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IZA DP No. 11514

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ABSTRACT

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

We analyze the impact of a recent initiative by the Australian Government to reduce disadvantage and improve children's welfare in Aboriginal communities. The policy – known as income management – quarantines 50 percent of welfare payments to be spent on priority goods (e.g., food, housing, education) and not on socially harmful goods (drugs, pornography, gambling). Our focus is on children's school attendance, which is a precise, high-frequency measure of community functionality and a key policy objective. We identify the causal impact of income management on attendance rates by exploiting exogenous variation in its staggered rollout across communities. We find no evidence that income management increased attendance. Rather, the introduction of income management reduced attendance by 2.7 percentage points (4 percent) on average in the first five months after which attendance eventually returned to its initial level. The attendance penalty is similar for boys and girls, but is larger for secondary school students and students with a tendency to attend school regularly. Exploring the potential mechanisms, we show that income management did not significantly affect student enrollments or mobility patterns into and out of Aboriginal communities. Nor are our results explained by confoundedness with other policy initiatives. Instead, we find that the attendance penalty associated with the introduction of income management is virtually zero after the adoption of more exible administrative arrangements suggesting that implementation issues may be responsible for the temporary reduction in school attendance that we observe.

JEL Classification: D04, I28, I38

Keywords: income management, in-kind transfers, policy evaluation, Indigenous disadvantage, welfare quarantining

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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 Federal Government to address the behavioral causes of disadvantage in Aboriginal communities in the Northern Territory by quarantining welfare benefits.[2] The policy – known as income management – quarantines 50 percent of welfare payments to be spent on meeting priority needs rather than on less socially-desirable goods such as alcoholic beverages, tobacco products, pornographic material and gambling services. Although priority and excluded items are both defined in the legislation,[3] in practice

[1] Cornell (2006) discusses the differences in historical and contemporary 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, but like other citizens are also subject to the laws of the country in which they live (Brady, 2000).

[2] 'Aboriginal and Torres Strait Islander' is the preferred terminology for referring to the Indigenous peoples of Australia. According to the official definition, "an Aboriginal or Torres Strait Islander is a person of Aboriginal or Torres Strait Islander descent, who identifies as being of Aboriginal or Torres Strait Islander origin and who is accepted as such by the community with which the person associates" (Australian Institute of Aboriginal and Torres Strait Islander Studies, 2012). This definition has informed the standard Indigenous status question used in the Census, ABS surveys, and other official administrative records. People are typically asked to identify whether they are 'Aboriginal', 'Torres Strait Islander' or 'Both Aboriginal and Torres Strait Islander'. We will refer to people of Aboriginal or Torres Strait Islander descent 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.

[3] Priority items are defined in the Social Security and Other Legislation Amendment (Welfare Payment Reform) Act 2007 No. 130, 2007, Section 123TH. Excluded items are all items not specified in the priority item list and are defined in the Social Security and Other Legislation Amendment (Welfare Payment Reform) Act 2007 No. 130, 2007, Sections 123TI and 123 TJ.

income managed funds could be spent on anything other than excluded goods and services. Income management targets Aboriginal communities, is compulsory, and left communities with little choice over when and how it was rolled out. Its legislation was part of a reform package – the Northern Territory Emergency Response (NTER) – implemented in response to a highly publicized report documenting high levels of child sexual abuse and family violence within these communities (Wild & Anderson, 2007). The core objective of income management was to "stem the flow of cash going towards substance abuse and gambling and ensure that funds meant to be for children's welfare are used for that purpose" (Brough, 2007b). By restricting welfare payments, the legislation aimed "to promote socially responsible behaviour, particularly in relation to the care and education of children".[4] Informally, the aims of quarantining welfare payments also included an attempt to protect vulnerable family members – especially women – from financial exploitation and demands for money from relatives, a practice known as 'humbugging' (see Howard, 2007). Thus, income management involves an element of female empowerment, which is associated with better outcomes for children (Duflo, 2012).

Income management had a broad reach. The communities targeted for income management are extremely disadvantaged and have high rates of welfare dependence. Moreover, income management applied to virtually all social assistance benefits including child care benefits, family tax benefits, and old-age pensions, not just those welfare benefits directed towards low-income families (e.g., unemployment benefits, parenting payments, disability payments) (see Appendix Table A1).[5] The consequence is that approximately 55 percent of all adults in prescribed communities were being income managed by the end of the rollout; around 75 percent of adults had been income managed at some point between the start of the rollout (September 2007) and March 31, 2009 (AIHW, 2010). As Australia's social security system specifically targets families with children, it is likely that virtually all parents of the children in our sample would have been income managed after the

[4]Social Security and Other Legislation Amendment (Welfare Payment Reform) Act 2007 No. 130, 2007 123TB Objects, Section (a). The legislation (123TB Objects, Section (c)) further stated that it should ensure that "the amount set aside is directed to meeting the priority needs of (i) the recipient of the welfare payment; and (ii) the recipient's partner; and (iii) the recipient's children; and (iv) any other dependants of the recipient."

[5]The Australian social security system delivers benefits to a broad cross-section of the population. Unemployment benefits, for example, are a key element of the social security system and are paid out of general tax revenue rather than through an insurance mechanism, while income for older individuals is guaranteed through pensions which are income- and asset-tested. Australia's child care and family-tax payments correspond to the child care rebates and earned income tax credits provided through the U.S. tax system.

policy commenced in their communities.

Although the welfare of children took centre stage in the debate over the NTER, little empirical evidence has been brought to bear on the impact of restricting welfare payments on children's outcomes. This study will be the first to provide sound empirical evidence on the policy's impact on Aboriginal children's welfare. We focus our analysis on daily school attendance rates, which is a systematically recorded, high-frequency measure of community functionality. Although boosting school attendance rates in the Northern Territory was not a formally specified goal of the policy's legislation, it was expected to improve as a consequence of the policy nonetheless.[6] Improving school attendance rates is a first-order policy concern in regions where attendance rates are critically low (see Kremer & Holla, 2009, for a review of the literature). The hope was that by redirecting consumption decisions to improve children's nutrition and purchase education-relevant goods, protecting and stabilizing family life, and empowering women, income management would improve school attendance rates.

We identify the causal impact of income management by exploiting exogenous variation from the staggered rollout of the policy across communities. Because its initial rollout was place-based, benefit recipients were automatically income managed if they had lived in a prescribed community at any point between the time the policy was legislated and the time it was rolled out. This left very little room for exemptions. Our empirical strategy relies on the estimation of difference-in-difference models. 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. The resulting estimates have a causal interpretation so long as the rollout of income management is unrelated to trends in school attendance rates. We investigate the plausibility of this identification assumption by: i) carefully reviewing the administrative process underpinning the rollout; ii) examining the

[6]The Federal Government had high expectations that, once the new social security legislation measures were implemented in each community, all children of compulsory school age would be enrolled at and attending school. To cater for the increased demand of education services, the Federal Government therefore committed to a series of infrastructure and curriculum initiatives to enhance education (e.g., more classrooms, quality-teaching packages etc.). The education enhancement initiatives were intended to be carried out mainly through a Memorandum of Understanding between the Australian and Northern Territory Governments signed on 16 September 2007. The legislation allowed for the quarantining of up to 100 percent of welfare payments for families whose children are not attending school. However this part of the legislation was never implemented (Yu et al., 2008, p. 29).

relationship between community characteristics and program rollout; 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 reduce the potential for any remaining unobserved heterogeneity to confound our estimates by controlling for school-, day-, day-of-the-week-, and grade-level fixed effects and allowing each school to have its own season-specific time-trend.

Our research builds on a growing literature that exploits variation in implementation timing to evaluate the impact of major social programs (Ludwig & Miller, 2007; Finkelstein & McKnight, 2008; Hoynes & Schanzenbach, 2009; Cascio et al., 2010; Hoynes et al., 2011; Bailey, 2012), empowerment zones (Busso et al., 2013) and community health centers (Bailey & Goodman-Bacon, 2015). We are the first to evaluate the effectiveness of income management as a strategy for reducing social disadvantage among Aboriginal children. Importantly, we consider the differential effect of income management on the attendance rates of boys vs. girls, primary vs. secondary school students, and students with high vs. low levels of school attendance. Aboriginal boys are at an educational disadvantage relative to Aboriginal 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). Students with particularly low levels of school attachment are considered especially vulnerable because they are at the brink of disengaging entirely with the formal education system (Prout, 2008). In light of this, it is important to understand whether income management has heterogeneous effects on students' school attendance.

We find no evidence that income management led to an increase in student attendance. Rather, the introduction of income management reduced school attendance by 2.7 percentage points (4 percent) on average in the first five months after which attendance rates eventually returned to their initial levels. The attendance penalty is similar for boys and girls, but is stronger for secondary school students. Interestingly, the drop in attendance is not confined to students with low school attachment. Students with an above median propensity to attend school experienced greater (both in absolute an relative terms) reductions in school attendance as a result of income management. Our results are robust to a variety of modelling specifications and sensitivity checks.

We explore four key mechanisms – concurrent policy initiatives, geographic mobility patterns, student enrollments and implementation issues – through which income management may have reduced school attendance. Many programs and infrastructure projects were launched as part of the NTER; thus, it is important to consider the extent to which the relationship between income management and attendance is driven by concurrent policy effects. Moreover, Aboriginal families frequently leave their 'home' communities to travel to other remote communities for social and cultural reasons (Memmott et al., 2006), creating substantial attendance (and enrollment) churn as students enter and exit schools (Taylor & Dunn, 2010). Income management may have affected school attendance by increasing families' incentives or ability to temporarily leave their communities. At the same time, many children in the remote communities under study are not enrolled in school at all (Wilson, 2013), raising the potential for changing enrollment patterns to drive the relationship between income management and school attendance.

Furthermore, we carefully consider whether the way that income management was implemented may have reduced school attendance. The way that social and economic programs are implemented is often a defining factor in whether those programs achieve their intended goals (see Durlak & DuPre, 2008; Cerna, 2013). The lacklustre performance of the Learnfare initiative that linked families' welfare payments to the school attendance of their teenage children, for example, is due in part to the failure to fully overcome the challenges associated with administering it (Ethridge & Percy, 1993). The form that financial incentives (or sanctions) take (Dee, 2011), the coherence of the underlying statutes (Meier & McFarlane, 1995), and the way that parents are engaged (Gennetian, Darling, & Aber, 2016) can all matter for program outcomes. 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); each may have reduced children's school attendance.

We demonstrate that 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 transfers. Nor is it due to concurrent policy initiatives. Instead we find that the attendance penalty associated with the introduction of income management is virtually zero after the adoption of more flexible adminis-

trative arrangements suggesting that implementation issues may be responsible for the temporary reduction in school attendance that we observe.

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 that 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 (Central Land Council, 2008; AIHW, 2010). Evidence based on sound policy evaluation methods has been lacking. Despite this, 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.

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 246,000 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 – 51.0 percent of the population in remote areas – despite constituting only 2.8 percent of the Australian population overall (ABS, 2016). 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; Martin, 2017; Walter, 2017, for reviews). In particular, people see themselves in relation to others in their local

communities as well as in other remote areas, making it 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). Although parents have high educational aspirations for their children (Walter, 2017), 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; Trudgett et al., 2017). Low levels of school engagement and achievement have left critics arguing 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 issue and identify possible policy responses. The board's report was finalized in April 2007 (Wild & Anderson, 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, 2007a, 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. The NTER package was legislated on July 17, 2007, less than one month after it was announced.

Income management is the cornerstone of the NTER. Once income management begins in a community, 50 percent of residents' welfare entitlements (most income support and family assistance transfers) is paid in the usual way. The remaining 50 percent is retained by Centrelink[7] in an individual account to be allocated to a combination of priority goods.[8] Initially, people accessed their income-managed funds in three ways. First, in remote areas, purchases could be made at a licensed community store which would deduct funds from people's income-management accounts

[7]Centrelink is the Australian Government agency responsible for administering all transfer payments.
[8]Most advances, lump-sum payments and baby bonus installments were quarantined fully.

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 welfare recipients' income-management accounts.

Early reviews of income management documented numerous implementation problems including a lack of understanding about the policy, difficultly in accessing funds (especially when outside home communities and/or Centrelink's operating hours) and difficulty checking account balances (Central Land Council, 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.[9] 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 previous options for accessing income-managed funds (AIHW, 2010).

Exact expenditure data is not available for the sample period, but the majority of the allocated Centrelink funds under income management were spent on food (64 percent), housing (9.1 percent), store cards (6.3 percent), and clothing and footwear (5.9 percent). Some funds were allocated to a school nutrition program (2.6 percent), and a small fraction was allocated to education (less than 1.7 percent, bundled in a category called Other). Once the Basics Card was introduced, almost 100 percent of the allocated funds were in the categories food, housing and household goods (AIHW, 2010).

2.2 The Rollout 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.[10] The rollout occurred in clusters of typically three to four communities simultaneously in the northern and southern parts of

[9]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 www.mobiletransaction.org/australian-eftpos-system/.

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

the Northern Territory. Figure 1 highlights the progressive coverage of income management across communities.

[Figure 1 about here.]

The rollout of income management was not strictly random; several conditions needed to be met before income management began, none of which related specifically to schools or 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 merchandise availability that could be licensed to participate in the scheme. The objective was to ensure that communities had access to affordable, high quality food (Brough, 2007a).[11] Other requirements included that Centrelink staff were available to discuss income management and set up budget allocations; a government NTER administrator 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, representing 3.0 percent of clients who had ever been income managed, had been granted (AIHW, 2010).

The validity of our empirical strategy relies on the assumption that the rollout of income management was independent of trends in school attendance. To demonstrate that this assumption holds, we first consider the spatial variation in the timing of income management (see Figure 2). Although some regional clusters adopted income management at a similar time, there is no obvious spatial pattern to the rollout itself.

[Figure 2 about here.]

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

[11] It is unclear whether store licensing affected food availability and pricing. The NTER legislation was vague regarding licensing requirements 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.

characteristics constructed from the 2006 Australian Census.[12] We are able to obtain complete measures of community-level characteristics for 55 of the 78 communities, and for a further nine communities we have data on population size and gender ratios. For the remaining 14 communities we have no data at all.[13] 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.

[Table 1 about here.]

With the exception of household size (significant at 10 percent), we find no statistically significant relationship between community-level characteristics and rollout timing. Our R^2 is 0.090 in the limited sample and 0.077 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 Supplemental Nutrition Assistance Program (SNAP) benefits. Like Hoynes and Schanzenbach (2009), we interpret this as evidence that the timing of income management was not systematically related to community characteristics. Nevertheless, the institutional arrangements underlying the introduction of income management leads us to be cautious. We will account for any remaining selectivity associated with the non-random rollout 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 the NTER generally, and income management in particular. Many experts criticized the haste and lack of consultation preceding the NTER arguing that, as a consequence, it was poorly designed (Anderson, 2016; Behrendt, 2016; Bennet & Green, 2016). There was also dissatisfaction in many Aboriginal communities 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

[12] 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.

[13] There is no indication that our missing data are related to the implementation date. The correlation coefficient between implementation date and an indicator for missing data is only 0.014 (p=0.902).

generated by rapid program changes, frustration with a loss in empowerment, and embarrassment associated with accessing income-managed funds 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 residents of six remote communities found that 51 percent were in favor of income management and 46 percent were opposed (Central Land Council, 2008). A survey of 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. 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 what follows, we provide a brief review of the restricted welfare literature, focusing 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 arguably SNAP, which provides food vouchers to low-income families. Three important differences between SNAP and income management are worth noting however. First, SNAP provides supplemental benefits, while income management affects recipients' core welfare entitlements. Second, SNAP restricts recipients' consumption choices more than income management does, as SNAP benefits must be used for food purchases. Third, the introduction of income management reduces the utility derived from receiving welfare since benefits can no longer be spent in an unconstrained way, while the introduction of SNAP raises utility by providing additional benefits.

SNAP has been difficult to evaluate, primarily due to self-selection into and misreporting of program participation, with estimates of its effectiveness varying considerably (see Currie, 2003;

Hoynes & Schanzenbach, 2016, for reviews). The most compelling evidence exploits either experimental or quasi-experimental variation. In particular, demonstration projects conducted in the 1980s indicate that cash benefits lead to lower food expenditures than benefits provided through food vochers, although the negative treatment effect of cash benefits appears to be heterogeneous (see Fraker, Martini, & Ohls, 1995; Fraker, Martini, Ohls, & Ponza, 1995). Research exploiting variation in program commencement across counties also suggests that SNAP is associated with increased food expenditure (Hoynes & Schanzenbach, 2009) as well as improved birth weight (Almond et al., 2011) and gains in children's health and women's economic self-sufficiency (Hoynes et al., 2016).

Income management also shares similar objectives with a number of CCT programs operating in developed countries.[14] A common element of these programs is a focus on improving the health and education of dependent children in disadvantaged families. In several U.S. states, for example, 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). While CCT programs have often been successful in developing countries (see Rawlings & Rubio, 2005), there is less evidence that they are successful in developed countries. 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), for example. Slavin (2010) reviews a large number of (predominately U.S.) CCT programs and finds that most do not improve school attendance or educational attainment. Similarly, Medgyesy and Temesváry (2013) find mixed evidence that CCT programs improve education and health outcomes.

Income quarantining has been the least utilized form of restricted welfare. Although it 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 here. While New Zealand's scheme does not directly target its Indigenous population, it does disproportionately affect it (Humpage, 2016). We are not aware of any impact evaluation of income management in New Zealand.

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

Unfortunately, data limitations also preclude any impact evaluation of income management on consumption and expenditure patterns in NT Aboriginal communities. Evidence, however, suggests that any effect is likely to have been modest. Specifically, Brimblecombe et al. (2010) use time series data from a sample of ten community stores to study purchasing patterns. Using a before-after time series model, the authors find no evidence that income management influenced spending patterns. The authors caution against generalizing these findings, however, since their sample only includes stores managed by the Arnhem Land Progress Aboriginal Corporation which had been operating a voluntary 'food card' system before income management was introduced. Lamb and Young (2011) analyze 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 were exceptions. Finally, related research which also uses the timing of program implementation for identification finds evidence that birth weights fell in response to the introduction of income management (Doyle et al., 2017).

Overall, the literature on restricted welfare in developed countries suggests that, while some policies do seem to improve social and economic well-being (e.g., SNAP), many others fail to achieve their objectives and the long-term impact and cost-effectiveness of many programs remain unclear (Gentilini, 2016). It is likely that the context and program fidelity are important predictors of program outcomes. Campbell and Wright (2005), for example, argue 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.

Our paper also contributes to the literature evaluating place-based policies. Unlike typical welfare programs which target recipients based on individual characteristics, place-based policies target people based on where they live in the belief that "in order to help people, one must build or revitalize communities" (Ladd, 1994, p. 195). Well-known examples include State Enterprise Zones and Federal Empowerment Zones in the United States (see Neumark & Kolko, 2010; Ham et al., 2011; Busso et al., 2013; Freedman, 2013; Reynolds & Rohlin, 2015, for recent evaluations). Neumark and Simpson (2015) review this literature and find mixed evidence that place-based policies meet

their objectives. Income management differs from most place-based policies in terms of its central mechanism; most schemes rely on initiatives like business subsidies and tax-breaks to improve local employment opportunities whereas income management relies on changes in the delivery of welfare. Income management also operates in a unique setting – remote Indigenous communities – while most place-based policies target poor urban areas. Our work provides an interesting extension of this literature.

4 Data

4.1 Attendance Data

Our analysis is conducted with data from the Northern Territory Early Childhood Data Linkage Project, which is funded through a Partnership Project between the National Health and Medical Research Council (NHMRC) and the NT Government. In particular, we rely on daily attendance and enrollment records provided by the NT Department of Education, covering all students enrolled in the public school system born from 1994 onwards.[15] Our attendance data also provide daily indicators of whether a child is expected to attend a specific school on that day providing us with a measure of enrollment. The use of daily data is critical to our estimation strategy as it allows us to fully exploit variation in program timing, despite the policy being rolled out over a relatively short time frame. Moreover, our data come from the NT Education Department's administrative system allowing us to avoid the usual challenges associated with survey data (e.g 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 approximately 1.5 years before and after the implementation period. 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.[16] Our observation window allows us to determine

[15] All NT Government schools are required to provide daily records of student attendance through a centralized electronic database – the Student Administration and Management System. Upon initial enrollment, each student is given a unique identifying number, which allows us to track individual students across time and schools. We do not have data for private schools which operate in six of the communities in our sample.

[16] The rebranded scheme – New Income Management (NIM) – commenced on July 1, 2010, was rolled out across

whether income management was effective in the short- to medium-term.

To construct an estimation sample, we used the income management rollout schedule published in AIHW (2010), which lists the exact day on which income management commenced in each community. We matched communities to school names by looking up school addresses in the NT Schools Directory, or, in some cases, using 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 'homeland learning centers'. These are government-funded education facilities operating in very remote areas without the staffing or infrastructure requirements of a regular school. They typically have only a few enrollments at any time and comprise only 3.2 percent of student-day observations in our sample.

We also observe students' year level in our data. In the Northern Territory, schooling is compulsory from ages 6-17 (implying that most students are legally obligated to be in school until at least the end of 10th grade). Grade levels are segmented into primary (1-6), middle (7-9) and senior schools (10-12). An optional transition year is available before first grade. We restrict the sample to students enrolled in grades 1-12. Our final dataset is an unbalanced panel of 9,162 students attending 130 different schools. There are approximately 200 school days in each calendar year and altogether we have more than 3.5 million student-day observations.

4.2 Student and Community Characteristics

Statistics on attendance and geographic mobility for the students in our sample highlight three important stylized facts. First, school attendance is persistently low. Second, students are highly mobile. Third, the vast majority of students reside in very remote areas that are characterized by significant economic disadvantage.

Specifically, the average attendance rate is only 63.7 (57.9) percent for primary (secondary) students living in income-managed communities over the sample period (see Table 2). In comparison, the attendance rate is 86 percent for the rest of the Northern Territory during the same period. Non-attendance is a significant social concern. A major report on Aboriginal schooling

the entire Northern Territory, and involved substantial changes to the original scheme (Bray et al., 2014). We are unable to evaluate its impact due to the very short rollout period and the fact that post-2010 income management no longer applied to entire communities (and hence schools).

in the Northern Territory estimated 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 contributes to disparities in academic achievement and attainment. Biddle (2014), for example, finds that 20 percent of the gap in PISA test scores between Aboriginal and non-Aboriginal students can be explained by attendance.

Table 2 also highlights the significant degree of mobility within this population. Between 38.6 and 40.5 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.

The majority of students in our sample are enrolled in primary school (years 1-6). This is in part because there are more compulsory year levels in primary education. It also reflects the fact that enrollment drops sharply with age in remote Aboriginal communities (Wilson, 2013). The marked increase in secondary students over the period is driven by the cohort restrictions in the data – students born in or after 1994 are at most 12 years old in 2006 and are too young for middle school. By 2009 a much larger proportion of students have transitioned into secondary education.

[Table 2 about here.]

Finally, 93.3 percent of the schools in our sample are located in areas classified as 'very remote' by the Australian Bureau of Statistics (based on distance to urban centers). The remainder are classified as 'remote'. To put this in perspective, less than one percent of the 2006 Australian population resided in very remote areas (ABS, 2008). All schools in our sample, except one, qualify for remote area benefits offered by the NT Department of Education to attract teachers. More than 60 percent of schools qualify for the highest benefits.

A comparison of community characteristics highlights the economic and social disparities between remote Aboriginal communities and the rest of Australia (see Table 3). The 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 in the rest of Australia; there are also substantial disparities in terms of labor force participation, employment and income, and household size. Our

descriptive statistics reveal considerable heterogeneity across communities, in particular in labor force participation and languages spoken at home. On average, only 17.2 percent of households in income-managed communities speak English exclusively at home.[17]

[Table 3 about here.]

5 Estimation Strategy

5.1 Event Study Analysis

We begin by analyzing the effect of income management using an event study design, estimating 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 and $\tilde{\tau}_{st}$ 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 will be rolled out tomorrow, $\tilde{\tau}_{st} = 0$ if it was rolled out today, and $\tilde{\tau}_{st} = 1$ if it was rolled out yesterday. We restrict our data to the one-year window on either side of the implementation date implying that all communities are equally represented and sufficient observations are retained 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.[18] Finally, 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 through a careful examination of the pattern in event-date coefficients (see Hoynes & 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

[17] Many Aboriginal languages are spoken across the Northern Territory. English is often the second language.

[18] 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.

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 specification uses a difference-in-difference (DD) estimation model 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:

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

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 and day of the week d. 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), grade-level (λ_l), day-of-the-week (δ_d), and time (in days) (τ_t) fixed effects. Importantly, the inclusion of daily fixed effects 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 rollout of income management is not related to attendance patterns (see Section 2.2). Nevertheless, we 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

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

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

6 Results

6.1 Attendance

To establish the validity of the maintained assumptions underpinning the DD method, we first present results obtained from estimation of the event study model. The estimation of Eq. 1 results in separate estimated coefficients for each of 717 different event days for which attendance is measured. 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 noise inherent in the daily data we group these coefficients into bins of roughly one month.[19]

[Figure 3 about here.]

There is little evidence of any systematic trend in school attendance prior to the introduction of income management. 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

[19] In a robustness check, we also fitted nonlinear trends, which yield a similar conclusion. These results are provided upon request.

effect of income management on attendance, counter to the policy's aims.[20]

We turn now to the results of our DD estimation (Eqs. 2 and 3), presenting four model specifications: Model 1 includes no control variables; Model 2 includes control variables (Eq. 2); Model 3 includes school-specific quarterly trends (Eq. 3); and Model 4 adds 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 days elapsed since the onset of income management. Specifically, we include indicators for the introduction of income management 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 about here.]

We find that income management reduced school attendance by 1.8 percentage points (ppts) (see Panel A). As our data cover approximately 1.5 years after the introduction of income management, this can be interpreted as the estimated average treatment effect over 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 in driving the policy effect. To explore whether this estimate is driven by specific communities, we iteratively estimate Model 4 dropping each community from the sample in turn. Point estimates from this influence analysis range between -2.3 and -1.3 ppts and in all cases are statistically significant. We also re-estimate Model 4 separately for communities receiving income management earlier (up until 30 April 2008) rather than later (after 30 April 2008). The average treatment effect for early recipients is -1.1 ppts in comparison to -2.3 ppts for late recipients. Both estimates are statistically significant at the 1 percent level, while their

[20] Another common approach for testing the exogeneity of policy timing is to estimate a 'pseudo policy effect'. We are constrained by the fact that our data only go back to 2005. However, we calculated pseudo policy effects by assuming that income management was introduced two years before its actual implementation and re-estimating all models over the period 2005-2007 (inclusive). Results from this exercise (available on request) reveal no consistent evidence of a pseudo policy effect, which supports our identification strategy.

difference is statistically significant at the 10 percent level. Thus, the attendance penalty we find does not stem from the influence of particular communities or the relative timing of the reform.

Results in Panel B indicate that the average effect masks important dynamics in attendance behavior. The response in attendance follows a U-shaped pattern. In the immediate 30 days after income management, school attendance is estimated to fall by a statistically significant 1-2 ppts. The decrease in attendance (3-4 ppts) is greatest 60-89 days after income management is introduced, while there is no statistical difference in attendance 150+ days post income management. The average effect in the first five months is 2.7 ppts. Taken together, 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 the baseline trend.

To put our results in perspective, note that a 2.7 ppts reduction in the probability of attendance over the first five months translates to 2.3 additional absences over that period. Hancock et al. (2013) argue 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 may 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, Grade Level, and School Attachment

There are many reasons to believe that the effect of income management on attendance may vary with students' gender, grade level, and school attachment. 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. In our sample, the attendance rate for girls is 64.1 percent compared to 61.3 percent for boys. Biddle and Meehl (2016) argue that differences in the way that men and women experience discrimination, high incarceration rates among Aboriginal men, and the near absence of job opportunities for uneducated Aboriginal women all contribute to the gender gap in educational outcomes for Aboriginal children.

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 Aboriginal adolescents in remote areas not participating in education at all, noting 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). It is therefore also paramount to understand whether the policy primarily affected students who were already at the brink of disengaging with the formal education system (Prout, 2008).

We investigate whether income management has heterogeneous effects on school attendance by estimating our preferred specification (Model 4) separately for: (i) boys versus girls; ii) primary (years 1-6) versus secondary (years 7-12) students; and (iii) students with low versus high propensities to attend school. It is important to note that because we only observe students born in 1994 or later, the results for secondary schools are largely driven by students in lower grade levels. Results are reported in Table 5.

[Table 5 about here.]

We find that the average attendance response to income management is slightly larger for boys (-1.9 ppts) than for girls (-1.6 ppts), but the difference is not statistically significant. The attendance response to the timing of income management is also similar for boys and girls. In both cases, the impact of income management on attendance follows a U-shaped pattern; attendance first falls, then rebounds and after 150 days becomes statistically indistinguishable from its initial level. For both boys and girls, the largest downturn in attendance occurs between 60-89 days after the introduction of income management, although the drop is deeper for boys (4.8 ppts) than girls (2.9 ppts). There is more evidence of heterogeneity across school level, with income management having a much larger average effect on the attendance of secondary school students in both absolute and relative terms. Most concerning, the policy continues to have a negative and relatively large (1.9 ppts) effect on secondary school attendance after 150+ days, though this effect is only significant at the 10 percent level. This is suggestive evidence that income management may have had an ongoing harmful effect on the attendance of secondary school students.

We also explored how our estimates vary by students' long-term attachment to the school.

Specifically, we re-estimate our models separately for students with high (above median) and low (below median) attendance propensities.[21] The average treatment effect is -2.8 ppts (-3.6 percent) for students with high attendance propensities, while it is only -0.5 ppts (-1.0 percent) for students with a low propensity to attend school. The difference is statistically significant at the 1 percent level. Despite the disparity in average treatment effects, the short-term attendance response to the introduction of income management is very similar across the two groups. Both groups experience a large, statistically significant drop in attendance in the first month after the introduction of income management. Attendance continues to drop up until four months following income management. Only the longer run response depends on attendance propensity. Students with a high attendance propensity do not return to their longer-term school attendance rates even after five months (-3.0 ppts), while attendance rates are 1.9 ppts higher for students with a low attendance propensity. Thus, income management affected all students in the short run and had a longer-run effect on students with relatively strong school attachment.

7 Potential Mechanisms

Policy makers had hoped that income management would redirect household spending away from goods and services that can cause social harm and towards goods and services that are good for child welfare. The belief was that this would increase school engagement by improving children's health and safety, increasing parents' attentiveness, and reducing financial harassment.

Our results, however, indicate that income management reduced attendance in the short-term. In what follows, we investigate the potential mechanisms underlying this result. Specifically, we consider the extent to which our results reflect: i) the introduction of the NTER more broadly; ii) changes in student enrollments; iii) changes in student mobility; and iv) the way that income management was implemented. Overall, we find no support for the first three of these explana-

[21]The latent individual propensity to attend school for each student is predicted by backing-out the individual fixed effects after estimating Model 4 (including interactions with time since policy onset) using OLS regression and including all available observations on school attendance for each student. Because we have daily school data, the expected bias in the estimation of the individual fixed effects is likely to be small ($\bar{T} = 542$). A second source of bias comes from the fact that heterogeneity in the treatment effect by attendance propensity is not controlled for in the estimation used to obtain the individual fixed effects. However, since the average treatment effect is small relative to the average attendance propensity (1.8 ppts relative to 62.7 percent), this bias is also likely to be small.

tions. However, we do find evidence that implementation issues may have been responsible for the temporary downturn in school attendance following the introduction of income management.

7.1 Other NTER Measures

Income management was introduced into a fluid and rapidly changing policy environment. Many other programs, including store licensing, child health checks, additional police support and various infrastructure projects, were also rolled out to Aboriginal communities as part of the NTER (see Table A1). One possibility is that, rather than identifying the effects of income management per se, our results instead capture the effects of one or more of these other programs. While we cannot rule this out theoretically, we believe it is unlikely for several reasons.

First, the introduction of other NTER measures did not coincide with the rollout of income management, which began in September of 2007 and was completed in 94.0 percent of the communities by July 2008. Specifically, we document the cumulative coverage of the other key NTER measures across communities over the period July 2007 to July 2008 in Table 6. Alcohol restrictions were commonplace in remote communities even before 2007. The NTER introduced additional bans on alcohol and pornography that became effective almost immediately.[22] These bans were in place in 88 percent of communities before income management began. In contrast, extra police and related measures were introduced into only a small number of communities during the period that income management was being rolled out. Their introduction largely occurred later. Amongst all other NTER measures, the school nutrition program seems to have the time-line that is most similar to that of income management. However, it is difficult to envisage how this would have reduced attendance.[23] Rather, it provided an incentive for children to attend school, although Yu et al. (2008) find no empirical evidence of improved attendance when comparing a sample of schools that were early as opposed to late recipients of the school nutrition program.

[Table 6 about here.]

[22] Alcohol related laws came into effect on 18 August 2007 and alcohol offences on 15 September 2007 (Central Land Council, 2008).

[23] School meal programs in developing countries have proven effective in raising school attendance. See Kremer and Holla (2009) for an overview.

Second, our event study analysis indicates that our results are capturing the effects of income management rather than other components of the NTER. The decrease in school attendance occurs precisely at the point when income management is introduced into each community (see Figure 3). Given that the introduction of other key NTER measures did not coincide with the rollout of income management, they do not provide a compelling explanation for this result. Moreover, any aggregate response to the NTER overall, for example driven by collective sentiment, is captured by time fixed-effects.

For both reasons, we believe that our results are unlikely to be explained by confoundedness with the introduction of other key NTER measures.

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 are not enrolled in school (Wilson, 2013). In this section we explore whether the reduction in school attendance that occurred after the introduction of income management can be linked to changes in school enrollment. To the extent that income management led to safer, healthier, and more stable environments for children, it may also have had a beneficial effect in raising school enrollment rates. At the same time, enrollment rates may have also increased as a result of the initial uncertainty about whether income management would or would not be linked to children's lack of school participation. In particular, the July 2007 legislative amendments to enact income management include provisions that allow for the quarantining of up to 100 percent of welfare payments for families in which children are not maintaining an acceptable level of school attendance; these provisions have never been enforced in practice however (Yu et al., 2008). Nonetheless, some families may have moved to enroll children in school in the expectation that they would lose their benefits if their children were not attending school. In this case, the decline in attendance that we observe post income management might be due to a negative selection effect. That is, income management may have encouraged children who were previously un-enrolled – and who may have a lower propensity to attend – to enroll in school.

We observe the total number of students enrolled in each school on each day.[24] If income

[24]We do not observe enrollment rates because we do not observe the number of children in the community.

management influenced enrollment decisions, then we should see an increase in student numbers following its introduction. To investigate this, we re-estimate our event study model (Eq. 1) focusing on the number of enrolled students in community c at time (day) t (d). As before, we obtain estimates of our event-time indicators which identify deviations in the number of enrolled students relative to the omitted period ($\tilde{\tau}_{ct} = -365$) and plot these against the onset of income management. The results are presented in Figure 4.

[Figure 4 about here.]

Enrollment appears to be increasing with time. However, this is in part due to the fact that our data only capture students born in 1994 or later. By 2009, these students are still yet to age out of the education system, which means that students entering grade 1 each year are not offset by students exiting secondary education. The slope of the trend in Figure 4 should therefore be interpreted with caution. What is important for our analysis is whether there is a systematic discontinuous change in enrollments that coincides with the onset of income management. There is no strong evidence of such an effect. While the fitted linear trend lines give the perception of a small drop in enrollments, this is driven by less stable event-date coefficients further away from the onset of income management. Importantly, between ± 150 days around the introduction of income management there is a stable trend in enrollment. Overall, there is no indication that income management influenced school enrollments, making it unlikely that changes in school enrollments explain the estimated reduction in attendance.

7.3 Geographic Mobility

Geographic mobility is high in Northern Territory Aboriginal communities – families frequently relocate for social and cultural reasons, including ceremonies and the maintenance of kinship (Memmott et al., 2006). Income management may have been a barrier to geographic mobility since, before they left their home communities, residents needed to contact Centrelink to organize a way of accessing their benefits while they were away (AIHW, 2010). In theory, it is also possible that geographic mobility increased to avoid the policy.[25]

[25]In practice, however, this is unlikely to be empirically important as virtually all Aboriginal communities were ultimately subject to income management. In order to avoid the policy, a community member would have had

If the onset of income management altered mobility patterns, our results could again be reflecting a selectivity effect as children with higher attendance rates disproportionately leave Aboriginal communities (or children with lower attendance rates disproportionately stay). We explore the pattern in geographic mobility using data from the entire Northern Territory and categorizing schools by whether they are located in income-managed communities or not. Geographic mobility is measured by identifying students who change schools across communities (intra-community school changes are not counted as moves) allowing us to focus on the dynamics of in- and out-migration in income-managed communities. In-migration is defined as the number of students joining community c on day t; this includes students moving from other income-managed communities; other non income-managed communities; or from outside our administrative dataset (e.g., interstate moves or moves between the private and public education sectors). Out-migration is defined as the reverse of in-migration. The most common type of move is from one income-managed community to another (56.2 percent of moves within the Northern Territory in 2008). Moves i) from income-managed to non income-managed communities and ii) from non income-managed to income-managed communities account for an approximately even share of the remaining 43.8 percent of moves within the Northern Territory. Finally, of the 6,665 students enrolled in schools in income-managed communities in 2008 approximately 17.5 percent either entered or exited our administrative data system. Further details on mobility patterns are presented in Table A2.

Our approach to analyzing the mobility data is similar to that used for studying enrollments. That is, we estimate event study models of the same form as Eq. 1 focusing on in- and out-migration (as a fraction of student enrollment) at the community rather than individual level. As previously, we plot the event-day coefficients against time since the onset of income management. This allows us to assess whether there are any changes in mobility patterns that coincide with the introduction of income management.

In Figure 5 we plot the relationship between time since the onset of income management and the rate of in-migration (left) and out-migration (right).[26] The Y-axis is the deviation in the relevant

to leave Aboriginal land altogether. Moreover, once income-managed, a welfare recipient would still be subject to income management even if she moved away.

[26]We also conduct an event study analysis of the total mobility rate (i.e., in-migration + out-migration divided by enrollments). We find no evidence that the onset of income management affected total mobility. Results are available upon request.

mobility rate with $\tilde{\tau}_{st} = -365$ set as the reference period. Focusing first on in-migration, we find 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 the rate of 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.

[Figure 5 about here.]

Although overall mobility into and out of income-managed communities seems to be unaffected by the introduction of income management, it is possible that the composition of the migration flow was affected. Specifically, in- and out-migrants may have become more or less selected with respect to their propensity to attend school. We address this issue by focusing our attention on those with a low propensity to move; i.e., the 41.9 percent of students who made no geographic moves between 2006 and 2009. We estimate our main models using this sub-sample of students. Despite the smaller sample size, we find the same substantive results; there is a short-run reduction in attendance of up to 2.9 ppts and no effect on attendance after 150 days (Table A3). We conclude that changes in mobility patterns are unlikely to explain the drop in school attendance as income management was introduced.

7.4 Implementation Issues

It is possible that poor implementation of income management, coupled with widespread community dissatisfaction, reduced families' engagement with schools. In particular, the introduction of income management was characterized by a lack of consultation with stakeholders, confusion about how the policy would operate, hurdles in accessing welfare benefits, difficulty in checking account balances and increased barriers to moving between local communities. Initially, Centrelink struggled to administer the new, individual income management accounts and as a consequence it had to extend its operating hours to meet the increased service demand (FAHCSIA, 2008). Some income-managed clients experienced short-term consumption interruptions, because their welfare payments had been quarantined without their knowledge. At the end of November 2007, 22.6 percent of Centrelink

clients were placed on "auto income management", because they had failed to contact Centrelink staff to allocate their funds (AIHW, 2010, p. 23). This lack of consultation with Centrelink staff resulted in a high point of unallocated funds in the magnitude of 50.3 percent on 23 November 2007 (AIHW, 2010, p. 30). In some cases, the disruption caused by missing payments resulted in children being absent from school as they travelled with their parents to Centrelink offices in regional centers to sort out their benefits.[27]

There was also widespread dissatisfaction with the compulsory nature of the policy; many of those directly affected felt that they were unfairly targeted and did not need to be income managed (Yu et al., 2008; AIHW, 2010). Income management also placed constraints on resource sharing within families, which policy makers hoped would reduce the pressure ("humbugging") on women and the elderly to share their benefits with extended family members (AIHW, 2010). This aspect of the policy was poorly received, however, as remote Aboriginal communities are highly collectivist and resource sharing is an important social institution. Finally, there was a great deal of confusion about whether or not income management would be linked to school attendance and the perception that schools would be supplying enrollment and attendance data to Centrelink may have undermined community-school relations (Kroneman, 2007).

We investigate whether these initial implementation issues are the source of the reduction in school attendance by taking advantage of the introduction of the Basics Card in 2008, a second reform that significantly improved the operation of income management. The Basics Card overcame many of the operational problems associated with income management by allowing clients to use the card to purchase goods and services in the same way as a regular debit card. This eliminated the need for priority goods to be purchased from either nominated community stores or using store cards previously obtained from Centrelink. The Basics Card significantly reduced the transaction costs associated with income management, particularly when travelling outside home communities. It may have also assisted in restoring social capital by allowing family members to pool resources. Although Basics Cards were protected by a personalized identification number (PIN) and clients

[27]Personal communication with Olga Havnen, NT Coordinator General for Remote Service Delivery during the Northern Territory Emergency Response (November 22, 2017). Central Land Council (2008) reports disruption effects in six selected communities including lack of access to funds, missing transfers, and long waiting times at Centrelink to collect store cards.

were told not to share their card or PIN, in practice many people admit to doing both (AIHW, 2010; Bray et al., 2014). Qualitative evidence suggests that people viewed the Basics Card as a substantial improvement in the way income management operated (AIHW, 2010). We posit that, if implementation issues are driving our results, we should see attendance improve after the Basics Card is introduced.

The Basics Card was introduced on September 8, 2008 and was completely rolled out to all income-managed clients by December 15, 2008 three months later. Information regarding the rollout schedule for the Basics Card is not available. However, aggregate data on the allocation of income-managed funds imply that the rollout predominately occurred in the first month. Specifically, the fraction of income-managed funds allocated to store cards dropped from more than 20 to around 5 percent between September 8, 2008 and October 10, 2008, eventually becoming almost zero by the time the rollout was completed (AIHW, 2010).

We assess whether the introduction of the Basics Card mitigated the negative effect of income management on attendance by re-estimating our main models and including an indicator variable that takes the value one if $t \geq$ September 8, 2008 (and zero otherwise) (see Table 7).[28] This approach effectively acts as if the Basics Card was introduced across the whole Northern Territory on a single day. Although this is not strictly correct, any ensuing bias will be small and at worst attenuate our estimates. We estimate all models allowing the treatment effect to vary with time since implementation.

[Table 7 about here.]

Our preferred specification is presented in Column 3. School attendance continues to have the same U-shaped response to the introduction of income management. Moreover, the magnitude of our estimates is largely unaffected by the inclusion of the Basics Card indicator. The only difference is that attendance 150+ days post income management is now estimated to be 1.9 ppts lower and statistically significant. Critically, attendance rates are estimated to be 1.6 ppts higher following the introduction of the Basics Card. This finding provides evidence in support of the hypothesis that income management led to lower levels of school attendance in the short run because

[28] This indicator is not identified in Model 2 due to the inclusion of time fixed effects.

of implementation issues. When the program implementation improved so too did attendance.[29] Nevertheless, the coefficient on the Basics Card is not large enough to fully offset the initial effects of income management. We find no evidence that the policy ever had a positive effect on attendance.

8 Conclusion

Relative to Canada, New Zealand, or the United States, Australia stands out for its use of welfare quarantining as a key strategy to enhance the well-being of Indigenous communities. Income management – similar to other forms of conditional cash transfers – aims to improve social and economic outcomes by creating a healthy consumption environment. Currently, the Australian Government is actively extending its income management policy beyond Aboriginal communities. A new program has been rolled out universally in the Northern Territory, and several place-based programs are being trialled in other states to address entrenched disadvantage and high-risk consumption patterns. In some cases, income management is voluntary; in others it is compulsory.[30]

While conditional cash transfer programs have been subjected to rigorous evaluation, there is little credible evidence regarding the impact of income management on social and economic outcomes. We provide the first causal evidence linking income management to a key policy target – school attendance. In contrast to the policy's objectives, we find no evidence that school attendance increased after the introduction of income management. In fact, we estimate that attendance fell by 2.7 percentage points on average in the short run. This drop in attendance does not appear to be due to other contemporaneous social policy initiatives or to changes in either geographic mobility or school enrollment patterns. Rather, we argue that the way that income management was implemented may have resulted in income insecurity, barriers to day-to-day economic activity, and a loss of empowerment which may have led to increased family stress and had adverse consequences for parenting. These findings echo those of Gennetian, Seshadri, et al. (2016), who find that students receiving food stamps have disproportionately more behavioral problems at the end of the month

[29] We are limited in our ability to conduct placebo tests around the timing of the Basics Card given the single implementation date and unstable policy environment during our study period. Nevertheless, we re-estimated all models including indicators for up to 90 days before the Basics Card commenced. In all cases, estimates indicate that attendance was not increasing in the lead-up to the introduction of the Basics Card. Results are provided upon request.

[30] See www.dss.gov.au for more information.

when they are most likely to be subject to food insecurity.

Of course, the failure of income management to improve student attendance does not necessarily rule out other positive social and economic outcomes. Nevertheless, if income management did meet other key objectives (e.g., increased expenditure on food and education, less substance abuse) then it is puzzling that we do not observe any improvement in school attendance over the study period given the likely link between these outcomes and school engagement. More broadly, the overall trend in school attendance between 2006-2009 suggests that the NTER in general failed to lift attendance rates in remote Aboriginal communities despite the large number of policies targeting this goal.

Taking a broader perspective, a key take-away message of our research is that program implementation matters. Consistent with Cameron and Shah (2014), our results suggest that policy makers should pay careful attention to the erosion of social capital when implementing new programs. This is particularly true in Aboriginal communities where attempts to reduce disadvantage through increased social mobility may put social and cultural capital at risk (Walter, 2015). Income management also provides an interesting case study for understanding how weak program fidelity may not only undermine the benefits to social welfare reform, but may also have harmful consequences. Of particular concern is the potential for these harmful effects to disproportionately affect vulnerable groups. In particular, we find that the school attendance penalty was somewhat larger for secondary school students who already have disproportionately low attendance rates. At the same time, we find that income management affected not only vulnerable groups, but also had a lingering effect on those students with a relatively high propensity to attend school regularly. Hence, income management may have undermined the efforts of Aboriginal families who were ensuring that their children attended school more regularly.

A key question for policy makers and researchers is whether restricted welfare policies, such as income management, are preferable to regular cash transfers. Few studies compare the relative performance of cash versus in-kind transfers. Yet those that do find little evidence that one mode of delivery is clearly superior to the other when the focus is on food consumption and nutrition (Gentilini, 2016). Our results imply that, with adequate program administration, income management may at best be neutral with respect to student attendance.

At the same time, non-cash transfers are often associated with high administrative costs. The cost of administering income management was $451 million (AUD) between the 2007-08 and 2009-10 financial years, or approximately $20,700 per income-managed person.[31] Further research is needed to understand whether or not this cost is offset by other social benefits beyond increased school attendance or whether – as some experts have argued (Altman, 2016) – these resources could be redeployed more productively to enhance the wellbeing of Indigenous Australians.

[31]Figures on the cost of income management are reported in Buckmaster et al. (2012) based on budget papers available at www.budget.gov.au. The cost per person is calculated using the total number of persons who had been subjected to income management as of 31 March 2009 (21,763) (reported in AIHW, 2010).

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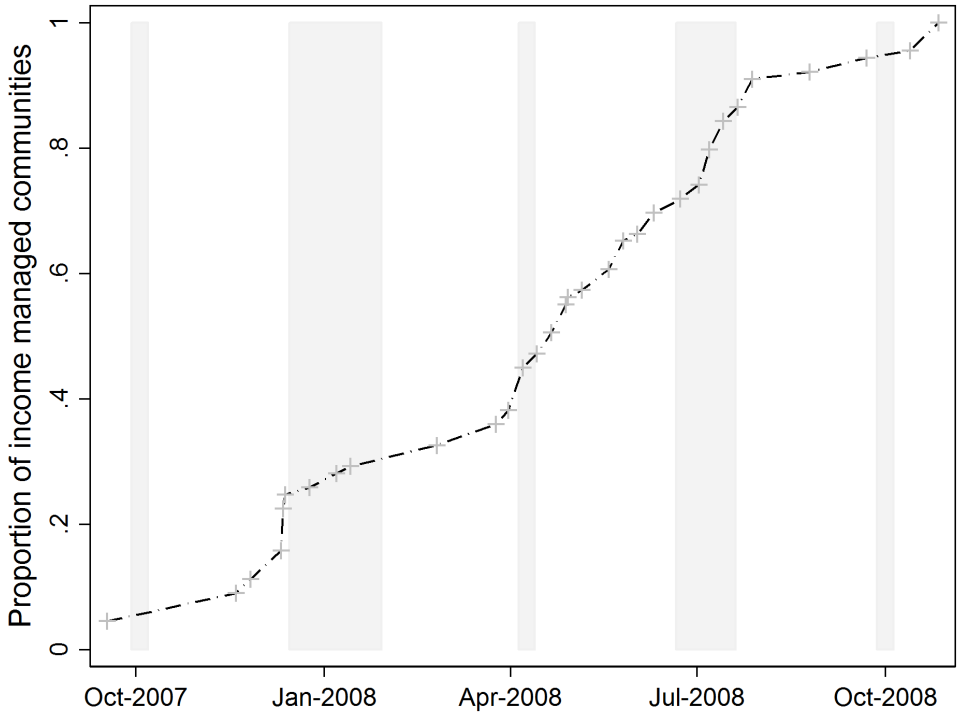
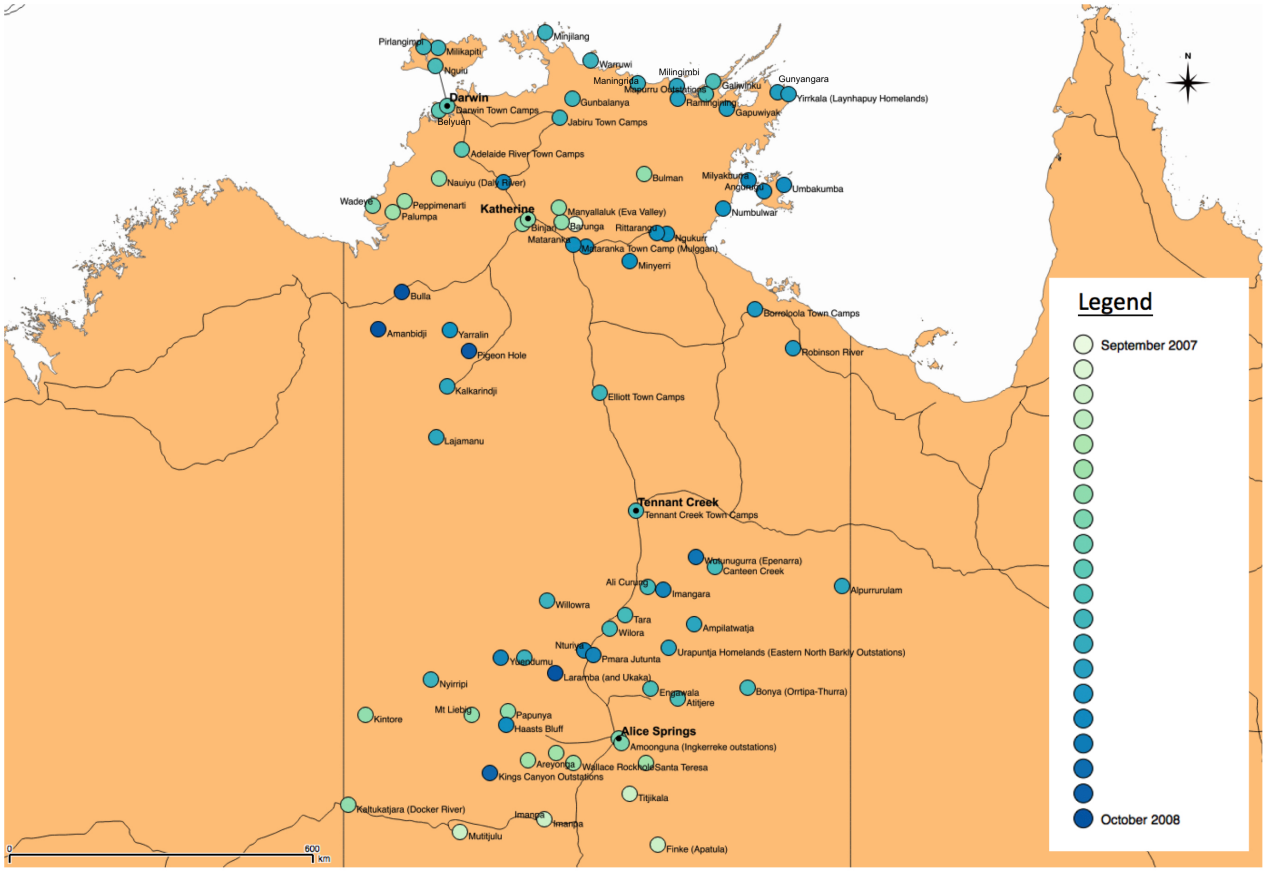
Figure 1: Cumulative Coverage of Income Management Across NTER Communities



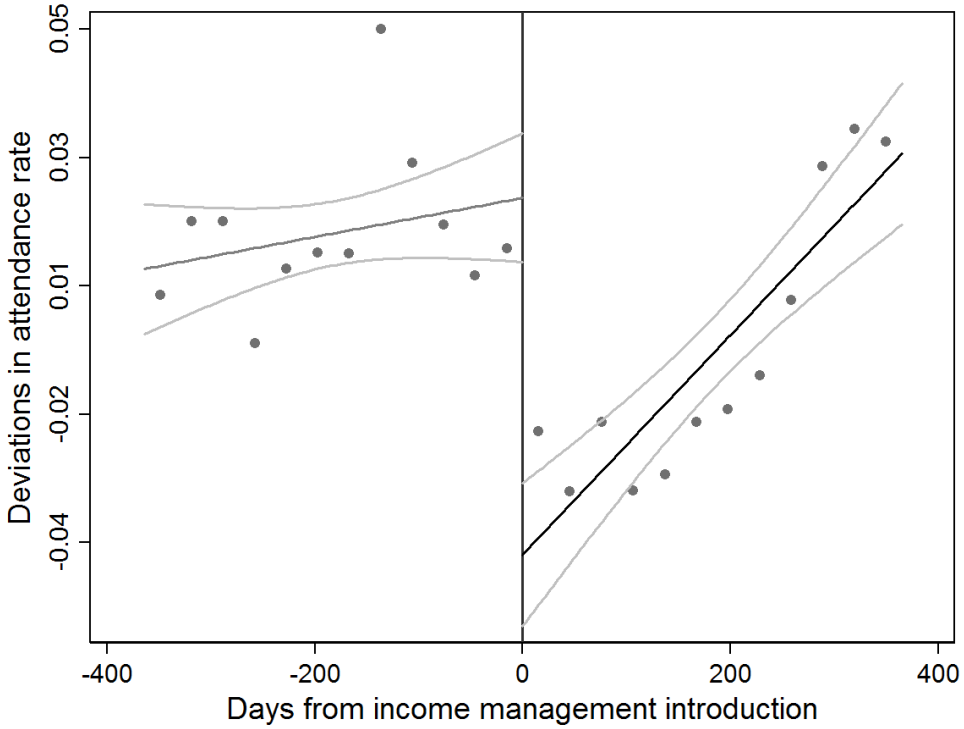
Notes: The graph shows the cumulative number of communities that have started income management on each date as a proportion of the total number of communities selected for income management. Shaded regions are school holiday periods. Crosses represent dates that income management commenced in one or more communities. For the complete rollout schedule see AIHW (2010).

Figure 2: Map of Communities Selected for Income Management and Program Commencement Dates



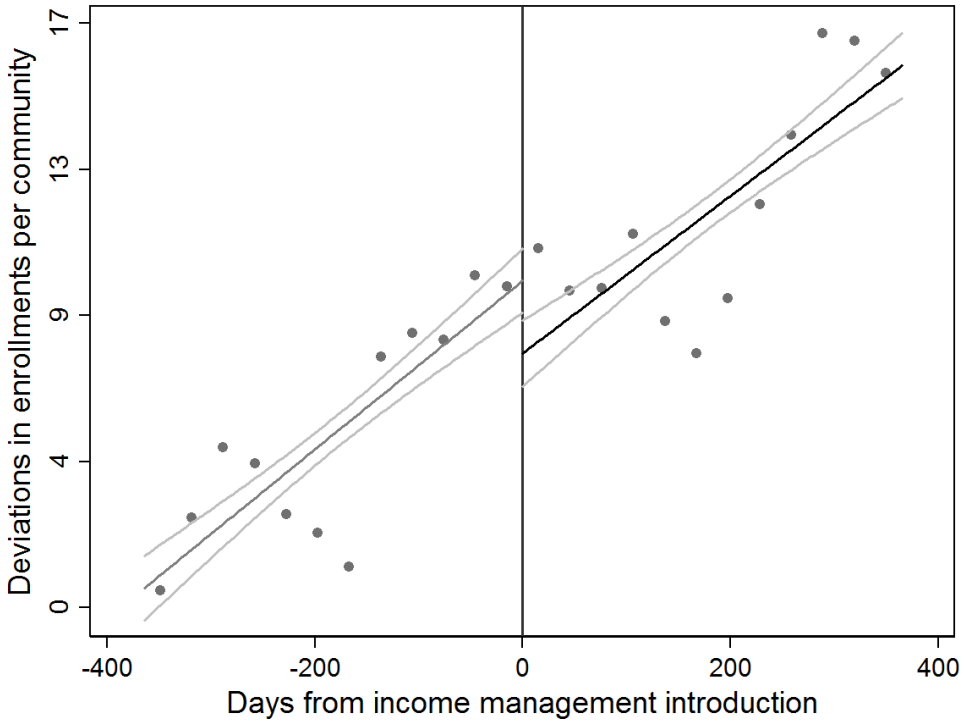
Notes: Color-coding on communities selected for income management reflects the date income management started in the relevant community as indicated in the legend. Major settlements in the Northern Territory are in boldface. People living in the municipal parts of these communities were not subject to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

Figure 3: Event Study Coefficients for School Attendance



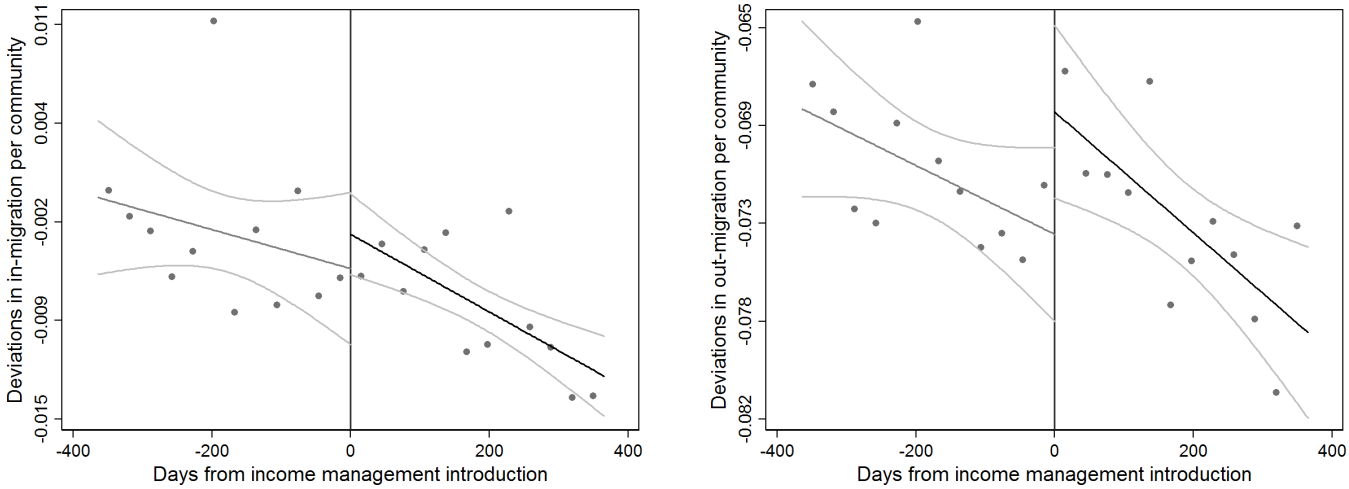
Notes: Results are based on OLS estimation of Eq. 1 using observations between ±365 days from the onset of income management in each community. The dependent variable is an indicator for whether student i in school s attended school for the whole day on school-day t. The regression controls for school fixed effects and separate indicators for each event-date (i.e., time until/since income management commenced). Due to school holidays and weekends, some event-dates have no observations such that the number of separate indicators is 717. Scatter points correspond to coefficients on the event-date dummies in Eq. 1. These are binned into 12 groups (approximately one month) each side of the implementation date. The reference period is $\tilde{\tau}_{st} = -365$ and deviations in the attendance rate are relative to attendance on this date. Linear trend lines and 95% confidence intervals through these points are also shown.

Figure 4: Event Study Coefficients for Number of Students Enrolled in Income-Managed Communities



Notes: Results are based on OLS estimation of the same form as Eq. 1 using observations between ±365 days from the onset of income management in each community. The dependent variable is the number of students enrolled in schools located in community c on school-day t. The regression controls for community fixed effects and separate indicators for each event-date (i.e., time until/since income management commenced). Due to school holidays and weekends, some event-dates have no observations such that the number of separate indicators is 717. Scatter points correspond to coefficients on the event-date dummies in Eq. 1. These are binned into 12 groups (approximately one month) each side of the implementation date. The reference period is $\tilde{\tau}_{st} = -365$ and deviations in the average number of enrolled students are relative to the average number of enrolled students on this date. Linear trend lines and 95% confidence intervals through these points are also shown.

Figure 5: Event Study Coefficients for Student Movement Into/Out of Income-Managed Communities



Notes: Results are based on OLS estimation of the same form as Eq. 1 using observations between ±365 days from the onset of income management in each community. For the left graph, the dependent 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. Moves into a community include students moving from other income-managed communities; other non income-managed communities; or students joining the administrative dataset for the first time or after and absence of at least six months (e.g., interstate moves or moves between the private and public education sector). For the right graph, the dependent variable is the total number of students leaving the community divided by the number of students enrolled in the community on day t. This is the reverse of moves into a community. The regressions control for community fixed effects and separate indicators for each event-date (i.e., time until/since income management commenced). Due to school holidays and weekends, some event-dates have no observations such that the number of separate indicators is 717. Scatter points correspond to coefficients on the event-date dummies in Eq. 1. These are binned into 12 groups (approximately one month) each side of the implementation date. The reference period is $\tilde{\tau}_{st} = -365$ and deviations in the rate of in-migration/out-migration are relative to the rate on this date. Linear trend lines and 95% confidence intervals through these points are also shown.

Table 1: OLS Regression of Community Characteristics on Income Management Commencement Date

Variable	Model 1	Model 2
Population/100	0.803	2.508
	(14.484)	(14.450)
(Population/100)^2	-0.287	-0.349
	(0.681)	(0.676)
Percentage male	2.996	0.372
	(5.541)	(5.194)
Median age	7.159	8.040
	(8.126)	(8.028)
Percentage English only language spoken at home	0.811	0.861
	(0.615)	(0.587)
Labor force participation rate	-0.150	-0.045
	(1.005)	(1.027)
Employment rate	0.228	0.230
	(0.703)	(0.701)
Median weekly personal income	0.168	0.166
	(0.248)	(0.230)
Average people per household	25.728*	25.512*
	(13.636)	(13.813)
Demographics miss		366.269
		(260.483)
N	55	64
R^2	0.090	0.077

Notes: Robust standard errors in parentheses. The dependent variable is the date income management was implemented in the community, with each day equal to one unit. Data on community characteristics are from the 2006 Australian Census using the geospatial unit 'Indigenous Local Area'. For the 14 communities for which we have no data, a suitably granular spatial unit could not be identified in the Census. Estimates are obtained by OLS. * is statistical significance at the 10% level.

Table 2: Sample Statistics for School Attendance Data: Communities Selected for Income Management

	Primary students[a]				
	2006	2007	2008	2009	All years
Attendance rate (%)[b]	63.17	64.00	62.69	64.95	63.73
Moved (%)[c]	40.50	38.55	40.14	39.42	58.12
No. 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
Moved (%)	49.21	50.69	51.69	53.95	67.22
N Students	378	1,014	1,658	2,037	2,660

Notes: Data are from the NT Department of Education administrative records and the reported statistics are based on the authors' calculations. The sample includes students born from 1994 enrolled in schools administered by the NT Department of Education operating in communities selected for income management. [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 attended school the whole day divided by the number of student-day observations where the student was expected to attend school. [c] Moved is an indicator variable for if at any time during the period the student changed his/her enrollment to a school into a different community (intra-community school changes are excluded) or left/joined the NT administrative dataset (which include interstate moves or moves between the private/public sector). Students are counted as having left if they exit the dataset for at least six months. Students are counted as having joined if they first enter the dataset or return to the dataset after an absence of at least six months. Students who join the sample in grade 1 or exit the sample in grades 11 or 12 are not included in this calculation.

Table 3: Characteristics of Communities Selected for Income Management Compared to the Australian General Population

	Aus. Pop.	Sample			
Variable	Mean	Mean	St. Dev.	Min	Max
Population	-	428.27	361.04	83	1904
Male (%)	49.4	48.57	3.28	40.87	56.52
Median age (years)	37	22.09	2.16	18	27
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 weekly personal income ($AUD)	466	209.82	39.93	148	466
Average people per household	2.6	6.08	1.43	3.3	9.6

Notes: 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.

Table 4: The Effect of Income Management on School Attendance: OLS Regression 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

Notes: Cluster robust (student level) standard errors reported in parentheses. The dependent variable is an indicator for whether the student attended school for the whole day at time t. The estimation sample is an unbalanced panel of all students in grades 1-12 enrolled in the NT public education system during the period 2006-2009 (inclusive). The full set of available controls include school fixed effects, time fixed effects (day level), a linear time trend, grade fixed effects (grades 1-12), day of the week fixed effects (Monday-Friday) and school-term fixed effects. There are four school terms per year; 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. Panel A and Panel B are the results of separate OLS regressions. *,** and *** is statistical significance at the 10%, 5% and 1% level respectively.

Table 5: The Effect of Income Management on School Attendance by Gender, School Level and School Attachment: OLS Regression Results

	Males	Females	Primary	Secondary	Low Attendance[a]	High Attendance[a]
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Single treatment identifier						
Treatment	-0.019***	-0.016***	-0.013***	-0.033***	-0.005	-0.028***
	(0.004)	(0.004)	(0.004)	(0.008)	(0.004)	(0.004)
Panel B: Treatment effect by time since income management commenced						
<30 days ago	-0.022***	-0.019***	-0.017***	-0.030**	-0.016**	-0.020***
	(0.005)	(0.006)	(0.004)	(0.009)	(0.006)	(0.005)
30-59 days ago	-0.034***	-0.024***	-0.022***	-0.055***	-0.027***	-0.024***
	(0.006)	(0.006)	(0.005)	(0.010)	(0.006)	(0.005)
60-89 days ago	-0.048***	-0.029***	-0.036***	-0.050***	-0.036***	-0.034***
	(0.006)	(0.007)	(0.005)	(0.011)	(0.006)	(0.006)
90-119 days ago	-0.038***	-0.022***	-0.028***	-0.040***	-0.031***	-0.026***
	(0.006)	(0.007)	(0.005)	(0.011)	(0.007)	(0.006)
120-149 days ago	-0.015**	-0.023***	-0.015**	-0.030**	-0.007	-0.026***
	(0.006)	(0.007)	(0.005)	(0.011)	(0.007)	(0.006)
150+ days ago	-0.004	-0.007	0.000	-0.019*	0.019***	-0.030***
	(0.006)	(0.006)	(0.004)	(0.010)	(0.006)	(0.005)
N	1837224	1738070	2921087	654207	1787287	1787986
R^2	0.111	0.098	0.097	0.129	0.113	0.070
Average attendance	0.613	0.641	0.637	0.579	0.483	0.769

Notes: Cluster robust (student level) standard errors reported in parentheses. All results are based on OLS estimation of the extended version of Eq. 3. The dependent variable is an indicator for whether the student attended school for the whole day at time t. The regression 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. The estimation samples come from an unbalanced panel of all students in grades 1-12 enrolled in the NT public education system during the period 2006-2009 (inclusive). [a] High and low attendance students: The latent individual propensity to attend school for each student is predicted by backing-out the individual fixed effects after estimating Model 4 (including interactions with time since policy onset) by OLS regression using all available time series data on school attendance for each student. Low attendance students have a latent propensity smaller than the median; high attendance students have a latent propensity equal or greater than the median. *,** and *** is statistical significance at the 10%, 5% and 1% level respectively.

Table 6: Number of Communities (Proportion of Total Selected) to Receive Major NTER Measures July 2007–July 2008

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 parentheses. For details on each measure see Table A1.

Table 7: The Effect of Income Management on School Attendance Controlling for Basics Card: OLS Regression Results

	(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

Notes: Cluster robust (student level) standard errors reported in parentheses. The dependent variable is an indicator for whether the student attended school for the whole day at time t. The estimation sample is an unbalanced panel of all students in grades 1-12 enrolled in the NT public education system during the period 2006-2009 (inclusive). Basics Card is an indicator for whether t is after this policy was introduced (September 8, 2008). The full set of available controls include school fixed effects, time fixed effects (day level), a linear time trend, grade fixed effects (grades 1-12), day of the week fixed effects (Monday-Friday) and school-term fixed effects. There are four school terms per year; 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. Estimates are obtained by OLS. *,** and *** is statistical significance at the 10%, 5% and 1% level respectively.

Appendix A

Table A1: Overview of Main Policies Introduced Under the NTER

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.

Table A2: Mobility Patterns of Students in Income-Managed Communities: Number of Students by Year (Proportion of Total Enrolled)

	2006	2007	2008	2009
No. of students who move IM to IM[a]	726 (14.4)	862 (14.6)	1065 (16.0)	1264 (17.4)
No. of students who move IM to non-IM[b]	654 (12.9)	783 (13.3)	970 (14.6)	989 (13.6)
No. of students who move non-IM to IM[c]	558 (11.0)	729 (12.4)	917 (13.8)	1008 (13.9)
No. of students who join NT Education System[d]	629 (12.4)	725 (12.3)	691 (10.4)	665 (9.1)
No. of students who leave NT Education System[e]	562 (11.1)	558 (9.5)	695 (10.4)	797 (11.0)
No. of students with no moves[f]	2838 (56.8)	3347 (56.1)	3653 (54.8)	3975 (54.7)
Avg. no. IM to IM moves | at least one move	10.91	11.14	10.11	8.09
Avg. no. IM to non-IM moves | at least one move	3.88	4.73	4.36	4.50
Avg. no. non-IM to IM moves | at least one move	4.36	4.99	4.54	4.43
No. of students enrolled[g]	5060	5891	6665	7273

Notes: Data are from the NT Department of Education administrative records and the reported statistics are based on the authors' calculations. The sample includes students born from 1994 enrolled in schools administered by the NT Department of Education operating in communities selected for income management. Figures in parentheses are the number of students with a relevant move divided by the total number of students enrolled at any stage that year. These figures do not sum to 100 since students can experience more than one type of move in a single year. [a] This is the number of students who at any time during the year changed their enrollment from a NT Government school in an income-managed community to a different NT Government school in a different income-managed community. [b] This is the number of students who at any time during the year changed their enrollment from a NT Government school in an income-managed community to a different NT Government school in a non income-managed community. [c] This is the number of students who at any time during the year changed their enrollment from a NT Government school in a non income-managed community to a NT Government school in an income-managed community. [d] This is the number of students who at any time during the year join the administrative dataset. Students are counted as having joined if they first enter the dataset or return to the dataset after an absence of at least six months. Students who join the sample in grade 1 are not included in this calculation. [e] This is the number of students who at any time during the year leave the administrative dataset. Students are counted as having left if they exit the dataset for at least six months. Students who exit the sample in grades 11 or 12 are not included in this calculation. [f] This is the number of students who for the whole year never change their enrollment to a school in a different community and do not join or leave the dataset. [g] This is the total number of students who are enrolled in an NT Government school in an income-managed community at some point during the year.

Table A3: The Effect of Income Management on School Attendance, Non-Movers Only: OLS Regression Results

	(1)	(2)	(3)
Panel A: Single treatment identifier			
Treatment	-0.017**	-0.010**	-0.008*
	(0.006)	(0.005)	(0.005)
Panel B: Treatment effect by time since income management commenced			
<30 days ago	-0.008	-0.016**	-0.015**
	(0.006)	(0.006)	(0.006)
30-59 days ago	-0.014*	-0.021**	-0.017**
	(0.008)	(0.006)	(0.006)
60-89 days ago	-0.030***	-0.033***	-0.029***
	(0.008)	(0.007)	(0.007)
90-119 days ago	-0.027**	-0.021**	-0.018**
	(0.009)	(0.007)	(0.007)
120-149 days ago	-0.023**	-0.009	-0.006
	(0.009)	(0.007)	(0.007)
150+ days ago	-0.002	0.005	0.004
	(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	1446422	1446422	1446422
R^2	0.104	0.105	0.114

Notes: Cluster robust (student level) standard errors reported in parentheses. The dependent variable is an indicator for whether the student attended school for the whole day at time t. The estimation sample is an unbalanced panel of all students in grades 1-12 enrolled in the NT public education system during the period 2006-2009 (inclusive) that excludes those students who moved community during this period. Movers are those students who are either i) enrolled in two or more different schools in different communities during the period (as identified in the NT Department of Education school enrollment records) or ii) who join/leave the estimation sample during the period, except for those students entering in grade 1 or exiting in grades 11 or 12. Students are counted as having left if they exit the dataset for at least six months. Students are counted as having joined if they first enter the dataset or return to the dataset after an absence of at least six months. The full set of available controls include school fixed effects, time fixed effects (day level), a linear time trend, grade fixed effects (grades 1-12), day of the week fixed effects (Monday-Friday) and school-term fixed effects. There are four school terms per year; 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. Estimates are obtained by OLS. *,** and *** is statistical significance at the 10%, 5% and 1% level respectively.