parents to not only revise their beliefs, but also adjust their investments in response.

This raises the question: Do parents update their perceptions of their child's relative school achievement when they are provided with accurate information about their child's test performance? We find some evidence that the release of NAPLAN reports results in parents having less optimistic views about their child's performance relative to their classmates (top row of Table 2). On average, parents interviewed after the release of NAPLAN reports rate their child's relative achievement as 0.086 points (on a 5-point scale) lower than parents interviewed earlier, a statistically significant effect with 90 percent confidence. This is a relatively small effect, corresponding to about 2 percent of the 3.76-point unconditional mean.

Parents also revise their satisfaction with their child's school after receiving information about their child's academic achievement (second row of Table 2). The release of NAPLAN results leads parents to reduce their overall satisfaction with their child's school by 0.109 points (on a 5-point scale). This is effect is also relatively small in magnitude; it corresponds to about 2 percent of the unconditional mean (4.44 points) in school satisfaction.

Diminished school satisfaction is likely to be consequential for the way that parents interact with schools. Parents who are more involved with their children's schooling report higher satisfaction levels (Friedman et al. 2007). Although some researchers also find that parents who are more satisfied with their parent-teacher interactions are more likely to be involved in their child's education both in school and at home (Patrikakou et. al 2000), others conclude the opposite (Park & Holloway 2013). In either case, while positive school–family

relationships predict academic achievement, this relationship is mediated by the extent to which parents are satisfied with their child's school (Hampden-Thompson & Galindo 2017).

4.2 Parents' Investments and Children's Time Use

Along with changing their views about children's academic achievement and their level of school satisfaction, parents also respond to objective information about their child's academic achievement by changing their investment choices. After the release of NAPLAN test results, parents increase the use of private tutoring and decrease the number of extracurricular activities that children engage in each week (see Table 3). Both responses are economically important. The chances of having a private tutor increase by 6.4 percentage points (43 percent) relative to an unconditional mean likelihood of having a private tutor of 15 percent. The drop in extracurricular activities is 0.321 per week, which amounts to 22 percent of the unconditional mean of 1.43 per week. Importantly, we can strongly reject the null hypothesis that our treatment has no joint effect on these monetary investments overall (p-value < 0.001).

At the same time, we find little evidence that either parental time investments or parenting style are affected by the release of test-score results. Although we do reject the null hypothesis that there is no joint effect on all three time investments (p-value = 0.041), we find no statistically significant effect of the release of NAPLAN results on any single time investment measure. There is also no evidence that the release of test reports affects parenting style overall (p-value = 0.775).[18]

One interpretation is that parents change their investment choices in the hopes of motivating children to put more time and effort into learning. Previous studies have adopted a similar perspective, modelling parents' investments through the lens of the incentives they provide to children (e.g., Doepke et al. 2019; Laferrère & Wolff 2006). Our results are consistent with Weinberg (2001) who models parents' use of financial investments to solve intra-household agency problems in children's provision of effort. Interestingly, we find that parental responses are largely financial; their time investments and parenting style are unaffected. At the same time, many parents may also react to information about their children's academic achievement by restricting the way that children spend their own time. After all,

[18] Note that the lack of evidence for parental responses in time investments or parenting style is not due to a lack of statistical power. Based on ex-post Minimum Detectable Effect (MDE) calculations with 95% confidence and 80% power we would be able to rule out effect sizes as small as 31 minutes per day in parental time spent with children, less than one at-home activity per week, or 7 percentage points in the probability of being a high-warmth parent. These are all relatively small effect sizes.

Table 3. The Effect of Releasing Test-Score Reports on Parental Investments and Children Time Use

	Effect of Post-September LSAC interview	Mean	Children	Obs.
Time investments:				
Hours/day with parents	-0.198	3.25	2,596	5,459
	(0.180)			
At-home activities/week	-0.445	9.20	2,592	4,240
	(0.354)			
Out-of-home activities/month	0.040	1.64	2,853	8,449
	(0.062)			
Monetary investments:				
30+ books at home	-0.016	0.74	2,592	4,243
	(0.032)			
Has private tutor	0.064***	0.15	2,667	5,901
	(0.023)			
Has allowance	-0.037	0.37	2,679	5,980
	(0.032)			
Extracurr. Activities/week	-0.321***	1.43	2,352	3,740
	(0.099)			
Parenting style:				
High warmth	0.012	0.72	2,800	8,028
	(0.028)			
Strict monitoring	-0.012	0.75	2,836	8,303
	(0.025)			
Minutes/day of child time in:			2,596	5,459
Educational activities	13.328	283		
	(12.669)			
Leisure	-21.114*	304		
	(12.558)			
Sleeping & personal care	6.415	638		
	(5.885)			
Other activities	2.797	216		
	(7.479)			

OLS coefficients estimated using Correia's (2017) reghdfe *Stata package. Each row represents an outcome variable. All regressions include fixed effects for survey wave, region and child age in months, and controls for weather, child and family characteristics (see equation 2). Child time use observations are weighted by 5/7 if taken on a weekday and by 2/7 if taken on a weekend day. We use all available data in our estimation sample of 2,894 children and 8,648 child-wave observations. Cluster-robust standard errors at the child level in parentheses. ***, ** and * mark estimates statistically different from zero at the 90, 95 and 99 percent confidence level.*

children's time use is consequential for their cognitive and non-cognitive development (Fiorini & Keane 2014). At the same time, children generally have limited agency in the decisions affecting them, putting their time use squarely in the hands of their parents. Adolescents have greater agency, yet their time use can also be shaped parents using more complex incentives

(Lundberg et al. 2009).[19] Examining children's time use directly provides important insights into the investments that their parents make in them.

A major strength of our study is our ability to analyze the effects of releasing children's standardized test scores on their time own use using information from 24-hour time-use diaries.[20] Few other studies have the advantage of such detailed data on the way children spend their time (Fiorini & Keane 2014). Given our research question, our outcomes of interest are the cumulative time that children spend in four mutually exclusive types of activities: i) educational activities; ii) leisure; iii) sleeping and personal care; and iv) other activities. The total time spent across these four types of activities sums to 1440 minutes per day. We estimate the determinants of children's time use a variation of the model given in equation (2). As our four time-use categories are mutually exclusive, estimated marginal effects will sum to zero across the four models, identifying the substitution of one type of time use for another.

We find that the release of test results in children spending 21 minutes less each day in leisure time, reallocating this time to educational activities, sleeping and personal care, and other activities (see Table 3). The reduction in leisure activities is statistically significant (with 90% confidence) and a joint F-test rejects the null hypothesis (p-value = 0.065) that there is no effect of the release of NAPLAN test results on children's time use overall. Taken together, the effect of releasing NAPLAN results on children's time use is consistent with the corresponding effects on other parental investments (see Table 3).

5. The Information Content of Children's NAPLAN Reports

The way that parents react to their children's NAPLAN reports ultimately depends on the nature of the information they receive. Importantly, standardized test results are only one indicator of children's academic performance; parents also receive key information through school report cards, parent-teacher interviews, direct observation, etc. Well-informed parents may consequently learn little from standardized test results about their child's overall academic performance they did not already know. Moreover, stability in test results over time implies that for many parents the release of new test scores may also provide no new information about where children stand in the standardized test-score distribution. In either case, parents will have

[19] See Hao et al. (2008); Kooreman (2007) and Lundberg et al. (2009) who model parents' interactions with their children using a non-cooperative game-theoretic approach. Some parent-child interactions can have unintended consequences on children's time use. Cosconati (2011), for example, provides evidence that parent-driven rather than child-driven curfews increases the study time of low-effort children but decreases the study time of high-effort children.

[20] Analytical weights of 5/7 and 2/7 are used to weight the weekday vs. weekend observations. See Mohal et al. (2020) for a detailed description of the time-use diary data in the LSAC.

little reason to adjust their investments. For other parents, children's test results may be surprising–-constituting either good or bad news—perhaps leading them to rethink their investment strategy. Finally, investment responses may be asymmetric depending on the nature of the information received. Haisken-DeNew et al. (2018), for example, estimate that the release of information about high-quality schools increases property prices by 3.6 percent, whereas the release of information about low-quality schools is unrelated to property prices.

In what follows, we investigate these issues by isolating more precisely the information content of children's NAPLAN reports and the investment changes that parents make in response to that information.

5.1 Heterogeneity in Information

We begin by investigating how parents' investment responses vary with two proxies of their baseline information: i) school sector; and ii) household income.

There is ample evidence that parents' school interactions vary across school sectors. Analyzing survey data on school choice, Goldring & Phillips (2008) find that parents willing to consider a private-school education report less parent-school collaboration, suggesting that parents may turn to private schools when they are dissatisfied with the communication and involvement they are experiencing in the public-school system. There is also evidence that private-school parents do get what they pay for. Feuerstein (2000), for example, finds that private-school parents are more involved than public-school parents even after controlling for socioeconomic status; private-school parents participate in parent-teacher organization more frequently, and spend more time volunteering at school. We therefore expect private-school parents to have more information than public-school parents generally, implying that their children's NAPLAN reports provide them with less new information. Consequently, we might expect private-school parents to respond less strongly to the release of NAPLAN reports.

Overall, 81 percent of children in our estimation sample attend public schools. The estimated effect of the availability of NAPLAN reports across school sectors is reported in Table 4. We find that there are no significant differences in the magnitude of public- vs. private-school parents' investment responses to NAPLAN information. At the same time, parents in the two sectors appear to be acting at different margins implying that any observed differences, while small in absolute terms, can be proportionately quite large. While 14 percent of public-school parents enroll their children in private tutoring, for example, the same is true of 20 percent of private-school parents. Thus, although both groups of parents are 6.5 percentage points more likely to enroll their children in private tutoring after NAPLAN results are released,

Table 4. The Heterogeneous Effects of Releasing Test-Score Reports Across Public and Private Schools

	Effect of Post-September LSAC interview if:		
Student attends a:	Public school [81%]	Private school [19%]	p-value diff.
Perceptions and satisfaction:			
Perceived child school achievement	-0.104**	-0.000	0.082
	(0.052)	(0.069)	
Satisfaction with child school	-0.106**	-0.096	0.844
	(0.047)	(0.062)	
Time investments:			
Hours/day with parents	-0.228	-0.016	0.327
	(0.185)	(0.247)	
At-home activities/week	-0.361	-0.671	0.505
	(0.365)	(0.515)	
Out-of-home activities/month	0.039	0.067	0.713
	(0.063)	(0.089)	
Monetary investments:			
30+ books at home	-0.011	-0.030	0.647
	(0.033)	(0.048)	
Has private tutor	0.065***	0.064*	0.977
	(0.024)	(0.034)	
Has allowance	-0.032	-0.052	0.587
	(0.032)	(0.044)	
Extracurr. Activities/week	-0.320***	-0.321***	0.993
	(0.100)	(0.123)	
Parenting style:			
High warmth	0.008	0.027	0.565
	(0.029)	(0.040)	
Strict monitoring	-0.009	-0.019	0.732
	(0.025)	(0.035)	
Minutes/day of child time in:			
Educational activities	13.269	13.760	0.976
	(12.975)	(18.495)	
Leisure	-27.482**	-12.318	0.305
	(12.552)	(17.150)	
Sleeping & personal care	5.008	2.067	0.691
	(6.282)	(8.254)	
Other activities	7.834	5.906	0.830
	(7.602)	(10.152)	

Average marginal effects from OLS models interacting post-September LSAC interview with dummies for public/private school. OLS model estimated using Correia's (2017) reghdfe *Stata package. Each row corresponds to a different outcome. All regressions include fixed effects for survey wave, region and age in months, and controls for weather, child and family characteristics. Child time use observations are weighted by 5/7 if taken on a weekday and by 2/7 if taken on a weekend day. Cluster-robust standard errors at the child level in parentheses. ***, ** and * mark estimates statistically different from zero at the 90, 95 and 99 percent confidence level.*

this results in a proportionate increase in private tutoring that is much greater among public-school parents (46 percent) than among private-school parents (33 percent). The effect of

NAPLAN reports on extracurricular activities is also proportionately larger among public-school parents. Moreover, while public-school parents moderate their perceptions of their children's school achievement and are less satisfied with schools in response to NAPLAN information becoming available, private-school parents' views about both are unchanged (see Table 4). Taken together, our results indicate that NAPLAN reports provide more information to parents in public schools than in private schools.

We also consider whether investment responses to NAPLAN information differs in high- vs. low-income families. There are well-documented disparities in the extent of parents' school involvement across the spectrum of socioeconomic status. High-income and highly educated parents are more likely to hold higher educational expectations for their children (Carolan & Wasserman 2015; Davis-Kean 2005) and are more likely to be involved in their children's education (Cheadle & Amato 2011; Stevenson & Baker 1987;). Even after controlling for parental occupation, education, and income, Cheadle and Amato (2011) find that differences in parental involvement persist along racial and ethnic lines. Similarly, Turney and Kao (2009) also find that migrant parents face more barriers to participation in their children's schools and as a result, are less involved than native-born parents. These gaps in parental involvement and expectations lead to differences in children's academic performance, with children from more advantaged families outperforming their more disadvantaged peers (see Sirin 2005 for a review). These differences can be attributed in part to not only family resources, but also parenting practices including engagement both at home and with schools as well as parent-child communication (Roksa & Potter 2011). To the extent that high-income parents are more involved in their children's education, we expect them to also have more baseline information than low-income parents and so respond less strongly to the information provided by their children's NAPLAN reports.

We investigate this by analyzing the differential response of households in the bottom vs. top tertile of the earnings distribution to NAPLAN information. Low- and high-income parents respond to NAPLAN information in a similar way (see Table 5). There is some suggestion that low-income parents react to the release of NAPLAN reports by changing their school satisfaction and the time children spend in educational activities, suggesting that for them the information content of the NAPLAN report may be higher. These differences are not significant, however. The lack of a differential response in parenting investments suggests that low-income parents may be constrained in responding to the information they receive. It is also

Table 5. The Heterogeneous Effects of Releasing Test-Score Reports for the Bottom and Top Family Income Tertiles

	Effect of Post-September LSAC interview if:		
Family income is in the:	Bottom tertile [33%]	Top tertile [33%]	p-value diff.
Perceptions and satisfaction:			
Perceived child school achievement	-0.096	-0.049	0.449
	(0.070)	(0.068)	
Satisfaction with child school	-0.127*	-0.064	0.239
	(0.066)	(0.061)	
Time investments:			
Hours/day with parents	-0.378	-0.510**	0.539
	(0.244)	(0.247)	
At-home activities/week	0.162	-0.381	0.228
	(0.509)	(0.496)	
Out-of-home activities/month	0.091	0.013	0.301
	(0.086)	(0.086)	
Monetary investments:			
30+ books at home	0.009	-0.014	0.568
	(0.046)	(0.045)	
Has private tutor	0.074**	0.064**	0.723
	(0.032)	(0.033)	
Has allowance	-0.055	-0.031	0.502
	(0.043)	(0.044)	
Extracurr. Activities/week	-0.293**	-0.303**	0.928
	(0.136)	(0.134)	
Parenting style:			
High warmth	0.014	-0.010	0.487
	(0.039)	(0.039)	
Strict monitoring	0.060*	0.016	0.164
	(0.035)	(0.034)	
Minutes/day of child time in:			
Educational activities	23.581	8.593	0.346
	(17.983)	(18.041)	
Leisure	-27.176	-10.055	0.255
	(16.826)	(17.077)	
Sleeping & personal care	2.046	3.610	0.847
	(8.828)	(8.361)	
Other activities	5.979	-0.251	0.516
	(10.803)	(10.101)	

Average marginal effects from OLS models interacting post-September LSAC interview with dummies for family income being in the bottom/top tertile. OLS model estimated using Correia's (2017) reghdfe *Stata package. Each row corresponds to a different outcome. All regressions include fixed effects for survey wave, region and age in months, and controls for weather, child and family characteristics. Child time use observations are weighted by 5/7 if taken on a weekday and by 2/7 if taken on a weekend day. Cluster-robust standard errors at the child level in parentheses. ***, ** and * mark estimates statistically different from zero at the 90, 95 and 99 percent confidence level.*

possible that, in Australia, socio-economic disparities in parents' human capital investments do not primarily operate through household income.[21]

Finally, there is heterogeneity in the format of NAPLAN reports themselves. While 30 percent of children live in jurisdictions which report both school-level and individualized test information, parents in other jurisdictions only learn how well their child's school has performed the following year when school-level test results are made available on the My School website.[22] We investigate this issue by estimating the effect of having a post-September interview separately in jurisdictions that do and do not report average school-level NAPLAN test scores. Results are reported in Table 6.

We find no significant differences in the effect of NAPLAN reports on perceived academic performance and school satisfaction among parents with vs. without school-level information. Children's NAPLAN reports moderate views of academic performance and reduces school satisfaction among both groups of parents. Similarly, irrespective of the type of NAPLAN report they receive, parents respond by reducing their child's extra-curricular activities and hiring private tutors. Changes in children's time use, however, are sensitive to the availability of information about school-level performance. Parents who do not receive school-level performance information increase the time children spend in educational activities by 24 minutes per day, reducing their leisure time daily by more than half an hour.

5.2 Good, Bad and No News

We turn now to consider the way that parents respond to the information contained in their child's NAPLAN reports. Some parents receive new information, i.e., news, about their child's standardized test performance; others do not. We identify the type of news that parents receive by forecasting each child's NAPLAN numeracy test score using information about their previous test scores and parents' prior perceptions of their child's academic performance. These forecasted numeracy test scores are compared to their realized scores allowing us to categorize parents into three groups—those who received "good news"; those who received "bad news"; and those who received "no news".

[21] There is evidence that the socioeconomic status of young Australians is more closely linked to parental occupation and education than to household income (Lim & Gemici 2011; Marks et al. 2006; Marks et al. 2000). Specifically, parental occupation and education are strongly linked to Australian children's educational outcomes (Crook 1997) and parents' education is a stronger predictor of children's test scores than is household income (Fejgin 1995; Ganzach 2000).

[22] Queensland, Western Australia, and South Australia are the only jurisdictions in Australia where children's individualized NAPLAN reports provide average test results at the school-level.

Table 6. The Heterogeneous Effects of Releasing Test-Score Reports Across States That do (not) Show School Averages in Their Reports

	Effect of Post-September LSAC interview if:		
School averages in NAPLAN Report?:	No [70%]	Yes [30%]	p-value diff.
Perceptions and satisfaction:			
Perceived child school achievement	-0.091*	-0.076	0.788
	(0.054)	(0.062)	
Satisfaction with child school	-0.093*	-0.142**	0.368
	(0.048)	(0.061)	
Time investments:			
Hours/day with parents	-0.318*	0.068	0.056
	(0.189)	(0.229)	
At-home activities/week	-0.248	-0.960**	0.083
	(0.376)	(0.451)	
Out-of-home activities/month	0.029	0.060	0.639
	(0.067)	(0.074)	
Monetary investments:			
30+ books at home	-0.040	0.048	0.025
	(0.034)	(0.043)	
Has private tutor	0.062**	0.067**	0.840
	(0.024)	(0.029)	
Has allowance	-0.042	-0.025	0.618
	(0.033)	(0.040)	
Extracurr. Activities/week	-0.306***	-0.350***	0.644
	(0.103)	(0.118)	
Parenting style:			
High warmth	0.012	0.010	0.945
	(0.030)	(0.034)	
Strict monitoring	-0.016	-0.005	0.712
	(0.027)	(0.031)	
Minutes/day of child time in:			
Educational activities	24.373*	-11.022	0.017
	(13.348)	(16.482)	
Leisure	-35.533***	1.014	0.010
	(12.860)	(15.854)	
Sleeping & personal care	6.330	0.442	0.430
	(6.442)	(7.963)	
Other activities	6.722	8.260	0.859
	(7.913)	(9.305)	

Average marginal effects from OLS models interacting post-September LSAC interview with dummies for family income being in a State or Territory that shows school test-score averages in addition to the national averages in their NAPLAN reports. OLS model estimated using Correia's (2017) reghdfe *Stata package. Each row corresponds to a different outcome. All regressions include fixed effects for survey wave, region and age in months, and controls for weather, child and family characteristics. Child time use observations are weighted by 5/7 if taken on a weekday and by 2/7 if taken on a weekend day. Cluster-robust standard errors at the child level in parentheses. ***, ** and * mark estimates statistically different from zero at the 90, 95 and 99 percent confidence level.*

Specifically, we use the following model to forecast parents' expectations regarding their child's NAPLAN test scores:

$$NAPLAN_{i,w} = f(NAPLAN_{i,w-1}, Perceived\ Assessment_{i,w-1}, \theta_{Region}, \theta_w) + \varepsilon_{iw} \quad (3)$$

where $NAPLAN_{iw}$ is the NAPLAN numeracy test score of child *i* in wave *w*. Our model allows for separate slopes of $NAPLAN_{i,w-1}$ across data cells defined by region, wave, and by parents' perceived assessment of their child's ability one wave prior, $Perceived\ Assessment_{i,w-1}$. We estimate the model's parameters using the sample of non-treated parents (i.e., those with pre-September interviews) so that our estimates are not affected by recently released NAPLAN results. Using parameter estimates from equation (3), we construct child-specific forecasted scores ($\widehat{NAPLAN}_{i,w}$) for the whole sample as well as standard errors of each forecast. We then create three new mutually exclusive categorical variables, $Good\ News_{i,w}$, $Bad\ News_{i,w}$, and $No\ News_{i,w}$. Specifically, $Good\ News_{i,w}$ takes the value of 1 if the child's realized NAPLAN test score is more than 1 standard error above the forecasted score, and 0 otherwise. Similarly, $Bad\ News_{i,w}$ takes the value of 1 if the child's realized NAPLAN test score is more than 1 standard error below the forecasted score, and 0 otherwise, while $No\ News_{i,w}$ takes the value of 1 if the child's realized score is within one standard error of their forecasted score.

We implement this classification for each child observation in LSAC waves 4 through 6 because, in these waves, parents have previously received NAPLAN test scores. Our model results in 75 percent of these parents receiving "no news" and the rest of parents receiving either "good news" (13 percent) or "bad news" (12 percent).

We then investigate how parents' investments responses vary with the type of news that they receive using the following model:

$$\begin{aligned} Y_{iw} = {} & \beta_0 Post_{iw} + \beta_1 Good\ News_{iw} + \beta_2 Bad\ News_{iw} \\ & + \gamma_1[Post_{iw} \times Good\ News_{iw}] + \gamma_2[Post_{iw} \times Bad\ News_{iw}] \\ & + \breve{\gamma}' X_{iw} + \breve{\delta}_w + \breve{\delta}_{Region} + \breve{\delta}_{Age} + \breve{\varepsilon}_{iw} \end{aligned} \quad (4)$$

The model in equation (4) allows us to isolate the effect of both i) the timing (before vs. after the release of NAPLAN reports) and ii) the news content (good, bad and none) of the information that parents receive. Specifically, $\hat{\gamma}_1 - \hat{\beta}_1$ identifies the difference in the investments of parents who *have* received a NAPLAN report with good news (i.e., where their child's realized test score exceeds its forecast) by the time of their LSAC interview relative to those of parents who *will* receive good news but have not yet done so because they were interviewed before NAPLAN reports are released. Similarly, the difference in the investments

between parents who *have* and who *will* receive bad news is identified by $\hat{\gamma}_2 - \hat{\beta}_2$, whereas $\hat{\beta}_0$ captures the difference in investments of parents who *have* received no news (i.e., whose child performs within forecast) and who *will* receive no news. These estimated differences are reported in Tables 4 and 5.[23]

The estimated effect of the news content of NAPLAN on parents' time and monetary investments as well as on their parenting style and children's time use are reported in Table 7. We find that parents—irrespective of the type of news they receive—significantly increase their investments in private tutoring (between 5.5 and 9.3 percentage points) and limit their child's extracurricular activities (between 0.259 and 0.357 activities per week) following the release of their child's NAPLAN numeracy test scores. The lack of a relationship between the type of news parents receive and their investment responses suggests that the information content of the NAPLAN report is less important than the availability of the report itself. That is, NAPLAN reports may have a priming effect on parents. This would be consistent with experimental evidence that providing parents with daily updates on their child's in-class engagement increases homework completion, improves on-task behavior, and raises class participation (Kraft & Dougherty 2013), while making objective information about children's missed assignments, grades, and attendance attenuates parents' upwardly biased beliefs about their child's effort at school (Bergman 2021; Bergman & Chan 2017).

The estimated effect of NAPLAN's news content on children's time use is also reported in the bottom of Table 7. Parents who receive bad news significantly increase the time their child spends in educational activities and significantly decrease their child's leisure time. In effect, receiving bad news seems to encourage parents to alter their child's time use to redress the poor performance in the NAPLAN test. Interestingly, parents who receive good news respond similarly, increasing time in educational activities and leisure time, as if to reinforce the academic performance they have just received good news about. It is only parents receiving no news who do not adjust the time their child spends in these two activities.

Taken together, our results indicate that, in some cases, the type of news parents receive matters for the investments that they make; in other cases, NAPLAN reports appear to have a priming effect, leading parents receiving both good and bad news to respond in similar ways. Our estimates come from triple-interaction models, however, which limits our estimation

[23] The average marginal effects reported in Tables 5 and 6 are obtained by using the *margins* command in Stata. The main effects in equation (4) themselves identify differences in parental group investments, for example between parents who will eventually receive good rather than no news ($\hat{\beta}_1$) or between parents who will eventually receive bad news rather than no news ($\hat{\beta}_2$). Appendix Table B4 maps the coefficients in equation (4) to the parental groups they isolate in the data.

Table 7. The Effect of Receiving Good News, No News, and Bad News Based on Numeracy Scores

	Effect of post-September LSAC interview if based on numeracy scores parents receive:			
	good news	no news	bad news	p-value diff.
Perceptions and satisfaction:				
Perceived child school achievement	-0.039	-0.122**	-0.168*	0.430
	(0.083)	(0.057)	(0.089)	
Satisfaction with child school	-0.119	-0.054	-0.117	0.493
	(0.074)	(0.051)	(0.086)	
Time investments:				
Hours/day with parents	-0.098	-0.174	-0.365	0.658
	(0.279)	(0.192)	(0.261)	
At-home activities/week	-0.470	-0.426	-0.518	0.984
	(0.512)	(0.380)	(0.579)	
Out-of-home activities/month	-0.128	0.031	0.044	0.202
	(0.100)	(0.071)	(0.111)	
Monetary investments:				
30+ books at home	-0.022	-0.006	-0.051	0.651
	(0.049)	(0.035)	(0.052)	
Has private tutor	0.080**	0.055**	0.093**	0.486
	(0.037)	(0.025)	(0.038)	
Has allowance	-0.068	-0.023	-0.058	0.475
	(0.047)	(0.034)	(0.048)	
Extracurr. Activities/week	-0.259*	-0.357***	-0.297**	0.668
	(0.145)	(0.101)	(0.144)	
Parenting style:				
High warmth	0.016	0.016	0.033	0.926
	(0.048)	(0.033)	(0.046)	
Strict monitoring	-0.002	-0.022	-0.013	0.885
	(0.043)	(0.030)	(0.043)	
Minutes/day of child time in:				
Educational activities	34.554*	-2.173	53.440***	0.002
	(19.514)	(13.509)	(19.317)	
Leisure	-45.803**	-10.689	-37.952*	0.080
	(20.325)	(13.227)	(19.613)	
Sleeping & personal care	0.483	9.690	-3.371	0.250
	(9.333)	(6.272)	(9.330)	
Other activities	11.711	4.136	-8.652	0.291
	(11.211)	(8.064)	(11.345)	

Average marginal effects from OLS models interacting post-September LSAC interview with news type based on forecasted vs actual numeracy test scores using Correia's (2017) reghdfe *Stata package. Sample restricted to waves 4 through 6 of LSAC, where lagged NAPLAN test scores are available. Each row corresponds to a different outcome. All regressions include fixed effects for survey wave, region and child age in months, and controls for weather, child and family characteristics (see equation 2). Child time use observations are weighted by 5/7 if taken on a weekday and by 2/7 if taken on a weekend day. We use all available data in our restricted sample of 2,725 children and 6,141 child-wave observations. Cluster-robust standard errors at the child level in parentheses. ***, ** and * mark estimates statistically different from zero at the 90, 95 and 99 percent confidence level.*

power. As a result, in most cases, differences in parents' responses across news types are not

statistically significant.

5.3 Benchmarking Relative Performance

Along with providing individualized results, NAPLAN reports also allow parents to gauge their child's relative test performance within the national distribution. Figure 5 show the way that a child's numeracy test score, for example, is displayed in their NAPLAN report. The black dot represents the child's score, while the black arrow indicates the national average.[24] This raises the possibility that parents adjust their investments in response to objective information about their child's relative academic performance.

Previous evidence indicates that parents may respond differently to information about relative rather than absolute performance and that both can be important in correcting parents' biased beliefs (Rogers & Feller 2018). We investigate this by considering the salience of the national test-score average as a reference point using a series of regression discontinuity models of the following form:

$$\begin{aligned} Y_{iw} = {} & \pi 1[NAPLAN_{iw} > \kappa_w] \\ & + g(NAPLAN_{iw} | NAPLAN_{iw} < \kappa_w) \\ & + h(NAPLAN_{iw} | NAPLAN_{iw} > \kappa_w) + \varphi' X_{iw} + \upsilon_{iw} \end{aligned} \tag{5}$$

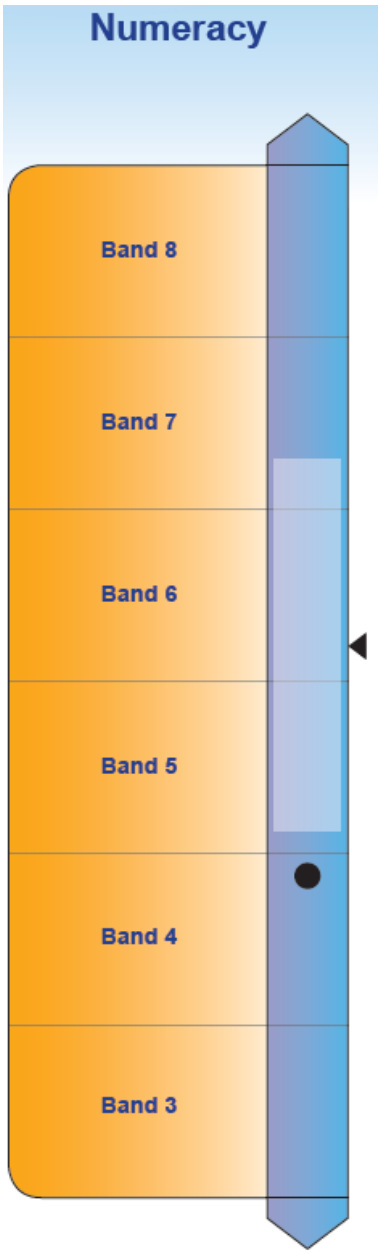
where Y_{iw} are outcomes; $NAPLAN_{iw}$ is again the NAPLAN numeracy test score of child *i* in wave *w*; κ_w is the national average of numeracy test scores in the child's test-taking cohort; $g(\cdot)$ and $h(\cdot)$ are local polynomials in $NAPLAN_{iw}$ estimated separately for scores below and above κ_w; and X_{iw} are controls to increase precision. We estimate these equations using only observations from interviews in October through December after the NAPLAN reports have been released. Our estimate of interest $\hat{\pi}$ identifies the causal effect of children scoring just above the national average, shedding light on whether parents adjust their expectations and parental investments in response.[25]

The effect of children scoring just above the national average in NAPLAN numeracy test on parents' perception about their child's achievement, their satisfaction with the child's school, parental investment in time and money, parenting styles, and child time use is shown in Table 8. Parents whose children score above the national average revise their perceptions of

[24] See Section 2.2 for an explanation of all other dimensions of the report.

[25] We find no evidence of imbalances in covariates around the national average (Appendix Table B5), little evidence of effects in falsification tests using pre-release observations interviewed in January through September (Appendix Table B6), and no evidence of test-score manipulation (Appendix Figure B1).

Figure 5. Example of How NAPLAN Reports Display Student and National Average Scores



Example of how the NAPLAN student report displays student test scores (black dot) and national average for the student's test-taking cohort (black arrow). NAPLAN reports display similar figures for reading, writing, and language conventions (with spelling and grammar & punctuation subcomponents). See Section 2.2 for more details on the performance bands and other quantities displayed in the reports, and visit https://www.nap.edu.au/results-and-reports/student-reports to see several examples of these cards.

children's school performance upwards, suggesting that parents—either consciously or unconsciously—use national averages as benchmarks to judge their child's performance. Scoring right above the national average triggers a shift in children's time use towards educational activities and away from leisure. This shift may explain the corresponding decrease

Table 8. Regression Discontinuity Estimates of the Effect of Receiving a NAPLAN Numeracy Score Above the National Average

	RD estimates in numeracy scores Child vs Nat. avg	Obs.	Bandwidth below	Bandwidth above
Perceptions and satisfaction:				
Perceived child school achievement	0.568***	1,474	23	26
	(0.169)			
Satisfaction with child school	-0.028	1,475	26	36
	(0.169)			
Time investments:				
Hours/day with parents	-0.016	1,160	33	52
	(0.447)			
At-home activities/week	-2.838**	855	23	38
	(1.404)			
Out-of-home activities/month	0.174	1,477	33	34
	(0.198)			
Monetary investments:				
30+ books at home	0.115	856	37	40
	(0.107)			
Has private tutor	0.094	1,365	26	41
	(0.067)			
Has allowance	0.172*	1,374	33	28
	(0.098)			
Extracurr. Activities/week	0.113	1,116	33	28
	(0.275)			
Parenting style:				
High warmth	-0.098	1,396	21	35
	(0.087)			
Strict monitoring	0.149*	1,437	26	21
	(0.090)			
Minutes/day of child time in:		1,160	34	30
Educational activities	86.357**			
	(39.395)			
Leisure	-84.704**			
	(36.402)			
Sleeping & personal care	-6.242			
	(19.460)			
Other activities	-3.088			
	(24.368)			

Robust bias-corrected regression discontinuity effects of being above the national average in NAPLAN numeracy test scores, restricting the sample to only post-September LSAC interviews and estimated using Calonico et al.'s (2017) rdrobust *Stata package. Each row corresponds to a different outcome. We restrict our sample to children-wave observations with a post-September interview and in each regressions use all available data for 1,257 children and 1,547 child-wave observations. We calculate bandwidths using two different CER-optimal selectors, use triangular kernels, adjust estimates for mass points in the running variable, show estimates using linear fits, and include controls for weather, child and family characteristics. Child time use observations are weighted by 5/7 if taken on a weekday and by 2/7 if taken on a weekend day. Cluster-robust standard errors at the child level in parentheses. ***, ** and * mark estimates statistically different from zero at the 90, 95 and 99 percent confidence level.*

in at-home activities with parents if those activities are largely leisure. Interestingly, estimating

corresponding regression discontinuity models which benchmark against school-level averages provides suggestive evidence that parents also adjust their investments in response to children's relative performance within schools.[26]

6. Conclusions

Parents often have imperfect information about children's human capital development. As a result, even well-intentioned parents may make suboptimal choices when investing in their children. The provision of objective information to parents about their children's absolute and relative academic achievement is a key strategy in closing these information gaps. Ultimately, however, the consequences for children's learning hinge on the way that parents respond to the information they receive.

Our research makes an important contribution by demonstrating that the availability of children's standardized test scores leads parents to moderate their beliefs about children's academic achievement and be less satisfied with schools. Importantly, parents also reallocate their investments by increasing private tutoring, reducing extracurricular activities, and shifting their children's time from leisure to educational activities. Together, our results provide evidence that information gaps influence parents' human capital investments, even in contexts with a high degree of parent-school interaction and easily accessible information on children's academic progress. Receiving new information results in parents redirecting their investments in ways that target the improved academic achievement of their children. This is particularly true in the public-school sector where information disparities are likely to be larger. In some cases, parents' investment responses depend on whether they learn their child is performing better, worse, or as expected. In other cases, standardized test results seem to have a priming effect, leading all parents receiving new information to redirect their investments towards educational activities.

Our results lead us to several conclusions. First, parents care about children's relative academic performance. When children score just above the national average, parents respond by raising their perceptions of how well their child performs relative to his peers and increasing their educational investments, at the expense of children's leisure time. Children's relative test performance is likely to particularly salient for Australian parents given that offers of university

[26] These models are estimated using the subsample of observations from Queensland, Western Australia, and South Australia. See Figure B2 for a typical NAPLAN report in these jurisdictions. Results are provided in Appendix Table B7. Our limited sample size results in a loss of estimation precision which leaves many of our estimates statistically insignificant despite being economically meaningful. Nonetheless, the pattern of results is broadly consistent with those based on the national average.

admission are made centrally based on students' academic rank within the overall cohort of high school graduates. In some jurisdictions this rank is derived solely from standardized exams administered in 12th grade, while in others final results in selected subjects are used in combination with standardized tests (Marks et al., 2001). It is an open question whether parents are equally focused on national benchmarks in the context of low-stakes testing.

Second, objective information has a role in correcting parents' informational biases, suggesting that there is a behavioral link between information gaps and parental investment. One potential mechanism is motivated beliefs (Bénabou & Tirole 2016). Parents may be holding unreasonably optimistic beliefs about their children's academic achievement because they want it to be so, regardless of whether these beliefs are accurate. Objective information works to dispel these misperceptions, at least partially. The fact that public-school parents are more responsive to this information is consistent with this interpretation. In the private-school sector, where parental feedback is more common, it is likely harder for parents to hold unreasonably overconfident beliefs.

If motivated beliefs are indeed at the core of our findings, one must also wonder whether providing more and clearer information to parents could backfire as a policy. The concern is not only that correcting beliefs that parents themselves consume has a negative immediate effect on their welfare. There is also the possibility that, for sufficiently overconfident parents, more feedback could result in misdirected learning. When faced with feedback, some parents may become too pessimistic about their children's ability, lowering outcomes and thus confirming their more pessimistic expectations in a self-defeating circle (see Heidhues et al. 2018). Future research examining this possibility would be particularly useful.

Finally, our findings provide conclusive evidence of the complementarity between (perceived) child quality and educational investments. This is an elusive yet very important element of the household education production function linked to reinforcing investment, which is often cited as one of the key motivations behind changes in parental investments. A related literature shows changes in private tutoring in response to school investments, such as access to better schools or to more qualified teachers (Pop-Eleches & Urquiola 2013; Chang et al. 2020). Our findings suggest that interventions that keep parents better informed—scalable and likely very cost-effective—can also be effective for increasing parental investments in their children's education. We show that these interventions will be most effective at raising parental investments in public-school children, which are the majority in our setting and are also relatively more disadvantaged. Assuming private tutoring leads to better educational outcomes,

better information can therefore become a progressive policy to close socioeconomic gaps in academic achievement.

Going forward it would be valuable for researchers to undertake a more systematic exploration the constraints that parents face in adjusting their investments once information barriers are lessened. Private tutoring, in particular, appears to be parents' tool of choice when seeking to improve the academic achievement of their children. Yet information asymmetries in the market for private tutors may make it difficult for parents to choose the right tutor for their child. Moreover, parents in more disadvantaged schools face a myriad of resource constraints when investing in their children; simply providing them with better information about their children's academic performance will not necessarily translate into greater investment. More targeted information that is sensitive to the constrains that parents face is likely to be more meaningful.

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Appendix A – The Construction of NAPLAN Scales

An important feature of the NAPLAN test, besides its standardized nature, is its common assessment scale. NAPLAN results are reported using five scales, one for each of the skills assessed. These scales have been designed such that they are common across all grade levels from grade 3 to grade 9. By locating all student results on a single scale, the NAPLAN tests can provide significant information about the development of student achievement over time. As each NAPLAN test is different each year, individual student's raw scores can be converted to its equivalent on the NAPLAN scale using equivalence tables that are published annually. The NAPLAN scales are constructed from scores that range from approximately zero to 1000. Each score represents the same level of achievement over time. For example, obtaining a score of 600 in grade 3 reading in 2010 is to be understood as indicating the same level of reading skills as obtaining a score of 600 in grade 5 reading in 2012. The scales, however, cannot be compared across domains, so, a score of 600 in grade 3 reading versus a score of 700 in grade 3 writing does not by itself indicate that the student is more proficient in writing than in reading.

Each scale is divided into ten bands, from 1 to 10, that represent increasing levels of knowledge and understanding of the skills demonstrated in the assessment. These bands are used to determine how each child is performing against established national standards. The national minimum standard describes the level of skills and understanding expected for students in that grade and encompasses one band at each grade level. For example, Band 2 is the minimum standard for students in grade 3. If a child's NAPLAN test score places them in a lower band than the minimum standard, this indicates that the child does not demonstrate the learning outcomes expected for their grade level in that domain. For each grade level, NAPLAN results are reported against 6 of the 10 bands from the common scale. For example, the grade 3 student report scale displays bands 1-6 and the grade 4 student report scale displays bands 3-8.

Appendix B – Additional Tables and Figures

Table B1. Measures Included in Parental Investment Variables and Control Variables

Variable	Waves available	Definition
Time spent with child (days/week of activity)		
Read with child	3 & 4	The number of days in the past week where the parent or an adult in the family has read to the study child from a book.
Told child a story	4 & 5	The number of days in the past week where the parent or an adult in the family has told the study child a story, not from a book.
Drawn picture with child	4 & 5	The number of days in the past week where the parent or an adult in the family has drawn pictures or done other art or craft activities with the study child.
Music with child	4 & 5	The number of days in the past week where the parent or an adult in the family has played music, sung songs, danced or done other musical activities with the study child.
Toys or games with child	4 & 5	The number of days in the past week where the parent or an adult in the family has played with toys or games indoors, like board or card games and excluding electronic games, with the study child.
Everyday activities with child	3, 4 & 5	The number of days in the past week where the parent or an adult in the family has involved the study child in everyday activities at home, such as cooking or caring for pets.
Played outdoors with child	3, 4 & 5	The number of days in the past week where the parent or an adult in the family has played a game outdoors or exercised together (e.g., walking, swimming, cycling) with the study child.
Sum of activities/week	3, 4 & 5	Sum of days per week spent with the study child being engaged in activities inside the home.
Parent-child activities (times last month)		
Gone to playground or pool	3 to 6	Equals 1 if study child has gone to a playground or a swimming pool with their parent or another adult in the family in the past month.
Gone to concert, museum, etc.	3 to 6	Equals 1 if study child has gone to a concert, play museum, art gallery or community or school event with their parent or another adult in the family in the past month.
Attended a religious service	3 to 6	Equals 1 if study child has attended a religious service, church temple, synagogue or mosque with their parent or another adult in the family in the past month.

Variable	Waves available	Definition
Visited library	3 to 6	Equals 1 if study child has visited a library with their parent or another adult in the family in the past month.
Sum of activities last month	3 to 6	Sum of parent-child activities outside the home in the last month.
Monetary investments in child		
More than 30 books at home	4 & 5	Equals 1 if study child has more than 30 books at home.
Hired tutor	4 to 6	Equals 1 if study child has received additional help or tutoring from anyone outside the household in the last 12 months.
No pocket money	4 to 6	Equals 1 if study child does not receive weekly pocket money.
Number of extracurricular activities last week	5 & 6	Total number of regular extracurricular activities (at least once a week for three months or more) study child has participated in, in the past week. The list of extracurricular activities are: community group, team sport, individual sport, art, academic classes, new skill classes, and religious activities.
Parental Warmth		
Display physical affection	3 to 6	How often the parent has expressed affection by hugging, kissing, and holding the study child in the past six months. Answered on a scale of 1 to 5 where 1 is 'Never/Almost Never' and 5 is 'Always/Almost Always'.
Express happiness to child	3 to 6	How often the parent has told the study child how happy he/she makes them in the past six months. Answered on a scale of 1 to 5 where 1 is 'Never/Almost Never' and 5 is 'Always/Almost Always'.
Warm encounters with child	3 to 6	How often the parent has had warm, close times together with the study child in the past six months. Answered on a scale of 1 to 5 where 1 is 'Never/Almost Never' and 5 is 'Always/Almost Always'.
Enjoy doing things with child	3 to 6	How often the parent enjoyed listening to the study child and doing things with him/her in the past six months. Answered on a scale of 1 to 5 where 1 is 'Never/Almost Never' and 5 is 'Always/Almost Always'.
Close when happy or upset	3 to 6	How often the parent has felt close to the study child when he/she was happy and when he/she was upset in the past six months. Answered on a scale of 1 to 5 where 1 is 'Never/Almost Never' and 5 is 'Always/Almost Always'.

Variable	Waves available	Definition
High warmth	3 to 6	We define a parent to have high warmth parenting style if they have rated themselves with a total of 20 or more points from the above 5 warmth parenting items.
Parental Monitoring		
Know child's friends' names and faces	3 to 6	How many of study child's close friends the parent knows by sight and by their first and last names. Answered on a scale of 1 to 5 where 1 is 'None of them' and 5 is 'All of them'.
Know child's friends' parents' names and faces	3 to 6	How many of study child's close friends' parents the parent knows by sight and by their first and last names. Answered on a scale of 1 to 5 where 1 is 'None of them' and 5 is 'All of them'.
Know where child is	3 to 6	How often the parent knows where study child is in the course of a day. Answered on a scale of 1 to 5 where 1 is 'Always' and 5 is 'Never'. We reverse code the scale such that 1 is 'Never' and 5 is 'Always', so that the scale is increasing in monitoring.
Know who child is with	3 to 6	How often the parent knows who the study child is with in the course of a day, when the study child is away from home. Answered on a scale of 1 to 5 where 1 is 'Always' and 5 is 'Never'. We reverse code the scale such that 1 is 'Never' and 5 is 'Always', so that the scale is increasing in monitoring.
Talk with child about their life	3 to 6	How often the parent talks to the study child about what is going on in his/her life. Answered on a scale of 1 to 5 where 1 is 'Always' and 5 is 'Never'. We reverse code the scale such that 1 is 'Never' and 5 is 'Always', so that the scale is increasing in monitoring.
Child goes out without telling	3 to 6	How often the study child goes out without telling the parent where he/she will be. Answered on a scale of 1 to 5 where 1 is 'Always' and 5 is 'Never'.
High monitoring	3 to 6	We define a parent to have high monitoring parenting style if they have rated themselves with a total of 24 or more points from the above 6 monitoring parenting items.
Parent's assessments		
Child's performance in school	3 to 6	How the parent would describe the study child's overall achievement at school. Answered on a scale of 1 to 5 where 1 is 'Excellent' and 5 is 'Well below average'.

Variable	Waves available	Definition
Satisfaction with school	3 to 6	How satisfied the parent is with the school that the study child currently attends. Answered on a scale of 1 to 5 where 1 is 'Very satisfied' and 5 is 'Very dissatisfied'.
Child and parent characteristics		
Child's age (years)	1 to 6	Study child's age in years.
Female child	1 to 6	Equals 1 if study child is female.
Child birth weight (kilograms)	1	Study child's weight at birth.
Number of siblings	1 to 6	Number of siblings study child has in the household.
2 Biological parents in household	1 to 6	Equals 1 if both study child's biological mother and biological father live at home with study child.
Female responding parent	1 to 6	Equals 1 if the responding parent is female.
Household gross income (AUD/week)	2 to 6	Usual weekly income (gross) earned by adults in the household.
University-educated parent(s)	1 to 6	Equals 1 if one or both parents of the study child has completed at least a bachelor's degree.
Migrant parent(s)	1	Equals 1 if one or both parents of the study child was not born in Australia.
Non-English speaking background parent(s)	1	Equals 1 if one or both parents of the study child comes from a non-English speaking background and speaks a language other than English at home.

Table B2. Categorization of Time-Use Diary Activities Across Waves

Category	*Wave 4*	*Wave 5*	*Wave 6*
Educational-Related Activities	[41] Organised team sports and training i.e fooball, basketball, netball etc. [42] Organised individual sport i.e. swimming, dancing, martial arts, etc. [45] Scouts, girl guides, etc. [47] Going out to museums, cultural events, fairs, community events, church etc. [50] Non-Active Activities [52] Listening to music, CDs, playing music for leisure [53] Reading or being read to for leisure [55] Non-Active Club Activities i.e. Chess Club [58] Homework (not on computer) including music practice [61] Computer for homework – internet [62] Computer for homework – not internet [70] School Lessons	[40] Organised team sports and training [41] Organised individual sport and training [44] Active club activities [46] Going out to a concert, play, museum, art gallery, community or school event, an amusement park etc. [51] Listening to music [52] Playing musical instruments or singing for leisure [53] Reading or being read to for leisure [55] Non-active club activities [58] Doing homework (not via electronic devices) [60] Doing homework [70] School Lessons	[401] Archery / Shooting sports [402] Athletics / Gymnastics [403] Fitness / Gym / Exercise [404] Ball Sports [405] Martial arts / Dancing [406] Motor Sports / Roller Sports / Cycling [407] Water/Ice/Snow Sports [408] Organised team sports and training other [411] Archery / Shooting sports (individual) [412] Athletics / Gymnastics (individual) [413] Fitness / Gym / Exercise (individual) [414] Martial arts / Dancing (individual) [415] Motor Sports / Roller Sports / Cycling (individual) [416] Ball Sports (individual) [417] Water/Ice/Snow Sports (individual) [418] Organised individual sport and training other [440] Active club activities [462] Attendance at concert/theatre [463] Attendance at museum / exhibition / art gallery [464] Attendance at zoo / animal park / botanic garden [511] Listening to music [521] Playing musical instruments or singing for leisure [531] Reading or being read to for leisure [551] Attend courses (excluding school /university)

Category	*Wave 4*	*Wave 5*	*Wave 6*
			[552] Clubs [581] Doing homework (not via electronic devices) [601] Doing homework (electronic device) [701] School Lessons
Leisure Activities	[40] Active Activities [43] Ball games, riding a bike, scooter, skateboard, skipping, running, games and other free activities [44] Taking Pet for a walk [46] Shopping [48] Cinema [49] Live Sporting Events [54] Board or card games, puzzles, toys, art and craft, etc. [56] Doing nothing [60] Electronic media, games, computer use [63] Computer games – internet [64] Computer games - not internet [65] Xbox, Playstation, Nintendo, WII etc [66] Internet not covered elsewhere [67] TV/DVD [80] Communication [81] Talking face to face [82] Talking on a landline phone [83] Talking on a mobile phone [84] Texting, email, social networking such as Facebook or twitter [85] Skype or Webcam	[42] Unstructured active play [43] Walking pets / playing with pets [45] Shopping [47] Religious activities / ritual ceremonies [48] Attending live sporting events [49] Active activities NEC [54] Unstructured non- active play [56] Doing nothing [59] Non-active activities NEC [61] Playing games [62] Watching TV programs or movies/videos [63] Spending time on social networking sites [64] Downloading/posting media (e.g music, videos, applications) [65] Internet shopping (excluding downloading/posting media) [66] General Internet browsing (excluding homework) [67] Creating/maintaining websites (excluding social networking profile) [68] General application use (e.g Microsoft Office excluding homework) [69] Electronic device use NEC	[421] Archery / Shooting sports (unstructured) [422] Athletics / Gymnastics (unstructured) [423] Fitness / Gym / Exercise (unstructured) [424] Ball Sports (unstructured) [425] Martial arts / Dancing (unstructured) [426] Motor Sports / Roller Sports / Cycling (unstructured) [427] Water/Ice/Snow Sports (unstructured) [428] Unstructured active play Other [430] Walking pets/playing with pets [451] Shopping [452] Purchasing consumer goods [453] Purchasing durable goods [454] Window shopping [455] Purchasing repair services [456] Purchasing administrative services [457] Purchasing personal care services [458] Purchasing other services [461] Attendance at movies / cinema [465] Attendance at other mass events [466] Going out NEC [471] Religious practice

Category	*Wave 4*	*Wave 5*	*Wave 6*
		[80] Talking face-to-face (in person not via electronic devices) [81] Talking on a landline phone (not video chat) [82] Talking on a mobile phone (not video chat) [83] Video chatting (e.g Skype) [84] Texting/emailing [85] Online chatting / Instant messaging [86] Non-verbal interaction (e.g cuddles) [87] Negative face-to-face communication [88] Communication NEC	[472] Weddings, funerals, rites of passage [473] Religious activities / ritual ceremonies NEC [481] Attending live sporting events [491] Active activities NEC [541] Chess, card, paper and board games / crosswords [542] Games of chance / gambling [543] Hobbies, collections [544] Handwork crafts (excl. clothes making) [545] Arts [548] Unstructured non-active play NEC [555] Religious groups [561] Doing nothing [591] Non-active activities NEC [611] Playing games (electronic device) [612] Playing games (Electronic device) nfd [621] Watching TV programs or movies/videos [631] Spending time on social networking sites [641] Downloading/posting media [651] Internet shopping [661] General Internet browsing [671] Creating/maintaining websites [681] General application use [691] Electronic device use NEC [802] Talking face-to-face [811] Talking on a landline phone [821] Talking on a mobile phone

Category	*Wave 4*	*Wave 5*	*Wave 6*
			[831] Video chatting [841] Texting/emailing [851] Online chatting / Instant messaging [861] Non-verbal interaction [871] Negative face-to-face communication [881] Communication NEC
Personal Care Activities & Sleep	[10] Eating/drinking [20] Personal care/hygiene [21] Bathing, dressing, toileting, teeth brushing, hair care etc. [22] Dentist, Doctor, Chiropractor, Physio etc. [57] Sleeping/napping	[10] Eating/drinking [20] Cleaning teeth [21] Showering/bathing [22] Getting dressed/getting ready [23] Personal care not elsewhere classified (NEC) [24] Doctor [25] Dentist [26] Physiotherapist / Chiropractor [27] Medical/Health care NEC [57] Sleeping/napping	[101] Eating/drinking [201] Cleaning teeth [211] Showering/bathing [221] Getting dressed / getting ready [231] Personal care NEC [241] Doctor [251] Dentist/Orthodontist [261] Physiotherapist / Chiropractor [271] Medical/Health care [281] Personal care/Medical/Health Care NEC. [571] Sleeping/napping (not end of day bed-time
Other Activities	[30] Chores [31] Making own bed, tidying own room [32] Making, preparing own food [33] Getting self ready, packing own school or sports bag [34] Cleaning, tidying other rooms [35] Cooking, meal preparation, making lunch, setting table for others [36] Washing dishes, stacking and emptying dishwasher [37] Gardening, putting out the bin	[0] Retailing (including fast food) [1] Pamphlet delivering [2] Umpiring/refereeing [3] Car washing [4] Gardening / lawn mowing [5] Babysitting [6] Animal care [7] Working in a family business or farm [8] Work not elsewhere classified (NEC) [9] Volunteering [30] Cleaning/tidying [31] Laundry/clothes care	[1] Retailing [11] Hospitality (including fast food) [21] Clerical/office [31] Labourers and related workers [41] Gardening / lawn mowing [51] Babysitting [61] Apprenticeships/trades persons [71] Working in a family business or farm [81] Work Other [82] Umpiring (work) [83] Car washing (work)

Category	*Wave 4*	*Wave 5*	*Wave 6*
	[38] Taking care of siblings, other children [39] Taking care of pets [90] Travel [91] By foot [92] By bike, scooter, skateboard etc. [93] By private car [94] Travel by public transport such as bus, taxi or aeroplane [99] Other	[32] Food/drink preparation [33] Food/drink clean up [34] Gardening / lawn mowing [35] Animal care (excluding active play) [36] Home maintenance [37] Taking care of siblings [38] Chores NEC [90] By foot [91] By bike, scooter, skateboard etc [92] By private motor vehicle/bike [93] By public/chartered transport such as bus, taxi or aeroplane [94] Travel NEC [99] Other	[84] Animal care (work) [91] Volunteering (work) [301] Cleaning/tidying [311] Laundry/clothes care [312] Clothes making [321] Food/drink preparation [331] Food/drink clean up [341] Gardening (maintenance chores) [342] Cleaning grounds/garage/shed/outside of house (chores) [344] Pool care (chores) [351] Animal care [361] Home maintenance [362] Design/Home Improvement [363] Heat/water/power upkeep [364] Car/boat/bike care [365] Selling/disposing of household assets [366] Rubbish/Recycling [367] Packing [368] Household management Other [371] Taking care of siblings (chores) [381] Chores NEC [901] By foot [911] By bike, scooter, skateboard etc [921] By private motor vehicle/bike [931] By public/chartered transport [941] Travel NEC [981] Filling out the diary [971] Illegal activities

Category	*Wave 4*	*Wave 5*	*Wave 6*
			[998] Uncodeable activity
			[991] Other

Table B3. Summary Statistics in the Estimation and Reference Samples

	Estimation sample (+ Sept. interv.)		All test-takers		Diff.	
	Obs.	Mean	Obs.	Mean		
Everyday activities (times per week)						
Read with child	7,743	1.04	9,934	1.00	0.04	
Told child a story	5,050	1.17	7,072	1.16	0.01	
Drawn picture with child	5,050	0.53	7,072	0.52	0.01	
Music with child	5,050	1.42	7,072	1.44	-0.02	
Toys/games with child	5,050	0.83	7,072	0.82	0.01	
Everyday activities with child	7,746	2.73	9,940	2.74	-0.01	
Played outdoors with child	7,746	1.79	9,940	1.75	0.04	
Sum of activities/week	5,047	9.11	7,066	9.08	0.03	
Parent-child outings (times last month)						
Gone to a playground/pool	9,808	0.59	12,820	0.58	0.01	**
Gone to concert, museum	9,808	0.46	12,820	0.46	0.00	
Attended a religious service	9,808	0.30	12,820	0.30	0.00	
Visited library	9,808	0.28	12,820	0.27	0.01	
Sum of activities last month	9,808	1.64	12,820	1.60	0.04	**
Material investments						
>30 books at home	5,050	0.74	7,072	0.73	0.01	*
Hired a tutor for child	7,022	0.15	9,807	0.16	-0.01	
No pocket money given to child	7,111	0.37	9,949	0.38	-0.01	
Extracurricular activities (times last week)						
Community group	4,484	0.10	6,276	0.10	0.00	
Team sport	4,484	0.48	6,276	0.47	0.01	
Individual sport	4,484	0.26	6,276	0.25	0.01	
Art etc.	4,484	0.32	6,276	0.31	0.01	
Academic classes	4,484	0.08	6,276	0.08	0.00	
New skill classes	4,484	0.03	6,276	0.03	0.00	
Religious activities	4,484	0.15	6,276	0.15	0.00	
Sum of extracurr. activities last week	4,484	1.42	6,276	1.40	0.02	
Warmth parenting (5-point scales)						
Display physical affection	9,327	4.30	12,274	4.28	0.02	**
Express happiness to child	9,335	4.01	12,282	3.99	0.02	*
Warm encounters with child	9,329	4.11	12,277	4.09	0.02	**
Enjoy doing things with child	9,337	4.27	12,285	4.26	0.01	
Close when happy or upset	9,333	4.36	12,280	4.34	0.02	
High warmth (20+)	9,318	0.72	12,264	0.71	0.01	**
Monitoring parenting (5-point scales)						
Know child's friends names/faces	9,675	3.68	12,662	3.65	0.03	*

	Estimation sample (+ Sept. interv.)		All test-takers		Diff.	
	Obs.	**Mean**	**Obs.**	**Mean**		
Know child's friends' parents names/faces	9,675	3.29	12,662	3.25	0.04	***
Know where child is	9,692	4.65	12,680	4.64	0.01	
Know who child is with	9,692	4.57	12,680	4.55	0.02	**
Talk with child about their life	9,639	4.45	12,620	4.44	0.01	
Child goes out without telling	9,692	4.82	12,680	4.81	0.01	
High monitoring (24+)	9,622	0.75	12,600	0.73	0.02	**
Children's time use (minutes per day)						
Total time spent with either parent	6,490	210	9,066	211	-1.66	
Educational activities	6,490	259	9,066	260	-1.06	
Leisure activities	6,490	321	9,066	321	-0.30	
Sleeping & personal care	6,490	642	9,066	640	2.19	
Other activities	6,490	219	9,066	220	-0.79	
Children's NAPLAN-related variables						
Post-September LSAC interview	8,648	0.18	11,683	0.33	-0.15	***
Numeracy score	9,866	520	12,901	524	-4.63	***
Reading score	9,866	522	12,901	527	-4.31	***
Parent's assessments					0.00	
Child achievement in school	9,806	3.77	12,800	3.75	0.02	
Satisfaction with school	9,816	4.44	12,816	4.43	0.01	
Socio-demographic characteristics						
Child's age (years)	9,861	11.06	12,894	11.33	-0.27	***
Female child	9,866	0.49	12,901	0.49	0.00	
Child birth weight (kg.)	9,765	3.42	12,766	3.42	0.00	
Number of siblings	9,857	1.59	12,890	1.58	0.01	
2 Biological parents in household	9,861	0.78	12,894	0.78	0.00	
Female responding parent	9,857	0.96	12,890	0.96	0.00	
Household gross income (AUD/week)	9,271	2,310	12,098	2,300	9.88	
University-educated parent(s)	9,866	0.46	12,901	0.45	0.01	
Non-English speaking parent(s) at birth	9,866	0.14	12,901	0.14	0.00	
Migrant parent(s)	9,866	0.33	12,901	0.33	0.00	

The estimation sample (+ Sept. interv.) is the sample of children that took the NAPLAN test in the same year as the LSAC interview, including those whose LSAC interview took place in September (this latter group is excluded from our usual estimation sample). All test-takers include, in addition to the estimation sample, students taking NAPLAN tests ahead or behind their cohort school year and September interviews.

Table B4. The Parental Groups Isolated by Equation (4)

		The type of news parents (will) get when they receive NAPLAN score cards		
		Bad news	*No news*	*Good news*
Parents are interviewed before receiving NAPLAN score cards ($Post_{iw}$)	*No*	$\widehat{\beta_2}$	Comparison group	$\widehat{\beta_1}$
	Yes	$\widehat{\gamma_2}$	$\widehat{\beta_0}$	$\widehat{\gamma_1}$

Subgroups identified by Equation (4) estimates of $Investment_{iw} = \beta_0 Post_{iw} + \beta_1 Good\ News_{iw} + \beta_2 Bad\ News_{iw} + \gamma_1[Post_{iw} \times Good\ News_{iw}] + \gamma_2[Post_{iw} \times Bad\ News_{iw}] + \tilde{\gamma}' Weather_{iw} + \tilde{\delta}_w + \tilde{\delta}_{Region} + \tilde{\delta}_{Age} + \tilde{\varepsilon}_{iw}$ *after adding weather controls, and after accounting for wave, region and age fixed effects. All effects are interpreted relative to the comparison group.*

Table B5. Regression Discontinuity Balancing Tests of NAPLAN Numeracy Scores at the National Average Threshold on Pre-Determined Characteristics

	RD estimates using numeracy scores Child vs Nat. avg	Obs.	Bandwidth below	Bandwidth above
Pre-determined outcomes:				
Child's age (months)	-4.672	1,498	39	45
	(3.731)			
Female child	-0.079	1,498	30	45
	(0.095)			
Child birth weight (kg.)	-0.028	1,480	41	50
	(0.105)			
2 biological parents in household	-0.641	1,498	68	42
	(0.549)			
Household gross income (AUD/week)	-318.548	1,498	35	37
	(380.294)			
University-educated parent(s)	-0.077	1,498	30	39
	(0.095)			
Migrant parent(s)	-0.033	1,498	29	26
	(0.252)			

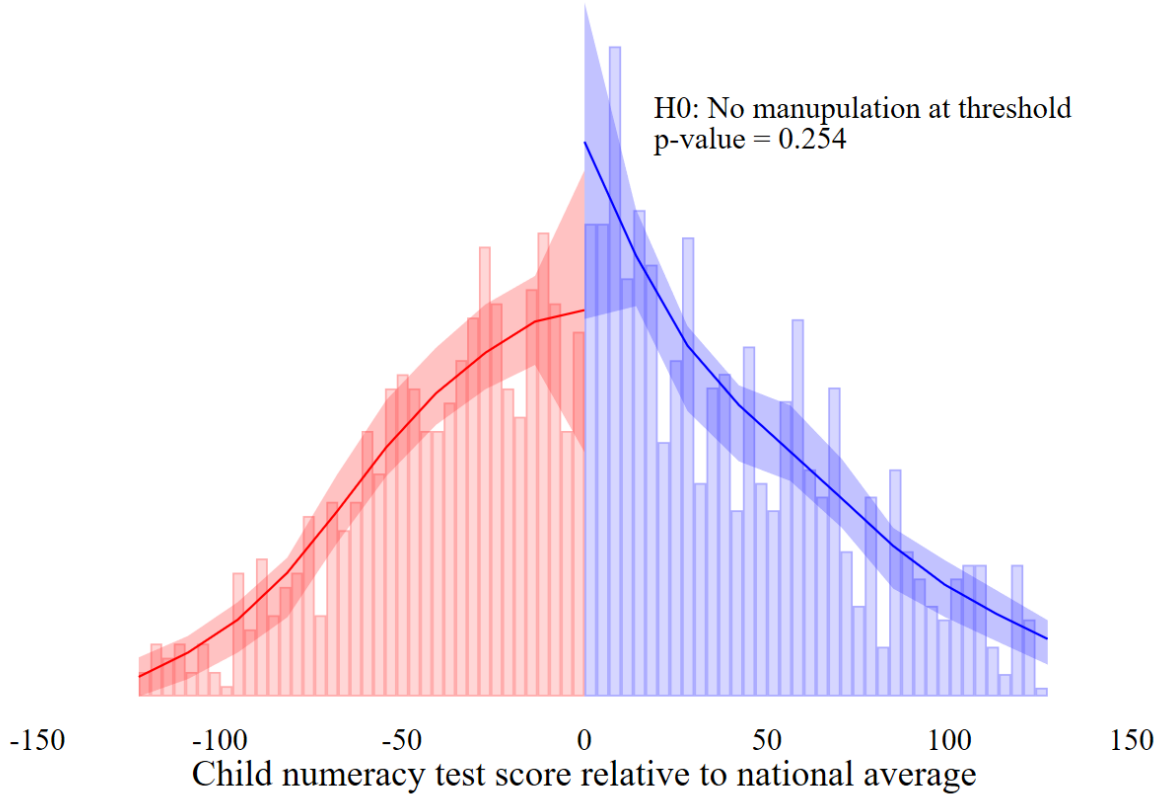
Robust bias-corrected regression discontinuity effects of being above the national average in NAPLAN numeracy test scores, restricting the sample to only post-September LSAC interviews and estimated using Calonico et al.'s (2017) rdrobust *Stata package. Each row corresponds to a different pre-determined outcome. We restrict our sample to children-wave observations with a post-September interview and in each regressions use all available data for 1,257 children and 1,547 child-wave observations. We calculate bandwidths using two different CER-optimal selectors, use triangular kernels, adjust estimates for mass points in the running variable, show estimates using linear fits, and include controls for weather, child and family characteristics. Cluster-robust standard errors at the child level in parentheses. ***, ** and * mark estimates statistically different from zero at the 90, 95 and 99 percent confidence level.*

Table B6. Regression Discontinuity Placebo Tests of NAPLAN Numeracy Scores at the National Average Threshold in pre-September LSAC Interviews

	RD estimates using numeracy scores Child vs Nat. avg	Obs.	Bandwidth below	Bandwidth above
Perceptions and satisfaction:				
Perceived child school achievement	0.008	6,808	31	47
	(0.066)			
Satisfaction with child school	0.016	6,817	35	40
	(0.062)			
Time investments:				
Hours/day with parents	-0.140	4,245	30	36
	(0.285)			
At-home activities/week	0.577	3,332	38	42
	(0.520)			
Out-of-home activities/month	0.207**	6,819	38	28
	(0.095)			
Monetary investments:				
30+ books at home	0.001	3,334	31	52
	(0.051)			
Has private tutor	0.016	4,461	27	39
	(0.040)			
Has allowance	-0.075	4,539	30	31
	(0.055)			
Extracurr. Activities/week	-0.052	2,613	27	47
	(0.141)			
Parenting style:				
High warmth	-0.022	6,495	33	36
	(0.041)			
Strict monitoring	0.010	6,717	34	40
	(0.036)			
Minutes/day of child time in:				
Educational activities	7.413	4,245	32	52
	(20.002)			
Leisure	20.741	4,245	22	48
	(22.636)			
Sleeping & personal care	1.480	4,245	28	45
	(9.809)			
Other activities	-21.924	4,245	22	48
	(13.978)			

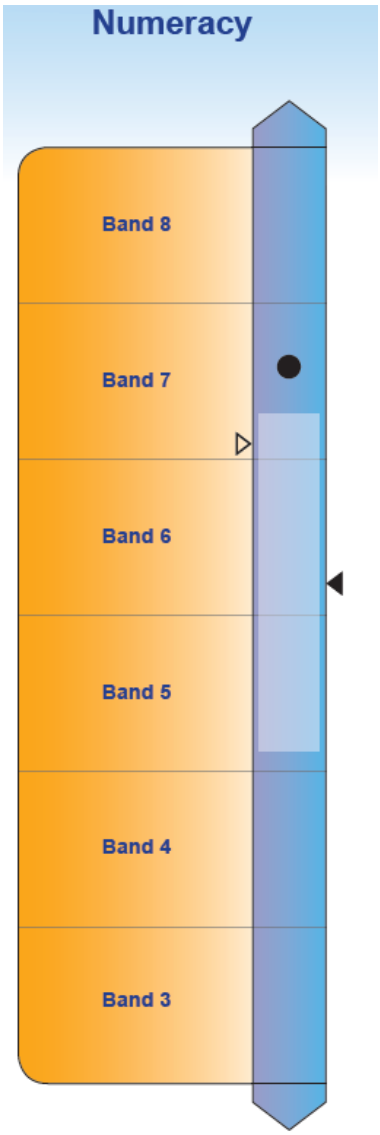
Robust bias-corrected regression discontinuity effects of being above the national average in NAPLAN numeracy test scores, restricting the sample to only post-September LSAC interviews and estimated using Calonico et al.'s (2017) rdrobust *Stata package. Each row corresponds to a different placebo outcome. We restrict our sample to children-wave observations with a pre-September interview (when NAPLAN results have not yet been released to schools) and in each regression we use all available data for 2,804 children and 7,101 child-wave observations. We calculate bandwidths using two different CER-optimal selectors, use triangular kernels, adjust estimates for mass points in the running variable, show estimates using linear fits, and include controls for weather, child and family characteristics. Cluster-robust standard errors at the child level in parentheses. ***, ** and * mark estimates statistically different from zero at the 90, 95 and 99 percent confidence level.*

Figure B1. Cattaneo, Jansson and Ma (2018) Manipulation Test for Discontinuities in the Density of NAPLAN Numeracy Scores at the National Average Threshold



Histogram and local polynomial density estimators of the density of NAPLAN numeracy test scores below (red) and above (blue) of the year's national average, produced using Cattaneo, Jansson and Ma's (2018) rddensity *Stata package. We calculate bandwidths using two different CER-optimal selectors, use triangular kernels, adjust estimates for mass points in the running variable, use quadratic polynomials to construct the density estimator, and use jackknife estimators for estimating the uncertainty around the local polynomial fits.*

Figure B2. Example of How NAPLAN Reports Display Student, National Average, and School Average Scores in Queensland, South Australia, and Western Australia



Example of how the NAPLAN student report displays student test scores (black dot), and the school average (black unfilled arrow) and national average (black filled arrow) for the student's test-taking cohort. NAPLAN reports display similar figures for reading, writing, and language conventions (with spelling and grammar & punctuation subcomponents). See Section 2.2 for more details on the performance bands and other quantities displayed in the reports, and visit https://www.nap.edu.au/results-and-reports/student-reports to see several examples of these cards.

Table B7. Regression Discontinuity Estimates of the Effect of Receiving a NAPLAN Numeracy Score Above the School Average, in States Where School Averages are hown

	RD estimates in numeracy scores Child vs School avg.	Obs.	Bandwidth below	Bandwidth above
Perceptions and satisfaction:				
Perceived child school achievement	0.138	463	30	43
	(0.254)			
Satisfaction with child school	0.606**	463	29	40
	(0.290)			
Time investments:				
Hours/day with parents	-0.518	354	29	42
	(1.330)			
At-home activities/week	0.092	267	27	56
	(2.059)			
Out-of-home activities/month	0.177	464	32	44
	(0.391)			
Monetary investments:				
30+ books at home	-0.068	268	35	41
	(0.214)			
Has private tutor	0.072	416	24	46
	(0.121)			
Has allowance	-0.007	418	40	51
	(0.162)			
Extracurr. Activities/week	-0.056	368	33	26
	(0.423)			
Parenting style:				
High warmth	0.172	443	31	42
	(0.144)			
Strict monitoring	0.204	457	35	45
	(0.149)			
Minutes/day of child time in:				
Educational activities	114.590	354	33	39
	(72.043)			
Leisure	-61.658	354	37	42
	(80.765)			
Sleeping & personal care	45.491	354	29	50
	(46.912)			
Other activities	-96.724**	354	27	52
	(45.358)			

Robust bias-corrected regression discontinuity effects of being above the school average in NAPLAN numeracy test scores, restricting the sample to only post-September LSAC interviews in States and Territories where school averages are shown in NAPLAN reports (Queensland, South Australia and Western Australia) and estimated using Calonico et al.'s (2017) rdrobust *Stata package. Each row corresponds to a different outcome. We restrict our sample to children-wave observations with a post-September interview and in each regressions use all available data for 1,257 children and 1,547 child-wave observations. We calculate bandwidths using two different CER-optimal selectors, use triangular kernels, adjust estimates for mass points in the running variable, show estimates using linear fits, and include controls for weather, child and family characteristics. Child time use observations are weighted by 5/7 if taken on a weekday and by 2/7 if taken on a weekend day. Cluster-robust standard errors at the child level in parentheses. ***, ** and * mark estimates statistically different from zero at the 90, 95 and 99 percent confidence level.*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