The Effect of Quarantining Welfare on School Attendance in Indigenous Communities*

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August 2017

*Acknowledgements here: We acknowledge (so far) valuable feedback from Heather d'Antoine, Matthew Gray, Nicholas Biddle, Jim Smith, Liz Moore, Wes Miller and David Cooper (AMSANT, initiated), Sharon Stone, Julie Brimblecombe, Gawaian Bodkin-Andrews, and Maggie Walters. This study used data from the Northern Territory (NT) Early Childhood Data Linkage Project, "Improving the developmental outcomes of NT Children: A data linkage study to inform policy and practice across the health, education and family services sectors", which is funded through a Partnership Project between the National Health and Medical Research Council (NHMRC) and the NT Government. This study uses administrative data obtained from the NT Department of Education through this NHMRC Partnership Project. The analysis conducted in this project will follow the NHMRC Values and Ethics: Guidelines for Ethical Conduct in Aboriginal and Torres Strait Islander Health Research (2003) and the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) Guidelines for Ethical Research in Australian Indigenous Studies (2012) (Reciprocity, Respect, Equality, Responsibility, Survival and Protection, Spirit and Integrity). The researchers are bound by, and the research analysis will comply with, all ethical standards outlined in the ethics agreement HREC Reference Number: 2016-2611 Project Title: Improving the developmental outcomes of Northern Territory children: A data linkage study to inform policy and practice in health, family services and education (Human Research Ethics Committee of the Northern Territory Department of Health and Menzies School of Health Research). Nathan Kettlewell was added to this agreement in January 2017.

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Abstract

To be written.

Keywords: income management, in-kind transfers, policy evaluation

JEL:

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1 Introduction

Indigenous people in Australia, Canada, New Zealand, and the United States often face extensive social and economic hardship despite living in some of the world's wealthiest nations. Indigenous communities have been shaped by many unique historical, cultural, and political events; nevertheless widespread disadvantage has been a nearly universal experience.[1] Rates of suicide and disease-related mortality are substantially higher in Indigenous populations than in general populations, for example, leading to a substantial gap in life expectancy (e.g. Hunter & Harvey, 2002; Bramley et al., 2004; Cooke et al., 2007; Clifford et al., 2013). Educational attainment and income levels are also lower (e.g. Cooke et al., 2007), while drug and alcohol problems (e.g. Brady, 2000); family violence (Memmott et al., 2001; Al-Yaman et al., 2006) and child abuse and neglect (Cross et al., 2000; Stanley et al., 2003; Sinha et al., 2011) are all more prevalent. In short, in "all four countries, Indigenous poverty has been not only deep and widespread but persistent, defying policy prescriptions" (Cornell, 2006, p. 2).

This paper analyzes the impact of a recent initiative by the Australian government to reduce disadvantage in Aboriginal communities by quarantining welfare benefits. The policy – known as income management – sets aside 50 percent of welfare benefits to ensure that they are spent on priority items (food, housing, clothing, utilities, or transport) and not on excluded items (alcohol, cigarettes, gambling or pornography) (AIHW, 2010). The Australian federal government introduced income management in 2007 as part of a reform package – the Northern Territory Emergency Response – in response to a highly publicized report documenting high levels of child sexual abuse and family violence within Aboriginal communities in the Northern Territory (NT) (Wild & Anderson, 2007). Income management is a community-level intervention. Its goals are to ensure that welfare payments are used to meet priority needs; reduce the funds available for anti-social behaviors linked to child abuse and family dysfunction; protect women and the elderly from excessive demands for money ("humbugging"); and promote socially responsible behavior, particularly with respect to the care of children (AIHW, 2010; Bray et al., 2012).

We identify the causal impact of income management on school attendance rates using a quasi-experimental approach that exploits a staggered policy roll-out across communities.[2] In remote areas, 75 percent of Indigenous students do not have an attendance rate of 80 percent which is often considered the minimum for effective learning (Wilson, 2013). High rates of absenteeism – on average around 40 percent over our study period – can account for as much as 20 percent of the gap in the test scores at age 15 for Indigenous and non-Indigenous students (Biddle, 2014). By constraining people's spending choices, income management is meant to increase the chances of children's basic needs being met and thereby result in better health, more school participation, and greater educational attainment (Bray et al., 2015). Our focus on school participation is also motivated by the fact that – in addition to being an

[1] See Cornell (2006), for example, who discusses historical and contemporary differences in models of self-government (self-management), land rights, and relations with central governments. Indigenous people occupy a unique policy space. They often have some form of self-governance (self-management), but like other citizens are also subject to the laws of the country in which they live (Brady, 2000).

[2] Importantly, income management was rolled-out separately to the other measures in the NTER. We discuss this issue further in Section 7.1

important driver of children's life chances – attendance rates are both systematically recorded and likely to respond quickly to changes in socioeconomic conditions. Importantly, access to schools' daily attendance data and exact program implementation dates allows us to precisely time the introduction of income management; in effect, communities that are treated later form the control group for communities that are treated earlier. In this way, we are able to overcome the many methodological hurdles associated with non-random program assignment, the absence of baseline data, small sample sizes, and the lack of comparators which often times preclude impact evaluations of interventions targeting Aboriginals (Cobb-Clark, 2013). Our research contributes to a growing literature that exploits variation in implementation timing to evaluate the impact of social programs such as Head Start (Ludwig & Miller, 2007), Medicare (Finkelstein & McKnight, 2008), Supplemental Nutrition Assistance Program (Hoynes & Schanzenbach, 2009), Title I (Cascio et al., 2010), Women, Infants, and Children (Hoynes et al., 2011), family planning programs (Bailey, 2012), Empowerment Zones (Busso et al., 2013) and community health centres (Bailey & Goodman-Bacon, 2015). We are the first to evaluate the effectiveness of income management as a strategy for reducing Indigenous disadvantage.

Importantly, we consider the differential effect of income management on the attendance rates of boys vs. girls and primary vs. secondary school students. Aboriginal boys are at an educational disadvantage relative to Indigenous girls from an early age (see Yap & Biddle, 2010; Wilson, 2013; Biddle & Meehl, 2016), while providing educational opportunities for high school students in remote Aboriginal communities is particularly challenging (Herbert et al., 2014). In light of this, it is important to understand whether income management has heterogeneous effects on students' school attendance.

We also investigate three key mechanisms – mobility patterns, student enrollment and implementation issues – through which income management may have influenced school attendance rates. Aboriginal families frequently leave their 'home' communities to travel to other remote communities for social and cultural reasons, e.g. the promotion and maintenance of kinship (Memmott et al., 2006). This temporary mobility produces a great deal of attendance (and enrollment) churn as students enter and exit schools (Taylor & Dunn, 2010). Income management may have affected school attendance by changing families' incentives or ability to temporarily leave their communities. At the same time, many students in the remote communities under study are not enrolled in school at all (Wilson, 2013), opening up the possibility that the relationship between income management and school attendance is driven by changing enrollment patterns. Finally, we also carefully consider whether the way that income management was implemented may have affected school attendance. Qualitative evidence indicates that the introduction of income management was characterized by a lack of consultation with Aboriginal communities, confusion about how to access existing benefits, and in some cases, short-run food insecurity (Yu et al., 2008). In 2008, the government responded to these issues by introducing the Basics Card. The Basics Card provides more flexible, faster, and easier access to people's welfare funds; reduces the barriers to temporary mobility; and is widely regarded as an improvement in the administration of income management (AIHW, 2010). Analyzing mobility patterns, enrollment levels, and the effect of the Basics Card helps shed light on the mechanisms linking income management to school attendance.

Our empirical strategy relies on the estimation of difference-in-difference models with

controls for school (community) and time (daily) fixed effects. The resulting estimates have a causal interpretation so long as the roll-out of income management is unrelated to trends in schools' attendance levels. We investigate the plausibility of this identification assumption by: i) carefully reviewing the administrative process used in the roll-out; ii) examining the relationship between community characteristics and program roll-out; and iii) using event study methods to assess trends in attendance patterns pre- and post-income management. In all cases, the resulting evidence gives us confidence that our identification strategy is sound. Nonetheless, we further reduce the potential for any unobserved heterogeneity to confound our estimates by controlling for school fixed effects, grade levels, day of the week, and allowing each school to have its own season specific time trend.

Our research makes an important contribution to the international debate on ending Indigenous disadvantage. Unlike the case in Canada, New Zealand, or the United States, the Australian government is unique in using the quarantining of welfare benefits as a key strategy in closing the gap in Indigenous outcomes. Income management, however, has been controversial with critics arguing that it is paternalistic and proponents arguing that it benefits Aboriginal communities. To date, what is known about the NTER's income management policy comes from qualitative evidence which can at best be described as mixed. Despite widespread dissatisfaction with implementation problems and the proscriptive nature of the scheme (Yu et al., 2008), some Aboriginal Australians believe that income management has had benefits in improving people's diets, reducing humbugging, and increasing savings (CLC, 2008; AIHW, 2010). Although there is a lack of sound evaluation evidence, the Australian government remains committed to income management as a policy option, announcing in the May 2017 federal budget that income management will be extended in all existing sites until mid 2019.[3]

Policy makers often justify the restriction of welfare benefits by appealing to social preferences or paternalism, especially when the consumption of certain goods has either negative (e.g. alcohol and tobacco) or positive (e.g. education and health care) externalities for families and children (Currie & Gahvari, 2008). In some cases, welfare benefits are restricted through the provision of in-kind rather than cash benefits; in other cases, the receipt of cash benefits is conditional on the purchase of certain beneficial goods (e.g. nutritious food or health care), meeting work requirements, or ensuring that children attend school. In-kind welfare benefits, most notably the Supplemental Nutrition Assistance Program (SNAP), have been particularly prevalent in the United States. Studies that, like ours, exploit variation in the timing of program implementation to achieve identification indicate that SNAP has resulted in increased food expenditure (Hoynes & Schanzenbach, 2009), improved birth weights (Almond et al., 2011) and gains in child health and female economic self-sufficiency (Hoynes et al., 2016). Conditional cash transfer programs, widely used to promote economic development, have also been used to combat poverty in developed countries.[4] These programs have been subjected to rigorous evaluation using experimental and quasi-experimental methods. Results indicate that conditional cash transfers can be successful in increasing school enrollment rates, improving preventative health care, and raising household consumption (see

[3]See www.dss.gov.au.

[4]Examples include the Opportunity New York City Family Rewards initiative and Canada's Self Sufficiency project (see Mendes et al., 2014).

Rawlings & Rubio, 2005). At the same time, the long-term impacts and cost-effectiveness of many programs remains unclear (SPRC, 2010) and there is evidence that programs which link welfare benefits to children's school attendance need to be accompanied by case management, financial support, and other support services to work well (Campbell & Wright, 2005).

Our evaluation of income management in Australia provides new evidence on the causal impact of restricting the way that welfare benefits can be spent on people's social and economic outcomes. Like conditional cash transfers, the goal of income management is to improve social and economic well-being in Aboriginal communities by increasing the consumption of beneficial goods and services. Unlike programs in other countries which typically target only discretionary income or additional payments, Australia's scheme is compulsory and limits people's ability to spend core welfare entitlements (see Mendes et al., 2014). Our analysis also contributes to the literature on place-based policy interventions aimed at boosting local development. Income management is intended to be a community-level intervention, with benefits permeating throughout the community at large through positive spill-over effects. Such interventions have been widely implemented in disadvantaged regions of developed countries (Neumark & Simpson, 2015).

We find no evidence that income management led to an increase in student attendance. On the contrary, the introduction of income management reduced school attendance by around 2-3 percentage points (3-5 percent) in the first six months after which attendance rates returned to their initial levels. These results are robust to a variety of modelling specifications and sensitivity checks. Importantly, income management did not significantly affect student enrollments or mobility patterns into and out of Aboriginal communities; thus, the drop in school attendance does not appear to be due to increased churning in student enrollments or new students. Instead we find that the attendance penalty associated with the introduction of income management is dramatically reduced after the adoption of the Basics Card suggesting that implementation issues may be responsible for the temporary reduction in school attendance that we observe.

This paper proceeds as follows. Background information on the Northern Territory and the details of income management, including the roll out, are discussed in Section 2. In Section 3, we review the previous literature on restricted welfare, focusing particularly on the developed country context. We discuss our data and present some descriptive statistics in Section 4. Our estimation strategy is outlined in Section 5, while our results are presented in Sections 6 and 7 (Mechanisms). Our conclusions and suggestions for future research are presented in Section 8. An appendix provides supplementary material.

2 Income Management in the Northern Territory

The Northern Territory is vast, covering approximately one sixth of the Australian continent. More than half of its approximately 230,000 residents live in the capital city of Darwin. Aboriginal and Torres Strait Islanders make up 25.5 percent of the Northern Territory's total population – 51 percent of the population in remote areas – despite constituting only 2.8

percent of the Australian population overall.[5] The Northern Territory is governed by its own local government in conjunction with the Australian Federal Government and approximately half of the Northern Territory is Aboriginal-owned as a result of the Aboriginal Land Rights (Northern Territory) Act of 1976.

Aboriginal kinship relationships are complex, dynamic and not easily captured by non-Aboriginal notions of family based on physical living arrangements (see Lohoar et al., 2014, for a review). In particular, as people see themselves in relation to others in their community and in remote areas, it is common for children and adults to move between households. Raising children is a collective responsibility; Aboriginal children are given a great deal of autonomy to develop their skills by exploring their environment under the watchful eyes of the community at large (Lohoar et al., 2014; Muir & Bohr, 2014). Education experts and community leaders have struggled to find ways to ensure that Aboriginal children can access "Western cultural capital" while at the same time nurturing their Aboriginality and Aboriginal culture (McTaggart, 1991, p. 297). Critics argue that education for Aboriginal students in remote parts of the Northern Territory has been "characterized by policy failure" (Fogarty et al., 2015, p. 1).

2.1 Background

In 2006, the NT Government responded to several media reports of child sexual abuse in Aboriginal communities by establishing an independent review board to examine the extent of sexual abuse and identify possible policy responses. The board's report – *Little Children are Sacred* (Wild & Anderson, 2007) – was finalized in April 2007. While the NT Government was still considering its own response, the Australian Federal Government intervened with the Minister for Indigenous Affairs declaring that there was "clear evidence that the Northern Territory government was not able to protect these [Aboriginal] children adequately" (Brough, 2007) (p. 10). The result was the announcement on June 21, 2007 of a significant set of reforms collectively known as the Northern Territory Emergency Response (NTER). The NTER package was legislated on July 17, 2007, less than one month after it was announced.

Income management is the key welfare reform in the NTER. Once income management begins in a community, 50 percent of residents' welfare entitlements is paid in the usual way. The remaining 50 percent is retained by Centrelink[6] in an individual account to be allocated to a combination of priority goods. Initially, people accessed their income-managed funds in three ways. First, priority goods could be purchased in remote areas at a licensed community store which would deduct funds from people's income-management accounts at the point of sale. Second, people could obtain store cards (gift cards) from Centrelink which were redeemable at participating stores in larger towns. Third, people could organize a third-party deduction, e.g. to a utility company or a landlord. Unallocated funds were retained in people's income-management accounts.

[5] We will refer to people of Aboriginal or Torres Strait Islander decent as simply Aboriginal since the vast majority of Indigenous individuals in the Northern Territory identify as Aboriginal singularly or as both Torres Strait Islander and Aboriginal.

[6] Centrelink is the government agency responsible for administering all transfer payments.

Early reviews of income management documented numerous implementation problems including a lack of understanding about the policy, difficultly in accessing funds (especially when outside the home community or outside of Centrelink's operating hours) and difficulty checking account balances (CLC, 2008; FAHCSIA, 2008; Yu et al., 2008; AIHW, 2010). In response, Centrelink contact hours were extended to meet client demand during the transition period (FAHCSIA, 2008). Additionally, in late 2008, the Basics Card was introduced as a fourth, more flexible transaction method. The Basics Card operated through Australia's EFTPOS system.[7] It was particularly useful for people travelling outside of their home communities. Effectively displacing store cards, the Basics Card was perceived by users as a significant improvement to the previous system of accessing income-managed funds (AIHW, 2010).

2.2 The Roll Out of Income Management

Income management first commenced in September 2007 and was gradually rolled out over the next 13 months across 73 Aboriginal communities and associated town camps.[8] The roll out occurred in clusters of typically three to four communities simultaneously in the northern and southern parts of the Northern Territory. Figure 1 highlights the progressive coverage of income management across communities.

The roll out of income management was not strictly random; several conditions needed to be met before income management began though none of them related specifically to schools or to children. The main criterion was that the community had at least one store meeting certain restrictions around sound financial practices (e.g. not engaging in monopoly pricing) and the quality and quantity of goods for sale which could be licensed to participate in the scheme. The objective was to ensure that communities had access to affordable, high quality food (Brough, 2007).[9] Other requirements included that Centrelink staff were available to discuss income management and set up budget allocations; a government business manager was in place for the community; arrangements were in place for deductions associated with utilities and rent; and there was a police presence in the community. Once rolled out to a community, income management became compulsory. Exemptions were possible only in special circumstances when it could be demonstrated the person was not a regular member of an income-managed community. By March 31, 2009, 15,125 people were subject to income management; only 649 exemptions (three percent of cases) had been granted (AIHW, 2010).

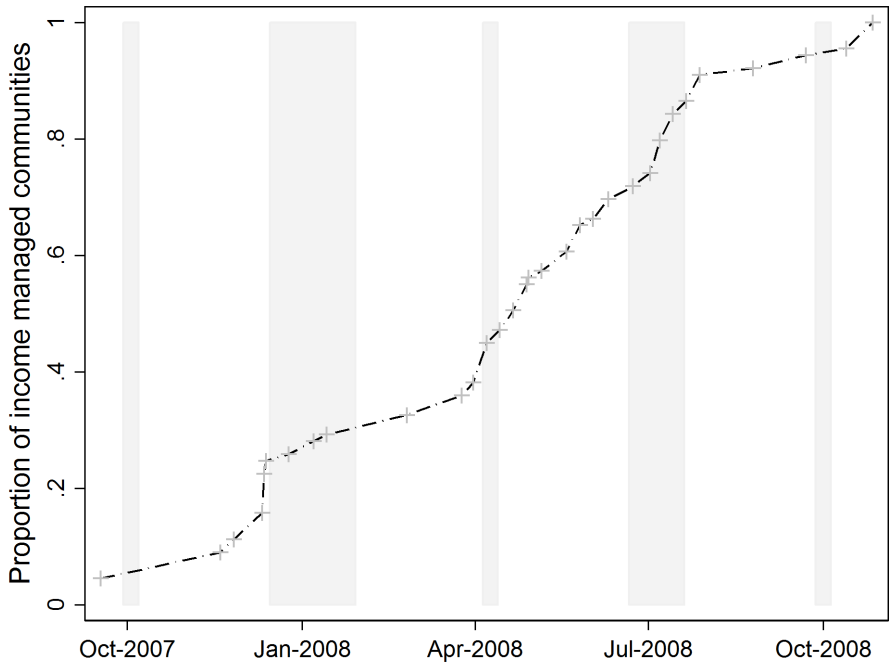
Our empirical strategy is valid so long as the roll of income management is orthogonal to trends in school attendance. We first consider the spatial variation in the timing of income

[7]EFTPOS (electronic funds transfer at the point of sale) is Australia's most widely used payment system handling 70 percent of debit card transactions. See https://www.mobiletransaction.org/australian-eftpos-system/.

[8]Town camps are small Aboriginal settlements located within the boundaries of major towns such as Darwin, Tennant Creek and Alice Springs.

[9]It is unclear whether store licensing affected food availability and pricing, however. The NTER legislation was vague as to what the store licensing conditions specifically entailed, and one year after the NTER commenced many stores were still operating with high prices and low quality stock (Yu et al., 2008). A subsequent review found that many stakeholders believed store licensing had improved the quality and quantity of stock (CIRCA, 2011), although there is no pre- and post-data to support these perceptions.

Figure 1: Roll-out of income management



Notes: Shaded regions are school holiday periods. Crosses represent dates that income management commenced in one or more communities.

management (see Figure 2). Although some regional clusters adopted income management at a similar time, there is no obvious spatial pattern to the roll out itself.

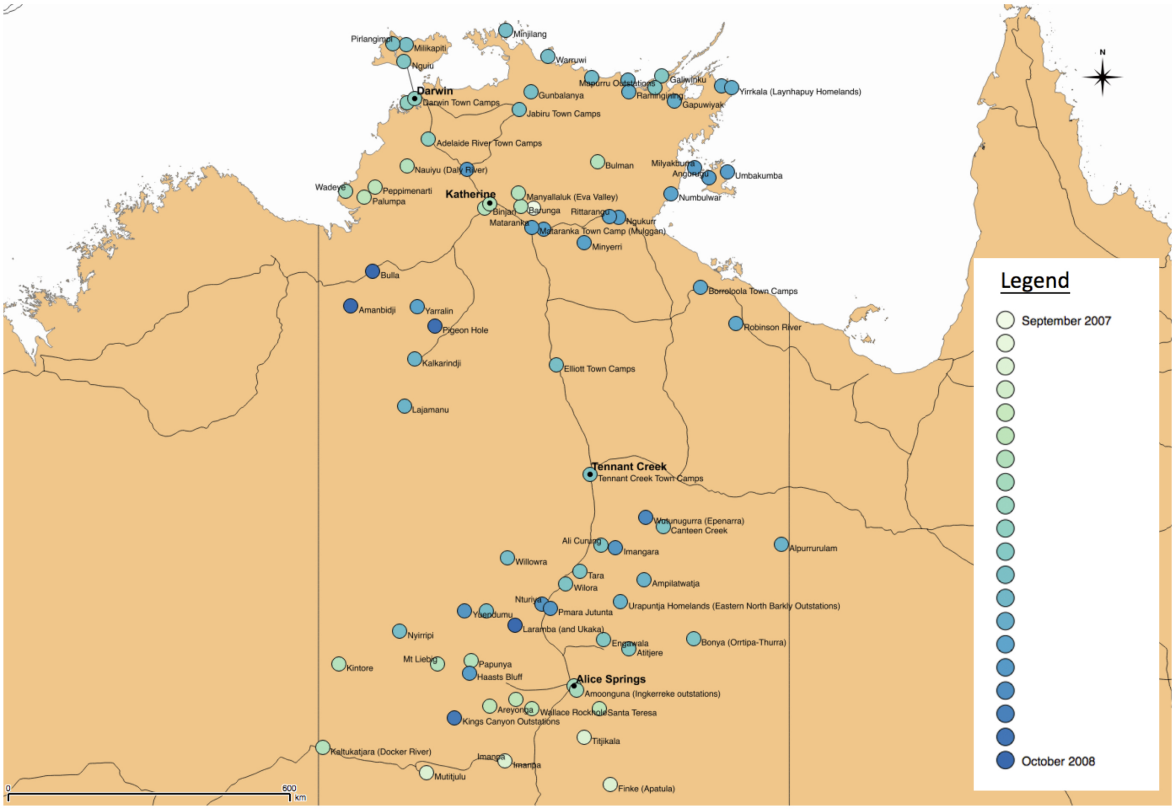
Second, we formally test whether or not there is observed heterogeneity in the timing of income management by regressing the date that income management began on a set of community-level characteristics constructed from the 2006 Australian Census.[10] Unfortunately, the small size of some NT communities makes it possible to construct a full set of measures for only 55 of the 78 communities for which we observe school attendance. In nine other communities, we only have data on population size and gender balance.[11] Estimation results based on the sub-sample of communities with complete data (n = 55) are presented in Column 1 of Table 1. Results based on the full sample (n = 64) which also control for an indicator of missing data are presented in Column 2.

With the exception of household size (significant at 10 percent), none of our other measures are statistically significant. Our R^2 is 0.099 in the limited sample and 0.084 in the full sample respectively; more than 90 percent of the variation in the timing of income management is unexplained by observed community-level characteristics. In comparison, Hoynes and Schanzenbach (2009) find that similar demographic characteristics explain 14 percent of the variation in the timing of SNAP. Like Hoynes and Schanzenbach (2009), we interpret this as evidence that the timing of income management was in large part not systematically related to community characteristics. Nevertheless, the institutional arrangements underly-

[10]See for example Hoynes and Schanzenbach (2009), Hoynes et al. (2011), Bailey (2012) and Bailey and Goodman-Bacon (2015) who adopt the same approach when relying on program timing for identification.

[11]There is no indication that missing data is related to implementation date. The correlation coefficient between implementation date and an indicator for missing data is only 0.026 (p=0.823).

Figure 2: Income managed communities across the Northern Territory



Notes: Color-coding on communities selected for income management reflects the date income management started in the relevant community as indicated in the legend. Major settlements in the Northern Territory are in boldface. People living in the municipal parts of these communities were not subject to income management (only those living in the associated town camps).

ing the introduction of income management give us reason to be cautious. For this reason, we will account for any selectivity bias associated with the non-random roll out of income management by controlling for school (i.e. community-level) fixed effects in all estimations.

2.3 Community Reaction

There was a mixed reaction to the introduction of income management. A major review of the NTER found that in many Aboriginal communities there was dissatisfaction with the way that income management was implemented and operated. In particular, (Yu et al., 2008) cite a lack of consultation, misunderstanding about the way income management was meant to operate, uncertainty generated by rapid program changes, frustration with the loss in empowerment, and embarrassment associated with accessing income-managed funds when in urban areas. Despite this, the authors also find evidence of support for income management with some people reporting an improvement in the quality and quantity of available food, less humbugging, reduced tobacco purchases, and higher savings. One small survey of 141 people in six remote communities found that 51 percent of people were in favor of income management and 46 percent were opposed (CLC, 2008), while another survey of

Table 1: Community characteristics and timing of income management

Variable	Model 1	Model 2
Population/100	-0.600	1.155
	(14.703)	(14.652)
(Population/100)^2	-0.220	-0.285
	(0.691)	(0.685)
Percentage male	2.835	0.231
	(5.490)	(5.154)
Median age	7.874	8.734
	(8.277)	(8.184)
Percentage English only language spoken at home	0.953	1.002
	(0.655)	(0.630)
Labor force participation rate	-0.298	-0.194
	(1.024)	(1.043)
Employment rate	0.172	0.174
	(0.705)	(0.703)
Median personal income	0.232	0.231
	(0.297)	(0.277)
Average people per household	28.301*	28.049*
	(14.147)	(14.309)
Demographics miss		403.619
		(266.768)
N	55	64
R^2	0.099	0.084

Note: The outcome variable is the date income management was implemented in the community, with each day equal to one unit. Robust standard errors in parentheses. * is statistical significance at the 10% level.

76 Centrelink clients found that two-thirds supported the policy (AIHW, 2010).

3 Previous Literature

Income management falls within a category of policies best described as 'restricted welfare'. These policies include in-kind transfers, conditional cash transfers (CCTs) and income quarantining. In what follows, we provide a brief review of the literature on restricted welfare with a focus on policies targeting disadvantaged populations in developed countries.

In-kind transfers, in the broadest sense, simply refer to the public provision of goods

and services. Examples include public housing, medical care, child care and education. The most widely studied program with direct relevance to income management is probably SNAP, which provides food vouchers to low income families. Two important differences between SNAP and income management are worth noting however. First, SNAP is more restrictive than income management since benefits are limited to food purchases. Second, SNAP targets discretionary expenditure, while income management affects the welfare client's core entitlement (Mendes et al., 2014). SNAP has been difficult to evaluate, primarily due to self-selection and misreporting of program participation, with estimates of its effectiveness varying considerably (see Currie (2003) and Hoynes and Schanzenbach (2016) for reviews). Papers using variation in program commencement across counties provide arguably the most reliable evidence. These studies have shown that SNAP is associated with increased food expenditure (Hoynes & Schanzenbach, 2009), improved birth weight (Almond et al., 2011) and gains in child health and female economic self-sufficiency (Hoynes et al., 2016).

Income management also shares similar objectives to a number of CCT programs operating in developed countries. A common element of these programs is a focus on improving the health and education of dependent children in disadvantaged families. For example, in several U.S. states, receipt of Temporary Assistance for Needy Families (TANF) payments is conditional on parents meeting objectives relating to health-checks, immunizations, school attendance and student grades (Ziliak, 2015).[12] While CCT programs have often been successful in developing countries (see Rawlings & Rubio, 2005), there is less evidence they are successful in developed countries. For example, Opportunity NYC – a CCT program modelled on Mexico's Oportunidades program – failed to improve educational outcomes or health in New York (Riccio et al., 2013). Slavin (2010) reviews evidence on the effect of a large number of CCT program (predominately from the United States) and finds that most do not improve school attendance or attainment; similarly Medgyesy and Temesváry (2013) find mixed evidence on the success of CCT programs on education and health outcomes.

Income quarantining has been the least utilized form of restricted welfare. Although this has become increasingly important in Australia, we are aware of only one other scheme internationally that involves involuntary income quarantining. Since 2012, New Zealanders aged 16-19 have been subject to an income management scheme similar to that studied in this paper. While the New Zealand scheme does not directly target the Indigenous population, it does disproportionately affect it (Humpage, 2016). We are not aware of any empirical evaluation of New Zealand's income management measure.

Overall, the literature on restricted welfare policies in developed countries suggests that, while some policies do seem to improve social outcomes (e.g. SNAP), many others fail to achieve their objectives. It is likely that context and program fidelity are important. For example, Campbell and Wright (2005) note that the CCT programs linked to education with the most supporting evidence are those accompanied by case management, financial support, and other support services.

To the best of our knowledge, only two studies use quantitative data to evaluate aspects of the income management scheme studied in this paper, and we are aware of no study that has

[12]TANF is a large-scale program that provides temporary financial assistance to families with dependent children. Funding for TANF comes from both Federal and State Government; however States have considerable control over the way funds are distributed.

examined school outcomes. Brimblecombe et al. (2010) use time series data from a sample of 10 community stores to study purchasing patterns. Using a before-after time series model, the authors find no evidence that income management influenced spending patterns in the communities. The authors also caution against generalising these findings since their sample only includes stores managed by the Arnhem Land Progress Aboriginal Corporation, and these stores already operated a voluntary 'food card' system before income management was introduced. Lamb and Young (2011) have similar data on revenue from electronic gambling machines in two major townships – Alice Springs and Katherine. Although these towns were not covered by income management, they both have large Aboriginal settlements on their outskirts (town camps) that were affected. Most of the venues in their sample experienced no change in gambling, although two venues servicing predominately Aboriginal patrons did experience a statistically significant reduction.

Our paper also contributes to the place-based policy literature and more specifically to the evaluation of place-based people policies, which take the view that "in order to help people, one must build or revitalize communities" (Ladd, 1994, p. 195). In contrast to regular welfare support, which typically targets recipients based on non-spatial indicators like income and wealth, place-based people policies target people based on where they live. Well known examples include U.S. State Enterprise Zones and Federal Empowerment Zones (see Neumark and Kolko (2010), Ham et al. (2011), Busso et al. (2013), Freedman (2013) and Reynolds and Rohlin (2015) for recent evaluations). Neumark and Simpson (2015) review this literature and find overall mixed evidence that policies meet their objectives. Income management differs from most place-based policies in terms of its central mechanism; most schemes use measures like business subsidies and tax-breaks to improve local employment opportunities whereas income management uses changes to the delivery of welfare. It also operates in a unique setting – remote Indigenous communities – while most place-based policies target poor urban suburbs. It is therefore an interesting case study for this literature.

4 Data

4.1 Attendance data

The analysis is conducted with data from the Northern Territory (NT) Early Childhood Data Linkage Project, "Improving the developmental outcomes of NT Children: A data linkage study to inform policy and practice across the health, education and family services sectors", which is funded through a Partnership Project between the National Health and Medical Research Council (NHMRC) and the NT Government.[13] We use from this datasource daily attendance and enrollment records provided by the NT Department of Education, covering

[13]A collaboration between the NT and South Australia (SA) Governments enabled the establishment of the SA NT DataLink facility in 2009, which is responsible for linking datasets from state Government departments SA NT (2017). With the support of the Population Health Research Network (PHRN), part of the Australian Government's National Collaborative Research Infrastructure Strategy (NCRIS), the Education Investment Fund Super Science Initiative, and a range of other stakeholders, the SA NT Datalink was established to support important research to inform many areas of policy and service development within the NT, SA and nationwide.

all students enrolled in the public school system.[14] The use of daily data is critical to our estimation strategy. It allows us to fully exploit variation in program timing, despite the policy being rolled-out over a relatively short time frame. Since our data are administrative records that cover the entire NT government school population, we do not face issues common to survey data such as small sample size, sample selection, attrition bias and recall bias.

The sample is restricted to the period 2006-2009 (inclusive). Since income management was first introduced in September 2007 and fully rolled out by October 2008, this window covers the implementation period plus around 1.5 years before and after. We restrict our analysis to this window because the NTER income management scheme was reformed in 2010 in such a way that is not amenable to evaluation with our data (the re-branded scheme is known as 'New Income Management').[15] Our window allows us to determine whether income management was effective in the short- to medium-term.

To construct an estimation dataset, we used the income management roll-out schedule published in AIHW (2010). This gives us the precise day income management commenced in each community. We matched communities to school names by looking up the school's address on the NT Schools Directory, or in some cases from the school's own website. We were able to match 130 schools in our data belonging to 78 separate communities. In most communities there is one major school; 61 communities have a single school only. Forty-seven of our schools are so called 'homeland learning centres'.[16] These are government funded education facilities that operate in very remote areas without the same staffing or infrastructure requirements of a regular school, and typically have only a few enrollments at any time (they comprise just over 3 percent of student-day observations in our sample).

We also observe the student's year level in our data. In the NT education system, compulsory schooling is from ages 6-17 (meaning most students are in school until at least the end of year 10). The year levels are segmented by primary years (1-6), middle years (7-9) and senior years (10-12). An optional transition year is available before year 1. In our analysis we restrict the sample to students enrolled in years 1-12.

Our final dataset is an unbalanced panel of 9,162 students attending 130 different schools. There are approximately 200 school days each calendar year and altogether we have more than 3.5 million student-day observations.[17]

[14] One limitation is that we do not have data on some private schools that operate in communities subject to income management. We do not view this as a significant limitation since private schools are only operating in six of the communities in our sample.

[15] New Income Management commenced on 1 July 2010. It involved significant reforms to the original scheme and was rolled out to the entire Northern Territory. Some benefits were dropped from the scheme, voluntary income management was introduced, and there was greater scope for exemptions. These changes left the total number of people in the Northern Territory subject to income management largely unchanged, although there were substantial shifts in the composition of the income-managed population (Bray et al., 2014). We are unable to evaluate the impact of the 2010 reform due to the very short roll out period and the fact that income management after 2010 no longer applied to entire communities (and hence schools).

[16] Homeland Learning Centres are not listed on the NT Schools Directory but could be identified by the community name associated with the relevant Homeland Learning Centre in our data.

[17] Note that we do not actually observe whether a particular student's care-giver is subject to income management. However, since virtually all care-givers would have been receiving family payments, we expect almost all students were directly affected. Note also that the communities targeted by income management had very high welfare recipiency rates, potentially facilitating large indirect effects (e.g. reduced financial harassment, increased safety and lower exposure to substance abuse).

4.2 Student and community characteristics

To better understand the student population under study, we report basic descriptive statistics on students, schools and communities. Two important facts emerge. First, attendance is persistently low in our population. Second, the vast majority of students in our sample reside in very remote areas that are characterized by significant economic disadvantage.

Statistics on student attendance and mobility are reported in Table 2. The average attendance rate is only 64 (58) percent for primary (secondary) students living in income managed communities over the sample period. In comparison, the attendance rate is 86 percent for the rest of the Northern Territory during the same period. This low attendance rate is a significant social concern; a major report on Aboriginal schooling in the Northern Territory found that students attending less than 80 percent of the time were at high risk of not meeting minimum standards for literacy and numeracy (Wilson, 2013). More generally, the attendance gap between Aboriginal and non-Aboriginal students is likely to contribute to disparities in academic achievement and attainment. For example, Biddle (2014) finds that 20 percent of the gap in PISA test scores between Aboriginal and non-Aboriginal students can be explained by attendance. There is no evidence that attendance improved over the period. In fact, in 2008 – the year income management is introduced in most communities – attendance is actually lower than other years. In 2009 attendance seems to recover for primary students, although not for secondary students.

Table 2 also highlights the significant degree of mobility within this population. Between 36 and 42 percent of primary students experience at least one move in each year. Mobility is even higher for secondary students. This reflects the high degree of mobility of Aboriginal people generally in the Northern Territory. Later we consider mobility as a potential mechanism for changes in attendance. Finally, note that the majority of students in our sample are enrolled in primary school (years 1-6). This is expected since there are more compulsory year levels in primary education. It also reflects the fact that enrollment in education drops sharply with age in remote Aboriginal communities (Wilson, 2013). The data indicate that enrollment in middle and high school improved over the period, in particular in 2007 where the number of secondary students more than doubled on the previous year.

Turning to community characteristics, first note that 93 percent of the schools in our sample are in areas classified as 'very remote' by the Australian Bureau of Statistics (based on distance to urban centres). The remainder are classified as 'remote'. To put this in perspective, in 2006 less than one percent of the Australian population resided in very remote areas (ABS, 2008). All but one school in our sample qualifies for remote area benefits offered by the NT Department of Education to attract teachers, and 61 percent of schools qualify for the highest award.

To highlight the economic and social disparities between the remote Aboriginal communities in our sample and the rest of Australia, we present in Table 3 a comparison of key community indicators based on the 2006 Australian Census. First note that the mean community size is only 428 people, which demonstrates that children in our sample come from small, geographically disparate communities (see also Figure 2). The average median age is much lower in our sample than the rest of Australia. We also see significant economic disparities in terms of labor force participation, employment and income, while housing is considerably more crowded (6.1 persons per household versus 2.6). The descriptive statis-

Table 2: Sample statistics for school data

Primary students[a]					
	2006	2007	2008	2009	All years
Attendance rate[b](%)	63.17	64.00	62.69	64.95	63.73
Changed school[c](%)	36.72	35.25	40.00	40.07	57.26
Students	4,682	4,877	5,007	5,236	8,491
Secondary students					
	2006	2007	2008	2009	All years
Attendance rate (%)	63.16	60.77	56.92	56.16	57.91
Changed school (%)	41.01	42.21	46.14	47.18	62.82
Students	378	1,014	1,658	2,037	2,660

[a] Primary students are those enrolled in grades 1-6. Secondary students are in grades 7-12.
[b] The attendance rate is the sum of student-day observations where the student was expected to attend school divided by the number of student-day observations where the student attended school the whole day.
[c] Changed school is a dummy variable =1 if at any time during the period the student changed his/her enrollment or left/joined the NT administrative dataset (which are most likely interstate moves or moves between the private/public sector). Students who join/leave the sample in grades 1, 11 or 12 are not included in this calculation.

tics also reveal considerable heterogeneity across communities, in particular across language and labor force statistics.[18] For instance, Aboriginal children affected by Income Management belong to communities where only 17.2 percent of households use English as their first language.[19]

Table 3: Community characteristics compared to the Australian general population

	Aus. Pop.	Sample			
Variable	Mean	Mean	St. Dev.	Min	Max
Population	-	428.27	361.04	83	1904
Percentage male (%)	49.4	48.57	3.28	40.87	56.52
Median age (years)	37	22.09	2.16	18	27
Percentage English only language spoken at home (%)	78.5	17.23	22.60	0	94.38
Labor force participation rate (%)	64.6	37.78	16.23	6.90	83.50
Employment rate (%)	94.8	86.00	15.91	9.22	100
Median personal income ($AUD)	466	209.82	39.93	148	466
Average people per household	2.6	6.08	1.43	3.3	9.6

Note: Data are from the 2006 Australian Census. For the sample characteristics, N=64 in the case of population and percentage males. N=55 for all other variables. Community data are for the Indigenous Local Area for that community. For the missing observations, a suitably granular spatial unit could not be identified in the Census data.

[18] It is possible that some of the variance in labor force statistics is due to how questions on employment are interpreted in different communities. For example, in 2006 (the census year), the Community Development Projects employment scheme meant that in some communities many adults were participating in community development projects as a way to earn their welfare support. This may have been recorded as employment by some but not others. There is no reason to believe that such measurement error would be related to the timing of income management.

[19] A variety of Indigenous languages are spoken across the Northern Territory and English is often the second language.

5 Estimation Strategy

5.1 Event Study Analysis

We begin by analyzing the effect of income management using an event study model. Specifically, we estimate the following model:

$$Y_{ist} = \alpha + \sum_{d=-365}^{365} \pi_i \mathbf{1}(\tilde{\tau}_{st} = d) + \gamma_s + \epsilon_{ist} \tag{1}$$

where Y_{ist} is an indicator of whether student i in school s attended school for the whole day on school-day t. $\tilde{\tau}_{st}$ is the "event date" which measures the number of days since the introduction of income management. For example, $\tilde{\tau}_{st} = 1$ if income management was rolled out one day ago; $\tilde{\tau}_{st} = 2$ if it was rolled out two days ago and so on. We restrict our data to the one-year window on either side of the implementation date. Since our data starts a little over one year before income management is introduced to the first community, this window ensures all communities are equally represented, while also providing sufficient observations to examine pre- and post-implementation trends. Note this does not mean we have a strictly balanced panel; school holidays and weekends create gaps in the data such that for some t only a subset of schools identify the coefficient.[20] γ_s captures school fixed effects, ϵ_{ist} is a stochastic error term and the remaining variables are parameters to be estimated.

The main purpose of the event study analysis is to directly evaluate the validity of our identification assumption by carefully examining the pattern in event-date coefficients (see Hoynes and Schanzenbach (2009)). If the introduction of income management is unrelated to trends in school attendance, then we would expect to see no systematic trend in our event-date coefficients prior to the introduction of income management. At the same time, a discontinuous change in attendance patterns that coincides with the introduction of income management is consistent with income management having a causal effect.

5.2 Difference-in-difference Estimation

Our baseline model is a difference-in-difference (DD) estimator that effectively uses communities that receive income management later as a control group for those receiving income management earlier. The estimation equation is as follows:

$$Y_{isldt} = \alpha + \beta IM_{isldt} + \gamma_s + \tau_t + \lambda_l + \delta_d + \epsilon_{isldt} \tag{2}$$

where Y_{isldt} is an indicator of whether student i in school s enrolled in grade l attended school for the whole day on school-day t (d indicates the day of the week e.g. Monday). Moreover, IM_{isldt} is an indicator variable that equals one if the student is enrolled in a school that is located in a community in which income management has commenced and equals zero otherwise. The model also accounts for school (γ_s), day-of-the-week (δ_d), grade-level (λ_l) and time (in days) (τ_t) fixed effects.[21] Importantly, the inclusion of daily fixed effects in Eq. 2

[20] For example, if income management is introduced on a Monday for school s, then there is no observation for $\tilde{\tau}_{st} = -1$ for that school as no student is expected to attend school on a Sunday.

[21] These are accounted for by including a vector of school and school-day dummies respectively.

effectively controls for a nonparametric time trend in attendance. Finally, ϵ_{isldt} is a stochastic error term and the remaining variables are parameters to be estimated. Our main interest is in $\hat{\beta}$ which captures the effect of income management on the probability of attending school. This has a causal interpretation if the standard conditional independence assumption holds; that is, if – conditional on the other controls in the model – the introduction of income management is unrelated to trends in school attendance rates.

Our review of the administrative process underlying the introduction of income management along with the lack of an empirical relationship between community characteristics and the onset of income management give us confidence that the roll out of income management is not related to school attendance patterns (see Section 2.2). Nevertheless, we can relax our identification assumption by adopting a less-flexible parametric specification for our time fixed effects and allowing the time trend in attendance to vary at the school level. Specifically, we also estimate the following model

$$Y_{islndt} = \alpha + \beta IM_{islndt} + t + \gamma_s + \rho_n + \rho_n\gamma_s + \lambda_l + \delta_d + \epsilon_{islndt} \tag{3}$$

which accounts for a linear time trend t, school-level fixed effects, fixed effects for the four school terms each year (ρ_n), and an interaction between the latter two. Other variables are as defined in Eq. 2. This specification is particularly appealing since school-terms vary approximately with seasons in the Northern Territory, allowing us to control for seasonal patterns in attendance at the school level.[22] In Eq. 3, both the level of and term-specific trend in attendance is allowed to vary across schools.

6 Results

6.1 Attendance

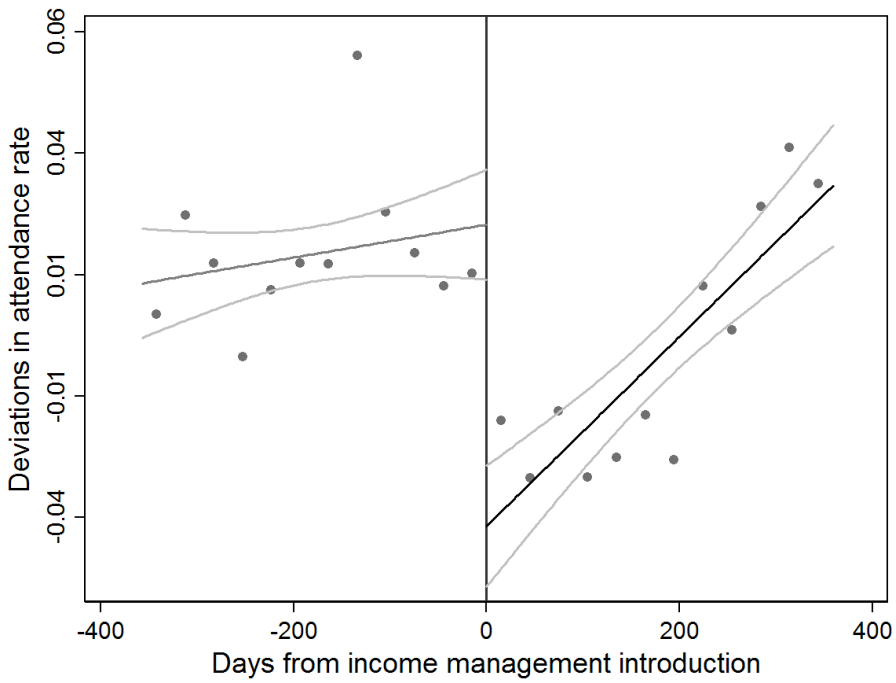
To establish the validity of the maintained assumptions underpinning the difference-in-difference (DD) method, we first present the estimation results obtained from the event study model (Eq. 1). These results are also informative about the longevity of any policy effect.

The estimation of Eq. 1 results in separate estimated coefficients for each of 729 different event-days.[23] These coefficients effectively capture daily changes in attendance levels in the lead up to and following the introduction of income management. In Figure 3, we plot these coefficients and fit linear trends before and after the introduction of income management. To suppress the degree of of noise inherent in daily data we group these coefficients into bins of roughly one month.

[22]The climate in the northern parts of the Northern Territory is tropical, which can result in heavy rain and flooding during in the wet season (November-April) in some areas. This is likely to influence attendance in certain schools at certain times. In 2007 the school terms were as follows: term 1 – 29 January-5 April; term 2 – 16 April-22 June; term 3 – 23 July-28 September; and term 4 – 8 October-14 December. These dates are similar for other years.

[23]In practice, only 717 coefficients are estimated because school holidays and weekends create gaps in the data. The fact that different subsets of schools identify each coefficient contributes to the variation that can be seen in Figure 3.

Figure 3: Dynamics in attendance around the introduction of income management



Notes: Scatter points correspond to coefficients on event-time dummies in Eq. 1. These are binned into 12 groups (approximately one month) each side of the implementation date. The reference group is $\tilde{\tau}_{st} = -365$. Linear trend lines and 95% confidence intervals through these points are also shown.

There is little evidence of any systematic trend in school attendance prior to the introduction of income management (see Figure 3). Certainly, there is no evidence to suggest that school attendance was falling in the lead up to income management; if anything the trend was upwards. At the same time, we observe a discontinuous drop in attendance that occurs precisely at the onset of income management. Attendance rebounds quickly, however, returning to baseline levels in about six to 12 months. These results support the validity of our identification strategy and point to an adverse effect of income management on attendance, counter to the policy's aims.[24]

We turn now to the results of our DD estimation (Eqs. 2 and 3). We present four different specifications: Model 1 is a more parsimonious specification of Eq. 2, including no control variables; Model 2 includes control variables; Model 3 is an exact reflection of Eq.3; and Model 4 includes a full set of interactions between i) school fixed effects, ii) school-term fixed effects, and iii) a linear time trend. Finally, since our event study results point to a dynamic effect of income management on attendance – namely a short-run decrease and subsequent return to trend – we also estimate Models 1 - 4 allowing the treatment effect to vary with

[24]Another common approach for testing the exogeneity of policy timing is to estimate a 'pseudo policy effect' by acting as if the policy was introduced x years earlier and estimating the models on recoded data. We are constrained by the fact our data only go back to 2005; the best we can do is move implementation back two years and estimate our models on the period 2005-2007 (inclusive), which gives us less than one year of pre-policy observations while also coinciding with the introduction of the NTER. Nevertheless, result from this exercise (available on request) support our main results by finding no consistent evidence of a pseudo policy effect.

"days elapsed since the onset of income management". Specifically, we control for separate indicators for if income management was introduced less than 30 days ago, 30-59 days ago, 60-89 days ago, 90-119 days ago, 120-149 days ago and 150+ days ago. Results from models with an aggregate treatment effect are presented in Panel A of Table 4; estimates from models with dynamic treatment effects are presented in Panel B.

Table 4: Regression results: main results

	(1)	(2)	(3)	(4)
Panel A: Single treatment identifier				
Treatment	-0.015***	-0.021***	-0.018***	-0.018***
	(0.003)	(0.004)	(0.003)	(0.003)
Panel B: Treatment effect by time since income management commenced				
<30 days ago	-0.037***	-0.011**	-0.020***	-0.020***
	(0.004)	(0.004)	(0.004)	(0.004)
30-59 days ago	-0.034***	-0.021***	-0.031***	-0.029***
	(0.004)	(0.005)	(0.004)	(0.004)
60-89 days ago	-0.052***	-0.033***	-0.041***	-0.038***
	(0.005)	(0.005)	(0.005)	(0.005)
90-119 days ago	-0.054***	-0.031***	-0.032***	-0.030***
	(0.004)	(0.006)	(0.005)	(0.005)
120-149 days ago	-0.041***	-0.027***	-0.021***	-0.019***
	(0.004)	(0.006)	(0.005)	(0.005)
150+ days ago	-0.006**	-0.005	-0.003	-0.005
	(0.003)	(0.007)	(0.004)	(0.004)
School FE		Y	Y	Y
Time FE		Y		
Time trend			Y	Y
School-Term FE			Y	Y
School×Term			Y	Y
School×Time trend				Y
Time trend×Term				Y
School×Term×Time trend				Y
Grade FE		Y	Y	Y
Day of the week FE		Y	Y	Y
N	3575294	3575294	3575294	3575294
R^2	0.001	0.092	0.094	0.101

Note: Cluster robust (student level) standard errors reported in parenthesis. Outcome variable is an indicator =1 if the student attended school for the whole day at time t. Panel A and Panel B are the results of separate OLS regressions. *,** and *** is statistical significance at the 10%, 5% and 1% level respectively.

We find that income management reduced school attendance by around 2 percentage points (ppts) (see Panel A). Since our data cover around 1.5 years after income management

was introduced, this can be interpreted as the estimated average treatment effect for the short- to medium-term. The result is remarkably stable across specifications. Interestingly, results from Model 1 (no controls) are close to results from the DD estimators, implying that school fixed effects and controls for time trends are not overly important for correctly estimating the policy effect.

Results in Panel B indicate that the average effect masks important dynamics in attendance behaviour. The response in attendance follows a U-shaped pattern. In the immediate 30 days after income management, the DD models estimate a statistically significant decrease in attendance of between 1-2 ppts. The decrease in attendance is highest 60-89 days after income management is introduced at between 3-4 ppts. Estimates for 150+ days after income management are close to zero and statistically insignificant across all DD models. Altogether, our results indicate that income management caused a reduction in school attendance in the short-term. In the medium-term attendance recovered but never beyond baseline trend.

To put our results in perspective, note that our estimates imply that on average students missed 2-3 additional days of school during the first 150 days of income management. Analysis in Hancock et al. (2013) suggests that 'every day counts' in the sense that there is a strictly decreasing relationship between attendance and academic achievement in Australia. On this basis, it is possible that income management would have negatively affected student achievement. However, given the gradients estimated in Hancock et al. (2013) it is also likely this effect was modest.

6.2 Heterogeneity by Gender and Grade Level

There are many reasons to believe that the effect of income management on attendance may vary with students' gender and grade level. Aboriginal boys are less likely to be attending school regularly and have lower levels of educational achievement (test scores) and attainment than do Aboriginal girls. Biddle and Meehl (2016) argue that differences in the way that men and women experience discrimination, high incarceration rates among Indigenous men, and the near absence of job opportunities for uneducated Indigenous women all contribute to the gender gap in educational outcomes for Indigenous students.

Moreover, educational disparities are much starker among high school students, particularly in remote Aboriginal communities. A 2003 review of secondary education in the Northern Territory, for example, pointed to the large number of Indigenous adolescents in remote areas not participating in education at all and noted that "the review team doubts that what is being delivered meets acceptable criteria for secondary education" (Ramsey, 2003, p. 164). A decade later, a subsequent review recommended that secondary education in remote and very remote schools be progressively relocated to urban areas with students accommodated in residential facilities (Wilson, 2013).

We investigate whether income management has heterogeneous effects on school attendance by estimating our extended version of Eq. 3 (Model 4 in Table 5) separately for: i) boys versus girls; and ii) primary (years 1-6) versus secondary (years 7-12) students. The results are reported in Table 5.

We find that the relationship between income management and attendance is similar for boys and girls. In both cases, the impact of income management on attendance follows a

Table 5: Regression results: heterogeneous treatment effects

	Males	Females	Primary	Secondary
<30 days ago	-0.022***	-0.019***	-0.017***	-0.030**
	(0.005)	(0.006)	(0.004)	(0.009)
30-59 days ago	-0.034***	-0.024***	-0.022***	-0.055***
	(0.006)	(0.006)	(0.005)	(0.010)
60-89 days ago	-0.048***	-0.029***	-0.036***	-0.050***
	(0.006)	(0.007)	(0.005)	(0.011)
90-119 days ago	-0.038***	-0.022***	-0.028***	-0.040***
	(0.006)	(0.007)	(0.005)	(0.011)
120-149 days ago	-0.015**	-0.023***	-0.015**	-0.030**
	(0.006)	(0.007)	(0.005)	(0.011)
150+ days ago	-0.004	-0.007	0.000	-0.019*
	(0.006)	(0.006)	(0.004)	(0.010)
N	1837224	1738070	2921087	654207
R^2	0.111	0.098	0.097	0.129

Note: All results are based on estimation of the extended version of Eq. 3, which includes a full set of interactions between i) school fixed effects, ii) school-term fixed effects, and iii) a linear time trend (see Model 4 of Table 4), for the relevant sub-sample of students. Cluster robust (student level) standard errors reported in parenthesis. Outcome variable is an indicator =1 if the student attended school for the whole day at time t. *,** and *** is statistical significance at the 10%, 5% and 1% level respectively.

U-shaped pattern; attendance first falls, then rebounds and after 150 days becomes insignificant. The largest downturn in attendance occurs between 60 - 89 days after the introduction of income management and is slightly deeper for boys (5 ppt) than girls (3 ppts). There is more evidence of heterogeneity across school level. The impact of income management is always larger in magnitude for secondary school students at all time periods after income management is introduced. Most concerning, the policy effect is still negative and relatively large (2 ppts) after 150+ days, although this estimate is only significant at the 10% level. This is weak evidence that income management may have had ongoing harmful effects on attendance for secondary school students.

7 Possible Mechanisms

The program logic predicted that income management would improve attendance by redirecting spending away from things that can cause social harm towards things that are good for child welfare, such as food, clothing and school supplies. This would in turn improve the health of children and the attentiveness of parents, leading to lower absenteeism. In addition, the program was expected to improve safety and reduce financial harassment, which may have also led to greater school engagement.

In contrast, our results indicate that income management reduced attendance in the

short-term. In this section, we consider whether our results can be explained by: i) other policies introduced under the NTER; ii) changes in student enrollments; iii) changes in student mobility; and iv) implementation problems with the policy. We find no support for the first three of these explanations. However, we do find evidence that implementation issues may have been responsible for the temporary downturn in school attendance.

7.1 Other NTER measures

As we discussed in Section 2, the policy environment was not stable during the introduction of income management. Under the NTER, there were several other programs that were also being rolled out to communities. These included store licensing, child health checks, additional police support and various infrastructure projects. Details on the major measures that were introduced as part of the NTER are in Appendix B.

One concern is that our results may be picking up the effect of these other measures. There are several reasons why we think this is unlikely. First, no measure perfectly mirrored the roll-out pattern of income management. In Table 6 we report the cumulative coverage of the major NTER programs across communities between July 2007 and July 2008 (by which point income management had reached 94 percent of targeted communities). Bans on alcohol and pornography occurred almost immediately. Extra police and related measures were only received by a minority of communities over the period. The school nutrition program seems to have been rolled out on a similar time-line to income management. However, it is difficult to envisage how this measure would reduce attendance, since it provided an incentive to attend school.[25]

We are further convinced that our results are picking up the effect of income management by our event study analysis. In Figure 3, the decrease in attendance occurs precisely when income management is introduced in each community. Given that no other policy mirrored the roll-out of income management, it would be a strong coincidence to observe this if it was due to other parts of the NTER. For the same reason, it is also unlikely that our results are due to a general negative response to the NTER. Note also that any macroeconomic response to the NTER in general, such as collective sentiment, should be captured by our time fixed effects in Eq. 2. Altogether, we find it unlikely that confoundedness with other NTER measures explains our results.

7.2 Enrollment

Although school enrollment is mandatory until age 17 in the Northern Territory, in practice many children living in the remote Aboriginal communities that comprise our sample are not enrolled in school (Wilson, 2013). In this section we explore the question; could income management have influenced enrollment? The program logic predicts that, if anything, enrollment should have increased. If enrollment did increase, our results on attendance may

[25] We have also been unable to confirm whether it followed the same spatial pattern as income management. Although we are not aware of any formal evaluation of the school nutrition program, a descriptive analysis by Yu et al. (2008) found no evidence of improved attendance when comparing a sample of schools that were early recipients of the measure to later recipients.

Table 6: Roll-out of major NTER measures

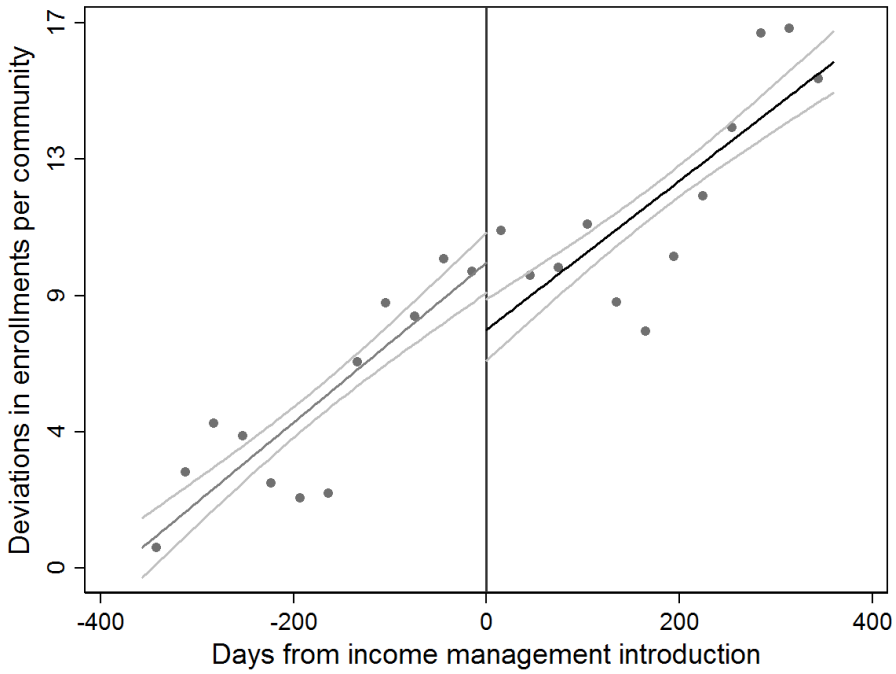
Measure	Jul-Sep 2007	Oct-Dec 2007	Jan-Mar 2008	Apr-Jul 2008
Welfare reform and employment				
Income management	4 (4.8)	23 (27.7)	33 (39.7)	78 (94.0)
Store license	2 (3.7)	8 (14.8)	18 (33.3)	54 (100.0)
RAEs lifted	15 (23.0)	65 (100.0)	65 (100.0)	65 (100.0)
CDEP transition	3 (3.6)	30 (36.1)	30 (36.1)	30 (32.5)
CEBs	25 (35.6)	38 (53.4)	54 (76.7)	69 (83.1)
Education and child health				
Child health checks	22 (26.5)	48 (57.8)	69 (83.1)	81 (97.6)
School nutrition	3 (4.4)	7 (9.6)	25 (34.2)	68 (93.2)
Accelerated literacy	0 (0.0)	0 (0.0)	0 (0.0)	30 (81.1)
Quality teacher package	0 (0.0)	0 (0.0)	0 (0.0)	34 (85.0)
Law and order				
Banning alcohol	73 (88.0)	83 (100.0)	83 (100.0)	83 (100.0)
Banning pornography	73 (88.0)	83 (100.0)	83 (100.0)	83 (100.0)
Night patrols	0 (0.0)	0 (0.0)	1 (2.2)	14 (39.1)
Extra police	6 (8.2)	12 (16.4)	16 (21.9)	17 (23.3)
THEMIS police station	6 (8.2)	12 (16.4)	16 (21.9)	17 (23.3)
Family support				
Safe house	0 (0.0)	0 (0.0)	0 (0.0)	10 (13.7)
RAFCW	0 (0.0)	0 (0.0)	0 (0.0)	12 (14.4)
Child special services	0 (0.0)	0 (0.0)	0 (0.0)	12 (14.4)
Housing and land				
Leases	27 (39.7)	27 (39.7)	65 (95.6)	68 (100.0)
All CCU works completed	0 (0.0)	0 (0.0)	0 (0.0)	72 (98.6)
Governance				
GBMs	12 (14.8)	67 (82.7)	81 (100.0)	81 (100.0)

Source Yu et al. (2008). Figures for each quarter are the cumulative number of communities that received the measure by the end of that quarter. The percentage of communities to have received the measure relative to the target number of communities is in parenthesis. For details on each measure see Appendix B.

simply be picking up a type of negative self-selection effect. For example, income management may have encouraged students who were previously un-enrolled to enroll; however these students also happened to have lower attendance propensity.

We do not observe the actual enrollment rate in our data, since we only have information on those attending school. However, we do know the aggregate number of students enrolled in each school on each day. If income management influenced enrollment decisions, then we should see an increase in the number of students following the policy's introduction. To explore this we estimate our event study model (Eq. 1) but replace the unit identifier with communities and the outcome variable with the number of students enrolled in community c at time (day) t. Again, we obtain the coefficients on the event-time indicators (which identify the deviation in the number of students enrolled in each school relative to the reference group $\tilde{\tau}_{ct} = -365$) and plot these relative to the onset of income management. The results are in Figure 4.

Figure 4: Dynamics in enrollments around the introduction of income management



Notes: Scatter points correspond to coefficients on event-time dummies in Eq. 1 with student enrollment as the outcome variable and community as the unit of observation. These are binned into 12 groups (approximately one month) each side of the implementation date. The Y-axis represents deviations in the average number of enrolled students with $\tilde{\tau}_{ct} = -365$ used as the reference group. Linear trend lines and 95% confidence intervals through these points are also shown.

Enrollment is increasing with time due to the growing population. To better understand the magnitude of growth note that for $\tilde{\tau}_{ct} = -365$ the average number of students per community is 59. Importantly, note there is no indication that the trend in enrollment changes at the onset of income management (the small drop indicated by the linear trend lines is driven by functional form). In particular, between ± 150 days there is a relatively stable trend in enrollment. There is some indication that enrollment increases more rapidly around 150 days before income management commences. At this time, there is an approximately 1.5 percent increase in students. This may reflect other parts of the NTER. For example, the increased police presence in some communities may have led to greater enforcement of student enrollment. Overall, there is no indication income management influence school enrollments and therefore changes in enrollments are unlikely to explain the estimated reduction in attendance.

7.3 Geographic mobility

Geographic mobility is high within the Nothern Territory's Aboriginal communities – families frequently relocate for social and cultural reasons, such as ceremonies and the maintenance of kinship (Memmott et al., 2006). There were concerns that income management would inhibit such movements, since clients would need to organize through Centrelink ways to access their income outside the home community ahead of travel (AIHW, 2010). The introduction of the Basics Card helped to address this (AIHW, 2010), but this method for accessing funds was

not available when income management was first introduced.[26]

If mobility patterns changed at the onset of income management, our results could be reflecting a self-selection effect. To explore geographic mobility patterns we use data from the entire Northern Territory and divide schools into those that are in communities selected for income management (IM communities) and all other communities (non-IM communities). Geographic mobility is measured by identifying when students change schools into a new community (intra-community school moves are not counted as moves). We focus on dynamics in in-migration and out-migration for IM communities. In-migration is the number of students joining community c on day t, which includes students joining from other IM communities (IM to IM moves), from non-IM communities (non-IM to IM moves) or from outside our administrative dataset (which could be interstate moves or moves between the private/public sector). Out-migration is reverse of these. The most common type of move is IM to IM, accounting for 56 percent of the moves we observe in 2008 (IM to non-IM and non-IM to IM moves account for a roughly even share of the remaining 44 percent). We observe only a small number of students joining/leaving our dataset over the period.[27]

Our main approach for analysing the mobility data is similar to our approach for enrollments; we estimate event study models of the same form as Eq. 1 but change our observational unit to communities rather than individuals and replace the outcome variable with either in-migration or out-migration (divided by the number enrolled students for the community). Again, we plot the event-day coefficients against time since the onset of income management with the expectation that there is no change in the mobility trend around the policy's introduction.

In Figure 5 we plot the relationship between time since the onset of income management and in-migration (left) and out-migration (right).[28] The Y-axis is the deviation in the relevant mobility rate with $\tilde{\tau}_{st} = -365$ set as the reference group. Focusing first on in-migration, there is no clear pattern in the data and certainly no evidence that mobility changes around the onset of income management. There is some indication of a small increase in out-migration around the time income management commenced. However, there is also considerable variability in the data and this result is not significant. Overall, Figure 5 provides no strong evidence that student mobility was affected by income management.

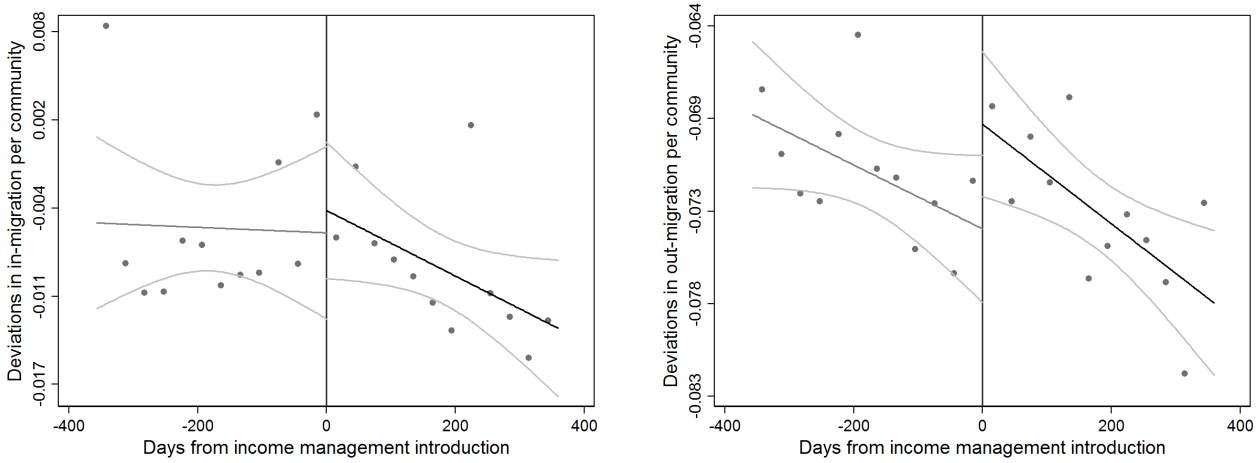
A different way of assessing whether mobility is important is to focus our attention on students with low historical propensities to move. This helps to deal with the possibility that, for example, students with a low attendance propensity were more likely to move away

[26]Another possibility is that mobility increased before the introduction of income management due to people trying to avoid the policy. We are sceptical of this effect. Virtually all Aboriginal communities were ultimately subject to income management. In order to avoid the policy, the person would need to move away from Aboriginal land. Such moves are to our knowledge much less common than moves within Aboriginal communities (in our data a disproportionate number of moves occur within income managed communities). Note also that once income management commenced in a community, people were still subject to the policy even if they moved away.

[27]In 2008 there were 376 instances of students joining IM schools and 359 exits, which is a small fraction of the 6,665 students enrolled in IM schools that year. Note we do not include students entering grade 1 or exiting grade 11-12 in these counts as they may be commencing/finishing school.

[28]In results omitted for brevity (but available on request) we also set total mobility as an outcome variable (i.e. in-migration + out-migration divided by enrollments); finding no evidence of any effect around the onset of income management.

Figure 5: Student mobility



Notes: Scatter points correspond to coefficients on event-time dummies in Eq. 1 with different measure of mobility as the outcome variable and community as the unit of observation. These are binned into 12 groups (approximately one month) each side of the implementation date. The Y-axis represents deviations in the average amount of daily mobility with $\tilde{\tau}_{ct} = -365$ used as the reference group. Linear trend lines and 95% confidence intervals through these points are also shown. Left: the outcome variable is the total number of students moving into the community divided by the number of students already enrolled in the community on day t. Right: the outcome variable is the total number of students leaving the community divided by the number of students enrolled in the community on day t.

from a community when income management commenced. To do this we restrict our sample to only those students with no moves between 2006-2009.[29] We then estimate our main models on this sub-sample of students. For brevity, we report the results in Appendix A (Table A1). Because so many students change schools, this exercise reduces our sample size by 55 percent. Nevertheless, we still estimate the same response to income management – namely a short-run reduction in attendance of up to 3 ppts and no effect on attendance after 150 days. We conclude that changes in mobility are unlikely to explain our results.

7.4 Implementation Issues

Problems with the implementation of income management are well documented (see Section 2). These include a lack of consultation, confusion about how the policy would operate, difficulty accessing funds, difficulty checking account balances and increased hassle costs associated with mobility. Centrelink hours needed to be extended to meet the increase in service demand (FAHCSIA, 2008). It is even likely that some people experienced a real decrease in purchasing power, at least in the short-term. For example, on 30 November 2007, 22.6% of income management clients were having their money defaulted to an income management account, rather than delivered in ways that could be used to purchase priority goods and services (AIHW, 2010). There was also widespread dissatisfaction with the compulsory nature of the policy; many of those directly affected felt like they were unfairly targeted and did not need to be income managed (Yu et al., 2008; AIHW, 2010). Another aspect that was poorly received by some was that income management hindered the sharing of resources within families (AIHW, 2010). Remote Aboriginal communities tend to be

[29]Note this is not a balanced panel as it still includes students entering our sample in grade 1 or exiting our sample in grades 11-12 during the period.

highly collectivist and resource sharing is an important social institution.[30]

One hypothesis is that the poor implementation of income management, coupled with widespread negative sentiment, reduced social capital and undermined the intent of the policy. For example, Cameron and Shah (2014) show how a poorly targeted social welfare program in Indonesia reduced social capital in communities; Ethridge and Percy (1993) and Meier and McFarlane (1995) link fidelity in the implementation stage to success for social welfare programs in the United States. It is possible that rather than promoting greater school engagement from students and parents, income management had a deleterious effect by disrupting the lives of families in Aboriginal communities in a poorly managed way.

To test whether implementation issues could be driving our results, we take advantage of a reform that significantly improved the operation of income management; the Basics Card. We posit that, if implementation issues are driving our results, then we should see attendance improve after the introduction of this measure. The Basics Card (discussed in Section 2.1) overcame many of the operational problems associated with income management. Clients could use the card to purchase goods and services in the same way as a regular debit card. Prior to this, clients could only purchase priority goods from a nominated community store, or needed to arrange through Centrelink store cards to be used elsewhere. As a result, the Basics Card significantly reduced the transaction costs associated with income management, particularly with regards to travel outside the home community. It may have also helped to restore social capital by allowing family members to pool resources. Although Basics Cards were protected by a PIN code, and clients were not strictly allowed to share their card and PIN, in practice many people admit to doing this (AIHW, 2010; Bray et al., 2014). Qualitative evidence suggests that people saw the Basics Card as a significant improvement to the operation of income management (AIHW, 2010).

The Basics Card was first introduced on 8 September 2008 and rolled out to income management clients until 15 December 2008 (i.e. three months). While we do not have access to the roll-out schedule for the Basics Card, data on aggregate allocations of income managed funds imply the roll-out predominately occurred in the first month. Allocations of income managed funds to store cards dropped from more than 20 percent to around 5 percent between the introduction of the Basics Card and 10 October 2008 and then progressively dropped towards zero by the time the roll-out was completed (AIHW, 2010).

To estimate whether the Basics Card mitigated the negative effect of income management on attendance, we estimate Models 1, 3 and 4 in Table 7 including an additional dummy variable for if $t \geq 8$ September 2008 (i.e. when the Basics Card was introduced).[31] This approach effectively acts as if the Basics Card was introduced across the whole Northern Territory on a single day. While this is not strictly correct, we note that since the measure was rolled-out relatively quickly, any bias is likely to be small and in addition will be towards zero. Our results from this exercise are reported in Table 7. Because we are interested in explaining the dip in attendance following income management, we estimate the models allowing the treatment effect to vary with time since implementation.

[30]Note however that one of the goals of income management was to reduce "humbugging" (the practice of harassing typically elderly and female family members for money). The new constraints on income sharing may have helped to address this problem.

[31]Note we cannot identify the coefficient on this variable in Model 2 due to the inclusion of time fixed effects.

Table 7: Regression results: Mitigating effect of Basics Card

	(1)	(2)	(3)
<30 days ago	-0.036***	-0.020***	-0.020***
	(0.004)	(0.004)	(0.004)
30-59 days ago	-0.033***	-0.031***	-0.029***
	(0.004)	(0.004)	(0.004)
60-89 days ago	-0.049***	-0.043***	-0.041***
	(0.005)	(0.005)	(0.005)
90-119 days ago	-0.049***	-0.036***	-0.036***
	(0.005)	(0.005)	(0.005)
120-149 days ago	-0.034***	-0.026***	-0.028***
	(0.005)	(0.005)	(0.005)
150+ days ago	0.005	-0.011**	-0.019***
	(0.006)	(0.005)	(0.005)
Basics Card	-0.012**	0.010**	0.016***
	(0.005)	(0.004)	(0.004)
School FE		Y	Y
Time trend		Y	Y
School-Term FE		Y	Y
School×Term		Y	Y
School×Time trend			Y
Time trend×Term			Y
School×Term×Time trend			Y
Grade FE		Y	Y
Day of the week FE		Y	Y
N	3575294	3575294	3575294
R^2	0.001	0.094	0.101

Note: Cluster robust (student level) standard errors reported in parenthesis. Outcome variable is an indicator =1 if the student attended school for the whole day at time t. Basics Card is an indicator for if t is after this policy was introduced. *,** and *** is statistical significance at the 10%, 5% and 1% level respectively.

Our estimates still indicate the same U-shaped response to income management. However, we also see that once we control for the introduction of the Basics Card, the coefficient for 150+ days is now negative and significant. In our DD specifications, this coefficient implies a 1-2 ppts decrease in the probability of attending school. Critically, the coefficient on the Basics Card is positive and of similar magnitude to this. In the medium-term, the positive effect from the Basics Card fully offsets the negative effect from income management and explains why we find no effect from income management after 150 days in our main estimations. This result is consistent with the hypothesis that implementation issues explain the short-run decrease in attendance caused by income management; when the implementation

improved so did attendance. Nevertheless, the coefficient on the Basics Card is only large enough to offset the initial effects of income management – we still find no evidence that the policy ever had a positive effect on attendance.

8 Conclusion

To be written

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Appendix A

Table A1: Regression results: non-movers only

	(1)	(2)	(3)
Panel A: Single treatment identifier			
Treatment	-0.018**	-0.009**	-0.007
	(0.006)	(0.004)	(0.004)
Panel B: Treatment effect by time since income management commenced			
<30 days ago	-0.007	-0.013**	-0.012**
	(0.006)	(0.006)	(0.005)
30-59 days ago	-0.014*	-0.022***	-0.018**
	(0.007)	(0.006)	(0.006)
60-89 days ago	-0.033***	-0.038***	-0.033***
	(0.008)	(0.006)	(0.006)
90-119 days ago	-0.032***	-0.026***	-0.022***
	(0.008)	(0.006)	(0.007)
120-149 days ago	-0.021**	-0.006	-0.002
	(0.009)	(0.006)	(0.006)
150+ days ago	-0.001	0.008	0.008
	(0.010)	(0.006)	(0.006)
School FE	Y	Y	Y
Time FE	Y		
Time trend		Y	Y
School-Term FE		Y	Y
School×Term		Y	Y
School×Time trend			Y
Time trend×Term			Y
School×Term×Time trend			Y
Grade FE	Y	Y	Y
Day of the week FE	Y	Y	Y
N	1620269	1620269	1620269
R^2	0.110	0.111	0.120

Note: Cluster robust (student level) standard errors reported in parenthesis. Outcome variable is an indicator =1 if the student attended school for the whole day at time t. Non-movers are those students who have not changed communities between 2006-2009 (inclusive) according to the school attendance data. *,** and *** is statistical significance at the 10%, 5% and 1% level respectively.

Appendix B

Welfare reform and employment

Income management – Involved quarantining 50 percent of most welfare payments. Transfer payments subject to income management were: Newstart allowance; Disability support pension; Parenting payments (partnered/single); Carer allowance; Carer payment; Youth allowance, Age pension; ABSTUDY; Family tax benefits Part A and B. Income management applied to all recipients of these benefits unless they obtained an exemption. Exemptions could be given to: i) students living away from home or whose payments are received by a third party; ii) temporary residents to a community; iii) persons who moved indefinitely away from a community; iv) persons in the community to assist with the NTER; v) persons with little connection to the community. One-off payments (including the Baby Bonus) were subject to 100 percent income quarantining. Quarantined income could not be spent on alcohol, tobacco, pornography or gambling.
Store licence – The licensing of community stores was a precondition for the introduction of income management to ensure that participants had at least one local option for buying necessities with their managed funds. To obtain a licence stores needed to demonstrate sound financial practices with regards to stock and pricing. Centrelink clients could organize to access their income management funds at licensed stores, with the store-operator responsible for ensuring the income was not spent on prohibited items.
Remote area exemptions (RAEs) lifted – RAEs refer to exemptions given to job seekers on the required obligations in order to receive welfare support. This measure aligned the requirements for urban and rural job seekers.
Community Development Employment Projects (CDEP) transition – CDEP is a Government program whereby community members agree to pool unemployment benefits and have them paid as a type of wage in exchange for participation in various local community initiatives. Under the NTER, CDEP was to be phased out. However, the decision was overturned in April 2008 and CDEP was reinstated.
Community Employment Brokers (CEBs) – CEBs were employed to coordinate employment services under the NTER until mid-2009.

Education and child health

Child health checks – Child health checks involved clinicians visiting areas covered by the NTER and conducting voluntary health assessments of children aged 15 years and under. Under the measure between 57-65 percent of eligible children were seen by a physician (Matheson & Hardie-Boys, 2011).
School nutrition – Under this measure, schools provide breakfast and lunch to students, paid for by parents.
Accelerated literacy – A teaching program for enhancing literacy skills across all ages.
Quality teacher package (QTP) – the QTP is a professional development framework focused on improving the skills of local Indigenous staff in communities.

Law and Order

Banning alcohol – Serious penalties associated with possession, use and supply of alcohol in affected communities.
Banning pornography – Made it an offence to possess or supply pornographic publications, videos or refused classification material.
Night patrols – Night patrols are community led services that aim to resolve issues of conflict and crime in a culturally appropriate way. The exact operation and role of night patrols is fluid and differs across communities.
Extra police – Additional police officers were placed in some communities.
THEMIS police station – Operation THEMIS involved the construction new police stations in 18 communities.

Family support

Safe house – Additional safe houses were constructed or expanded. Safe houses provide sanctuary to people escaping family violence. Funding was also allocated to cooling off houses, which are used by people to avoid committing family violence.
Remote Aboriginal family and community workers (RAFCWs) – These workers provide support and community education in the area of child protection. RAFCWs were placed in 13 communities and provided outreach services to a further 20 communities (FAHCSIA, 2011).
Child special services – Under this measure an Aboriginal Mobile Outreach Service was established, which involved teams of counsellors and social workers who provided support to children, adolescents and families in matters of sexual assault.

Housing and Land

Leases – Compulsory five-year leases were used by the Australian Government as a legal basis for undertaking infrastructure and community service projects on Aboriginal land.
All Community Clean Up (CCU) works completed – Funding was provided for several measures to improve the safety and condition of existing buildings. These included property assessments, minor vital repairs, make safe works and an asbestos survey.

Governance

Government Business Managers (GBMs) – GBMs were employees of the Department of Families, Housing, Community Services and Indigenous Affairs (Australian Government) who were allocated to NTER communities and tasked with coordinating all government services for that community.