

# Does Money Matter? An examination of government funding, school sectors, and student achievement

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Submitted: 24<sup>th</sup> November, 2021

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## Abstract

The achievement gap between advantaged and disadvantaged students in Australia is one of the largest in the OECD. Due to the litany of negative consequences arising from educational inequality, research has begun to look for policy interventions to improve the educational outcomes of disadvantaged students. A growing body of evidence suggests that modifying school funding policies to better assist disadvantaged students may be one potential solution. This research aims to provide the first systematic analysis of the impact of school funding upon student achievement in Australia. It proposes that government funding has a significant positive effect upon student achievement across all school sectors. Additionally, it proposes that funding has a differential effect upon student achievement based upon school sector and student year-level.

The data used in this research was collected by the Australian Curriculum, Assessment and Reporting Authority (ACARA) from 2009-2016, and details school-level financial records and student achievement results for every primary school in Australia. This research finds that government funding has a significant positive impact upon student achievement in Australia in Years 3 and 5. It also finds that independent schools derive a greater increase in student achievement for every dollar spent than schools in the catholic or government sectors, and that government funding has a greater positive effect upon students in Year 3 than in Year 5. Analysis of funding trends also demonstrates that government funding to the independent and catholic sectors has risen substantially faster than government funding to the government sector. Given the lower achievement of the government sector and the reduced impact of every dollar of funding it receives compared to the independent sector, this research concludes that current government funding policies are exacerbating the achievement gap and reinforcing educational inequality in Australia. To reduce the achievement gap in Australia, funding should be redirected from the independent sector to the government sector.

## Statement of Originality

*This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.*

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Date: 24/11/2021

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## Acknowledgements

My most sincere gratitude goes to Hangyoung Lee, my primary supervisor, without whom this thesis would not have been possible.

## Abbreviations

Abbreviation	Meaning
ACARA	Australian Curriculum, Assessment and Reporting Authority
DESE	Department of Education, Skills and Employment
FTE	Full-Time Equivalent
ICSEA	Index of Community Socio-Educational Advantage
LBOTE	Language Background Other Than English
NAPLAN	National Assessment Program – Literacy and Numeracy
NCLBA	The ‘No Child Left Behind Act’
NCVER	National Centre for Vocational Education Research
OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student Assessment
TIMSS	Trends in International Mathematics and Science Study

## Chapter 1 – Introduction

Australia has one of the largest divides between its highest and lowest performing students among the nations of the Organisation for Economic Co-operation and Development (OECD) (Gonski et al. 2011). This is particularly problematic because a significant proportion of this divide is caused by a student's family background, an ascribed characteristic over which they have no control (Breen and Jonsson 2005; Chesters and Smith 2015). The effect of family background upon student achievement is demonstrated in the data collected during the Programme for International Student Assessment (PISA). In this assessment program, Australian students from advantaged backgrounds scored 92 points higher than students from disadvantaged backgrounds, an outcome which suggests that disadvantaged students have fallen three years behind in their schooling (OECD 2018b). This achievement gap threatens the social and economic fabric of Australia (Hetherington 2018), because the resulting educational inequality will reduce the life outcomes of disadvantaged students, reinforcing a cycle of social and economic inequality (Chesters 2019; Hetherington 2018).

However, family background is not the sole factor causing this gap in student achievement. In Australia, students from disadvantaged backgrounds overwhelmingly attend materially disadvantaged schools, and these schools typically educate a disadvantaged student body (Bonnor et al. 2021; Palardy 2008; Rumberger and Palardy 2005; Smith, Parr, and Muhidin 2019). As such, these schools often struggle to provide a school environment conducive to learning, which can be achieved by employing high-quality teachers, offering smaller class sizes, teaching a diversified curriculum, and providing suitable educational resources for students (Baker, Farrie, and Sciarra 2016; Perry and Southwell 2014; Sullivan, Perry, and McConney 2013). Moreover, due to factors beyond their control disadvantaged students typically require more educational resources to attain a given level of achievement than their advantaged peers (Bonnor 2019), which means that disadvantaged students who attend poorly resourced schools face a compounded form of disadvantage (Bonnor 2019; Bonnor and Shepherd 2017). To ensure that this achievement gap does not continue to grow, schools educating disadvantaged students must be provided with more financial resources to ensure that they can meet the needs of their students.

The importance of equitable access to high-quality education was made clear in this decade's Education Declaration, the primary goal of which was to create an education system that "promotes excellence and equity" (Education Council 2019). The importance of universally available high-quality education lies in its ability to improve the life outcomes of every citizen, while also promoting economic growth and increasing social mobility at the national level (Bonnor et al. 2021; Brown 2013; Hetherington 2018). The benefits of education to the individual can be categorised as either economic or non-economic. In economic terms, education increases an individual's supply of 'human capital' – the knowledge, skills, and experience possessed by an individual – which enhances their ability to successfully navigate the labour market, thereby improving their career prospects and life outcomes (Forbes, Barker, and Turner 2010). In non-

economic terms, education can promote long-term health and wellbeing by increasing an individual's self-awareness and promoting a greater sense of autonomy over their life which enables them to make better decisions regarding their wellbeing (Robeyns 2006).

As a result of these benefits, educational attainment is strongly associated with employment status and income (Forbes et al. 2010), social status (Goldthorpe 2014), and health and wellbeing in later life (Easterbrook, Kuppens, and Manstead 2016; Ross and Wu 1995). Specifically, research in the Australian context suggests that every additional year of education – beyond nine years of schooling – increases the lifetime income of an individual by 10% (Leigh and Ryan 2008). In addition to the quantity of schooling, international findings suggest that the quality of education an individual receives also acts as a significant predictor of lifetime income (Checchi and van de Werfhorst 2014). These findings suggest that the achievement gap between advantaged and disadvantaged students in Australia may cause significant economic inequalities between these individuals in later life. Therefore, ensuring that high-quality education is distributed equitably, and that an individual is not limited in their educational achievement by ascribed characteristics, is a matter of social justice and human rights.

There is also a strong economic case to be made for reducing the achievement gap in Australia. A recent report conducted by the Public Education Foundation analysed Australia's PISA outcomes between 2009 to 2015 and used this data, in conjunction with lifetime earnings data, to model the cost to Australia's Gross Domestic Product (GDP) of the growing achievement gap between advantaged and disadvantaged students (Hetherington 2018). This model predicted that the growth in educational inequality over this six-year period will cost Australia \$20 billion throughout the working lives of this cohort of students. However, this figure only estimates the loss of GDP from lower lifetime output of these students, not the broader costs of the resulting economic inequality. Research is clear on the broader impact of economic inequality, it is detrimental to the growth of national GDP and the social fabric of a nation (Sen 1997; Stiglitz 2016; Wilkinson and Pickett 2010). Therefore, reducing the achievement gap makes both ethical and fiscal sense to policymakers.

However, educational policy in Australia over the past two decades has done little to improve educational outcomes for disadvantaged students (Bonnor et al. 2021). This shortcoming is largely due to the complexity of improving student outcomes with policy intervention and the multitude of ideological factions competing to influence educational decision making (Connell 2013b). Two of the largest predictors of student achievement are family background and school attended (Chesters 2019; Perry and McConney 2010; Sirin 2005). Without radical reforms to taxation and social security infrastructure, family background is not a trait that is amenable to policy change. Similarly, without a substantial overhaul of the current school system it is unlikely that policy intervention will be able to influence the quality of school that a student attends. However, educational policy does have the capacity to ensure that schools – especially those catering to disadvantaged students – are well-resourced. Such intervention would stem the growing resource inequality between wealthy and impoverished schools, which could increase the possibility that

disadvantaged students will have access to the human and educational resources required to close the achievement gap (Ryan 2013; Windle 2014). This suggestion, that student outcomes can be improved by alterations to school funding policy, was proposed in the historic Gonski Review (Gonski et al. 2011). Specifically, the report recommended a needs-based and sector-blind approach to school funding. If implemented correctly, it is hypothesised that this proposal would substantially reduce the achievement gap in Australia. Although a decade has passed since the review was published and school funding policies continue to ignore the 'needs-based' aspect of this recommendation (Bonnor et al. 2021). Moreover, the recommendation that funding policies be 'sector-blind' has encouraged the federal government to over-fund the most advantaged school sector: the independent sector.

The Australian school system comprises three school sectors: government, catholic, and independent. The government sector educates approximately 65.6% of all students and is funded almost entirely by the state and federal governments (Australian Bureau of Statistics 2021). This is because most government schools do not charge parents any fees for their child's attendance. Similarly, the catholic sector educates 19.4% of all students and receives about 70% of its funding from state and federal governments (Australian Bureau of Statistics 2021; Chesters 2018). The rest of the sector's income is derived from small attendance fees and donations from private sources. It is also important to note that unlike the other sectors, government funding to the catholic sector is directed to the Diocese, a religious body in each geographical region (Catholic Schools NSW 2020). Each Diocese then has control over how much of these funds go to individual schools, which may lead to certain schools receiving more, or less, funding than expected. Conversely, the independent sector educates approximately 15% of Australian students (Australian Bureau of Statistics 2021), and receives 45% of its income from state and federal governments. The remainder of the sector's funding comes from substantial student fees paid by parents and private donations from wealthy alumni (Chesters 2018; Watson and Ryan 2010). It is important to note that even though the independent sector derives a substantially smaller portion of its funding from government sources, it receives almost 50% more in total per-student funding than the catholic or government sectors (Bonnor 2019; Chesters 2018).

This financial inequity between sectors is further aggravated by the socioeconomic divide between sectors, a finding that was highlighted in a recent report published by the Centre for Policy Development (Bonnor and Shepherd 2017). Of the students educated by independent schools, 48% are in the top quarter of the SES distribution while only 8% come from the bottom quarter. Conversely, the report found that the proportion of students attending government schools in the bottom SES quarter was approximately 30%, while only 21% were from the top quarter. These findings suggest that the independent sector educates a disproportionate share of advantaged students, while the government sector educates a disproportionate share of disadvantaged students. This outcome is problematic because studies have shown that disadvantaged students require a greater amount of resources to attain a given level of achievement than their advantaged peers and because the government sector receives substantially less total per-student funding than the independent sector (Bonnor 2019; Duncombe and Yinger 2004). To remedy this problem,

government schools should receive more per-student funding than independent schools. Furthermore, the fact that the independent sector receives 50% more in per-student funding than either catholic or government sector suggests that independent schools – especially those catering to advantaged students – should receive substantially less government funding (Lye and Hirschberg 2017).

A point in favour of this argument is that Australia is the only OECD nation in which governments contribute a substantial amount of funding to non-government schools (OECD 2012; Windle 2014). Another problem with Australia's school funding policies is that the amount of government funding to non-government schools has been increasing rapidly over the past two decades while government funding to government schools has stagnated (Bonnor and Shepherd 2017; Windle 2014). Based upon the evidence presented so far, this policy stance is likely to widen the achievement gap and promote educational inequality. While reducing the amount of government funding allocated to the independent sector appears likely to reduce educational inequality in Australia, previous attempts to cut funding to the independent sector have failed due to the power of the independent school lobby (Gorur 2013; Kenway 1987; Pusey 1991).

Previous Australian studies have highlighted that a growing number of members of parliament and senior executives of the Australian Public Services are alumni of wealthy independent schools (Kenway 1987; Pusey 1991). Such representation provides the independent school lobby with a direct route to influencing educational policy and ensuring that independent schools continue to receive government funding (Gorur 2013). However, this is not the sole reason that school funding reform in Australia has not occurred. Since research began on the topic, there has been a lack of consensus about the effect of funding upon student achievement (Hyman 2017). This uncertainty has led to many prominent politicians – even the Federal Minister for Education – arguing that reforms to current funding policy would do little to help disadvantaged students (Cobbold 2017).

The uncertainty about the effect of funding upon student achievement began after Eric Hanushek, a prominent US educational economist, found that funding had no significant impact upon student achievement (Hanushek 1986). Before academics could respond to these findings, the results of this study were widely promoted by conservative pundits who were in favour of school privatisation and reductions in government spending (Payne and Biddle 1999). Subsequent studies by leading academics found that Hanushek's research suffered from a poorly devised methodology and that his results were inconclusive (Greenwald, Hedges, and Laine 1996). Despite this refutation and subsequent studies demonstrating that funding had a positive effect upon student achievement, many prominent academics and politicians maintained the stance that targeted school funding could not reduce educational inequality. However, the past two decades have seen a proliferation of studies investigating the topic, and a growing body of research has consistently found a significant and positive effect of school funding upon student achievement (Baker 2017; Baker et al. 2016; Kirabo Jackson, Johnson, and Persico 2016; Lafortune, Rothstein, and Schanzenbach 2018).

Despite a growing international consensus that school funding positively impacts student achievement, there has been no systematic examination of the subject using school funding and student achievement data in Australia. This lack of research in the Australian context is another factor contributing to the hesitancy among Australian policymakers to implement school funding reforms. Therefore, this paper aims to initiate research into how school funding affects student achievement in Australia. The paper will also contribute to the nascent literature about how school funding impacts student achievement among different populations. It does so by examining the effect that funding has on student achievement between the school sectors and between two age groups of students. These populations were chosen due to the growing resource divide between the school sectors and a growing literature that suggests the importance of early intervention for addressing educational inequalities (Aikens and Barbarin 2008; Bonnor and Shepherd 2017; Burger 2010).

This research will make another important contribution to the Australian educational context by examining the effect of per-student government funding – rather than the per-student total amount of funding – that a school receives. This focus on government funding is important in the Australian context because it is the only source of school funding that can be meaningfully altered by policy intervention. In Australia, most government schools cannot raise money by collecting student fees because many disadvantaged parents would be unable to pay them. Similarly, governments cannot limit the attendance fees charged by schools in the independent sector. Therefore, altering the amount of government funding a school receives is the only way to influence student achievement with funding intervention.

With these facts in mind, the key research questions of this thesis are:

1. To what extent does government funding affect student achievement in Australia?
2. Does government funding have differential effects upon student achievement between the school sectors?
3. Does government funding have differential effects upon student achievement between students in Year 3 and Year 5?
4. How are current funding policies affecting the achievement gap in Australia?

To answer these questions, this research will use school-level financial and student outcome data from every primary school in Australia. The data, collected by the Australian Curriculum, Assessment and Reporting Authority (ACARA), contains school financial information and student results in a national testing program from the years 2009 to 2016 – the only years for which both variables are currently available. The investigation will focus upon how yearly changes to funding, within each school, influence student achievement in Years 3 and 5 within each sector. It is hypothesised that funding will have a significant positive impact upon student achievement, that the independent sector will derive the largest benefit from increases in government funding, and that students in year 3 will derive a larger benefit from increases in government funding. It is hoped that this research will promote future systematic studies examining how school funding impacts student achievement in Australia. Moreover, it is hoped that this research will

create guidelines for the equitable distribution of government funding to improve educational outcomes for disadvantaged students, thereby reducing educational inequality within Australia.

This introduction has provided an overview of the research question and explained the project's significance. The second chapter of this paper presents a literature review which examines the predictors of student achievement and presents an overview of the international literature on the effect of school funding upon student achievement. The third chapter outlines the methods and analytic strategy used to conduct this investigation. In the fourth chapter, the results from the analysis are presented and explained. The fifth chapter discusses the implication of the investigation's results and evaluates current funding policies. The last chapter presents the conclusions of this thesis.

## Chapter 2 – Literature Review & Hypotheses

This chapter reviews the literature of several topics of importance to this research: educational inequality, determinants of student achievement, impacts of funding upon achievement, and trends in Australian educational finance policy.

### Educational Inequality

Education is the keystone of a nation's economic and social development, but it also has the effect of promoting health and wellbeing, improving lifetime earnings, and increasing tolerance and civic engagement among individuals (Checchi and van de Werfhorst 2014; Easterbrook et al. 2016; Leigh and Ryan 2008). In contrast, lower educational outcomes are associated with poorer health, higher rates of unemployment, lower wages, and social exclusion (Forbes et al. 2010; Korda et al. 2020; Stipek 2004). The impact that these outcomes have upon an individual's life highlights the importance of making high-quality education universally available to a population (Gerrard, Savage, and O'Connor 2017). However, recent reports suggest the achievement gap between advantaged and disadvantaged students in Australia is growing (Bonnor 2019; Gonski et al. 2011; Hetherington 2018), which threatens to aggravate existing educational and economic inequalities.

Educational inequality can be conceptualised as having three different dimensions: opportunities, experiences, and outcomes (Perry 2018). Educational opportunities arise from the inputs a school system receives and the equity of access to these resources. An example of which is that a student attending a well-funded school that employs highly qualified teachers, who teach a modified curriculum, is likely to have better educational opportunities than one who does not (Beese and Liang 2010; Perry and McConney 2010). Educational experiences arise from these opportunities in the form of positive classroom experiences, more engaging student-teacher interactions, and beneficial peer interactions (Perry 2018). Together, opportunities and experiences culminate to influence the educational outcomes of a student, which can be measured in rates of high school completion, tertiary admission scores, or results on standardised tests. Typically, it is educational outcomes which are used in studies assessing the relationship between education and its impacts in later life (Easterbrook et al. 2016).

This way of conceptualising educational inequality makes salient the impact of inequalities in the dimensions of opportunity or experience, and how they might impact a student's educational outcomes. It is important to note that there is natural variation in the aptitude and motivations of students while at school, which means that student outcomes will never truly be equal. As such, a degree of inequality within student outcomes does not necessarily indicate the presence of a problem. However, the presence of a strong link between ascribed characteristics – such as socioeconomic status, gender, language background, or indigeneity – and student outcomes indicates a significant problem because students should not be

constrained by characteristics beyond their control. Such a problem exists in Australia, where reports have shown that student achievement is largely predicted by socioeconomic status, indigeneity, remoteness, and language background (Bankwest Curtin Economics Centre 2017; Gonski et al. 2011). Of these factors, socioeconomic status, or family background, appears to have the largest effect upon student achievement in Australia and internationally (Chesters 2019; Sirin 2005; Thomson 2018; Thorson and Gearhart 2018).

The number of long-term positive impacts associated with education make it a vital component in improving the life outcomes of students (Baker 2018). However, the link between socioeconomic status and student outcomes implies that disadvantaged students are, on average, less likely to achieve high educational outcomes. This compounded form of disadvantage experienced by students from lower socioeconomic backgrounds reduces the social mobility within a nation and perpetuates economic inequality (Machin and Vignoles 2004). The mechanism for this is clear: children from more advantaged families obtain better educational outcomes, thereby increasing the likelihood of attaining better paying jobs and securing a higher status position within society (Forbes et al. 2010). These high-status individuals are in turn more likely to have children who will obtain better educational outcomes than students from disadvantaged families (Liu 2018; Pfeffer 2008), reinforcing the cycle and increasing the divide between advantaged and disadvantaged families.

Extensive research has been conducted to determine the societal costs of inequality and the evidence is clear. Economic inequality contributes to higher levels of social exclusion, lower levels of political participation, and poorer economic growth (Sen 1997; Wilkinson and Pickett 2010). Therefore, reducing the achievement gap in Australia is both an ethical and economic imperative. However, to improve student outcomes it is important to understand the key predictors of a student's achievement during their time at school.

## **Predictors of Student Achievement**

Formal research into student achievement began with the historic 'Coleman Report' (Coleman 1966), a monumental study which surveyed a randomly selected sample of 4,000 US schools, incorporating 600,000 students and 50,000 teachers. The report was commissioned by Congress after the implementation of the Civil Rights Act of 1964 to understand how educational inequality was affecting students in the US. The report presented many important findings, but those most relevant to this research identified the key determinants of student achievement: a student's family background and the background characteristics of other students attending their school (Coleman 1966: 325). Notably, the report also concluded that school-level factors had little influence on a student's achievement. In contrast, many studies have found that school-level factors, in addition to a student's family background and the characteristics of other students at their school, play an important role in student achievement (OECD 2012; Palardy 2008; Raudenbush and Eschmann 2015; Sirin 2005; Thomson 2018). Therefore, this review will examine how both family background and school-level characteristics can predict student achievement.

## Family Background

One of the most consistent findings in the field of education research has been the strong positive effect of family background on a student's achievement (Breen and Jonsson 2005; Hancock et al. 2018; Pfeffer 2008; Suter 2000), and many studies have identified that family background is the largest determinant of a student's educational achievement (Sirin 2005; Woessmann 2004). This effect is clear in Australia, where students from the top quartile of SES typically outperform students from the lowest quartile of SES by an amount equivalent to three years of schooling (Thomson, De Bortoli, and Underwood 2017). This is a fundamental problem because disadvantaged students, due to the numerous barriers they face, are less likely to attain high levels of educational achievement. These lower outcomes reduce the probability of these students continuing their education beyond high school (Rabiner, Godwin, and Dodge 2016), thereby limiting their career prospects and relegating them to lower status positions in society (Breen and Jonsson 2005).

While the relationship between a student's family background and their achievement in school has been known for decades, the exact mechanisms underpinning this relationship and the degree to which they influence this relationship remain unknown (Thomson 2018). One of the most widely accepted explanations for this relationship is that high-status families possess a greater supply of resources – in the form of financial, educational, social, or cultural capital – which can be used to improve cognitive development and learning capacity and to better navigate the education system (Bourdieu 1986; Breen and Goldthorpe 1997; Chesters and Smith 2015; Sullivan 2001). These advantages result in improved educational outcomes for their children (von Hippel, Workman, and Downey 2018).

Studies have also shown that high-status families create home environments which are more conducive to a child's cognitive development (Evans et al. 2010; Sullivan 2001). This home environment is created by a greater supply of educational resources and the intent behind parents' engagement with their children in their younger years. Evidence for the benefit of material and cultural resources in the home has emerged from large international datasets which have shown that the number of books in a home is one of the strongest predictors of student achievement (Evans et al. 2010; Thomson et al. 2017). The presence of these educational resources allows high-status families to create a more structured approach to play time and parent-child interactions which helps to improve the cognitive development of their children relative to their disadvantaged peers (Aikens and Barbarin 2008; Engle and Black 2008). These advantages result in a significant difference in the cognitive development between high-status and low-status children before they attend preschool or school (von Hippel et al. 2018).

The financial resources available to high-status families can also improve their children's educational achievement by creating more educational opportunities or superior educational experiences. An example of increasing educational opportunities for their children exists in the fact that high-status families are more likely to pay for access to high-quality preschools and schooling (Gørgens, Ryan, and Zhao 2020; Raudenbush and Eschmann 2015; Reid and Ready 2013; Windle 2014). The relationship between school-

level characteristics and achievement will be discussed in the following portion of the literature review, but there is a clear positive effect of better quality schooling upon student achievement (Beese and Liang 2010; Bonnor et al. 2021; Reid and Ready 2013). Another characteristic of high-status families which improves their children's outcomes lies in their greater supply of educational capital.

Parenting techniques have been found to be a strong predictor of a child's educational achievement (Benner, Boyle, and Sadler 2016). This research has shown that high-status families are more likely to take an active role in their child's education once they begin attending school or preschool. This active participation can raise the educational aspirations of their children, help them to better navigate the school system, and assist them with any learning difficulties that may arise during their time at school (Benner et al. 2016; Evans et al. 2010; Roksa and Potter 2011). A significant body of research has found substantial positive effects between a student's academic aspirations and their educational achievement (Marjoribanks 2005b; Polesel, Leahy, and Gillis 2018). Aspirations are thought to affect achievement by instilling an internal motivation for a student to achieve at a certain level (Marjoribanks 2005b). This intrinsic motivation can be negatively impacted by problems that arise with subject difficulty or navigating the school system, problems which active parenting can solve (Evans et al. 2010; Polesel et al. 2018). Therefore, the resources possessed by high-status families have a substantial positive impact upon their children's educational achievement.

However, another mechanism underpinning the relationship between family background and student achievement has been advocated by a growing body of geneticists and economists. They propose that the discrepancy in student achievement caused by family background is mediated by genetically heritable characteristics, such as cognitive ability (Liu 2018). Economists have cited evidence for the effect of an innate and immutable cognitive ability by highlighting the significant effect of prior achievement in determining a student's current educational achievement when socioeconomic status has been controlled for (Marks 2017). Many of these academics use this finding to argue that policy intervention will have little effect upon reducing a natural divide between individuals (Marks 2006; Marks and Mooi-Reci 2016). However, this argument has several problems. The largest of which is that this approach does not consider the substantial positive effect of the home environment upon cognitive development prior to a student attending school or participating in formal assessments (von Hippel et al. 2018). Another problem with this belief is that it is extremely deterministic and suggests that current educational inequalities will persist because the causes are immutable genetic characteristics (Thomson 2018).

However, rigorous studies conducted by geneticists refute the claim that the achievement gap between high and low status families is solely due to heritable characteristics. Studies analysing the effect of genetic material upon student achievement found that genetics accounts for no more than 20% of the relationship between family background and a child's educational achievement (Conley et al. 2015; Liu 2018). Liu (2018) also found that parental education was strongly associated with better academic outcomes for their children, independent of genetic material. The key mechanism used to explain the effect of genetic material

is the formation of assortative mating patterns among high-status individuals (Conley et al. 2015). This phenomenon is seen in the preference for high-status individuals to seek out high-status partners as mates, which reproduces genes that are favourable to cognitive ability and therefore educational achievement (Conley et al. 2015). However, geneticists highlight that this coupling of high-status partners is also likely to create a beneficial home environment and provide parents with a greater capacity to positively influence their children's educational outcomes (Conley et al. 2015; Liu 2018; Miller, Mulvey, and Martin 2001).

The positive effect of family background upon student achievement is consistently found to be the largest determinant of student achievement. However, there are methodological issues associated with the measurement of family background and student achievement. Family background has typically been measured using a combination of parental education, occupation, and income (Sirin 2005). Although due to the limited availability of high-quality data, many studies only account for the socioeconomic characteristics of one parent, while other US studies instead use the receipt of nutritional assistance as a proxy for socioeconomic status (Sirin 2005). Similar problems arise in the measurement of student achievement. Studies typically report grades from standardised tests, scores on university entrance exams, or report high school completion rates (Thomson 2018). This variation in the measures used to estimate background and student achievement can cause problems when generalising the findings of studies (Sirin 2005). However, attempts to correct this problem have been made in the domain of measuring family background. The Programme for International Student Assessment (PISA) has created an Index of Economic, Social and Cultural Status which measures the highest level of a parents' education, an index of family wealth, an index of home educational resources, and an index of cultural possessions (OECD 2017). This variable can better approximate the effect of family background and determine the effect sizes of each component upon student achievement (OECD 2017). Such information is crucial to generalising findings to different populations and to improving our understanding of which mechanisms associated with family background most influence student achievement.

### **School-Level Achievement**

Contrary to the findings of the Coleman Report, a growing body of research demonstrates the effect of school-level characteristics upon student achievement (Chesters 2019; Palardy 2008; Sirin 2005). A review by US academic Gregory Palardy (2008) creates a useful conceptualisation of school-level characteristics, distinguishing between how school inputs and school policies affect student achievement. In this conceptualisation, school inputs are factors that a school receives, such as the demographics of its student body, the supply of financial and educational resources, and its structural characteristics. Schools have little influence over these characteristics and educational policy can only meaningfully impact the supply of resources and a school's structural characteristics (Palardy 2008). Conversely, school practices and policies are factors which schools have more control over, and through which they can best utilise their inputs to positively affect student outcomes. Many of these practices are limited by the resources available within the school and the school's community, such as parental involvement in decision-making and teacher efficacy (Palardy 2008), therefore this review will not examine these factors.

### ***Student Demographics***

Since the Coleman Report researchers have found that a student's peer group has a significant effect upon their educational achievement (Caldas and Bankston 1997; Coleman 1966; Palardy 2008; Sewell, Haller, and Portes 1969). Attending a school, or preschool, with a more advantaged student body significantly improves the results of a student, regardless of their socioeconomic status (Chesters 2019; Reid and Ready 2013). Research suggests that this is caused by a process of socialisation, whereby students match their academic aspirations to their peer group (Duncan, Haller, and Portes 1968), and higher academic aspirations are associated with increased student achievement (Polesel et al. 2018). Multiple findings appear to verify this hypothesis; disadvantaged students who attend higher-status schools achieve substantially higher grades than their family background would suggest (Aikens and Barbarin 2008; Chesters 2019; Rumberger and Palardy 2005).

Findings in Australia suggest that the reverse is also true. Advantaged students who attend disadvantaged schools achieve poorer grades than their family background would suggest (Chesters 2019). Beyond peer effects, another possible explanation for the strong effect of student body demographics upon student achievement may be the presence of an environment conducive to academic performance. Studies have shown that schools catering to an advantaged population cultivate environments which encourage better academic performance (Palardy 2008). This positive environment is created by employing higher quality teachers and reducing class sizes, which have both been found to have a significant positive effect upon student achievement (Pianta et al. 2002; Rothstein 2004). However, the presence of these factors within schools is largely determined by the resources available to a school.

### ***School Resources***

School resources can be defined as the financial resources school receives and the material and human resources which they can buy with them (Palardy 2008). This review will address the effects of school funding upon student achievement in greater detail later, but this section will detail some of the outcomes associated with well-resourced schools. Studies in Australia have found that well-resourced schools employ higher quality teachers, offer smaller class sizes, and teach a more diversified curriculum (Perry and McConney 2010; Perry and Southwell 2014).

Employing higher quality teachers appears to improve student outcomes by increasing student engagement, resulting in higher student achievement (Beese and Liang 2010; Borman and Kimball 2005). However, it is important to note that problems exist in identifying teacher quality, beyond their ability to improve student achievement, as several important studies have found no relationship between teacher credentials and their effect upon student outcomes (Harris and Sass 2011; Rothstein 2010). Another important determinant of student achievement, resulting from school resources, is the size of the classroom, or the ratio of students to teachers (Baker 2017; Kirabo Jackson et al. 2016). It is hypothesised that this relationship is due to the increased attention and support each student within the class receives from the teacher, which can increase the likelihood that student problems are addressed (Baker 2018).

Last, access to an 'academic curriculum' offers students more opportunities to engage with their education and better prepares them for continuing this education beyond school. The presence of an academic curriculum is highly dependent upon the resources supply of a school and it represents an important determinant of educational achievement among students (Perry and Southwell 2014).

### ***Structural Characteristics***

The structural characteristics of a school, such as location, size, and school sector, also have a significant effect upon student achievement. International research has found that disadvantaged students are more likely to reside in poorer neighbourhoods (Evans 2004). This is problematic because in many countries, such as the US and Australia, school quality is highly dependent upon the area a student lives (Lamb et al. 2015; Sirin 2005; Smith et al. 2019). This phenomenon excludes many students, who reside in disadvantaged suburbs, from attaining a high-quality education thereby reducing their educational achievement (Smith et al. 2019). Another factor which influences student outcomes is the size of a school. Internationally, there is evidence that an association exists between smaller school sizes and improved educational achievement (Egalite and Kisida 2016; Kuziemko 2006). While unknown, it is hypothesised that this outcome is due to the larger class sizes and less academically-focused school climate found in larger schools (Egalite and Kisida 2016). However, studies in Australia suggest an opposite effect. An early Australian study found that there is a positive relationship between school size and student achievement, largely the result of economies of scale in which these larger schools can employ more teachers and supply students with better educational resources (Mok and Flynn 1996).

Another strong predictor of student achievement is the sector that a school belongs to (Watson and Ryan 2010). Schools in Australia are classified as government, catholic, or independent, and student achievement is substantially higher in independent schools than in catholic schools, and higher in catholic schools than in government schools (Watson and Ryan 2010). The main explanation for this outcome is the clear link between school sector and the social status that the school caters to (Watson and Ryan 2010). In Australia, independent schools are largely attended by Australia's most advantaged students whereas the government sector educates a disproportionate share of Australia's most disadvantaged students (Bonnor and Shepherd 2017). Another explanation for the effect of school sector upon achievement is the divide in resources available to the different sectors (Palardy 2008). This relationship is also prevalent in Australia, where independent schools have substantially greater income and better facilities than either catholic or government schools (Chesters 2018; Lye and Hirschberg 2017; Watson and Ryan 2010).

The literature review has so far informed the reader about the key determinants of student achievement at both the individual level and at the level of the school, and it has shown that educational inequalities can exist within any of these domains. To reduce the achievement gap in Australia between advantaged and disadvantaged students it is suggested that policy intervention focus on school-level characteristics rather than individual-level characteristics, such as family background and educational aspirations, as they are more amenable to policy intervention. As such, altering the supply of financial resources that a school

receives is likely to be the easiest policy intervention to implement. Therefore, the next section of this review will examine the impacts of school funding upon student achievement.

## **Funding & Student Achievement**

School funding holds a unique position as one of the few policy levers available to governments seeking to redress educational inequalities. As this review has shown, children from higher status families are more likely to achieve better educational outcomes than their peers (Breen et al. 2009; Erikson et al. 2005; Ferreira and Gignoux 2014; Hallinan 1988). This is largely due to the greater pool of social, financial, cultural, and educational capital present within these families, which improves cognitive development at an early, reduces the cost of navigating the education system, and increases the aspirations and opportunities of these children (Bourdieu 1986; Chesters and Smith 2015; Pichler and Wallace 2009; Sullivan 2001). Without intervention, this divide will manifest in reduced career opportunities for disadvantaged students, perpetuating existing social inequalities (Gore et al. 2017; Jerrim and Macmillan 2015; Polesel et al. 2018). However, increasing funding to schools that educate disadvantaged students may improve the educational outcomes for these students by providing them with access to more educational resources (Hyman 2017; Kirabo Jackson et al. 2016).

The impact of school funding upon student outcomes has been a hotly debated topic among educators, economists, and politicians for many decades. The ferocity and confusion surrounding the debate is largely the result of conservative pundits in the United States who sought to delegitimise the role of government spending in education (Payne and Biddle 1999). These pundits widely promoted the pioneering work of economist Eric Hanushek and soon many US politicians found themselves engaged by the idea that government intervention was minimally effective in improving the outcomes of disadvantaged students. However problematic these ideas were, they were based upon findings conducted by prominent academics. Hanushek was the first academic to conduct a systematic review into the effect of school funding upon student achievement. In this review, Hanushek (1986) aggregated the available studies on school funding to determine whether they demonstrated an effect upon student achievement. His initial conclusions were that school funding had no reliable or significant impact upon student outcomes (Hanushek 1986).

These findings were widely published by conservative pundits, but many scholars found problems with Hanushek's findings (Payne and Biddle 1999). The first group of researchers to challenge Hanushek's findings were Larry Hedges, Richard Laine, and Rob Greenwald. These researchers identified a number of methodological flaws in Hanushek's research and refuted his conclusions, citing the fact that Hanushek failed to aggregate effect sizes properly and did not include all available studies (Hedges, Laine, and Greenwald 1994). They also highlighted that Hanushek's original findings stated that over 70% of the studies displayed a positive relationship between school funding and student outcomes. They argued that

this percentage was substantially higher than random chance would suggest and indicated that this result supported the idea that school funding has a significant positive effect upon student achievement.

Following this early refutation of Hanushek's work, the same authors conducted a comprehensive systematic review in which they aggregated the effect sizes of school funding upon achievement for all available studies (Greenwald et al. 1996). Their findings demonstrated a significant positive effect between the amount of funding a school received and the achievement of its students (Greenwald et al. 1996). In response to these findings, Hanushek (1997) continued to argue that school funding was an ineffective tool to improve student outcomes because schools could make poor use of the money provided to them. While important in shaping the discourse surrounding the topic, many of the studies prior to 2001 suffered from a significant methodological limitation.

Studies conducted in the US prior to 2001 suffered from small sample sizes, often having to aggregate cases of financial reform in individual schools to determine the effect of funding upon achievement. These financial reform cases often occurred due to specific instances of court-mandated funding increases which, while an important source of information for early researchers, are not widely applicable to the entire population of US schools (Kirabo Jackson et al. 2016). This paucity of data came to an end in 2002 when President George W. Bush signed the 'No Child Left Behind Act' (NCLBA) into law to close the achievement gap between advantaged and disadvantaged students (Kim and Sunderman 2005). The NCLBA mandated annual testing of all US students in elementary grades across core subject areas to identify where and why students were falling behind. While the standardised yearly testing placed a disproportionate burden on disadvantaged and racially diverse schools, it did provide a wealth of data for educational researchers (Kim and Sunderman 2005; Simpson, Lacava, and Graner 2004).

In 2015 students who began school in 2002 became the first NCLBA cohort to graduate from high school and their graduation renewed policy interest in the effect of school funding upon student achievement. Since 2015, there have been a growing number of US studies focusing on the topic, looking at the outcomes of increased funding in both the short and long-term. One recent study, which investigated the long-term student outcomes associated with increased school funding, found that students whose schools received a 10% increase in funding were 7% more likely to enrol in college and 11% more likely to graduate (Hyman 2017). This study also found that increased funding led to schools employing more teachers and reducing class sizes, thereby increasing student engagement at school and short-term achievement which had a beneficial impact upon long-term student outcomes (Hyman 2017). One key limitation of this study was that the changes to school funding occurred in affluent school districts, which limits the generalisability of the findings to disadvantaged students. This problem was overcome by two recent studies, which found that increased school spending resulted in higher teacher-student ratios and improved teacher quality, which substantially increased educational achievement for disadvantaged students (Baker et al. 2016; Lafortune et al. 2018).

These studies contribute to a growing consensus that funding has a significant and positive effect upon student achievement in the United States. Beyond the effect upon student achievement, studies have begun to investigate the effect of funding upon a student's life outcomes. One such study was conducted by Kirabo Jackson and his colleagues in 2016. The study used a nationally representative longitudinal dataset comprised of students born from 1955 to 1975 who were followed until 2011, and it found that a 10% increase in per-student funding resulted in 0.31 more years of completed education, 7% higher wages, and a 3.2% reduction in the annual incidence of adult poverty (Kirabo Jackson et al. 2016). This study also found that increased funding had a greater positive effect upon student achievement in children from low-income families, often because the schools they attended suffered were materially disadvantaged. These findings suggest that increasing school funding to disadvantaged schools in the United States can reduce the achievement gap and improve the life outcomes of these students. However, they also raise the question about whether funding has a differential effect based upon the population receiving it.

To date there have been no rigorous academic studies investigating to what extent school funding impacts student achievement in different populations. Research from think tanks in the US suggests that educating disadvantaged students can cost up to 200% more than educating advantaged students (Duncombe and Yinger 2004). This logic is also present in the Gonski Report – which suggests greater financial loadings for disadvantaged students (Gonski et al. 2011) – and in the current school-funding models used in Australia which provide minor loadings for disadvantaged students (Bandaranayake 2013). One substantial limitation of Australia's school funding models is that there has been no evaluation of the impact they have upon student achievement (Bandaranayake 2013). Another significant limitation is that they do not provide answers about how the effect of school funding differs based upon a student's age.

A growing body of research suggests that early educational intervention is crucial to reducing the achievement gap between students (Burger 2010; von Hippel et al. 2018). This early intervention is important because most of the achievement gap between students manifests before they attend school (von Hippel et al. 2018). Research in the field of early education demonstrates that student outcomes in preschool and the first year of schooling are closely associated with the age a student attends preschool and the quality of the preschool (Burger 2010; Reid and Ready 2013). It is hypothesised that this positive impact of early education upon student outcomes is caused by the improvement in cognitive development and familiarity with educational institutions which they provide (Burger 2010). Similarly, research into the trajectories of student performance suggest that it is harder to improve student achievement as a child ages (Aikens and Barbarin 2008; Rabiner et al. 2016). This is largely due to the iterative process of schooling – students who struggle from a young age are more likely to have significantly lower educational achievement in the future (Magnuson et al. 2016). These findings suggest that changes to school funding may have a significantly larger impact upon younger students.

The research presented so far has only highlighted studies conducted in the US because of the predominance of US research on the topic of school funding. Fortunately, the creation of PISA and the

Trends in International Mathematics and Science Study (TIMSS) has created an abundance of international data for comparative analysis. This data is available across English-speaking nations, and analysis of these countries shows that school funding has a significant positive impact upon student achievement (Beese and Liang 2010). The researchers suggested that this effect was due to the additional financial resources being used to improve educational resources, such as improving teacher quality and employing more teachers to reduce classroom sizes (Beese and Liang 2010). Similar analysis conducted upon the majority of OECD nations has found that student achievement is positively affected by an increase in school funding, and that supplying disadvantaged students with a greater pool of financial resources is a possible solution to reducing the achievement gap between high and low-status students (OECD 2016).

International analysis shows that school funding has a significant and positive impact upon student outcomes and that it can reduce the achievement gap within nations (Beese and Liang 2010; OECD 2016). However, it is important to note that while increases to funding demonstrate a positive impact upon student achievement within a nation, they cannot be used to make comparisons between nations (Woessmann 2016). For between nation comparisons, student achievement is more closely related to specific school governance structures and certain educational practices - such as exit exams at the completion of schooling and teacher certification – than the amount of funding provided to schools (Woessmann 2016). These results suggest that to understand the effect of school funding upon achievement it is important to acknowledge the nation's educational context. Herein lies a problem: there has been little quantitative work examining the impact of student funding conducted in Australia.

## **Funding & Student Achievement in Australia**

Determining the effect of school funding on student achievement in Australia is important because Australia has a unique education system and geography which may substantially reduce the generalisability of international findings (Perry 2018). Regarding differentiating factors, Australia has one of largest independent school sectors in the OECD and the state and federal government provides more public funding to these independent schools than any other nation in the OECD (OECD 2020b:301). This size of the independent sector has also contributed to the growing social segregation between school sectors in Australia, in which the independent sector educates the largest proportion of advantaged students and the government sector the largest proportion of disadvantaged students (Bonnor et al. 2021; Lye and Hirschberg 2017; Perry 2018). Due to these factors, Australia has one of the largest achievement gaps between high and low-status students in the OECD (OECD 2020b). Regarding geography, Australia's immense size means that many schools are located in geographically remote areas which substantially increases the cost of educating students and leads to lower teacher quality (Downes and Roberts 2018; Holden and Zhang 2018). These factors differentiate Australia from other nations, yet there has been no systematic examination of the impact of funding upon student achievement that accounts for these specific Australian circumstances.

A primary reason for this research absence is the lack of publicly available school-level financial and student achievement data. In response to this absence, the Australian Curriculum Assessment and Reporting Authority (ACARA) and the National Assessment Program – Literacy and Numeracy (NAPLAN) were created in 2008, and since then there has been a gradual accumulation of financial and student achievement data (Gorur 2013). Although, without access to this data many researchers have been able to identify a clear divide in outcomes between students from indigenous, remote, and low-SES backgrounds and their counterparts by looking at rates of Year 12 completion, tertiary entrance results, and university attendance (Bankwest Curtin Economics Centre 2017; Chesters 2019; Connell 2013b; Gonski et al. 2011; Lamb et al. 2015; Perry and Southwell 2014; Smith et al. 2019; Windle and Stratton 2013). Due to their disadvantaged backgrounds many of these children are already behind by the time they arrive at school, and studies have identified that a lack of access to resources – both material and educational – for these groups is exacerbating the achievement gap (Downes and Roberts 2018; Gonski et al. 2011; Perry and Southwell 2014).

Studies in Australia have shown that disadvantaged children are more likely to attend materially disadvantaged schools (Chesters 2019; Perry and McConney 2010). These schools are less likely to offer small classroom sizes, higher quality teachers, adequate educational aids, and an academic curriculum, further compounding the disadvantage that their students face (Chesters 2019; Downes and Roberts 2018; Kline, White, and Lock 2013; Perry and Southwell 2014). This research suggests that there is a significant imbalance between resources available to schools in Australia, and research is needed to determine whether fixing this resource imbalance would reduce the achievement gap in Australia.

With each year the data collected by ACARA offers more insights into the impact of school funding upon student outcomes. The first major area which researchers are investigating involves the equity associated with parental fees at high and low-SES government schools (Rowe and Perry 2020; Thompson, Hogan, and Rahimi 2019). In this research, both groups have provided descriptive profiles of parental contributions to high and low-status government schools. Their findings were similar: on average parents of students at high-SES schools contributed up to four times more in fees than parents of students attending low-SES schools (Rowe and Perry 2020; Thompson et al. 2019). This finding led both groups to conclude that this funding disparity is likely to reinforce inequalities in student achievement between high and low-status students by providing high-status students with access to more educational resources. The recommendation resulting from this research was that governments should increase funding to low-SES schools to address this growing gap in resources. At present, these studies are the only published material to quantitatively analyse differences in funding between government schools. To date, there has only been one report that examines the link between school funding and student outcomes across all school sectors in Australia (see Gannicott 2016).

This report was published in a periodical distributed by the Centre for Independent Studies, a think tank which focuses on free market solutions to policy problems. The report was not peer-reviewed and has

several limitations. The first methodological problem is that the study only analyses one year of per-student funding and student outcome data. This approach has no ability to determine whether yearly fluctuations in funding amounts to schools have any effect upon student achievement, and therefore cannot conclude whether changes to funding impact student achievement (Hsiao 2007). Despite this, the author concludes that funding has a small negative impact upon student outcomes (Gannicott 2016). This conclusion is problematic because the author does not control for any variables that underlie the relationship between higher per-student funding and lower academic achievement, such as indigeneity, school remoteness, and school disadvantage (ACARA 2020). Therefore, the conclusions of this study do little to contribute to the national understanding of how school funding influences student achievement.

The absence of research on the topic of school funding and student achievement in Australia represents a significant problem. Without evidence, policymakers and politicians are prone to make important decisions based upon dated information or problematic ideologies (Connell 2013a; Savage 2017). However, before progressing it is important to understand the context of Australia's education system.

## **Trends in Australia's Education System**

Australia's education system has undergone a substantial transformation in the past few decades. Since 1973, the number of students educated in non-government schools has increased from 21 to 35 percent (Chesters 2019), caused by an exodus of high-SES students leaving the government sector (Teese 2007). This increase in the proportion of disadvantaged students within the government sector has substantially increased the cost per-student associated with educating students within the sector (Bonnor 2019; Chesters 2018). Another important change has been the provision of government funding to non-government schools. This process began in 1970 and funding to non-government schools was increased in 1974 in response to the Karmel Review into school financing (Harrington 2011; Windle 2014). While unique among the OECD, this is not entirely problematic. However, reports suggest that since 2000 government funding to non-government schools, both catholic and private, has increased substantially faster than funding to government schools which has caused a substantial resource imbalance between the sectors (Cobbold 2017; Gonski et al. 2011; Thompson et al. 2019; Vella 1999).

This resource imbalance has been exacerbated over the past two decades by wealthy independent schools which have substantially increased the fees they charge parents (Lye and Hirschberg 2017). This fee increase has resulted in fewer parents being able to afford the cost of private education which has left them reliant upon materially disadvantaged government schools (Gørgens et al. 2020). This transformation has created a distinct gradient in the quality of education, one which favours students with access to more resources (Chesters 2019; Connell 2013b; Lamb et al. 2015; Smith et al. 2019). This fact was recognised in the Gonski Report, which highlighted that Australia has a greater gap between its highest and lowest performing students than any other OECD nation (Gonski et al. 2011). Although the Federal government has been provided with recommendations to redress this problem (Gonski et al. 2011), there has been no

substantive action. Instead, the Federal government has exacerbated the problem by increasing the funding provided to non-government schools relative to the government sector (Di Gregorio et al. 2020; Lamb et al. 2015; Windle 2014).

To understand the impact of these changes to Australia's education system, this research will look specifically at the effect of changes in government funding upon student achievement and determine whether there is a differential effect of this funding policy between sectors and between age groups. It will also assess whether the inequality in increases to government funding between sectors has persisted.

## Hypotheses

A growing body of international research suggests that school funding has a significant positive impact upon student achievement (Baker 2017; Hyman 2017; Kirabo Jackson et al. 2016; Lafortune et al. 2018). Greater amounts of school funding allows schools to employ more teachers, thereby reducing class sizes and creating an environment more conducive to learning (Kirabo Jackson et al. 2016). Additional funding also allows schools to provide students with better educational resources and a more diversified curriculum which aids student learning (Baker 2017; Perry and Southwell 2014). Due to the indirect benefits which additional funding confers upon schools it is expected that:

**Hypothesis 1** – Government funding would have a significant positive impact upon student achievement in both Years 3 and Year 5.

However, it is expected that the effect of funding upon student achievement will vary between different populations. Research conducted by policy institutes in the US has shown that disadvantaged students require substantially more funding to achieve a similar level of achievement as advantaged students (Duncombe and Yinger 2004). This finding is echoed by the Gonski Report which recommends that schools educating disadvantaged students should receive additional funding (Gonski et al. 2011). In Australia, all sectors educate disadvantaged students. However, the government sector educates a disproportionate share of disadvantaged students, while the independent sector educates the most advantaged students. Given that it costs more to educate disadvantaged students, it is expected that:

**Hypothesis 2** – Government funding has a differential effect upon student achievement between the school sectors, and this effect would be larger among independent schools than catholic and government schools.

Another differential effect of funding is likely to appear when examining different age groups of students. Recent research suggests that influencing student achievement grows more difficult as children age (Aikens and Barbarin 2008; Rabiner et al. 2016). This is likely due to the iterative nature of schooling, where students who struggle early often become disenfranchised with the education system as they fall further behind their peers (Magnuson et al. 2016). These findings are consistent with the early education literature which highlights the importance of enrolling children in high-quality preschool as early as possible (Burger

2010; Reid and Ready 2013). Due to the importance of early intervention for addressing educational difficulties, it is expected that:

**Hypothesis 3** – Government funding has a differential effect upon student achievement based upon the age of students, and that the effect of funding would be larger in Year 3 than in Year 5.

## Chapter 3 – Methods

### Methodology

This research employed a quantitative methodology utilising secondary data. This approach was chosen due to the absence of rigorous investigations exploring the effect of school funding upon student achievement in Australia. Furthermore, such an approach allows for the systematic examination of how changes to funding influence every primary school within Australia.

### Data

The relationship between school funding and student achievement was explored using several datasets collected by the Australian Curriculum, Assessment and Reporting Authority (ACARA) between the years 2009 to 2016. ACARA was established in 2008 in response to the distinct lack of school-level data in Australia (Gorur 2013). Since 2008, the organisation has collected school-level data across several domains for every school in Australia. The datasets used in this research provide information for the 3,254 primary schools across Australia and details the student achievement and financial characteristics of 633 catholic schools, 2,233 government schools, and 388 independent schools. At the time of writing, school-level financial data has only been made available to researchers from the years 2009 to 2016. Therefore, this research can only investigate how variation in government funding over this period influenced student achievement. Access to the data was granted by the National Centre for Vocational Education Research (NCVER) on behalf of the Australian Government's Department of Education, Skills and Employment.

For the final analysis, this project used a combined dataset of school characteristics, school-level financial data, and school-level NAPLAN outcomes. The school characteristics data provides information about the composition of the student body – such as socioeconomic status, indigeneity, and the percentage of students from a language background other than English (LBOTE) – and the number of teachers employed by the school. The school-level financial data reports the income that each school receives annually. The income data reports per-student and total values for funding received from the Australian Government, State Governments, parental contributions, and from private donations. The last dataset details the school-level outcomes in the NAPLAN assessment. NAPLAN is an annual assessment which examines all students in Australia in years 3, 5, 7, and 9 across five domains: reading, writing, grammar, spelling, and numeracy. The assessment is based upon a national minimum standard that students in each year group should be able to demonstrate. The raw test score of each student is transformed and then allocated to a 'performance band' for easier interpretation by parents (ACARA 2016).

## Measurement

The analysis focuses upon two dependent variables: school-level NAPLAN performance in Year 3 and Year 5. The decision to exclude Years 7 and 9 was made based upon a growing body of research which demonstrates the importance of early intervention to improve a student's long term educational achievement (Duncan et al. 2012; Rabiner et al. 2016; Stipek 2004). To simplify the analysis, a variable averaging the school-level NAPLAN scores across each of the five domains was created. This approach reduces the richness of the findings – for instance whether school funding has a differential impact upon literacy or numeracy – but is more relevant to the aims of this project, given its interest in how school funding influences the overall academic achievement of students.

The primary independent variable used in this analysis was the per-student amount of government funding received by each school. Dollar values were converted to 2016 dollars, in line with the Reserve Bank of Australia's reported rate of inflation (Reserve Bank of Australia 2021). Since the original dataset reported the Federal and State Government funding a school received separately, a new variable was created aggregating the total amount of government funding each school received. This was done to better capture the effect of total government funding upon student achievement. Similarly, per-student funding amounts were used in the analysis to better estimate the effect of funding upon each student and to allow for comparisons between schools of differing sizes. Contrary to the methods of most international studies, this analysis investigated the effect of government funding rather than the effect of total funding. This change was made because government funding is more amenable to policy intervention than any other component of school funding. Standardising the collection and amount of parental fees cannot be changed by government policy, nor can the donations from private sources. Furthermore, government funding represents the largest proportion of income that the government and catholic sectors receive, while also making up nearly half of all income to the independent sector. This makes government funding the most important variable when investigating the relationship between funding and student achievement in an Australian context.

This analysis also controls for several variables that are associated with government funding and student achievement. The first control variables are the other forms of per-student funding that a school receives, namely the fees paid by parents and the donations made to schools from private sources. This was done to ensure that the analysis controlled for any effects upon student achievement arising from yearly variation in non-government funding sources. Another variable, school-level socioeconomic status, was controlled for using a proxy variable: the Index of Community Socio-educational Advantage (ICSEA). This variable was used because the ACARA dataset has no direct measure of school-level socioeconomic status, however ICSEA is widely used in educational research in Australia as a proxy for socioeconomic status

(Bonnor 2019; Thompson et al. 2019). This is because ICSEA reports the educational advantage of schools, a concept that is composed of several variables: parental occupation and education, school remoteness, and the percent of indigenous students and disadvantaged LBOTE students attending a school (ACARA 2012). The first two factors, parental occupation and education, are primary components in most measures of socioeconomic status (Sirin 2005). The ICSEA measure has a median value of 1,000 and a standard deviation of 100, with a range of 500 to 1,300 (ACARA 2012). A lower ICSEA value indicates that a school educates a relatively disadvantaged student body, while schools with higher values educate a more advantaged student body. Given the high correlation between ICSEA values and school indigeneity ( $r=0.70$ ), it was determined that indigeneity did not need to be controlled for in addition to this value. However, ICSEA only accounted for disadvantaged LBOTE students and because of this it was not strongly correlated with the percentage of LBOTE at a school ( $r=0.06$ ). Therefore, LBOTE was included as another control variable to better reduce effects that may arise from the high-performing groups of LBOTE students.

Last, the analysis controlled for the student-teacher ratio and the total number of enrolments at a school. The student-teacher ratio was chosen as it represents a key measure of human resources available at a school and because lower student-teacher ratios have demonstrated a significant positive impact upon student achievement (Kirabo Jackson et al. 2016). This suggests that higher student-teacher ratios are associated with a less favourable academic environment. Enrolments were controlled to ensure that variation in funding was not due to changes in the size of the student body and because of the fact that larger schools can employ economies of scale to lower per-student costs in operating schools (Mok and Flynn 1996).

## **Analytic Strategy**

Because each of the variables are continuous, and the dataset can be organised in a panel structure, this research uses fixed-effect regression for its analysis. Fixed-effect regression models the difference of each variable's school-year from the school mean (Borenstein et al. 2010). Therefore, it focuses on within-school variation over time, which makes it an appropriate analytic strategy given the topic of this research: how changes in government funding influence student achievement. However, it should be noted that fixed-effect regression does not model between-school variation, which means that this research does not answer questions about whether schools that receive more government funding show higher levels of student achievement. Another reason for using a fixed-effect regression is that they assume that changes to government funding have a constant effect across schools. An additional benefit of using a fixed-effect model is that it controls for any unobservable variables or time-invariant variables, thereby eliminating any potential omitted variable bias (Borenstein et al. 2010). Because fixed-effect regression does not allow the use of time-invariant variables, the dataset was split by school sector (a time-invariant variable) and the effect of government funding upon student achievement was estimated separately for schools in the catholic, government, and independent sectors. Last, the analysis used a lagged approach – by looking at

student outcomes one year after changes to funding occurred – because changes to a school’s budget were not assumed to affect the acquisition of resources or student achievement immediately.

The analysis was conducted using the software package STATA/SE 16.1, and descriptive statistics for all variables were summarised by school sector and reported in Table 1. Consistent with prior research, the descriptive statistics demonstrate a considerable gap between school sectors in terms of socioeconomic status (approximated by ICSEA), the total amount of funding a school receives, and student achievement in Years 3 and 5. To better explore the discrepancy in funding between sectors, and to examine current trends in school funding policy, the analysis computed the average per-student funding values for each source of funding for all sectors between 2009-2016. This information was presented in Figure 1. The cumulative percentage change each year in government funding was also computed for each sector. This information demonstrates that increases in government funding to the government sector is lagging the catholic and independent sectors and is presented in Figure 2.

The fixed-effect models for Year 3 and for Year 5 are reported in Tables 2 and 3, respectively. Specifically, fixed-effect models were created for each school sector. For each year-level and within each sector, three sub-models were created. Model 1 demonstrates the effect of the independent variable, per-student government funding, upon student achievement. Model 2 demonstrates the effect of the control variables on student achievement, without the independent variable. Model 3 demonstrates the effect of the independent variable upon student achievement with each of the control variables included. Results were presented in this way to ensure that multicollinearity was not an issue. The fixed-effect models were then visualised using a counterfactual approach in Figures 3 and 4. Last, a suest test was conducted to determine whether funding had a significant differential effect on student achievement based upon school sector or year-level. The suest test compares the difference in the regression coefficients and tests for statistical significance (for more details about suest test, see Weesie 1999). The results from this testing are presented in Table 4.

## Chapter 4 – Results

Table 1. Descriptive Statistics of Key Variables.

	Catholic	Government	Independent
<b>Socioeconomic Index (ICSEA)</b>			
Mean	1050.79	1005.04	1085.69
Median	1047	997	1081
Standard Deviation	65.69	88.80	66.04
Range	670	728	355
<b>Full-Time Equivalent Teaching Staff</b>			
Mean	24.59	26.94	63.31
Median	19.4	23.55	52.5
Standard Deviation	21.87	30.11	50.05
Range	218.6	3209	353.3
<b>Enrolments</b>			
Mean	403.68	432.88	775.89
Median	349	384	696
Standard Deviation	288.80	296.83	541.75
Range	1,989	5,358	3,045
<b>Student-Teacher Ratio</b>			
Mean	16.89	16.20	13.12
Median	17.24	16.60	13.10
Standard Deviation	2.70	2.87	3.14
Range	21.90	109	63.49
<b>Percentage of Students from non-English Backgrounds (LBOTE)</b>			
Mean	22.40%	21.47%	19.26%
Median	12%	12%	12%
Standard Deviation	24.32%	23.20%	22.34%
Range	100%	100%	100%
<b>Year 3 NAPLAN Total</b>			
Mean	419.90	404.87	434.78
Median	420.4	405.6	435.6
Standard Deviation	29.51	38.83	31.13
Range	311	422.8	231.2
<b>Year 5 NAPLAN Total</b>			
Mean	497.56	483.30	511.26
Median	497.8	482.8	511
Standard Deviation	25.23	35.45	27.14
Range	305	418.4	214.8
<b>Per-Student Total Income</b>			
Mean	\$12,175.71	\$12,395.18	\$17,859.75
Median	\$11,376.88	\$11,409.02	\$15,936.78
Standard Deviation	\$3,069.23	\$4,123.26	\$5,892.10
Range	\$34,155.47	\$186,122.47	\$44,094.91
<b>Per-Student Government Funding</b>			
Mean	\$9,622.20	\$11,804.63	\$8,193.60
Median	\$8,989.36	\$10,921.55	\$8,585.99
Standard Deviation	\$2,578.11	\$3,769.02	\$2,306.02
Range	\$36,239.58	\$50,270.69	\$19,644.17
<b>Observations</b>	4,616	16,828	3,044

Notes: Data are from the Australian Curriculum, Assessment and Reporting Authority (ACARA) between the years 2009 to 2016.

### Descriptive Statistics

Table 1 displays the mean, median, standard deviation, and range of the key variables of this research among all primary schools in each school sector for all years between 2009 and 2016. First, there appears to be a substantial difference between the mean socioeconomic status of each sector (approximated by ICSEA). On average, government schools are the least advantaged (1005.04) while independent schools are

the most advantaged (1085.69). Similarly, the standard deviation associated with socioeconomic status is substantially larger among government schools (88.80), implying that government schools cater to a broader range of students than catholic or independent schools. These findings are consistent with prior research in Australia (Chesters 2018; Gørgens et al. 2020; Watson and Ryan 2010). The three school sectors have a similar percentage of students from a language background other than English (LBOTE). Independent schools have a slightly smaller percentage of LBOTE students (19.26%) than catholic or government schools (22.40% and 21.47%, respectively). Regarding full-time equivalent teachers and enrolments, catholic and government schools appear to have comparable figures while independent schools have substantially more teachers and enrolments. However, Table 1 indicates that independent schools have a substantially lower student-teacher ratio (13.12 full-time equivalent teachers per student enrolled) than either catholic or government schools (16.20 and 16.89, respectively). This finding suggests that the independent sector has more human resources available with which to improve student achievement, a finding consistent with previous Australian research (Bonnor and Shepherd 2017).

The descriptive statistics also show a clear achievement gap between the school sectors. Across Years 3 and 5 the independent sector substantially outperforms the catholic and government sectors. In Year 3, the independent sector had an average NAPLAN score of 434.78 – 14.88 points higher than the catholic sector and 29.91 points higher than the government sector (419.90 and 404.87, respectively). This achievement gap persists in Year 5, where the independent sector scored 511.26 – 13.7 points higher than the catholic sector and 27.96 points higher than the government sector (497.56 and 483.30, respectively). Across both year-levels, this gap is equivalent to an entire standard deviation in achievement scores, a finding which highlights the substantial achievement divide between school sectors.

This achievement divide can be contextualised by examining the imbalance in total per-student funding between the sectors. On average, government schools receive slightly more per-student income than catholic schools (\$12,395.18 and \$12,175.71 per-student, respectively). However, both school sectors receive substantially less per-student funding than independent schools which receive, on average, \$17,859.75 per-student. This figure is 44.09% more than government schools receive and 46.68% more than catholic schools receive per student. This funding imbalance has been identified in previous research which examined how the substantial student fees charged by the independent sector contributes to inequalities in school resources (Lye and Hirschberg 2017; Watson and Ryan 2010). This is problematic because research suggests that this funding inequality may contribute to the student achievement gap (Baker 2018; Bonnor 2019; Chesters 2019; Hyman 2017; Kirabo Jackson et al. 2016; Perry and McConney 2010).

Understanding how government funding contributes to financial inequalities between the sectors lies at the heart of this research. Table 1 shows that government schools receive the largest amount of per-student government funding – \$11,804.63 per student. This value is 22.68% greater than the amount received by catholic schools (\$9,622.20 per student) and 44.07% greater than the amount received by

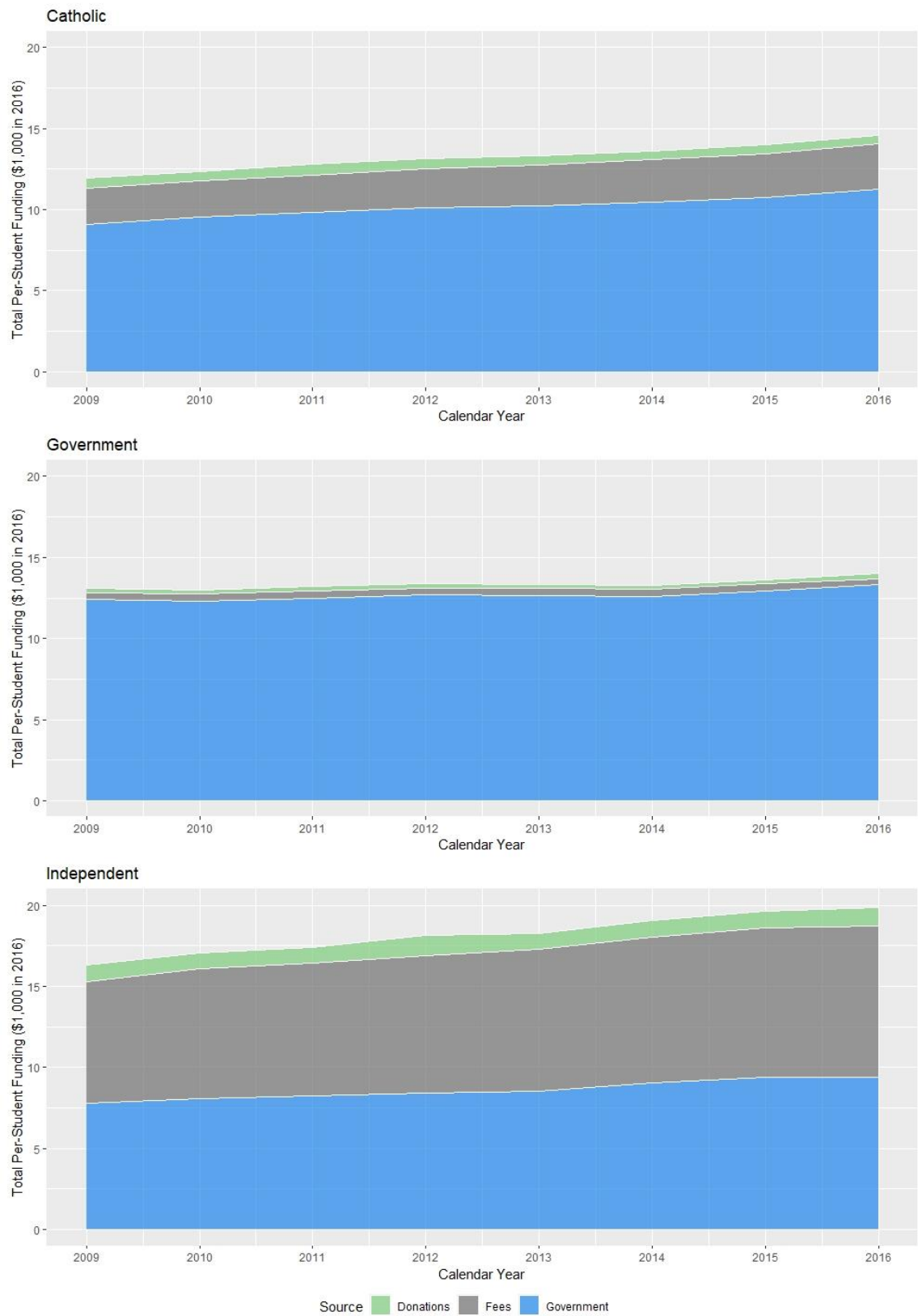
independent schools (\$8,193.60 per student). While substantially smaller than the amount that government schools receive, the amount of government funding directed to independent schools exacerbates this imbalance in total funding because independent schools can collect substantial amounts in student fees from wealthy parents whereas catholic and government schools cannot. This funding imbalance has also been aggravated by changes to school funding throughout the period investigated by this research.

## Trends in School Funding

Figure 1 presents the total amount of funding each school sector received, classified by source of funding, from 2009 to 2016. It shows that the catholic sector derived almost 79% of its funding from the state and federal governments (blue area) while the remainder came from fees paid by parents (grey area) and private donations (green area). Similarly, the government sector receives almost 95% of its funding from government sources, while the remainder is derived from student fees and private donations. In contrast, the independent sector only receives 48.9% of its funding from government sources. The majority of its funding comes from fees paid by parents and private donations. Figure 1 also visualises the resource divide between the independent sector and the catholic and government sectors and demonstrates the extent of changes to funding throughout this period.

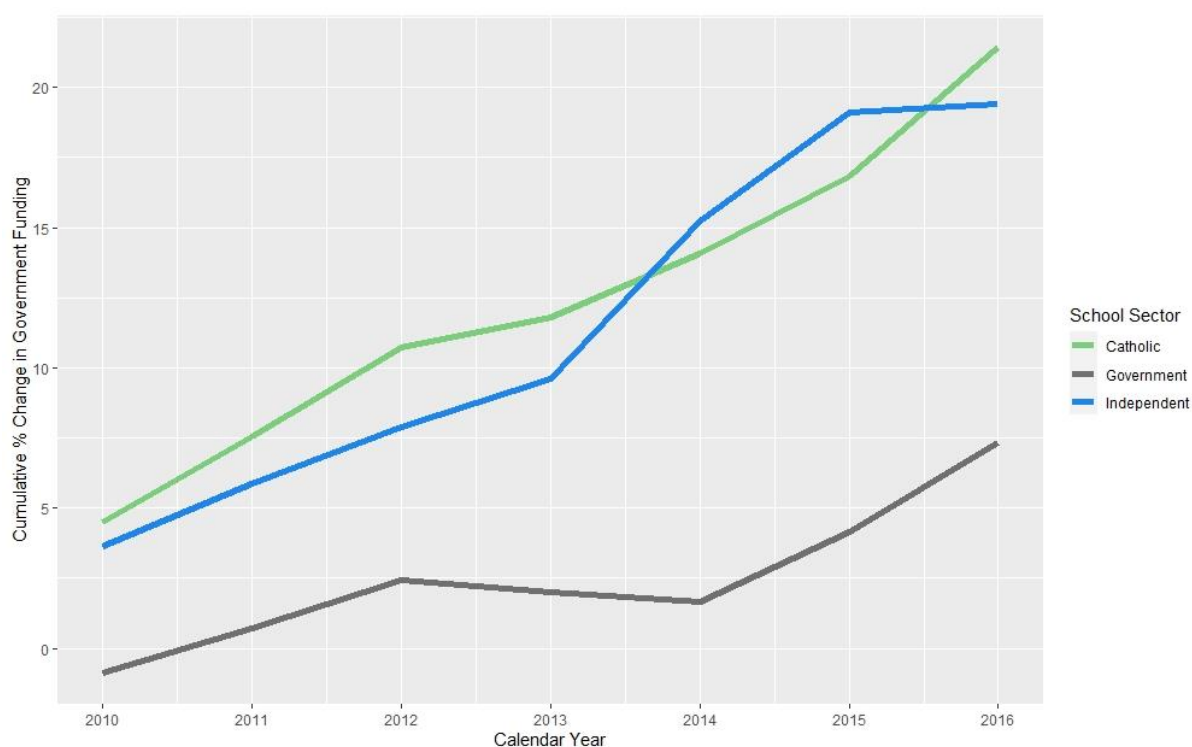
From 2009 to 2016 catholic schools displayed the largest percentage increase in total funding per student, rising 22% (\$11,959.52 to \$14,592.77). Independent schools also saw their total income per student increase by 21.6% (\$16,399.77 to \$19,869.48). However, the increase in total funding to government schools was substantially smaller than the other school sectors – government schools only received a 6.7% increase in their per-student funding (\$13,111.82 to \$13,991.06). These findings suggest that the government sector has received substantially smaller increases to their total funding than the non-government sectors. Analysis of changes in the amount of per-student government funding received by each sector (shown in Figure 2), suggests that this imbalance is a direct cause of changes to government funding.

Figure 1. Income Breakdown by School Sector, 2009-2016.



Notes: Data are from ACARA between the years 2009 to 2016.

Figure 2. Cumulative Percentage Increase in Government Funding by School Sector, 2010-2016.



Notes: Data are from ACARA between the years 2009 to 2016.

Figure 2 displays the annual percentage changes to the per-student government funding received by each sector from 2010 to 2016. It demonstrates that the government sector received substantially smaller increases in per-student government funding than the catholic and independent sectors. Catholic schools received the largest percentage increase in government funding per student, rising from \$9,105.62 to \$11,240.98 or an absolute change of 23.5%. Similarly, independent schools received a 21% increase from 2009 to 2016 (\$7,778.67 to \$9,411.84 per-student). By contrast, government schools received the smallest increase in the per-student government funding they received – only a 7.5% increase, from \$12,396.62 to \$13,325.34. These findings confirm previous research which found that government schools have received substantially smaller increases to their funding than the non-government sector in the first decade of the century (Watson and Ryan 2010). Given that increases in funding are disproportionately benefiting the non-government sector, it is important to understand how funding influences student achievement.

## Government Funding and Student Achievement

Table 2. Effect of per-student government funding upon Year 3 NAPLAN outcomes.

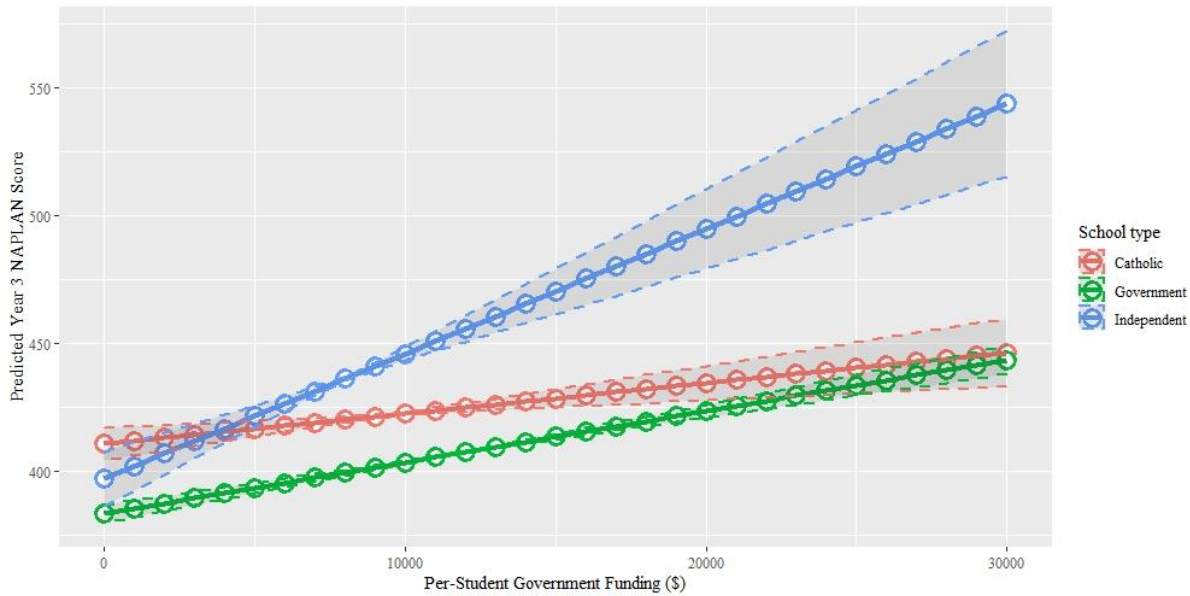
Variables	Catholic			Government			Independent		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Per-Student Government Funding (\$1,000)	2.058*** (.286)		1.553*** (.323)	.898*** (.156)		.924*** (.153)	7.285*** (.593)		5.897*** (.686)
Per-Student Private Sources (\$1,000)		1.525* (.773)	1.307 (.772)		-1.405 (.762)	-1.720* (.763)		-.652 (.358)	-.664 (.352)
Per-Student Parent Fees (\$1,000)		4.813*** (.958)	3.229** (1.011)		-2.540 (1.493)	-2.356 (1.491)		2.754*** (.341)	1.566*** (.362)
ICSEA		.158*** (.017)	.156*** (.017)		.316*** (.010)	.316*** (.010)		.162*** (.021)	.148*** (.021)
Enrolments		-.007 (.008)	-.002 (.008)		.015*** (.002)	.017*** (.003)		.010 (.005)	.000 (.005)
Student-Teacher Ratio		-.617* (.254)	-.220 (.266)		-.486*** (.109)	-.416*** (.109)		-.583* (.301)	.167 (.309)
LBOTE Proportion		-.004 (.040)	-.013 (.040)		.165*** (.028)	.155*** (.028)		.079 (.044)	.071 (.044)
Constant	402.868*** (2.672)	258.206*** (18.587)	240.715*** (18.880)	396.325*** (1.795)	86.161*** (10.403)	74.554*** (10.564)	378.956*** (4.728)	233.300*** (24.278)	211.012*** (23.998)
Observations	3,969	3,969	3,969	14,606	14,606	14,606	2,446	2,446	2,446

Notes: Data are from ACARA between the years 2009 to 2016. The dependent variable is the average NAPLAN outcome of Year 3 students for each sector. Robust standard errors are shown in parentheses. \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Table 2 examines the relationship between per-student government funding and student outcomes in Year 3. Model 1 omits all control variables and presents the relationship between per-student government funding and student achievement. Model 2 incorporates the control variables, without the independent variable, and displays their relationship with student achievement. Model 3 combines both independent and control variables to determine the net effect of per-student government funding upon student achievement while holding the control variables constant. Across all school sectors, Model 1 shows a positive coefficient for per-student government funding, meaning that increases in per-student government funding improves students' NAPLAN outcomes in Year 3. After controlling the relevant covariates, the coefficients are reduced but remain positive. The positive effect of government funding is statistically significant across all school sectors. Therefore, these findings confirm hypothesis 1 of this research.

Comparing the effect sizes between sectors reveals that there are substantial differences in the effect of government funding upon student achievement. The effect size is smallest in the government sector (0.924), which indicates that government schools derive the smallest benefit for every additional \$1,000 of government funding. While the catholic sector demonstrates a slightly larger effect size than the government sector (1.553), it is the independent sector which receives the largest benefit for every additional \$1,000 in government funding (5.897). This finding indicates that there is a differential effect of government funding upon achievement in Year 3, and that the independent sector derives the greatest benefit from each additional dollar in government funding. The significance of these findings are tested in the next part of this section.

**Figure 3. Visualising Per-Student Government Funding and its Predicted Effect upon Year 3 NAPLAN Outcomes.**



Notes: Data are from ACARA between the years 2009 to 2016. Predicted Year 3 NAPLAN scores (circles with solid lines) are generated from Model 3 of Table 2 with 95% confidence interval (dotted lines).

To illustrate the differential effects of per-student government funding between school sectors, Figure 3 depicts predicted Year 3 NAPLAN scores. Using Model 3 presented in Table 2, predicted Year 3 NAPLAN scores were calculated for every school in each sector by manipulating the values of per-student government funding from \$0 to \$30,000, while keeping the original value for all control variables. Then, the predicted Year 3 scores were averaged across all observations within each school sector. Therefore, Figure 3 estimates the expected average score of all schools within each sector for a given dollar value of per-student government funding when all other school-level control variables are maintained. Doing so allows us to predict the impact of changes to per-student government funding given the existing conditions of schools. Furthermore, the 95% confidence intervals were included in Figure 3 to account for the uncertainty in the estimated effect of per-student government funding upon student achievement in Year 3.

It is the difference in the slopes between the sectors which highlights this differential effect of funding. The independent sector has the steepest slope, followed by the government then catholic sectors. This suggests that with every additional dollar of government funding received, independent schools derive a substantially larger benefit for their students. However, the y-intercept of each sector reveals another interesting finding. In a hypothetical situation without any government funding, it is catholic schools that have the highest level of student achievement, followed by independent then government schools. This finding echoes an early Australian study which found that students of catholic schools were more likely to have higher achievement scores than their peers at government or independent schools because of the academic environment cultivated by catholic schools (Vella 1999). The difference between the y-intercept values of independent and government schools is also consistent with findings that suggest the higher socio-educational advantage of higher-status students is a primary cause of this achievement gap (Gerrard et al. 2017).

This figure also provides valuable information about the practical implications of changes to school funding between the sectors, and how best to reduce the student achievement gap using government funding. For each sector to achieve an average NAPLAN score of 425 in Year 3 – which equates to the transition point between bands 4 and 5 (ACARA 2019) – independent schools would, on average, require only \$6,000 per student in government funding. By contrast, catholic schools would require \$12,000 per student and government schools would require almost \$21,000 per student to achieve this score. The same hypothetical can be explored for an average NAPLAN score of 450, a value firmly in band 5 (ACARA 2019). Independent schools would require just under \$11,000 per student in government funding, while catholic and government schools would both require over \$30,000 per student. These findings suggest that improving student achievement in the catholic and government sectors requires substantially more government funding per student than the independent sector. While research has not specifically examined this outcome, it can potentially be explained by the severe resource inequality between the

sectors caused by the inequality in the per-student total funding received by each sector (Lye and Hirschberg 2017).

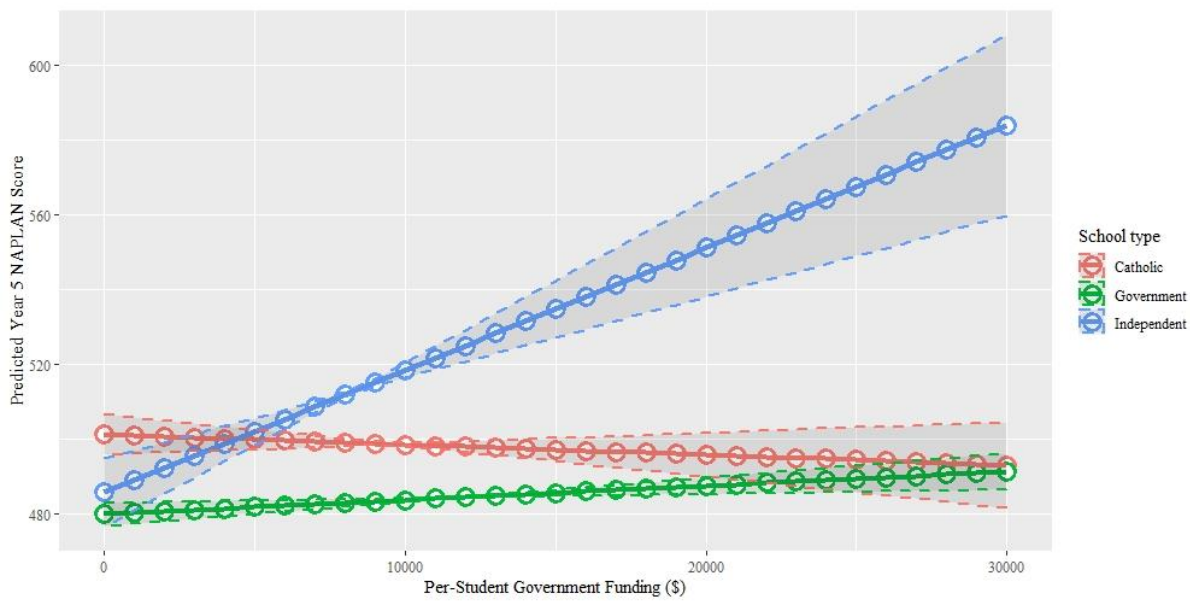
Table 3. Effect of per-student government funding upon Year 5 NAPLAN outcomes.

	Catholic			Government			Independent		
Variables	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Per-Student Government Funding (\$1,000)	.559*		.265	.376**		.400**	3.699***		3.386***
	(.251)		(.281)	(.135)		(.131)	(.506)		(.586)
Per-Student Private Sources (\$1,000)		-.153	-.169		-.115	-.249		-.067	-.094
		(.509)	(.510)		(.650)	(.652)		(.295)	(.292)
Per-Student Parent Fees (\$1,000)		2.169**	1.927*		-.619	-.545		1.467***	.809**
		(.769)	(.811)		(1.269)	(1.269)		(.284)	(.304)
ICSEA		.171***	.170***		.292***	.292***		.157***	.152***
		(.015)	(.015)		(.009)	(.009)		(.018)	(.018)
Enrolments		.015*	.016*		.010***	.011***		.001	-.004
		(.007)	(.007)		(.002)	(.002)		(.004)	(.005)
Student-Teacher Ratio		-.231	-.162		-.329***	-.298**		.010	.451
		(.220)	(.232)		(.092)	(.092)		(.248)	(.258)
LBOTE Proportion		.055	.053		.164***	.160***		-.002	-.007
		(.035)	(.035)		(.024)	(.024)		(.037)	(.037)
Constant	493.446***	310.069***	307.051***	480.010***	187.606***	182.232***	483.043***	326.202***	309.637***
	(2.346)	(16.092)	(16.408)	(1.545)	(8.857)	(9.027)	(4.051)	(20.081)	(20.133)
Observations	4,031	4,031	4,031	14,606	14,606	14,606	2,508	2,508	2,508

Notes: Data are from ACARA between the years 2009 to 2016. The dependent variable is the average NAPLAN outcome of Year 5 students. Robust standard errors are shown in parentheses. \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

Table 3 presents the outcomes from the lagged fixed-effects model analysing the effect of per-student government funding upon Year 5 NAPLAN achievement. The Year 5 analysis also confirms the first hypothesis, that government funding has a significant positive impact upon student achievement in independent and government schools. However, unlike the Year 3 model, there appears to be no significant impact of school funding upon the catholic sector in Year 5 after controlling for the relevant variables. Like Model 3 presented in Table 2, there appear to be substantial differences in the sizes of the coefficients between the sectors in Model 3 of this table. This finding suggests that government funding also has a differential effect upon student achievement in Year 5, although the significance of this finding will be assessed later. The last finding of interest is made by comparing Model 3 in Tables 2 and 3, where it appears there is a substantial decrease in the effect size of government funding upon achievement, from Year 3 to Year 5, within each school sector. The significance of this finding will be assessed later, but it suggests that government funding has a differential effect upon student achievement between different year-levels of students, and that older students derive a smaller benefit from increases in government funding than younger students.

**Figure 4. Visualising Per-Student Government Funding and its Predicted Effect upon Year 5 NAPLAN Outcomes.**



Notes: Data are ACARA between the years 2009 to 2016. Predicted Year 5 NAPLAN scores (circles with solid lines) are generated from Model 3 of Table 3 with 95% confidence interval (dotted lines).

Figure 4 illustrates the differential effect of per-student government funding by school sector using predicted Year 5 NAPLAN scores. Like Figure 3, it uses Model 3 presented in Table 3 to calculate and then average the predicted Year 5 NAPLAN scores for every dollar in government funding (from \$0 to \$30,000) for each school within each sector while holding the original values for all control variables constant. Similarly, 95% confidence intervals were included in the figure to account for the uncertainty in the estimated effect of per-student government upon student achievement in Year 5.

Like Figure 3, it demonstrates the significant positive effect of funding within independent schools. However, the effect of funding upon student achievement in government schools is shown to be substantially smaller than independent schools, while there appears to be no effect of funding upon students at catholic schools. This finding suggests that increases in government funding to catholic schools may not be an effective method for improving student achievement in Year 5. Analysis of the slope and intercepts demonstrates that independent schools continue to derive the largest benefit of per student funding increases in Year 5. Like Figure 3, the intercepts of each sector suggest that without government funding catholic schools would attain a substantially higher level of student achievement while government and independent schools would achieve comparable results.

The practical implications of changes to funding arising from this figure differ substantially to those of Figure 3. To achieve a NAPLAN score of 500 in Year 5 – which is the approximate midpoint of a Band 6 result (ACARA 2019) – independent schools require approximately \$4,500 per student in government funding. Conversely, government schools would require, on average, over \$30,000 per student in government funding. Due to the non-significance of the relationship within the catholic sector, conclusive comments cannot be made about this relationship from Figure 3. However, findings from Table 1 imply that maintaining the current levels of government funding, of approximately \$9,500 per student, would keep catholic schools achieving a NAPLAN score of 500 in Year 5. Furthermore, due to the substantial differences in the effect of funding upon achievement between the sectors, the figure does not provide another point of comparison. Therefore, these findings suggest that government schools require a substantially larger amount of government funding in Year 5 to achieve a comparable level of student achievement than either independent or catholic schools. However, to conclusively test the second and third hypotheses of this paper, the significance of the differential effect size of government funding between sectors and between year-levels must be determined.

## Determining the Significance of the Differential Effect of Government Funding

Table 4. Comparison of Government Funding Coefficients between Sectors and Year-Levels.

		Year 3			Year 5		
		Catholic	Government	Independent	Catholic	Government	Independent
<b>Year 3</b>	Catholic		0.629	-4.344***	1.288**		
	Government			-4.973***		0.524*	
	Independent						2.511*
<b>Year 5</b>	Catholic					-0.135	-3.121***
	Government						-2.986***
	Independent						

Notes: The result is based on a suest test conducted across Model 3 of Table 2 and Table 3. Numbers are the difference in the coefficient of per-student government funding between school sectors or between year-levels.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 4 presents the differences in the coefficients listed in Tables 2 and 3 between sectors or year-levels. The statistical significance of these differences was ascertained using a series of suest tests (Weesie 1999). In this table, the value presented indicates the difference in effect size between the sector listed in the row compared to the sector listed in the column for each combination of year-groups. Comparisons between sectors in year 3 shows that the catholic sector had a coefficient that was 0.629 larger than the government sector, however this difference was not significant. Therefore, it cannot be assumed that government funding has a differential impact on student achievement between catholic and government schools. However, the coefficient for the catholic sector was 4.344 smaller than for the independent sector and this difference was significant. Similarly, the government sector had a coefficient that was 4.973 smaller than the independent sector and this difference was also significant. This indicates that government funding has a substantially larger impact upon student achievement in independent schools than it does in government or catholic schools. Comparisons between the sectors in year 5 show a smaller coefficient discrepancy, but the same trend. There is no significant difference in the way that funding impacts student achievement in catholic and government schools. However, independent schools derive a substantially larger benefit from every additional unit of government funding in Year 5 than catholic or government schools. These findings confirm hypothesis 2, that funding has a differential effect between the sectors and that the independent sector gains the largest benefit from increases in government funding.

Comparisons can also be made between the effect of funding on student achievement in Years 3 and 5 within each school sector. Table 4 shows that the effect of funding is larger in Year 3 than it is in Year 5. The effect size shrinks by 0.524 in government schools, by 1.288 in catholic schools, and by 2.511 in independent schools from Year 3 to Year 5. This decrease in effect size was significant across all school sectors. These findings confirm hypothesis 3, that funding has a differential effect based upon student age and younger students derive a larger benefit from increases in government funding.

## Control Variables

Tables 2 and 3 also present information about the effect that changes to the control variables have upon student achievement within the same school. Income from private sources appears to have a significant negative impact upon student achievement within government schools in Year 3, although this effect disappears in Year 5. This negative effect is likely due to instances of materially disadvantaged government schools requiring external funds to employ teachers and supply adequate resources for students (Thompson et al. 2019). There is no significant effect of income from private sources upon student achievement in catholic or independent schools. In contrast, increases in the fees paid by parents had a

significant positive impact upon student achievement in catholic and independent schools across both year-levels. Of interest is the finding that across both year-levels the positive effect of increases in fees paid by parents was substantially higher in catholic schools than in independent schools. This may be because substantial increases in fees at catholic schools are only likely to occur at schools educating an advantaged student body, and funding has been shown to disproportionately benefit advantaged schools (Vella 1999). By contrast, yearly increases in fees are common among independent schools so the effect of additional funding is likely to be smaller (Lye and Hirschberg 2017; Vella 1999).

Changes in the socioeconomic status, approximated by ICSEA, of a school's student body was the only control variable to have a significant positive impact upon student achievement across all school sectors and year-levels ( $p < 0.001$ ). This finding is consistent with the extensive body of literature that has shown the positive effect of a higher status family background upon student achievement (Breen and Goldthorpe 1997; Marjoribanks 2005a; Pfeffer 2008). Another student-composition variable that displayed a significant positive impact upon student achievement was the percentage of students who come from a language background other than English (LBOTE). However, changes in the percentage of LBOTE students at a school only had a significant positive impact upon government schools, but this effect was present in both Years 3 and 5. Without adequate clarification about the student's background it is hard to judge the cause of this effect (Lingard, Creagh, and Vass 2012). One possible explanation behind the positive effect of increases in the percentage of LBOTE students at a school upon achievement may be that these students are from Asian or Indian family backgrounds, and Australian research has shown that these students typically outperform their peers (Dandy and Nettelbeck 2002; Marks and Phillips 2020). Another possible explanation is that Australian immigration policies over the past three decades have favoured highly-educated immigrants (Kennedy et al. 2015; Kler 2007), who in-turn are more likely to have children who achieve higher educational attainment (Conley et al. 2015).

The last control variables used in this research were the student-teacher ratio and the number of enrolments at a school. Yearly changes of these variables within schools only had a significant impact upon student achievement in government schools. Across both year-levels, the student-teacher ratio was negatively associated with student achievement ( $p < 0.001$ ), which suggests that increases in the number of teachers per student had a positive impact upon student achievement. This is consistent with international findings which suggest that decreasing the student-teacher ratio is a significant predictor of increased student achievement due to the additional feedback and guidance these teachers can provide (Baker et al. 2016; Kirabo Jackson et al. 2016). Similarly, increases in the number of enrolments at a school had a small but significant positive impact upon student achievement. However, this effect was only present in government schools, but was consistent across both year-levels. A potential explanation for this is that increases in the number of students attending government schools would increase the total, not per-student, amount of funding that these schools would receive, thereby allowing them to provide better educational resources for their students (Mok and Flynn 1996).

## Chapter 5 – Discussion

This research had three primary aims. The first was to understand current trends in government funding between sectors in Australia. The second sought to determine whether per-student government funding had a significant positive impact upon student achievement in Years 3 and 5. The third aim then explored whether government funding had a differential impact upon student achievement based upon school sector or student age. To investigate, this research examined a comprehensive dataset which detailed financial characteristics and student outcomes from every primary school in Australia across eight years. With this information, this research can assess how current government funding policies impact the achievement gap between school sectors.

The analysis of this paper culminated in four key findings. The first was that government funding to the non-government sectors has risen at a substantially faster rate than it has for the government sector from 2009-2016. The second was that government funding had a significant positive effect upon student achievement in Year 3, across all sectors, and within the independent and government sectors in Year 5. This finding confirms the first hypothesis of this research. The third finding demonstrated that per-student government funding has a significant differential effect upon student achievement between the sectors. Specifically, the independent sector derives the greatest increase in student achievement for every additional dollar of government funding, while there is no differential impact of funding on student achievement between the catholic and government sectors. This finding confirms the second hypothesis of this research. The last key finding was that school funding had a significant differential impact upon achievement between Years 3 and 5. Across all sectors, government funding had a greater positive impact on student achievement in Year 3 than it did in Year 5, and this differential effect was found to be significant. This finding confirms the third hypothesis of this research.

These findings suggest that current government funding policies are exacerbating the achievement gap between school sectors. At present, the independent and catholic sectors have a significantly higher level of student achievement than the government sector. Taken together the findings, that the non-government sector is receiving substantially larger percentage increases in their per-student government funding than the government sector and that government funding has a significant positive impact upon student achievement across all sectors, suggest that this funding will disproportionately increase student achievement in the non-government sector. However, the differential effect of funding between sectors must also be accounted for. This research demonstrated that the independent sector derives the largest improvement in student achievement from increases in government funding. This indicates that the independent sector, already the most well-resourced and highest achieving school sector in Australia, will benefit the most from current government funding policies. This outcome is contrary to one of the primary goals of the Australian Government, to promote “excellence and equity” in education (Education Council 2019, page 4). The importance of these findings will be discussed in greater detail below.

## Significant Positive Effect of Government Funding upon Student Achievement

The first finding of this research, that government funding has a significant effect upon student achievement in Australia, confirms the first research hypothesis and adds to the growing consensus of international research about the positive effect of school funding upon student achievement (Baker 2018; Baker et al. 2016). It is hypothesised that this mechanism acts indirectly by improving the capacity for schools to provide better educational and human resources to their students – such as smaller classroom sizes, better quality teachers, and higher quality teaching aids (Kirabo Jackson et al. 2016). These factors are all positively associated with student achievement (Barnett 2011). Therefore, this primary finding suggests that modifications to current school funding policies could reduce the achievement gap in Australia.

## The Differential Effect of Government Funding between Sectors

The finding that each dollar of government funding does not have a uniform effect upon student achievement between the sectors confirms the second research hypothesis. This research found that the independent sector derived a larger increase in student achievement for every additional dollar of government funding than catholic or government schools, while there was no difference in the effect size of funding upon achievement between catholic or government schools. No research has explored the differential effect of funding between school sectors, but other research has found that school funding has a differential impact upon student achievement among students from different socioeconomic backgrounds (Hyman 2017). This US study found that advantaged students in urban areas benefited more from every dollar of funding than disadvantaged students, and this finding provides a framework for interpreting the results of this research. Specifically, more advantaged students gain a greater benefit from every additional dollar spent on them compared to disadvantaged students. This causal mechanism mirrors the US finding that disadvantaged students require greater amounts of funding to attain a comparable level of achievement as advantaged students (Duncombe and Yinger 2004). Table 1 demonstrates that the independent sector is the most advantaged in Australia, followed by the catholic and then the government sectors. This information would predict that independent schools receive the largest benefit for every additional dollar of funding, which is what this research found.

However, this explanation does not reveal the causal mechanisms through which advantaged schools derive a larger increase in student achievement from every dollar of government funding when compared to disadvantaged schools. Several explanations for this phenomenon can be found by considering the predictors of student achievement, which were outlined in the literature review section of this paper. When a school has no pressing financial concerns, perhaps it is then able to hire higher quality teachers, reduce classroom sizes, procure better educational resources, and cultivate an environment more conducive to learning. Each of these factors has a significant positive impact upon student achievement (Baker 2017;

Borman and Kimball 2005; Perry and McConney 2010; Polesel et al. 2018). This paper, however, is unable to comment upon whether these factors are the source of this differential effect in government funding between the sectors because these variables were not collected in the financial dataset provided by ACARA. In addition to this differential effect of government funding upon achievement between school sectors, this research also found that the impact of government funding upon achievement was smaller in older students.

## **Age Reduces the Effect of Government Funding**

This research suggests that funding has a smaller positive impact upon older students than on younger students. This finding has significant implications for educational policymakers: to reduce the achievement gap in Australia, additional government funding should be directed towards younger students. This is suggested because reducing the achievement gap for older students requires a substantially larger amount of funding than it does for younger students. While this makes intuitive sense, it appears to be a novel finding as – to the best of my knowledge – there have been no published studies examining the differential effect of school funding for students of different ages. Although, evidence from the early education literature may provide an explanation for this result.

As people age, their cerebral plasticity decreases and with it their ability to learn (Bonnier 2008; Rosenzweig and Bennett 1996). Many studies have investigated the effect of early intervention strategies upon children from groups who may be at risk of poor educational achievement, such as children from low-income families and children with neurodevelopmental abnormalities, and concluded that early intervention was successful in improving the cognitive development of participants (Bonnier 2008). These findings share similarities with studies examining the efficacy of preschool and early education strategies. Several reviews have found that early education has substantial short-term effects – up to three years – and moderate long-term effects upon student achievement (Barnett 2011; Burger 2010). It is hypothesised that this improvement in achievement is due to enhancing the learning capacity of these students and familiarising them with school institutions and practices (Burger 2010), while also improving their cognitive development (Burger 2010; Reynolds et al. 2007). Furthermore, providing disadvantaged students with access to early education has demonstrated a compensatory effect, whereby disadvantaged students have larger relative increases in cognitive development compared to their peers (Burger 2010). While the achievement gap caused by the home environments of different socioeconomic status groups is unlikely to be resolved in full (Barnett 2011), these findings demonstrate that targeted interventions – such as increased funding to younger disadvantaged students – may reduce this gap and prepare disadvantaged students for higher achievement in school.

## **No Effect of Funding upon Achievement in Catholic Schools at Year 5 Level**

The reduced effect of funding in Year 5 was emphasised by the finding that funding had no effect upon student achievement in catholic schools in Year 5. Part of this change between year groups is likely mediated by the decreased effect of government funding upon student achievement with age, however this does not account entirely for the finding. One explanation may be found in early Australian studies that examined achievement differences between the school sectors. These studies found that students attending catholic schools were more likely to perform better than students at government schools because catholic schools were more likely to attract advantaged students (Le and Miller 2003; Vella 1999), and that they cultivated higher academic aspirations within their student body than government or independent schools (Cardak and Vecchi 2013; Vella 1999). These findings were supported by a more recent study which found that while the effect size of catholic school attendance upon student achievement had decreased it still remained positive and significant (Cardak and Vecchi 2013). Given that independent schools are, on average, more advantaged than catholic schools it is possible that the academic environment cultivated by catholic schools reduces the effect size of funding upon student achievement.

Another possible explanation for the loss of significance is that catholic schools did not utilise the increased funds they were given by the federal government appropriately. Evidence for this hypothesis can be seen in Table 1, which shows that catholic schools have the highest student-teacher ratios. Lower student-teacher ratios are a primary mechanism through which funding can improve student outcomes (Kirabo Jackson et al. 2016). However, a recent analysis of catholic schools and student achievement provides an argument against this hypothesis, as the authors noted that over the past two decades catholic schools used their larger pool of resources to substantially reduce student-teacher ratios (Cardak and Vecchi 2013, p. 41). Therefore, the finding that catholic schools cultivate higher educational aspirations in students than other school types may explain part of this reduced effect – additional funding may have less influence on academically motivated students. However, more research needs to be undertaken to adequately explain this finding.

## **Implications of the Predictive Funding Models**

Figures 3 and 4 depict the outcome of the models displayed in Tables 2 and 3 and provide policymakers with several important findings. If, in the interest of reducing the achievement gap, policymakers wanted to fund each sector so that they were to achieve a Year 3 NAPLAN score of 425 – the transition point between bands 4 and 5, and well above the national minimum standard (ACARA 2019) – then Figure 3 provides this information. For catholic schools to achieve a score of 425, then they would need to be funded to the amount of approximately \$12,000 per-student. The government sector would require almost \$21,000 per-student to attain this value, and the independent school sector would require just under \$6,000 per-student. Such information provides a standard for assessing the current allocation of government funding. At present, the catholic sector receives \$10,171.35 per-student, which is just under the prescribed value of \$12,000. Meanwhile, the government sector receives \$12,714.33 – approximately

\$8,285.67 less than the estimated value of \$21,000 to achieve this score. While the independent sector receives \$8,588.39 per-student – an amount \$2,588.39 more than required to achieve a score of 425. This comparison demonstrates that government schools require substantially more government funding to improve their achievement in Year 3, whereas the independent sector is currently being over-funded.

The same analysis can be conducted for students in Year 5 using Figure 4. Given the differential effect of funding, the NAPLAN score of 500 appears to be the only value for which this analysis is applicable. Figure 4 demonstrates that government funding has no effect upon the outcomes for students within the catholic sector. For the independent school sector to attain a score of 500, they would require only \$4,500 per-student in government funding. However, for the government sector to achieve the same score they would require over \$30,000 in per-student government funding. This imbalance is largely the result of the differential effect that occurs due to a student's level of socioeconomic advantage (Hyman 2017). Although it is also caused by the material advantage which has accrued to the independent sector due to the fees paid to attend these schools, the effect of these fees is visible in Table 3 ( $p < 0.01$ ). These outcomes also suggest that government funding to independent schools should be reduced and funding to government schools should be substantially increased.

Such a proposition may encounter significant opposition from proponents of fiscal austerity. Previous studies have highlighted that educating students within the government sector is significantly more costly to the government and suggestions have been made to redirect this funding to catholic and independent schools which can better use government funds (Cardak and Vecchi 2013; Daniels 2011). Doing so is hypothesised to save the government a substantial sum of money and improve student outcomes (Daniels 2011). However, this suggestion has obvious problems. The first is that many disadvantaged families cannot afford the fees associated with sending their children to independent schools without additional government funding to make it cheaper (Gerrard et al. 2017). However, increases in government funding to independent schools has not reduced the fees charged by these schools, who instead have spent the additional funding upon improving their educational resources and building more infrastructure (Gørgens et al. 2020; Watson and Ryan 2010). In fact, over the past two decades these schools have substantially increased their fees as greater numbers of advantaged students leave the government sector (Gørgens et al. 2020; Lye and Hirschberg 2017). Reducing funding to government schools would either further reinforce the compounded disadvantage experienced by students from lower status backgrounds or force students to migrate to the catholic sector.

Further financial reductions to the government sector would burden the catholic sector with an increasing share of disadvantaged students (Chesters 2019). However, the catholic sector has already been negatively affected by an increasing proportion of disadvantaged students (Cardak and Vecchi 2013). This is because the limited financial resources made available to the catholic sector are insufficient to adequately educate a more disadvantaged student body (Cardak and Vecchi 2013). Furthermore, mass enrolment within the catholic sector has a secondary problem associated with offering a secular education to those who do not

believe in religion (Chesters and Haynes 2016). This analysis suggests that propositions to channel funding towards more efficient school sectors would not have a positive impact upon educational inequality in Australia. Therefore, substantially more government funding should be directed to the government sector while the independent sector should have its funding reduced. However, an examination of current government funding policies reveals that policymakers are taking the opposite approach.

## Current Funding Policies

The findings from this research show that government funding to catholic and independent schools has risen substantially faster than it has to government schools (Figure 2). After adjusting for inflation, Catholic schools have received 23.5 % more in per-student government funding from 2009 to 2016, independent schools have received a 21% increase, while government schools have received a substantially smaller increase of just 7.5%. These changes in funding are contradictory to the findings of this research and suggest that current funding policies are exacerbating the achievement gap. A possible justification for these funding policies can be found in the Gonski Report, which recommended that funding to schools which educate disadvantaged students should be substantially increased, regardless of sector (Gonski et al. 2011). This sector-blind recommendation could be used to justify recent increases in funding to the catholic and independent sectors. However the government sector educates the majority of disadvantaged students (Chesters 2019), and should have received a larger increase in its per-student government funding relative to the catholic and independent sectors.

A possible explanation for this discrepancy can be found in the Federal Government's focus on 'equity' in education. Within education, equity speaks to principles of fairness and inclusion. Fairness exists when ascribed characteristics – such as socioeconomic status or language background – do not preclude a student from reaching their educational potential, while inclusion necessitates a minimum standard of education for all (Field, Kuczera, and Pont 2007). However, another common definition of equity can be described with the concepts of vertical and horizontal equity (Fazekas 2012). Horizontal equity exists when schools sharing certain characteristics are funded at a similar level. Vertical equity exists when schools with divergent characteristics are funded at appropriate levels to their characteristics (Bandaranayake 2013; Fazekas 2012). For example, an affluent school within a metropolitan city would require less funding to educate each student to a given level than a disadvantaged school in a remote area. Therefore, schools should receive funding based upon the needs of their student body.

However, the federal government has not stated which definition of equity it subscribes to regarding school funding. Although, material published by the federal government provides suggestions. The Department of Education, Skills and Employment (DESE) claims that the federal government is striving to make the distribution of funds between the sectors more equitable by increasing government funding to the catholic and independent sectors (Australian Government 2021b, 2021a). The justification for this decision is thus:

“While 4 out of every 5 school funding dollars comes from public sources, it is not evenly distributed across sectors. On average, around three quarters of funding for Catholic schools and less than one half of funding for independent schools is from public sources. In contrast, almost 95% of funding for schools in the government sector comes from the Australian Government and state and territory governments. The government sector receives around 71% of total combined public funding.” (Australian Government 2021a)

This quote demonstrates that the Federal Government believes equity is best achieved by ensuring all school sectors receive a comparable amount of government funding, regardless of the educational outcomes of this policy. This research has demonstrated that the government sector requires more funding to achieve a similar educational achievement for its students. That is because the sector educates a disproportionate share of disadvantaged students and has far fewer material resources available to them than do independent schools (Chesters 2019; Gørgens et al. 2020). This research has also shown that if policymakers are concerned about equity in education that the independent sector should receive significantly less per-student funding. This is because every additional unit of government funding the sector receives exacerbates the achievement gap in Australia. This suggestion echoes one of the conclusions stated in the Gonski Report: that materially advantaged schools receiving government funding should have that funding removed from them (Gonski et al. 2011). Such a recommendation is consistent with international practices.

However, Australia contributes more public funding, as a percentage of its GDP, to the private education sector than any other nation in the OECD (OECD 2018a, p. 274). To understand how this arose, a brief explanation is necessary. Public funding of non-government schools occurred in response to the 1973 Karmel Report which found that many religious schools, classified then as independent schools, were struggling to provide a quality education for disadvantaged students (Karmel 1973; Windle 2014). Consequently, government funding to non-government schools was introduced. In later years the committee behind the report began advocating for the removal of government funding to wealthy independent schools. This caused a substantial amount of political pushback and eventually ended with the committee being disbanded (Windle 2014). Since then the federal government has made many failed attempts to reduce the government funding allocated to wealthy independent schools (Gonski et al. 2011; Kenway 1987; Windle 2014). This failure is due to several factors: the influential lobby group campaigning for the independent sector (Gorur 2013; Kenway 1987), the changing composition of the senior Australian public service workforce to individuals who graduated from these wealthy independent schools (Pusey 1991; Windle 2014), and particularly the lack of consensus about the impacts of government funding upon student achievement (Gonski et al. 2011; Thompson et al. 2019). While this research is unable to influence these first two factors it does highlight the importance of government funding in influencing student achievement.

## Significance

This study is the first to quantitatively explore the impact of government funding upon student achievement in Australia. It is also the first to demonstrate how the differential effects of government funding contribute to the student achievement gap. It is hoped that this research will prompt policymakers to recognise the negative impacts of current school funding models for disadvantaged students, and that it will encourage Australian academics to investigate the effects of government funding models upon student achievement. This is especially important as the specifics of many funding models used by the state and federal governments have not been made publicly available or, where they have, often do not assess how they affect student achievement (Bandaranayake 2013). However, the author acknowledges that making substantive changes to school funding models will not remedy the achievement gap in its entirety. An adequate amount of school funding only enables a school to provide students with high-quality educational resources – it does not guarantee that this will happen (Baker 2018).

## Limitations

Like any study, this research has several limitations. First, this study was limited by the available data. More information about the human and educational resources of each school would allow for better estimates of how changes to school funding impacts student achievement. Such data could also identify the causal mechanisms behind the differential effect of government funding upon student achievement between the school sectors. This information could be collected in survey format by ACARA, as it is collected during the PISA assessment (Sullivan et al. 2013). Another limitation of this study is that the analysis is conducted solely at the school-level, which precludes assumptions about the effect of changes to school funding being made at the individual-level. This problem could be solved by the collection of hierarchical data, where observations at the student-level are nested within school-level data. Such data would allow for better specification of the model and produce better predictive models demonstrating how changes in government funding could impact student achievement in different populations. A self-imposed limitation of the study is the use of only one component of student achievement. The datasets collected by ACARA included additional student achievement metrics, such as Year 12 completion rates and university attendance. However, the scope of this research was limited, and the study focused only on the effect of government funding upon student achievement in Years 3 and 5. Furthermore, the type of assessment – the NAPLAN tests – has several problems. A prominent one is the artificial inflation of school scores in an attempt to gain a better ranking on the My Schools website (Cobbold 2010), where the scores of each school are presented for prospective parents (Gorur 2013). Another substantial limitation of this research is the brief period of observation. At present, data for student achievement and school funding has only

been released from 2009 to 2016. Future investigations will gain more certainty about the impact of government funding upon student achievement with each year of data that becomes available for analysis. The last limitation of this study is that it focuses on the differential effects of funding between school sectors because of the substantial resource and achievement divide between them. However, it should be noted that there is also a division of resources and achievement within each of the school sectors.

## **Recommendations for Future Research**

Future research should address these within-sector differences to better understand the impact of government funding upon student achievement. In addition to school sector, the Gonski Report cites indigeneity, socioeconomic background, language background, and remoteness of school attended as additional determinants of educational disadvantage (Gonski et al. 2011). Understanding how government funding impacts student achievement differentially through these variables is immensely important work, as it would provide policymakers with more information about how best to distribute government funding to reduce educational inequality. Current school funding models operate on assumptions about relative levels of disadvantage between groups, however little is known about the dollar cost associated with improving student achievement within these groups (Bandaranayake 2013).

## **Recommendation for Policymakers**

The message of this research should be clear to policymakers. There is a clear achievement gap between the sectors, largely due to the government sector educating the largest share of disadvantaged students and the material imbalance between sectors (Bonnor et al. 2021). This achievement gap reduces equity, stifles social mobility, and causes undesirable outcomes associated with economic inequality. Despite the debate on the efficacy of school funding as a mechanism to redress educational inequality, this research has shown that government funding has a significant positive effect upon student outcomes across all sectors. Moreover, government funding disproportionately benefits the independent school sector because many of the schools within the sector are well-resourced, due to the significant fees paid by parents. This research suggests that per-student government funding to the independent school sector should be reduced – regardless of the political backlash – and that government schools should receive a substantial increase in per-student government funding. This would assist in reducing the achievement gap between school sectors.

## Chapter 6 – Conclusion

Research has shown that the achievement gap between advantaged and disadvantaged students in Australia is growing (Hetherington 2018). This increasing divide inhibits Australia's economic growth and reduces the life outcomes of disadvantaged students (Easterbrook et al. 2016; Hetherington 2018). Therefore, addressing this problem should be a priority for educational policymakers. However, ascribed characteristics, not amenable to policy change, underlie a substantial component of this achievement gap (Breen and Goldthorpe 1997; Pfeffer 2008). One potential solution is to increase the material resources provided to schools which educate disadvantaged students (Gonski et al. 2011). In Australia, the government sector educates the majority of disadvantaged students (Chesters 2018), and the government funding it receives has increased at a substantially slower rate than funding to independent and catholic schools which has left many government schools under-resourced (Chesters 2019; Windle 2014).

The uncertainty about the effect of school funding upon student achievement has caused policymakers to disregard the potential for funding to meaningfully improve student outcomes. However, a growing body of research suggests that increasing school funding has a significant and positive impact upon student achievement (Baker 2018; Kirabo Jackson et al. 2016). This research aimed to determine whether the same relationship between school funding and student achievement is applicable in the Australian context – which is especially important due to several factors which make Australia's school system unique. One such factor is the size of the independent school sector in Australia, and the substantial amount of government funding it receives which is an anomaly among the OECD (OECD 2012). Due to a notable absence of research upon the effect of funding upon different populations, this research also aimed to determine whether government funding had a differential impact upon student achievement based upon the sector of the school and the year-level of the students. It also evaluated how current funding policies impact the achievement gap between sectors.

Quantitative analysis of the financial and student achievement records from every primary school in Australia from 2009 to 2016 demonstrates that government funding has a significant positive impact upon student achievement across all sectors in Year 3 and in the government and independent sectors in Year 5. This finding suggests that changes to government funding policies can reduce the achievement gap in Australia. This research also found that government funding had differential effects based upon the year-level of the students and the school sector. The effect of funding upon student achievement decreased as students aged. Furthermore, this research found that independent schools received the largest benefit for every additional dollar of government funding, while there was no significant difference in the effect of government funding upon student achievement between catholic and government schools.

Such a finding is problematic because this research also shows that government funding to independent and catholic sectors grew substantially faster than funding to the government sector, an outcome which

could increase the achievement gap between sectors. Therefore, this research recommends that government schools should receive substantially more government funding per student than they are currently receiving. Conversely, the independent sector is being over-funded and redirecting this surplus funding to the government sector could assist in reducing the achievement gap in Australia. Last, due to the differential effects of funding upon year-level, it is recommended that this government funding be targeted towards younger students to improve their early academic success – a significant predictor of long-term student outcomes.

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