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ABSTRACT

Two Decades of Welfare Reforms in Australia: How Did They Affect Single Mothers and Their Children?

Worldwide, single mothers are profoundly time and income constrained, making them heavily reliant on government transfers. We examine how welfare reforms that introduced mutual obligations affected the economic position of single mothers and the development of their children over the past two decades in Australia. Using nationally representative longitudinal data, we show that disposable incomes of single-mother households were significantly reduced relative to partnered mothers since the 2005 Welfare-to-Work Act came into effect in July 2006, a downward trend that was aggravated by the Global Financial Crisis and the 2013 suspension of grandfathered single parenting payment rules. The reform diminished parenting and family payments for single mothers, who compensated income loss by increasing reliance on disability pension payments, work hours, and child-care expenditures. We then use nationally representative cohort data to estimate the impact of single motherhood on child skill development, following children who entered primary school when their mothers were affected by the Welfare-to-Work reform. We find unadjusted single-motherhood gaps of 0.2 SD in cognitive and 0.3 SD in non-cognitive skills. Non-cognitive skill gaps are only partially explained by differences in observable characteristics, while cognitive skill gaps are fully explained by observable characteristics. Differences in disposable household income between single and partnered mother households explain over 50% of the observed cognitive ability gaps in childhood and 25% in late adolescence. In the presence of positive spillover effects, we propose that welfare payments to vulnerable families may function as a social investment rather than a sunk cost.

JEL Classification: I32, I38, J12

Keywords: welfare dependence, family benefits, adversity, single motherhood, child development

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1. Introduction

Single mothers face a host of challenges in raising their children. They have lower wages, they receive less financial and time support from partners, and they have a relatively greater need for income support from outside sources, in particular from government (Sørensen 1994). For this reason, welfare reforms that introduce work requirements disproportionately affect single mothers, as they have two roles to fulfil: be an educator while spending time with their children and be the main income earner while spending time in the labour market. Previous analyses have shown how such reforms harmed the economic position of single mothers, for instance in the United States (Eissa and Liebman, 1996; Schoeni and Blank 2000; Meyer and Rosenbaum, 2000, 2001; Blank 2001, 2002; Grogger, 2003; Eissa, Kleven and Kreiner, 2008; Fang and Keane 2004; Hoynes and Patel, 2018; Wikle and Wilson 2019).

In this paper, we therefore argue that welfare targeted at single mothers, should be considered a long-term social investment rather than a short-term sunk cost in governmental budgets. While this view may seem non-traditional in public finance, two recent studies in the United States have argued along similar lines. Hoynes and Schanzenbach (2018) and Bailey et al. (2019) calculated the long-term returns on investment of social welfare programs in the United States, and demonstrate that the benefits of these programs largely outweigh their cost. They show that access to welfare programs has a large positive impact on children's education, health and labour market outcomes. The authors argue that welfare programs act as the investment in a child through either the allocation of parental time spent with the child or improved resources available for the child, leading to an improvement in the child's cognitive and behavioural skills. This higher human capital improves lifetime economic and health outcomes as well as social productivity, reducing the likelihood of future reliance on government support and increasing tax revenues in the long run.

Similar to many other countries, Australia has also introduced work requirements for welfare recipients in the past 20 years. Large budget deficits have prompted governments to reduce welfare benefits at the beginning of the new millennium, when one in five people of workforce age were receiving income support (McClure Report 2000, Saunders 2000, McDonald and Chenoweth 2006). Changes came progressively into effect, following recommendations of the McClure Report (2000). The report laid out six principles to change the welfare system, including the recommendation of a deepening of a mutual obligation approach that forced welfare recipients to contribute to social capital through job search and training requirements.

Mutual obligations requirements were phased into the Australian welfare system starting in 1999, but the most important changes were introduced in 2005 with the so-called Welfare-to-Work and Other Measures Act, which came into effect in July 2006. This legislation changed the eligibility criteria to parenting payments for welfare recipients with children. The reform hit hardest single parents with a dependent child. Previously, single parents with a dependent child under the age of 16 were eligible for the Parenting Payment Single (PPS). The reform reduced the eligibility age cut off to age 8. Single parents of children older than 8, who entered the welfare system after 1 July 2006, were instead eligible for unemployment benefits (Newstart Allowance NSA). The change in eligibility from PPS to NSA reduced the maximum payment rates, and affected waiting and preclusion periods and the cut-offs for tax offsets. Although the reform package protected single parents with children older than age 8 who were already on income support before 1 July 2006 through a grandfathering rule, sole parents were still required to meet work participation requirements. The reforms assumed that single parents have a capacity to work a minimum of 15 hours per week once their youngest child reaches age 8 and that it is feasible for them to fulfil job search requirements to remain eligible for income support (Summerfield et al. 2010). Further amendments came into effect in January 2013, switching grandfathered parenting payment recipients from PPS onto NSA if their youngest child was under age 13 by the end of 2012.

The reform package has been particularly challenging for single mothers who are consistently one of the most disadvantaged demographic group in Australia (ABS 2007; McNamara et al. 2004; Marks 2007, Grahame and Marston 2012). Single-mother households represent 82% of single-parent families, with an average disposable household income of $687 per week (Census 2016).[1] The financial vulnerability of single mothers is particularly concerning as 39% of children living in poverty come from single mother households (ACOSS 2018). Previous evidence suggested that the reforms increased poverty rates of single mothers in the welfare system (Wilkins 2013).

We document how Australia's welfare reform over the past two decades has affected single mothers' income and employment outcomes, and how such changes affected children's human capital development in single mother households. For the analysis, we use data from both the Household, Income and Labour Dynamics in Australia (HILDA) survey and from the Longitudinal Study of Australian Children (LSAC) (Kindergarten cohort). Using all available

[1] The average weekly ordinary time earnings for full-time adults in Australia in November 2019 was $1,659 with a disposable income of $998 per week (ABS 2019).

waves of HILDA (2001-2018), we document the evolution of single mother's income and sources, employment and childcare usage over time. We will use the LSAC data to estimate the impact of single motherhood on the cognitive and non-cognitive skills of children between 2004 (when the children are 4-5 years old) and 2018 (when they are 18-19 years old).

We contribute to the prior literature in three ways. Firstly, we provide a comprehensive overview of the different welfare regimes affecting single mothers over the 2001-2018 period in Australia, allowing us to evaluate the relative contribution of individual welfare policies in the evolution of income, labour supply and use of childcare services. Secondly, we are the first to estimate the impact of single motherhood on children's human capital development across the child's life stages in Australia: early childhood, adolescence and the period when children enter young adulthood. By connecting these findings with the changing welfare landscape, we contribute to a nascent literature on the long-term impact of welfare reform on children's cognitive and non-cognitive outcomes which is particularly limited in the Australian context (see Gaitz and Schurer 2017, Deutscher and Breunig, 2017 for exceptions). Finally, we contribute to a controversial policy discussion around the role of the social safety net as a social investment, rather than a sunk cost, which yields both public and private benefits.

The remainder of the paper proceeds as follows: Section 2 provides a review of the relevant literature. In Section 3, we document the core changes to the welfare legislation governing payments to single parent households in Australia over the past two decades. In Section 4, we describe the data and present summary statistics. In Section 5, we document the outcomes of single mothers in Australia between 2001 and 2018, comparing them to partnered mothers. In Section 6, we present estimates of the impact of single motherhood on children's outcomes. In Section 7 we discuss our findings and conclude. Supplementary material is presented in an Online Appendix.

2. Literature Review

A large body of literature – largely from the United States – has established that welfare policies significantly affect single mothers outcomes. Motivated by large changes in welfare benefits in the United-States in the 1990 from unconditional cash programs to workfare (EITC, PRWORA), a first strand of this literature focuses on estimating the impact of various welfare reforms on maternal labour supply, income and employment (Eissa and Liebman, 1996; Schoeni and Blank 2000; Meyer and Rosenbaum, 2000, 2001; Blank 2001, 2002; Grogger, 2003; Eissa, Kleven and Kreiner, 2008; Fang and Keane 2004; Hoynes and Patel, 2018; Wikle

and Wilson 2019). A second strand of literature analyses consumption patterns, life satisfaction, health and well-being outcomes, arguing that employment outcomes alone are not sufficient to conclude on the welfare implications of welfare reforms (Meyer and Sullivan 2004, 2008; Miligan and Stabile 2011; Herbst 2012, 2013; Evans and Garthwaite 2014; Han, Meyer and Sullivan 2021). Closely related, a smaller body of literature shows that welfare reforms can also affect partnering incentives (Grogger and Karoly 2009; Fisher and Zhu 2019). Fisher and Zhu (2019) demonstrate that the Australian Welfare-to-Work reform created incentives for single mothers to find a partner to avoid a drastic loss in welfare benefits induced by the reform. New data and long-term outcomes has enabled recent studies to bring nuance to older debates (Narain et al., 2017).

Recent studies emphasize that welfare policies have complex effects that depend importantly on family structures and incentives, and that are hard to disentangle in practice. Hoynes and Patel (2018) show that welfare changes create i) direct income effects, ii) indirect "earnings" effects – through labour supply adjustments at the extensive and intensive margins (although no evidence exists on responses at the intensive margin) — and iii) indirect "income adjustment" effects through other welfare benefits. Hoynes and Patel (2018) are the first to disentangle these three intermediate effects of welfare reforms for single mothers. Focusing on the EITC and using quantile regression techniques, they demonstrate that most of the positive effects found in the literature are concentrated in the low-medium income range of families, and are driven by the extensive margin of labour supply. In contrast, effects are null for the poorest families with little labour market attachment. This important finding is consistent with Bitler, Gelbach and Hoynes (2006, 2017), who show that mean effects of welfare reforms hide the large degree of heterogeneity in the treatment effects of the EITC, even for smaller subpopulations like single mothers.

Fewer studies have found evidence that welfare policies have intergenerational effects on child development, leading some to argue that welfare benefits for families should be seen by policymakers as long-term investments in children (Hoynes, Schanwenbach and Almond, 2016; Bailey et al., 2020; Hoynes and Schanzenbach, 2019). Most of the earlier evidence originates from studies on the relatively short-term effects of child-care policies on maternal labour supply and children's cognitive development and health (Bernal and Keane 2010, 2011; Blau and Terkin 2007; Herbst and Terkin 2011; Miligan and Stabile 2011; Bitler, Hoynes and Domina, 2014). Emerging evidence indicates that access to safety net programs more broadly defined generates large, positive and persistence intergenerational benefits that largely outweigh short-term implementation costs (Hoynes, Schanwenbach and Almond, 2016;

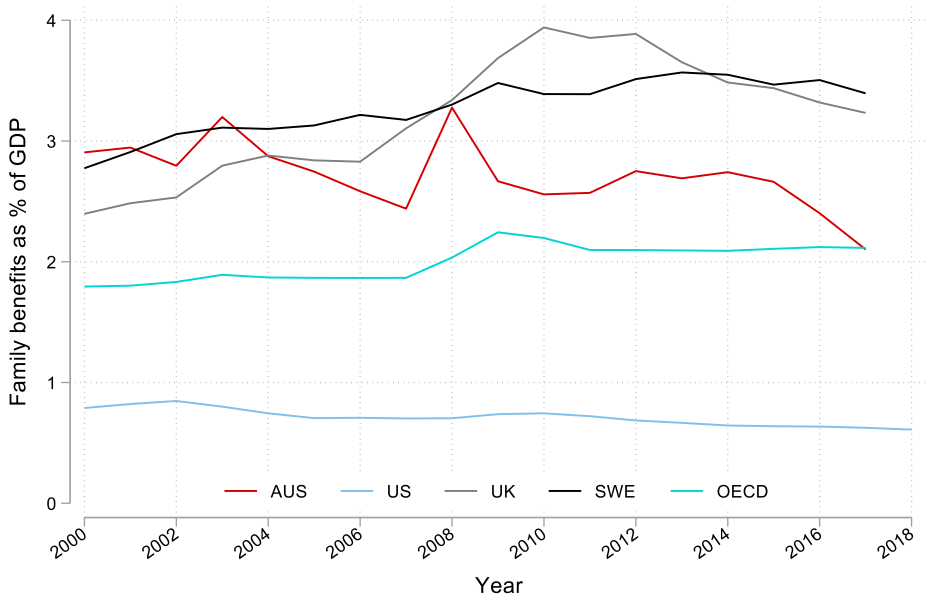
Musick and Mare 2007; Grogger and Karoly 2005; Aizer et al. 2016; Bailey et al. 2020). Aizer et al. 2016 collected historical administrative records on one of the first safety net programs in the United States, targeted at mothers with low support. Their study provides the first evidence that access to welfare in childhood increased educational attainment, earnings and longevity. By demonstrating long-term impact, these findings reinforce the notion that reforms which reduce welfare entitlements may reduce families' *capacity* to invest in family well-being, physical and mental health (e.g. Meyer and Sullivan 2004, 2008; Han, Meyer and Sullivan 2021; Miligan and Stabile 2011; Herbst 2012, 2013; Evans and Garthwaite 2014), maternal human capital (e.g. Blau and Terkin 2007; Herbst and Terkin 2011). These effects may be channels for the intergenerational effects of welfare programs, since well-being, physical and mental health all ultimately benefit child human capital (e.g. Bernal and Keane 2010, 2011; Miligan and Stabile 2011).

A vast literature in the social sciences has demonstrated that income and the early life environment are crucial determinants of child human capital development, wellbeing and longevity (Heckman 2006; Almond and Currie 2011; Almond, Currie and Duque 2018; Hoynes and Schanzenbach 2018). Increased income may benefit the child through direct mechanisms, such as an increase in the resources available to the child. Indirect mechanisms include increased parental time and improved parental well-being which increases their ability to nurture their children (Dahl & Lochner 2012; Duncan and Brooks-Gunn 2000). Thus, competing income and substitution effects make the direct impact of welfare reform challenging to measure (Bastian and Michelmore 2018). Reichman et al. (2020) highlight parenting as an important channel through which welfare reform generates poorer outcomes in children of disadvantaged households. Analysing welfare reform in the 1990s, which represented a major policy shift that substantially and permanently retracted cash assistance to poor mothers in the U.S., found that welfare reform had adverse effects on engagement in parent-child activities, children feeling close to their mothers, and mothers knowing their children's whereabouts, with the effects generally concentrated among boys. These findings have implications for children's development and contribute to a virtually non-existent literature on the effects of welfare reform on parenting and the small but growing economic literature on parenting. We found no evidence that the effects of welfare reform on parenting operated through the mother working more than full time, having multiple jobs, working in a service job, or having a non-standard work schedule.

The complex responses of families to changes in welfare benefits depend crucially on the institutional setting they face, including available child-care options and other welfare benefits

such as family benefits. As most of the literature has focused on the United States, the case of Australia offers unique perspectives. Australia is a rich country that has traditionally operated an exceptionally generous family benefit scheme that made Australia resemble more like Sweden before the 2005 Welfare-to-Work Act (3% of GDP, see Fig. 1). Since the Welfare-to-Work Act came into effect in 2006, Australia's family benefit generosity declined markedly, converging to the OECD average in 2017 (2.1% of GDP). Since then, it is located halfway in between the United Kingdom (3.2% of GDP) and the United States (0.6% of GDP).

Figure 1. Family benefits as share of GDP in selected OECD countries (2000-2018)



Note: Data obtained from OECD (2021), Family benefits public spending (indicator). doi: 10.1787/8e8b3273-en (Accessed on 19 September 2021). The vertical axis measures share of GDP. Horizontal axis plots the years from 2000 to 2018. Family benefits spending refer to public spending on family benefits, including financial support that is exclusively for families and children. Spending recorded in other social policy areas, such as health and housing, also assist families, but not exclusively, and it is not included in this indicator. Broadly speaking there are three types of public spending on family benefits: Child-related cash transfers (cash benefits) to families with children, including child allowances, with payment levels that in some countries vary with the age of the child, and sometimes are income-tested; public income support payments during periods of parental leave and income support for sole parents families. Public spending on services for families (benefits in kind) with children, including direct financing and subsidising of providers of childcare and early education facilities, public childcare support through earmarked payments to parents, public spending on assistance for young people and residential facilities, public spending on family services, including centre-based facilities and home help services for families in need. Financial support for families provided through the tax system, including tax exemptions (e.g. income from child benefits that is not included in the tax base); child tax allowances (amounts for children that are deducted from gross income and are not included in taxable income), and child tax credits, amounts that are deducted from the tax liability.

Single parent households in Australia are of key policy relevance. First, they concentrate most disadvantage, with 1 in 4 single parent households experience severe financial stress while less

than 1 in 30 do so in coupled parent households (Phillips and Narayanan 2021). Single mother households are twice as likely to live in poverty than single father households (Davidson et al. 2020). The Welfare-to-Work reforms affected most single mother households (Alexander et al 2005; Blaxland 2008; Marks 2007; Miranti et al 2011; Saunders et al 2008; Fisher and Zhu 2018). The existing empirical literature have overwhelmingly indicated that the policy change has decreased the financial wellbeing of single mother families (Brady and Cook 2015; Cook et al 2009, Cox & Priest 2008, DEEWR 2009, Grahame & Marston 2012). The reform did not only increase labour force participation rates (Gong and Breunig 2014) but also the probability of re-partnering (Fisher and Zhu 2018). A recent paper suggested that the reform also worsened health outcomes of single mothers (Jovanovski and Cook 2020). Wilkins (2013) finds that following the introduction of the Welfare to Work reforms, the single-parent poverty rate jumped from 19% in 2005 to 24% in 2007 and remained above 23% in the subsequent years. Third, single mother households face unique constraints with respect to raising children, leading to different margins of responses to welfare cuts and expansions.

We contribute to this literature by reporting the outcomes of single mothers and their children over the past two decades. We provide a comprehensive comparison of single and partnered mothers on six maternal outcomes, including labour supply, income, childcare use and various types of welfare receipt–similar to what has been reported in the literature (e.g. Meyer and Sullivan 2004, 2008; Han, Meyer and Sullivan 2021). We are among the few to estimate the single-motherhood penalty on outcomes of the children born in 1999/2000, who started school at the time when Australia changed its welfare regime to make single mothers work in exchange for welfare. This comparison is justified in our case because of the markedly different welfare regime facing single-parent families and married-couple families.

3. Institutional Background

The Australian government transformed the tax and welfare system in 1999,[2] making 2001-2018 an ideal period to assess the impact of welfare reform for single mothers.[3] The major trends in Australian welfare reform over the last two decades include:

a. a decline in the generosity of payments with more stringent restrictions on income eligibility;

[2] *A New Tax System Acts* 1999 (Cth).
[3] See Appendix A for a summary timeline of the welfare reforms from 2001-2018.

b. a shift to increased work obligations with the purpose of reducing welfare and intergenerational reliance whilst increasing the economic and social participation of citizens; and

c. an increase in childcare support.

Figure 2 describes the evolution of welfare reform in Australia between 1999 and 2018. In the following we describe in detail existing benefits and how they changed over time.

Family Tax Benefits: Family Tax Benefit (FTB) Part A was introduced on 1 July 2000 with the aim of providing income support for low-income families with dependent children.[4] Eligibility for FTB Part A is calculated based on household taxable income, living situation, number and age of dependent children and child support payments received, with the transfer amount increasing once the child turns 13. An annual supplement of $600 per child was introduced from June 2004 but from 2017, an income limit of $80,000 was introduced to be eligible for the supplement.

FTB Part B was also introduced on 1 July 2000 and provides additional income support to single parent families. The payment is made per family based on their income as well as the age of their youngest child. Until 30 June 2008, all lone parent families with FTB-eligible children were entitled to the maximum FTB Part B amount. However, on July 2008, an income threshold was introduced, limiting the payment to sole parents earning $150,000 or less per year. On 1 January 2005, an annual supplement of $300 was introduced if the single parent earns $100,000 or less.[5]

Parenting Payments: The Parenting Payment is a means tested payment for low-income families. It consists of the Parenting Payment Partnered (PPP) for low-income couples with dependent children and Parenting Payment Single (PPS) for low-income lone parents. A supplement of $300 was available for single parents on PPS who earn between $68,000-$150,000, which was later abolished on 1 July 2017.

The key legislative reform impacting single mothers during the 2001-2018 period was the introduction of the *Employment and Workplace Relations Legislation Amendment (Welfare*

[4] Maximum rates for FTB Part A is $5,518.80 for a child aged 0-12 and $6,953.25 for a child aged 13-19. This includes the end of year supplement. Based on September 2018 payments.
[5] $150 (part payment in 2005), subsequent payments were $300, indexed to CPI.

to Work and Other Measures) Act 2005 (Cth) ('Welfare to Work Act'). This had the objective of increasing labour force participation among welfare recipients by requiring parents to engage in a minimum of fifteen hours of paid work or work-related activity per week once their youngest child turned 6, in order to remain eligible for income support.

Another legislative change to the PPS was the change in the eligibility criteria, affecting 80,000 single parents. Single parents who claimed PPS on or after 1 July 2006 would only receive PPS until their youngest child turned 8. They were instead eligible for the Newstart Allowance (Newstart) which was a less generous payment and contained stricter income tests.[6] Single parents were unambiguously disadvantaged. For instance, a single mother with one child aged 8 who earns no labour market income would have experienced a 7% drop in her disposable income, whilst a mother earning $20,000 in labour market income would have experienced a 17% fall in disposable income (Fisher and Zhu 2019).

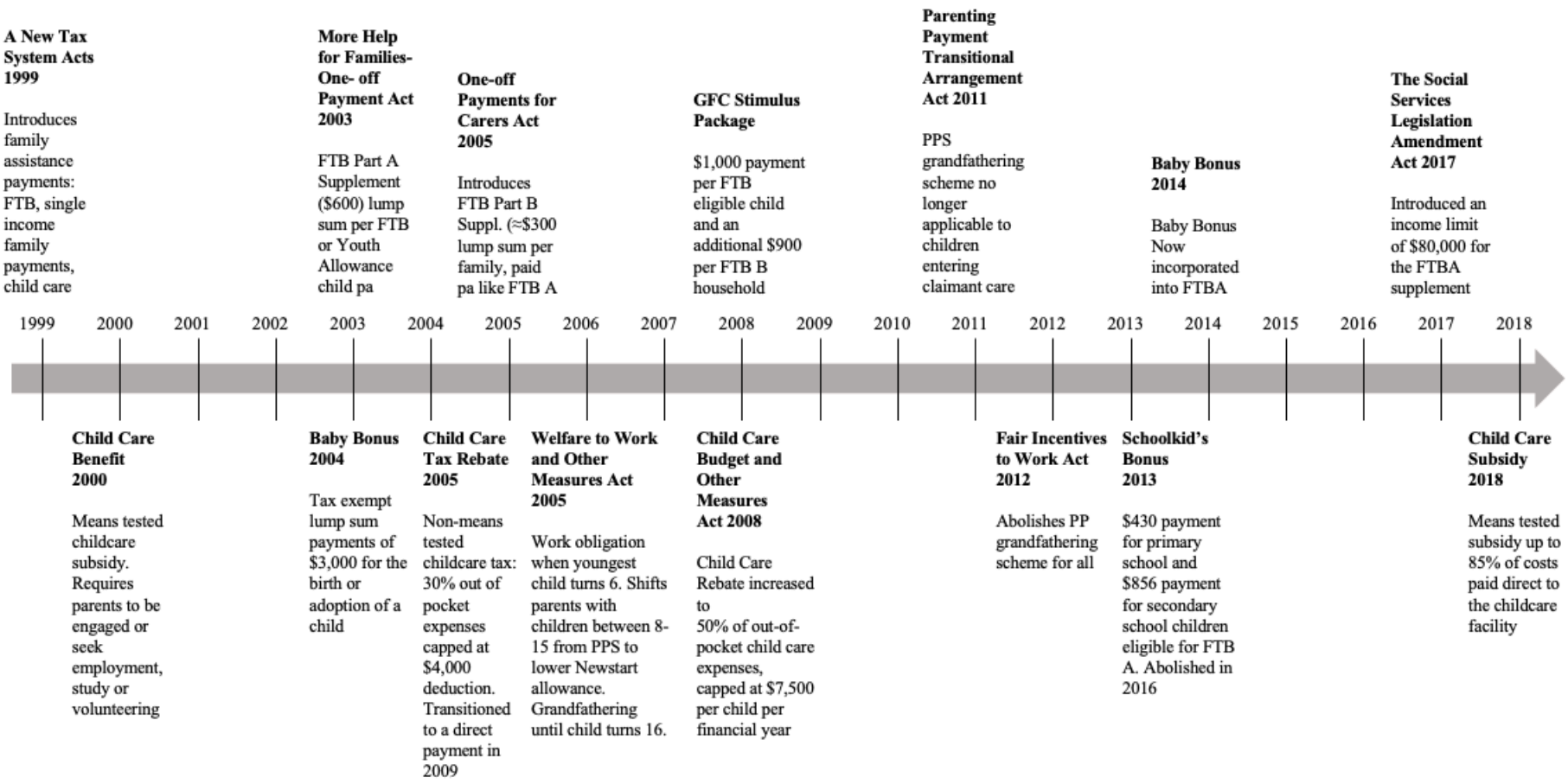
The Welfare to Work Act included a grandfathering provision where parents receiving PPS before 1 July 2006 continued to receive the payment until their youngest child turned 16. However, on 1 January 2013, this grandfathering protection was abolished by the *Social Security Legislation Amendment (Fair Incentives to Work) Act 2012* (Cth), affecting an additional 100,000 single parents (ACOSS, 2014).

Child Care Support: The Child Care Benefit (CCB) which was introduced on 1 July 2000, replaced the Childcare Assistance and Childcare Cash Rebate. CCB is a means tested subsidy for eligible families and requires parents to be engaged in or actively seeking employment, study or unpaid volunteering in excess of 15 hours per week and to use a paid childcare provider. The maximum amount that could be received per child per week was $144.

In 2005, the government introduced the Child Care Tax Rebate (CCTR) which is not income or asset tested and families received 30% of out of pocket child care expenses with an annual limit of $4,000 per child per year (APH, 2005). From July 2008, this rate was increased to 50% of costs and the annual limit increased to $7,500 per child per year. In 2009, the CCTR transitioned from a tax deduction to a direct payment.

[6] As of September 2018, the maximum payment for a single parent receiving PPS was $768.50 per fortnight, compared to the maximum payment for a single parent on Newstart which was $595.10 per fortnight.

Figure 2. Australian Welfare System Reform Dates



From 2 July 2018, the Child Care Benefit and Rebate payments were replaced by the Child Care Subsidy (CCS) which was based on a means tested system. The payments were made directly to the childcare facility rather than to the family. Families were eligible for a subsidy of up to 85% of childcare costs if a family's combined income was less than $66,958, with the subsidy decreasing to 20% if the combined income exceeded $351,248.

Bonus Payments: The Baby Bonus scheme was introduced in the 2002 Federal budget which aimed to assist new parents and stimulate fertility rates. The Scheme initially granted $2,500 in tax cuts per year which was later amended on 1 July 2004 to tax-exempt lump sum payments of $3,000[7] to families on the birth or adoption of a child. From 1 January 2009, only families with a combined adjusted taxable income of $75,000 or less in the six months following the child's birth or entry into the family's care were eligible for the payment. On 1 January 2013, the payment for subsequent children was reduced to $3,000 and only payable if paid parental leave was not received. The scheme was eventually dissolute on 1 March 2014, replaced by changes in FTB Part A.

In 2008-2009, the government introduced stimulus payments to households in response to the Global Financial Crisis. In December 2008, a bonus $1,000 payment per dependent child was paid to families eligible for FTB Part A in 2008-2009. In March 2009, families receiving FTB Part B received a $900 bonus payment through the Single Income Family Bonus. In March 2009, families receiving FTB Part A were entitled to a Back to School Bonus payment of $950 per dependent child aged 4-18 on 30 June 2009.

The Schoolkid Bonus was a yearly payment from January 2013-July 2016 for families who were eligible for FTB Part A, replacing the Education Tax Refund. Primary school children received a payment of $430 and secondary school children received a payment of $856.[8] From 2015, the payment was restricted to families who earned a combined annual income of $100,000 or less.

Thus, a large number of welfare and family policy reforms took effect in Australia between 1999 and 2018, starting with the 1999 New Tax System Act and finishing with the Child Care subsidy in 2018. In the next section we will assess how the economic position changed of families with dependent children over this time period.

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[7] The Baby Bonus payment increased to $4,000 in 2006 and $5,000 in 2008.
[8] Based on January 2016 payments.

4. Data

4.1 Household, Income, and Labour Dynamics in Australia (HILDA) survey

To document how the welfare of single and partnered mothers has changed over the past two decades in Australia, we use eighteen waves of data from the Household, Income and Labour Dynamics in Australia survey (HILDA) (2001-2018). HILDA is a nationally representative longitudinal household survey with an initial sample of 7,682 households, recording rich information regarding economic wellbeing, labour and family dynamics (Summerfield et al. 2017). This allows us to generate time-series graphs to document the evolution of disposable income, welfare receipt, labour market outcomes and childcare usage over time. The main variables of interest are defined as follows.

4.1.1 *Single Mother*

We define single mother as a female whose marital status is either separated, divorced, widowed or never married and who have dependent children between the ages of 0 and 18 residing in their home.[9] In our data, between 14.3% (2001) to 17.0% (2018) respondents are defined as single parents (male and female). This number is slightly higher than recorded in the 2006 and 2016 Census figures (~11%). Considering only the female sample, we record 1 in 5 women as single mothers in 2001 and 1 in 4 in 2018. In the final estimation sample, we have 13,677 single mothers and 44,293 partnered mothers. Our analysis focuses on outcomes of single mothers in any given time period.[10]

4.1.2. Disposable Income

Disposable income is the annual household disposable income, net of government transfers and taxes in each financial year. We adjusted disposable income for inflation using the Australian Bureau of Statistics Consumer Price Index so that income across all waves is presented in 2018 dollars, representing trends in real terms. We removed from the analysis. We remove 115 observations from the sample, for which negative values were recorded. We

[9] Dependent children include non-biological children.

[10] Single mother status changes over time. In our sample, there were 63% of mothers who were never observed to be a single mother. About 10% of the sample (or 1 in 2 of all single mothers) were observed to be a single mother for 10 or more years. This paper does not distinguish between chronic single motherhood or temporary single motherhood.

remove from the actual income analysis the bottom 0.5% of the income distribution (less than $10,000 disposable household income), to eliminate misreported values.

4.1.3. Welfare Receipt

Welfare receipt is constructed from a variable that records all welfare payments that mothers are eligible for.[11] Some welfare benefits are means tested, others are not. Benefits include the following Australian Government payments: (income-support) allowances,[12] tax-system administered family payments (some conditional other unconditional cash transfers),[13] parenting payments[14] made to low-income parents (both single and partnered), and one-off bonus payments.[15] Family payments and government bonus payments have been calculated by HILDA on the basis of eligibility criteria, payment rates and details on the family structure and income circumstances of the respondents (Wilkins 2014). The non-reliance on self-reporting derives more accurate estimates by minimising measurement error. However, the HILDA survey will slightly overestimate the family benefits and bonus payments as actual receipt of the payment may be slightly lower than eligibility for the payment. Similar to the construction of disposable income, welfare receipt has been adjusted for inflation using the CPI so that values are expressed in real terms at 2018 prices.

4.1.4. Summary statistics

Table 1 presents summary statistics comparing single mothers with partnered mothers. The two groups have inherently different underlying characteristics, evident in the statistical significance of the difference between the means (columns (3) and (4)). Relative to partnered mothers, single mothers are slightly older (47 years vs 41 years), are less likely to be employed

[11] Refer to Section 3: Institutional Background for an overview of the key welfare payments.
[12] HILDA variable *bnfalli*: Income support payments refer to the Newstart Allowance, Mature Age Allowance, Sickness Allowance, Widow Allowance, Special Benefit, Partner Allowance, Youth Allowance, Austudy, Abstudy and Community Development Economic Program (CDEP).
[13] HILDA variable *bnffama*: Family benefits are paid through the tax system such as the family tax benefit A (FTB-A) and family tax benefit B (FTB-B), the latter being means tested, and maternity payments, which are received at the birth of a newborn.
[14] HILDA variable *bnfpari*: Parenting payments are means tested. They are paid to single and partnered mothers who earn income below a specific threshold. These are: Parenting Payment Single (PPS) and Parenting Payment Partnered (PPP).
[15] HILDA variable *bnfboni*: Bonuses refer to one-off payments such as the financial year 2008-09 Stimulus payments that was paid in response to the Global Financial Crisis, Clean Energy Advance Payments and Schoolkids Bonus.

(52 vs 67%), are more likely to be unemployed (5% vs 2%) and out of the labour force (43% vs 31%) have lower educational attainment (48% vs 57% pursued tertiary education), lower household disposable income ($60,601 vs $99,445), lower labour force participation (52% vs 67%), but they work more hours per week (32 hrs vs 29 hrs), and have lower hourly wages ($30 vs $33). They also have lower human and health capital. For instance, single mothers are less likely to have university education (17% vs 31%) and have worse general health (2.9 score vs 2.5 score, where 5 is the worst).

On average, single mothers have lower levels of household disposable income and rely more on welfare payments than partnered mothers. Single mothers have over 50,000 less in household income (76K vs. 127K, measured in 2018 dollars). They receive on average $18K more in income and non-income related welfare payments than partnered mothers ($25K vs $6.6K per annum). This is so, because single mothers receive $3.4K more in pensions ($4.2K vs 0.8K), $3.9K more in parenting payments ($4.8K vs $0.9K), and $6.2K more in family payments (9K vs 2.7K). Single mothers have on average fewer children (1.7 vs 2) and lower child-care costs ($0.9K vs $1.9K).

Table 1: Summary Statistics on Single and Partnered Mothers in HILDA (2001-2018)

	Partnered mothers (PM)	Single mothers (SM)	PM-SM (1)-(2)	p-val	N. Obs. PM (1)	N. Obs. SM (2)
Age	41.39	46.51	-5.121	0.000	44293	13677
	(10.44)	(16.22)				
Employed	0.67	0.52	0.148	0.000	44293	13677
	(0.47)	(0.50)				
Unemployed	0.02	0.05	-0.026	0.000	44293	13677
	(0.15)	(0.22)				
Not in labour force	0.31	0.43	-0.121	0.000	44293	13677
	(0.46)	(0.49)				
Wage	619.81	498.05	121	0.000	44293	13677
	(732)	(679)				
Workhours	29.39	32.14	-2.755	0.000	29533	7107
	(13.64)	(13.41)				
Hourly wage	32.94	29.86	3.082	0.000	29510	7105

	(31.95)	(21.09)				
Disposable HH Income	127326	76202	51124	0.000	44293	13677
	(84074)	(55037)				
Welfare: pension, allowance, bonus	5159.96	19620.34	-14460	0.000	44293	13677
family, parenting, scholarships	(7581)	(14561)				
Welfare: income + non-income	6556.39	24765.22	-18208	0.000	44293	13677
support	(9730)	(19272)				
Welfare: pensions	784.70	4227.10	-3442	0.000	44293	13677
	(3469)	(8390)				
Welfare: parenting payments	896.09	4797.66	-3901	0.000	44293	13677
	(3555)	(7982)				
Welfare: allowances	282.43	987.19	-704	0.000	44293	13677
	(1877)	(3566)				
Welfare: non-income support other	303.34	231.69	71.646	0.000	44293	13677
than family	(1592)	(1451)				
Welfare: other public transfers	14.00	9.96	4.040	0.477	44293	13677
(scholarships)	(590)	(549)				
Welfare: bonus payments	305.34	719.63	-414	0.000	21978	6917
	(815)	(1563)				
Welfare: family payments	2727.89	9002.79	-6274	0.000	44293	13677
	(3950.47)	(9041.62)				
Welfare: all income-support	1963.22	10011.95	-8048	0.000	44293	13677
payments	(5204.87)	(9751.66)				
Welfare: all non-income support	3182.73	9598.43	-6415	0.000	44293	13677
payments	(4409.93)	(9601.32)				
Debt: Home	172527.72	58873.58	113654	0.000	43154	13410
	(257615)	(140988)				
Debt: credit card	648.40	1166.34	-517	0.000	12154	3750
(years 2002, 06, 10, 14, 18)	(2731)	(5411)				
Child care cost per annum	1905.42	870.81	1034	0.000	41744	13002
(preschool)	(5256)	(2741)				
Number of own resident children	1.97	1.65	0.318	0.000	44293	13677
	(0.95)	(0.91)				
Number of adults in household	4.07	3.03	1.034	0.000	44293	13677
	(1.07)	(1.30)				
Education: postgraduate degree	0.13	0.07	0.059	0.000	44293	13677
	(0.33)	(0.25)				
Education: undergraduate degree	0.18	0.10	0.076	0.000	44293	13677
	(0.38)	(0.30)				
Education: vocational training	0.27	0.31	-0.045	0.000	44293	13677
	(0.44)	(0.46)				
Education: Completed Year 12	0.15	0.12	0.031	0.000	44293	13677
	(0.36)	(0.33)				
Education: Less than Year 12	0.27	0.39	-0.120	0.000	44293	13677
	(0.45)	(0.49)				
General health status	2.51	2.86	-0.349	0.000	39758	11620
(1: best, 5 worst)	(0.89)	(0.99)				

Notes: Standard errors in parentheses. *p*-values are reported for the statistical difference between the means of partnered and single mothers. All dollar amounts are adjusted for inflation and are reported in 2018 dollars.

4.2 Longitudinal Study of Australian Children (LSAC)

To estimate the consequences of single motherhood for the skill development of children, we use data from the Longitudinal Study of Australian Children (LSAC), a biennial longitudinal survey started in 2004 and commissioned by the Australian Government. The aim of the cohort study is to better understand the influence of family, social, economic and cultural environments on the wellbeing and development of Australian children. LSAC follows two cohorts of children, the Birth and Kindergarten cohort. We will use the Kindergarten (K) cohort only, which comprises of 4,983 children born between March 1999 and February 2000. We examine the period spanning 2004-2018, which corresponds to waves 1-8 of the LSAC data.

We proxy children's cognitive and non-cognitive skills with standard and validated measures available in LSAC that have been used in the previous literature (Fiorini and Keane 2014), income (Khanam and Nghiem 2016) or the Baby Bonus (Gaitz and Schurer 2017).

4.2.1 Non-Cognitive Outcomes:

We use the Strengths and Difficulty Questionnaire (SDQ) which is an internationally recognised psychometric questionnaire for children and adolescents (Goodman 1997) and which has been applied previously in the literature to measure a child's non-cognitive skills (Fiorini and Keane 2014; Goodman et al. 2000; Hawes and Dadds 2004). It is designed to assess the behaviour and emotions across five domains: prosocial skills, hyperactivity, emotional symptoms, peer relationship problems and conduct problems. Both teachers and parents were asked to assess the study child across these dimensions. In our analysis we rely on teacher-assessed SDQ scores, rather than the parent-assessed SDQ variables. Teacher-assessed measures provide a more consistent and objective measure of the child's non-cognitive behaviours as teachers can benchmark the child's behaviour relative to the other children in the school. For the analysis we use a summary SDQ measure collected in Waves 1-6, when the study children were aged 4-15.

4.2.2. Cognitive Outcomes:

We use three different measures of cognitive ability available at different stages of the child's life: (1) childhood (ages 4-9), (2) middle adolescence (ages 14-15) and (3) late adolescence

(ages 18-19). To reduce the high dimensionality of the many measures available, we use factor analysis to reduce the many measures available at each stage of the child's lifecycle into one summary measure that is increasing in ability. In childhood, this measure comprised the Matrix Reasoning Test, the Peabody Picture Vocabulary Test and Learning Outcomes. The Matrix Reasoning Test[16] is based on the Wechsler Intelligence Scale for children that captures nonverbal intelligence. It has been widely used as an indicator for child development (Fuchs et al. 2008, 2010; Jaeggi et al. 2010; Mazzocco et al. 2011). The Peabody Picture Vocabulary Test[17] captures a child's receptive vocabulary and has been widely used in the literature when assessing child achievement (Maxfield 2013; Centre for Human Resource Research 2004). The Learning Outcome[18] is a LSAC outcome index derived from a multistage standardisation of vocabulary knowledge, parent ratings of reading skills and teacher evaluation of reading, writing and numeracy skills (Sanson et al 2005).

In middle adolescence, the LSAC assessed IQ in Wave 6 (ages 14-15), using the so-called Cogstate tests[19], a universally recognised and validated cognitive test created by a leading neuroscience technology company. It captures attention, memory and executive functioning. It is highly predictive of academic performance and later-life success (Duncan et al 2007; Brock et al 2009). The same items are available also for the mothers.

To measure late adolescence cognitive ability, we use the Australian Tertiary Admission Rank[20] (ATAR). The ATAR is calculated from all Higher School Certificate (HSC) exams that students sit in Year 11 and 12, their final year of high school. It is the credential awarded to secondary school students who successfully complete senior high school level studies (Years 11 and 12 or equivalent). The ATAR is indicative of a student's position relative to the other students in their cohort and state. The ATAR determines whether and at which university the student can study. High school dropouts do not have an ATAR.

4.2.3. Summary statistics:

Table 2 compares the means of children's outcomes between single (N=1,654, 11.6%) and partnered mothers (N=12,593, 88.5%). The study child's observable characteristics differ significantly between the two groups (see p-values of a test of equality of means, column (3)).

[16] Measured in Waves 2 and 3, when the child was aged 6-7 and 8-9.
[17] Measured in Waves 1, 2 and 3 when the child was aged 4-5, 6-7 and 8-9.
[18] Measured in Waves 1, 2 and 3 when the child was aged 4-5, 6-7 and 8-9.
[19] Measured in Wave 6 when the child was aged 14-15.
[20] Measured in Wave 8 when the child was aged 18-19.

Children in single mother households are perform lower on all available skill scores, they are more likely in need of medical attention and they are slightly older (in terms of months of age). They have fewer siblings (1.3 versus 1.6), and a higher probability that another adult who is not the second parent, to live in the household (41 versus 30%). They are slightly more likely to live in a household where English is spoken at home (93 vs 91%), and to be located in the inner regions of Australia (24 vs 21%).

Single and partnered mothers also differ significantly in observable characteristics. They are slightly younger (35 vs 35.5 years), are more likely to have no post-secondary education (28 vs 23%) or vocational training (35 vs 27%), and less likely to have a Bachelor degree (11 vs 20%). Perhaps the largest difference between single and partnered mother households is that they have less household income ($820 vs $2,200 per week), which is not surprising as weekly income is the sum of all incomes in the household. Single mothers are also significantly more likely to be unemployed than partnered mothers (6 vs 2%), but if working they do not have different workhours (21 hours per week for both household types). Single mothers score higher than partnered mothers on all there cognitive ability measures – executive function ($p<0.1$), memory ($p<0.01$) and attention ($p<0.01$). These summary statistics confirm that single mother households are more disadvantaged than partnered mother households on most socioeconomic outcome dimensions but not in terms of cognitive ability.

Table 2. Summary statistics of main variables in LSAC by partner status

	(1) Single Mothers mean/sd	(2) Couple Mothers mean/sd	(3) p-value test of equality (1)=(2)
Study child outcomes and characteristics			
Child SDQ (std.)[a]	-0.31	0.04	0.000
	(1.17)	(0.97)	
Child cognitive ability (std.)[b]	-0.23	0.03	0.000
	(1.05)	(0.99)	
Adolescent cognitive ability (std.)[c]	-0.08	0.01	0.002
	(1.00)	(1.00)	
Australian Tertiary Admission Rank (std.)	-0.29	0.03	0.000
	(1.14)	(0.98)	
Female study child	0.50	0.49	0.491
	(0.50)	(0.50)	
Age study child in months	124.59	117.82	0.000
	(40.06)	(40.51)	
Needs medical attention	0.11	0.10	0.307
	(0.31)	(0.30)	

Household characteristics			
Nr siblings	1.31	1.56	0.000
	(0.97)	(0.91)	
Other adults present	0.41	0.30	0.000
	(0.49)	(0.46)	
Language at home: Confidential	0.01	0.02	0.179
	(0.11)	(0.12)	
Language at home: European	0.00	0.00	0.176
	(0.04)	(0.06)	
Language at home: Slavic	0.01	0.02	0.166
	(0.12)	(0.14)	
Language at home: Others	0.04	0.05	0.023
	(0.19)	(0.22)	
Language at home: English	0.93	0.91	0.001
	(0.25)	(0.29)	
Lives in major city	0.62	0.64	0.113
	(0.48)	(0.48)	
Lives in inner regions	0.24	0.21	0.001
	(0.43)	(0.40)	
Lives in outer regions	0.12	0.13	0.313
	(0.33)	(0.34)	
Lives in remote areas	0.01	0.02	0.125
	(0.11)	(0.13)	
Mother characteristics and behaviours			
Age	35.08	35.51	0.001
	(5.90)	(4.80)	
Post-second qual: None	0.28	0.23	0.000
	(0.45)	(0.42)	
Post-second qual: Postgrad	0.07	0.09	0.049
	(0.26)	(0.28)	
Post-second qual: Grad diploma	0.07	0.09	0.011
	(0.25)	(0.28)	
Post-second qual: Bachelor	0.11	0.20	0.000
	(0.32)	(0.40)	
Post-second qual: Adv. diploma	0.10	0.11	0.475
	(0.30)	(0.31)	
Post-second qual: Certificate	0.35	0.27	0.000
	(0.48)	(0.44)	
Post-second qual: Other	0.01	0.02	0.085
	(0.10)	(0.13)	
Mother health: 1 best 5 worst	2.67	2.46	0.000
	(1.31)	(1.20)	
Household weekly income	818.15	2186.70	0.000
	(535.01)	(1501.66)	
Employed	0.71	0.77	0.000
	(0.45)	(0.42)	
Unemployed	0.06	0.02	0.000
	(0.23)	(0.14)	
Not in labour force	0.23	0.22	0.198
	(0.42)	(0.41)	

Work hours per week	21.34	21.05	0.513
	(17.66)	(17.01)	
Cognitive ability: Executive function	221.27	219.16	0.059
	(32.44)	(28.11)	
Cognitive ability: Memory	2.80	2.13	0.000
	(4.74)	(4.14)	
Cognitive ability: Attention	2.76	2.11	0.000
	(4.68)	(4.09)	
Reports no income	0.03	0.12	0.000
	(0.16)	(0.32)	
Observations	1654	12593	0.000
Percent of total sample	11.6	88.4	

Note: Single motherhood is defined as one parent only, and parent in household is female. One parent fathers, are dropped from the sample (N=126). Standard deviations are reported in parentheses. [a]: Strengths and Difficulties Questionnaire (Waves 1-6): [b]: Factor analytic measure across three outcomes (waves 1-3): Matrix reasoning, Peabody vocabulary test, learning outcomes (teacher assessed); [c]: Factor analytic measure across three test results: Executive function, memory and attention.

5. Evolution of outcomes of single versus partnered mothers

In this section we present trends on outcomes indicating the economic position of single mothers compared to partnered mothers, over the period 2001-2018. Our analyses reveal three stylized facts: 1) single mothers were made significantly worse-off relative to partnered mothers since the legislation of the 2005 Welfare-to-Work Act; 2) they benefitted disproportionately more from additional bonus payments paid by the federal government in response to the Great Financial Crisis (which affected Australia most in 2009); 3) the economic position of single mothers was further worsened by the 2013 suspension of the Welfare-to-Work grandfathering rule that initially protected single mothers from the new eligibility rules attached to parenting payments in 2006.

5.1 Raw differences in outcomes

To provide a comprehensive picture of the economic position of single and partnered mothers, we present trends on five key outcomes: 1) income, 2) work hours, 3) income- and non-income welfare receipt, 4) fertility, and 5) child care costs.

Fig. 3 shows the evolution of income (Fig. 3a), work hours (Fig. 3b) and welfare receipt (Fig. 3c, Fig. 3d), the number of own resident children (Fig. 3e), and child care costs (Fig. 3f), separately for both single mothers (dark grey line) and partnered mothers (light grey line) from 2001 to 2018. The light blue dashed line indicates the percent change in the difference between

the two groups, benchmarked against the difference observed in 2001. We indicate key reform dates with red vertical lines: Welfare-to-Work Act in 2005 (which came into effect in July 2006); federal government rescue packages paid to Australian resident to counterbalance the global financial crisis (GFC) in 2009; and the suspension of the grandfathering rule in 2013.

Single-mother households experienced a flatter increase in disposable household income than partnered mothers (Fig. 3a). The initial gap in 2001 widened by 30% until 2018. Disposable household incomes of single mothers remained constant at around $80,000 per annum since 2006, when the Welfare-to-Work act came into effect, with a temporary drop and recover after the GFC, and an ongoing decline since 2016. In contrast, disposable household incomes of partnered mothers continued to grow steadily, growing from over $122,000 in 2006 to 135,000 in 2018. This is a surprising finding, as the hours worked by single mothers grew more strongly than for partnered mothers by up to 140% of the 2001 difference (Fig. 3b). In 2018, the work-hours gap between single and partnered mothers was 50% larger than in 2001.

Fig. 3c explains why disposable household incomes may have stagnated for single mother households despite increasing labour supply. Between 2001 and 2009, single mother households lost over $3,000 in annual welfare payments in the form of income support. The market income they gained through an increase in workhours did not compensate fully for the loss in income support. In the same time period, income support levels for partnered mothers remained constant at around $2,000 since 2006. Non-income support was always greater for single mothers, with $9,000 per annum for single mothers and $3,000 for partnered mothers. During the GFC, single mothers received a larger non-income support boosts (~$4,000) than partnered mothers (~$2,000).

A deeper inquiry into welfare payments by category reveals that single mothers compensated the loss of their parenting, family, and allowance payments triggered by the Welfare-to-Work reform with an increase in the uptake of disability pension payments (Fig. A2, Appendix). Single mothers experienced a steady increase in the receipt of pensions – these are disability pension payments - since 2006, with a discontinuous jump in 2009 and another jump in 2013, while levels remained the same for partnered mothers. Overall, disability payment differences between single and partnered mothers grew by 100% between 2001 and 2018. Parenting payment differences between single and partnered mothers dropped by almost 60% between 2001 and 2018, while family payment differences decreased by 10-15%. Differences in the receipt of allowances between single and partnered mothers in 2001 declined by 50% until 2009, but then increased steadily until 2018.

Fertility declined for both single and partnered mothers steadily from 2001, but with different patterns (Fig. 3e). While partnered mother's fertility declined steadily between 2001 and 2018 (from an average of 2.1 children to under 2 children), it started to increase for single mothers after 2007 before dropping off in 2014. Single mother's fertility declined from an average of 1.7 to 1.6 children in 2007, increased to a peak of 1.7 children in 2014, and then dropped back to 1.6 children in 2018. This pattern is consistent with the fertility incentives of the Welfare-to-Work grandfathering rule, which granted single mothers to stay on parenting payments as long as their youngest child is not older than eight years of age. Thus, the increase in fertility of single mothers around 2007 reflects a timely pregnancy response to this grandfathering rule, while the subsequent decline in fertility in 2014 reflects the response to the suspension of the grandfathering rule.

Finally, pre-school child care costs (expressed in 2011 dollars) increased for both single and partnered mothers between 2002 (when first data were available in HILDA) and 2018, but again with different patterns (Fig. 3f). Annual child care costs of around $750 remained constant for single mothers between 2002 and 2007. They then spiked to $1,000 in 2008, and remained constant throughout. For partnered mothers, they increased more substantially, from an annual $1,750 in 2002 to $2,500 in 2018. In fact, the gap between single and partnered mothers child care costs increased by 150% since 2002. The spike in child care costs for single mothers in 2008 is consistent with the increase in fertility since 2007. The increase in child care costs for partnered mothers may be explained by their increase in workhours and a decline in child care subsidies for families with higher household incomes.

5.2 Controlling for differences in observable characteristics

These reported trends do not account for the possibility that the composition of single and partnered mothers may have changed as a consequence of the 2005 Welfare-to-Work Act, the 2009 GFC, and the 2013 suspension of the grandfathering rule. In Fig. 4 we document the estimated differences between single and partnered mothers observed in every time period since 2001. The estimated coefficients and 95% confidence intervals are obtained from a random effects model in which we control for observable differences in age, education, and health of the mother, and the household composition (number of own resident children, number of adult household members). Outcomes are standardised to mean 0 and standard deviation 1.

Overall, our conclusions remain the same, but with some nuanced differences. Fig. 4a still shows that differences in disposable household income between single and partnered mothers widened significantly since 2006 and stabilised at -0.2 SD since 2011. Fig. 4(b) shows that

workhours of single mothers also significantly increased relatively to partnered mothers between 2007 and 2015 between 0.1 to 0.18 SD. Since 2015 we find no difference in workhours between single and partnered mothers.

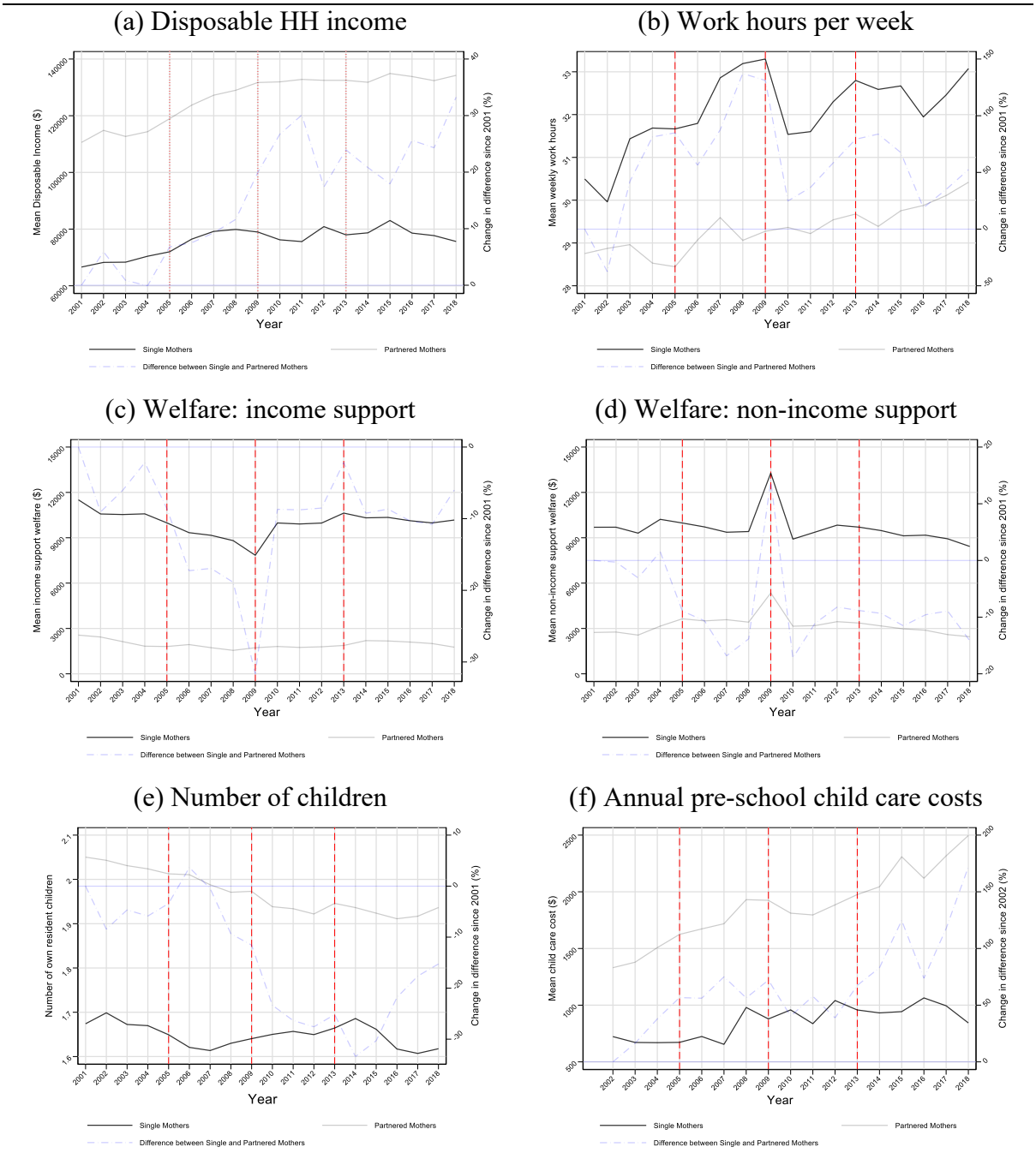
Receipt of income support welfare payments declined significantly for single mothers relative to partnered mothers since 2005, a difference that peaked in 2009 (0.1 SD-0.5 SD). The difference remained constant around -0.25 SD for all years between 2009 and 2018 (Fig. 4c). A very similar picture emerged for non-income support welfare receipt (Fig. 4d). The difference between single and partnered mothers increased significantly since 2006 up to -0.2 SD in 2008. There was no significant difference in the year the GFC affected Australia (2009). The reason is that single mothers disproportionately benefited from Bonus payments (see Appendix Fig. A3). After this temporary benefit increase for single mothers relative to partnered mothers, single mothers' non-income welfare receipt was smaller by around 0.3 SD (Fig. 4d). Appendix material (Fig. A3) shows the details by welfare category: pension payments increased for single mothers relative to partnered mothers by between 0.1 SD (2005-2009) and 0.45 SD after the suspension of the Welfare-to-Work grandfathering rule in 2013. Single mothers' parenting payments declined by up to 95%, family payments by up to 0.5 SD and allowance payments by up to 0.2 SD until 2012.

Fig. 4e shows that there is no statistically significant difference in fertility between single and partnered mothers once we control for observable differences in maternal characteristics. But we find a significant decline in the fertility of single mothers relative to partnered mothers after the suspension of the welfare to work grandfathering rule.

Fig. 4f demonstrates that preschool child-care costs in fact increased more for single mothers relative to partnered mothers once we control for differences in household characteristics. However, the difference by up to 0.1 SD is not statistically significant.

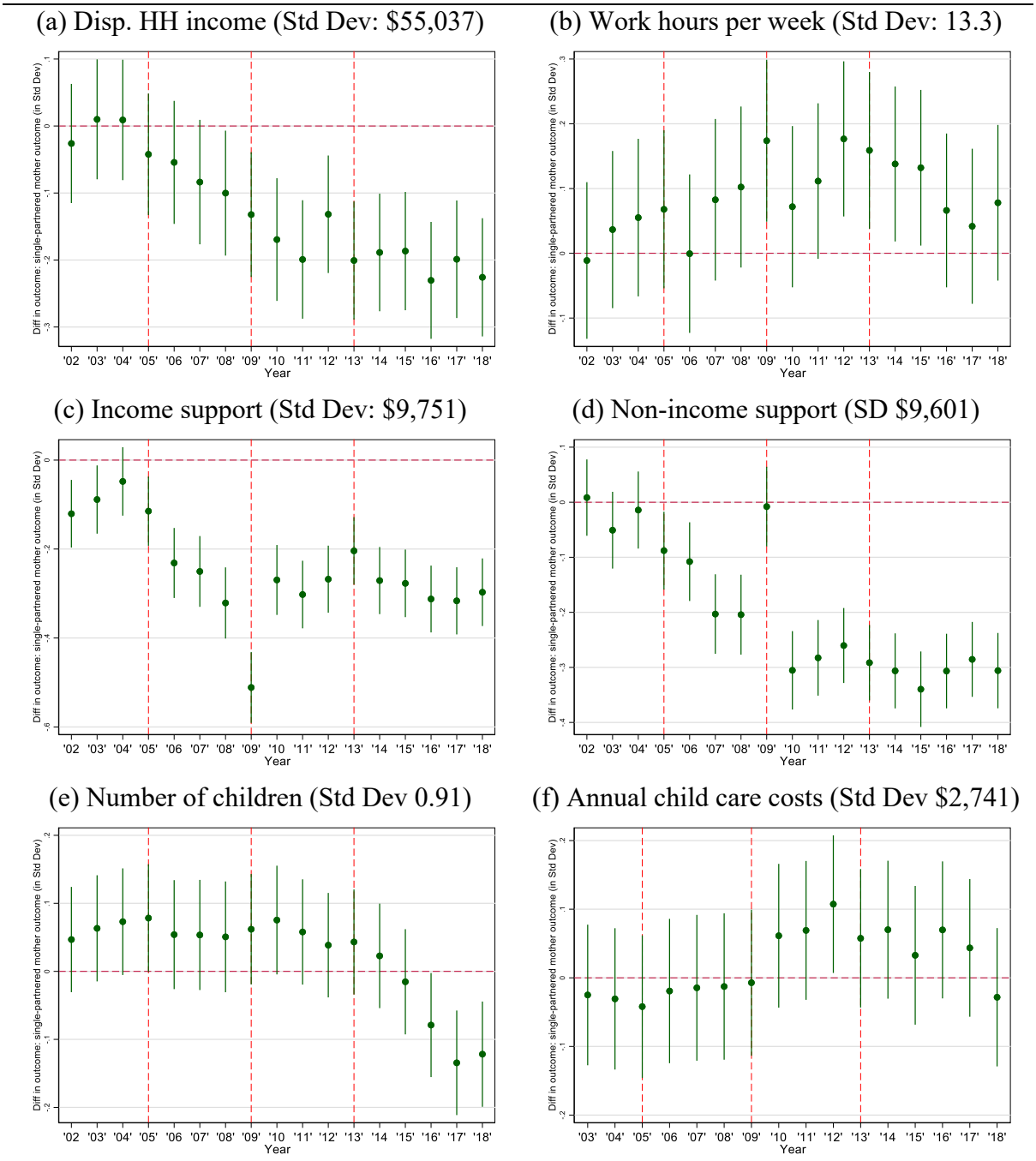
We conclude that the economic position of single mothers significantly worsened since the Welfare-to-Work reforms came into effect relative to partnered mothers. Although single mothers were disproportionately more supported by additional bonus payments paid by the federal government in response to the GFC, their economic position was further worsened by the after 2013.

Figure 3: Differences in outcomes between single and partnered mothers



Note: Reported are means of each outcome variales for single (dark-grey line) and partnered (light-grey line) mothers in each year (left-hand y-axis). Light-blue dash-dot line reports the percentage change in the difference between single and partnered mothers' outcomes relative to differences in baseline year (which is in most cases 2001). Vertical dashed, red lines indicate policy regimes: 2005 Welfare-to-WorkAct; 2009 Bonus payment in response to the Global Financial Crisis; 2013 suspension of Welfare-to-Work grandfathering rule.

Figure 4: Estimated difference between single and partnered mothers (Standard Deviations)



Note: Reported are estimated coefficients and 95% confidence intervals of an interaction term between single mother indicator and year dummies. The estimated model is a random effects OLS model, in which we regress the standardised outcome on a single mother binary indicator, dummy-variables for each year (relative to base 2001), and an interaction term between single mother status and year dummies. Each model controls flexibly for age, number of own resident children, number of adult persons in household, general health status and educational attainment. Coefficients are interpreted in terms of standard deviation change in the outcome variable. Vertical dashed, red lines indicate policy regimes: 2005 Welfare-to-Work Act 2009 Bonus payment in response to the Global Financial Crisis; January 2013 suspension of Welfare-to-Work grandfathering rule to parenting payments.

Thus, the welfare reforms led to a decline in disposable household income, an increase in hours worked and child-care costs (presumably because of increased need for childcare), and a radical change in the type of welfare payments contributing to total household income. Welfare payments for parenting activities were significantly reduced while disability pension payments were increased to compensate for income loss. In the next section, we evaluate how single motherhood during the time of such a radical welfare reform affected children's developmental outcomes.

6. Impact of single motherhood on child development

6.1 Estimation model

We now expand our analysis to study the impact of single motherhood on children's outcomes using data on the Kindergarten cohort of the LSAC. We estimate the effect of single motherhood on a child's cognitive and non-cognitive development across the child's major life stages and identify the factors that explain single-motherhood related skill gaps. To estimate the single motherhood skill gap, we use a random effects GLS regression models that allow us to exploit the longitudinal nature of our data as follows:[21]

$$Y_{it} = \beta_o + \beta_1 SM_{it} + \delta X'_{it} + \mu_t + \alpha_i + u_{it}. \quad (1)$$

Y_{it} captures the cognitive and non-cognitive outcome of interest for individual i at time t. The indicator SM_{it} is equal to 1 if the child belongs to a single mother household at time t, and 0 otherwise. The vector X' includes control variables: (1) study child characteristics (sex, age in months, any medical conditions), (2) household characteristics (number of siblings, are other adults present, geographic location, household income, language background), and mother characteristics and behaviours (educational attainment, age, physical health, labour supply, cognitive ability).[22] Our parameter of interest is β_1 which estimates the impact of single motherhood on the child's outcomes. Time trends in child development are controlled for flexibly allowing for non-linear time fixed effects μ_t.

We assume α_i, individual specific heterogeneity, to be a random effect which assumes that this heterogeneity is independent of single motherhood. This assumption may be violated

[21] For some outcomes, we only have measures available in one wave (e.g. the ATAR score). For such models we use an OLS specification.
[22] The set of covariates have been selected based on previous literature (see, for example Hoynes et al. 2016; Dahl and Lochner 2012; Khanam and Nghiem 2016).

if other time-invariant determinants - other than maternal characteristics and behaviours that we have controlled for – e.g., if child development systematically varies with the single motherhood status. Such influences could be parenting styles or attitudes towards education (Ermisch and Francesconi 2000; Krein and Beller 1988), which may not be captured by maternal cognitive ability and education levels, which we control for. As this omission may bias our estimation results of β_1, we estimate the baseline model also with a fixed effects specification, allowing time variation in the single-motherhood status. We can do this with our non-cognitive skill outcomes (SDQ scores), which are available for six time periods, and the childhood cognitive ability measures which are available for two time periods.

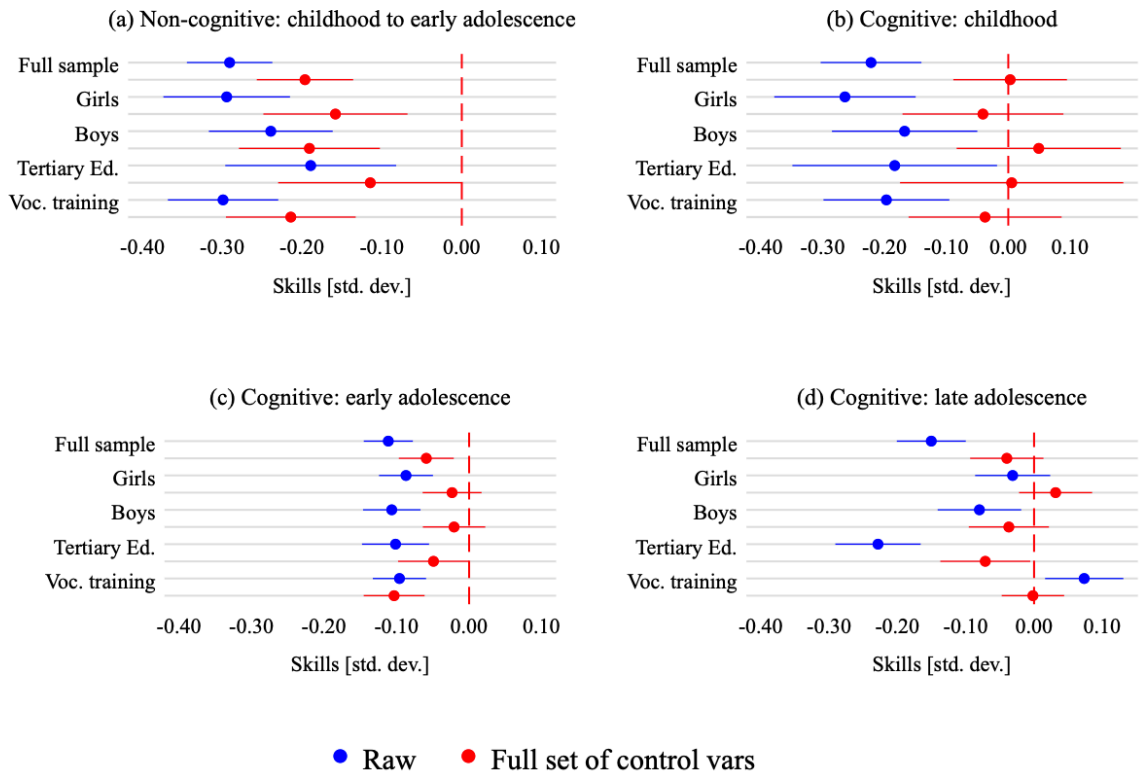
To explore heterogeneity in the effect of single motherhood, we present estimation results also by subgroups: girl vs boy study child and mothers with low vs high levels of educational attainment (low levels of education: completed Year 12 or less).

6.2 Estimation results: Single motherhood penalties

Fig. 5 summarises the estimation results on parameter β_1, interpreted as the single-motherhood skill gap expressed in percent standard deviation (SD). We report unadjusted (blue) and adjusted estimates (red). We report 95% confidence intervals and consider estimate significant at the 5% level or better ($p<0.05$). Full results are reported in Appendix Tables B1 and B2.
Overall, we find significant and large single-motherhood skill penalties for both non-cognitive skills and cognitive skills. While cognitive skill penalties are fully explained by observable differences between coupled and single mother households at any stage of the child's lifecycle, non-cognitive skill penalties are only partially explained. There are few noteworthy heterogeneities in the estimates. Skill gaps are roughly the same for boys and girls and for children in high and low educated single mother households. Yet, the education level of the mother plays an important role in cognitive skill gaps in early (ages 14-15) and late adolescence (ages 18-19).

Children in a single mother household score significantly 0.3 SD lower on non-cognitive skills (NCS) than children in a partnered mother household (Figure 5(a)), with no significant differences between boys and girls. The single mother NCS penalty appears larger in magnitude for single mothers with low levels of education (0.3 SD) than for single mothers with university education (0.2 SD), but the difference is not statistically significant.

Figure 5. Single motherhood skill penalty and child development over the lifecycle



Note: Reported are estimated parameters on the single motherhood variable obtained from a random effects GLS model. The outcome variables are: (a) Non-cognitive skills: Summary score on the strength and difficulty questionnaire (SDQ), that includes peer behaviours, sociability, emotional control. Measures available in waves 1-6 (b) Cognitive skills in childhood: Summary measure of three tests such as Peabody vocabulary test, matrix reasoning and learning outcomes. Measures available in waves 2-3. (c) Cognitive skills in adolescence: Summary measure across three IQ tests: Memory, coding speed, and executive function. Measure available in wave 6. (d) Uni admission rank: ATAR score measure available in wave 8. Models with full set of control variables include (1) study child characteristics (sex, age in months, any medical conditions), (2) household characteristics (number of siblings, where there are any other adults present, geographic location, household income, language background), and mother characteristics and behaviours (educational attainment, age, physical health, labour supply, cognitive ability). Sample size (a): Full: 14247, Girls 7036, Boys 7211, Moms with tertiary education: 5161, Moms without tertiary education: 7349 person-year observations. (d): Full: 5788, Girls 3287, Boys 2501, Moms with tertiary education: 2876, Moms without tertiary education: 2262 person-year observations. Table B1 Appendix reports all sample numbers and estimated coefficients. Table B2 reports full estimation results for the full sample.

Once controlling for all covariates, the single mother NCS gap is reduced by one third to 0.2 SD ($p<0.05$). For all subgroups considered, observable characteristics do not fully explain the single motherhood NCS penalty. The only exception is for university-educated single mothers, for whom the estimated penalty is reduced to 0.1 SD ($p<0.1$).

Single motherhood skill penalties are large and significant for cognitive skills at every life stage considered: 0.2 SD at ages 6-9, 0.1 SD at ages 14-15, and 0.15 SD at ages 18-19. However, once controlling for observable characteristics, the skill gap disappears fully. In most

cases, the estimate is a precise 0, independent of the group considered or the time period when cognitive skills are being measured.[23] The only exception is that children in university educated single-mother households tend to score 0.1 SD lower on the ATAR ($p<0.05$) (Figure 5(d)).

6.3 Mechanisms

The estimated skill penalties show that single mothers are in a more disadvantaged position in comparison to partnered mothers, and this has negative implications on their child's cognitive and non-cognitive development. We have also shown that once controlling for observable characteristics, the skill penalty disappears for cognitive skills, while it is reduced but not fully explained for non-cognitive skills. We now explore which factors explain the child skill penalty of single motherhood. To calculate the combined contributions of explanatory variables to the overall skill gap, we conducted a standard Oaxaca-Blinder decomposition (see Schurer et al., 2019 for methods and a comparable application).

In Fig. 6 we report the contribution to the raw single-motherhood skill penalty by blocks of variables for each of the four outcomes. We consider six categories of observable characteristics: (1) Child characteristics (green); (2) Household composition (pink); (3) Household income (blue); (4) Mother characteristics (red); (5) Mother labour supply; and (6) Mother cognitive ability. The contribution of unobserved factors to the overall gap is depicted in light blue. Full estimation results are reported in Appendix Table B3.

Differences in observable characteristics explain less than 40% of the single motherhood NCS gap: The three largest contributing factors are household composition characteristics, income, and mother characteristics. The child's characteristics, mother labour supply and mother cognitive ability play no role in explaining the gap.

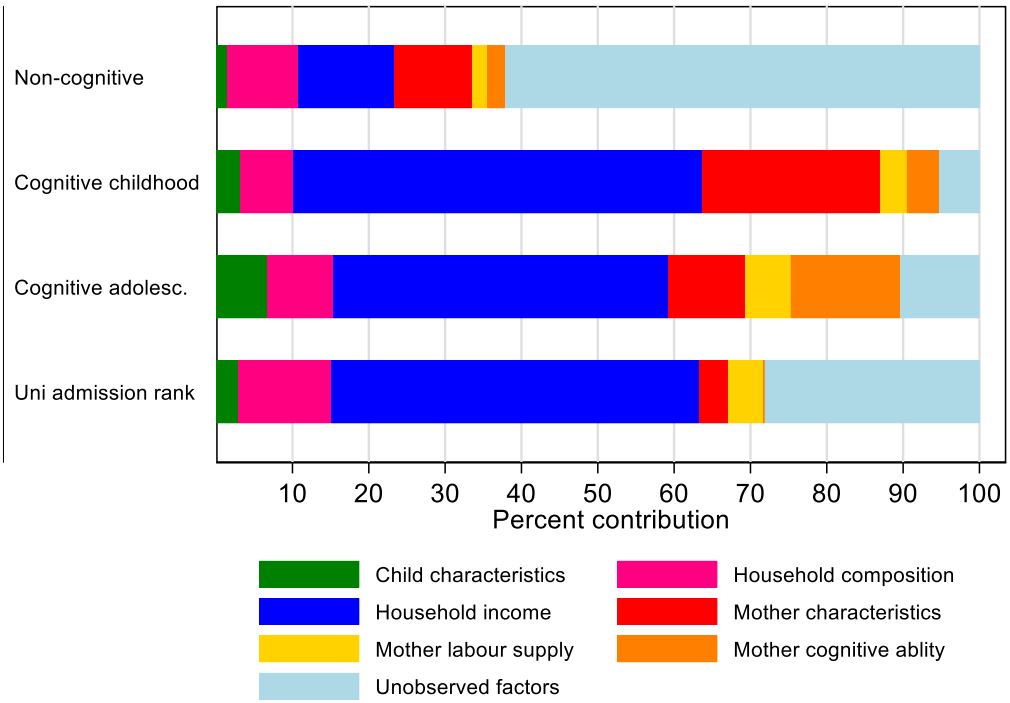
This picture is very different for the single motherhood cognitive skill (CS) gaps. Between 72% (late adolescence) and 95% (childhood) of the observed gaps are explained by differences in observable characteristics. The most important contributor is household income. It explains over 50% of the observed CS gap in childhood. Mother characteristics, such as health, education, and age, explain 25% of the overall CS gap in childhood. All other characteristics explain less than 10% of the gap.

[23] We re-estimated the models for NCS and childhood cognitive skills using a fixed effects GLS specification, in which we can purge the influence of unobserved individual-specific heterogeneity. We obtain very similar results, which are reported in Figure B1, appendix.

Mother cognitive ability plays a negligible role in CS gaps, except for the IQ test scores of children evaluated at ages 14-15, where differences in mother cognitive ability explain 15% of the raw IQ gap observed in early adolescence. This is hardly surprising, as both the mother's and the child's measures capture the same IQ dimensions.

The least well-explained cognitive ability gap is for the Australian Tertiary Admission Rank (ATAR), but still almost three quarters (72%) of the raw ATAR gap can be explained by differences in observable characteristics. Again, 50% of the gap are explained by differences in income between single and coupled mother households.

Figure 6: Oaxaca-Blinder Decomposition of Single Motherhood Skill Gap



Thus, income is an important mechanism through which single motherhood affects child cognitive skill development and non-cognitive skill development, albeit to a lesser extent. This finding is consistent with previous literature which highlights the importance of family income in children's development (Noble et al 2021, Dahl and Lochner 2012, Demo and Acock 1988, McLanahan and Booth 1989, Simons et al 1993).

7. Conclusion

Over the last two decades, single mother households in Australia have experienced a significant decline in their economic position. This is attributed to policy reforms, most prominently the

2006 Welfare-to-Work Reform, which have reduced government transfers and mandated a higher degree of labour market participation from welfare receiving sole parent households. Effective from 1 July 2006, this reform placed single parents who entered the welfare system on the lowly paid unemployment benefits (so-called Newstart Allowance), if their youngest child was 8 or over and moved all single parents with children aged over eight from parenting payments to the lower-paying Newstart, effective from January 2007. The reform therefore forced sole parent welfare receiving households to work more hours in the labour market, which disproportionately affected single mothers. The plight of single mother households was furthermore worsened by the 2009 Global Financial Crisis and the 2014 suspension of a grandfathering rule that protected single mothers with very young children against the economic hardship of the 2006 Welfare-to-Work reforms.

Analysing nationally representative survey data, we found that in comparison to partnered mothers, single mothers experienced slower disposable income growth, steeper reductions in welfare payments, and a large increase in the uptake of disability pension benefits between 2001 and 2018. Single mothers were harmed significantly more from the GFC, but also received more support from the federal government in 2009 through bonus payments than partnered mothers. While partnered mothers experienced continuous declines in fertility, single mothers actually increased their fertility in response to the 2006 Welfare-to-Work reforms, and then declined in their fertility once the grandfathering rule was suspended.

We then showed, using nationally representative data on a cohort of children who were about to start primary school when the 2006 Welfare-to-Work reform was introduced, that children in single-mother families experienced significant cognitive and non-cognitive skill gaps ranging between0.1 and 0.3 standard deviations (ages 5-19). Our finding is not particularly unusual as evidence from other countries suggest that children in single mother households have lower level of educational attainment (e.g. Ermisch and Francesconi, 2001 in the British context). What is unusual is that we can almost fully explain the single-motherhood skill gap by differences in observable characteristics. Disposable household income is the most prominent factor in explaining the cognitive skill gaps, especially in childhood. It explains over 55% of the single-mother cognitive skill penalty before the age of 10. In contrast, labour supply, the additional hours that mothers spent in the labour market instead in their homes, contributed little to the single motherhood skill gap. This suggests that the policy increased predominantly income constraints rather than time constraints.

Our evidence is consistent also with previous evidence that the 2006 Welfare to Work reform increased the probability of single mother households to end up in poverty (Wilkins

2013). Many social science experiments have shown that boosts to household incomes lead to better outcomes for children (see Noble et al 2021 for a recent review), although it is yet to be determined through which channels – family functioning, brain development, or parental inputs – income affects such outcomes. The Baby's First Years RCT, a large-scale intervention that provides poor families with permanent income boosts in the United States, will deliver the answers in the near future (Noble et al 2021).

The children in our analysis are already 5 years old, so we cannot make statements about early-life child development. But our findings are strong enough to say that welfare payments play an important role in supplementing household incomes of vulnerable families, and that these payments are associated with better long-term outcomes for children and adolescents. The single motherhood skill gap is mediated by household income throughout the educational ladder of the child, and even explains half of the Year 12 school achievement gap. The Australian Tertiary Admission Rank (ATAR) is a critical marker for the child's lifetime outcomes in Australia. Thus, the long-term effect of welfare payments needs to be considered, as it implies an investment in society's human capital, rather than as a sunk cost. Our findings support Hoynes and Schanzenbach (2018) and Bailey et al. (2019) who concluded that social welfare programs in the United States programs largely outweigh their cost once their positive spill-over effects to children's human capital are included in the cost-benefit calculation.

Of course, there are several limitations to our study that requires discussion. Our analyses suggest that our findings are driven by a lack of family income. It could also be, however, that more household income is associated with the presence of a father who shares child rearing duties and household decision-making. For instance, Schurer et al. (2019) have shown that fathers' engagement with the education of the child is a key determinant of children's non-cognitive skill development over the lifecourse, especially for children in disadvantaged homes. To some degree, we were able to rule out this possibility in our selected fixed effects estimations, under the assumption that father influence over and above bringing in income.

Another potential limitation of this paper is that we can only make statements about a cohort of children who were born in the year when Australia introduced mutual obligations into the welfare system and who were at pre-school age when the Welfare-to-Work reform came into effect in July 2006. These children were particularly hardly affected because their school entry at age 5, a critical period in a child's life, happened at a time when single mothers were hit hardest not only by a radical welfare reform but also by the economic devastation that

followed during the Global Financial Crisis. We thus interpret our skill penalty estimates as upper bounds of possible effects.

An important avenue for future research is the investigation of long-term outcomes of children's cognitive and non-cognitive development in response to welfare reform. Future research could assess how children in single mother households translate their poorer skill levels into post-secondary educational training, employment status, wage income and welfare participation, which are important outcomes suggested in recent literature (Aizer et al. 2016).

References

Aizer, A., S. Eli., J. Ferrie., and A Lleras-Muney. (2016). "The Long-Run Impact of Cash Transfers to Poor Families." *American Economic Review* 106(4), 935–971.

Almond, D., and J Currie. (2011). "Killing Me Softly: The Fetal Origins Hypothesis." *Journal of Economic Perspectives* 25(3), 153-172.

Almond, D., J. Currie and V. Duque. (2018). "Childhood Circumstances and Adult Outcomes: Act II." *Journal of Economic Literature,* 56(4), 1360-1446.

Ashenfelter, O. (1978). "Estimating the effect of training programs on earnings." *Review of Economics and Statistics,* 6(1), 47-57.

Australian Bureau of Statistics. (2019). *Household and Family Projections, Australia.* Accessed September 10, 2020. https://www.abs.gov.au/statistics/people/population/household-and-family-projections-australia/latest-release

Australian Bureau of Statistics. (2020). *Labour Force Status of Families.* Accessed September 10, 2020. https://www.abs.gov.au/statistics/people/population/household-and-family-projections-australia/latest-release

Australian Human Rights Commission. (2009). *It's About Time: Chapter 6: Government Support: Welfare and tax.* Accessed July 12, 2020. https://humanrights.gov.au/our-work/its-about-time-chapter-6.

Australian Institute of Health and Welfare. (2020). "Australia's Children." Web Report, Australian Government.

Bailey, M., Hoynes, H., Rossin-Slater, M., & Walker R. (2020). "Is the Social Safety Net a Long-Term Investment? Large-Scale Evidence from the Food Stamps Program." *Working Paper.*

Bastian, J., & Michelmore, K. (2018). "The Long-Term Impact of the Earned Income Tax Credit on Children's Education and Employment Outcomes." *Journal of Labour Economics,* 36(4), 1127-1163.

Baxter, J., & Alexander, M. (2016). "Mother's work-to-family strain in single and couple parent families: the role of job characteristics and support." *Australian Journal of Social Issues,* 43(2), 195-214.

Blank, R. (2002). "Evaluating welfare reform in the United States", *Journal of Economic Literature*, 40(4), 1105–66.

Blundell, R. (2001). "Welfare reform for low income workers". *Oxford Economic Papers*, 53, 189–214.

Blundell, R., A. Duncan, J. McCrae., and C. Meghir. (2000). "The labour market impact of the Working Families Tax Credit". *Fiscal Studies*, 21, 75–100.

Brady, M., K. & Cook. (2015). "The impact of welfare to work on parents and their children." *Evidence Base: A journal of evidence reviews in key policy areas*, 3(1), 1–23.

Brewer, M., A. Duncan, A. Shephard., & M.J. Suarez. (2006). "Did work families' tax credit work? The impact of in-work support on labour supply in Great Britain." *Labour Economics,* 13, 699–720.

Brinkman, S., Silburn, S., Lawrence, D., Goldfield, S., Sayers, M., & Oberklaid, F. (2010). "Investigating the Validity of the Australian Early Development Index." *Early Education and Development,* 18(3), 427-451.

Cheng H. (1985) "Benefits and limitations of panel data." *Econometric Reviews*, 4(1), 121-174.

Cobb-Clark, D., Zhu, A. (2017). "Childhood homelessness and adult employment: the role of education, incarceration, and welfare receipt." *Journal of Population Economics*, 30, 893-924.

Cunha, F., J. Heckman, & S. Schennach (2010): "Estimating the Technology of Cognitive and Noncognitive Skill Formation." *Econometrica*, 78, 883–931.

Dahl, Gordon., L. Lochner. (2012). "The impact of family income on child achievement: evidence from the earned income tax credit. *American Economic Review,* 102(5), 1927-56).

Davidson, P., Saunders, P., Bradbury, B. and Wong, M. (2020), Poverty in Australia 2020: Part 1, Overview. ACOSS/UNSW Poverty and Inequality Partnership Report No. 3, Sydney: ACOSS.

Deutscher, N., & R. Breunig. (2017). "Baby Bonuses: Natural Experiments in Cash Transfers, Birth Timing and Child Outcomes." *The Economic Record*, 94(304), 1-24.

Duncan, G., & Brooks-Gunn, J. (2000). "Family Poverty, Welfare Reform, and Child Development." *Child Development,* 71(1), 188-196.

Fang, H., & M.P. Keane. (2004). "Assessing the impact of welfare reform on single mothers." *Brookings Papers on Economic Activity*, no. 1, 1–95.

Fisher, H. and Zhu, A. (2019). "The effect of changing financial incentives on repartnering." *Economic Journal,* 129(623), 2833–2866.

Figlio, D., Karbownik, K., Roth, J. & Wasserman, M. (2019). "Family disadvantage and the gender gap in behavioral and educational outcomes." *American Economic Journal: Applied Economics*, 11(3), 338-81.

Fiorini, M., & Keane, M. (2014). "How the allocation of children's time affects cognitive and noncognitive development." *Journal of Labor Economics,* 32(4), 787-836.

Fok, Y., & McVicar, D. (2013). "Did the 2007 welfare reforms for low income parents in Australia increase welfare exits?" *IZA J Labor Policy,* 2(3), 3.

Francesconi, M. & W. van der Klaauw. (2007). "The socioeconomic consequences of in-work benefit reform for British lone mothers." *Journal of Human Resources*, 42, 1–31.

Gaitz, J., & S. Schurer. (2017). "Bonus Skills: Examining the Effect of an Unconditional Cash Transfer on Child Human Capital Formation." *IZA Institute of Labor Economics.* No 10525

Grahame, T., & Marston, G. (2012). "Welfare-to-work policies and the experience of employed single mothers on income support in Australia: Where are the benefits?" *Australian Social Work*, 65(1), 73-86.

Grogger, J. & L. Karoly. (2009). "The effects of work-conditioned transfers on marriage and child well-being: a review." *Economic Journal*, 119, F15–F37.

Heckman, J., LaLonde, R., & Smith, J. (1999). "The economics and econometrics of active labor market programs." *Handbook of labor economics,* 3(A), 1865-2097.

Hoynes, H., D. Schanzenbach (2018). "Safety net investments in children." *Brookings Papers on Economic Activity,* 89-132.
Hoynes, H., Schanzenbach, D., & Almond, D. (2016). "Long-Run Impacts of Childhood Access to the Safety Net". *American Economic Review*, 106(4): 903-934
Jovanovski, N., & Cook, K. (2020). "How Australian welfare reforms shape low-income single mothers' food provisioning practices and their children's nutritional health. *Critical Public Health,* 30(3), 340-351.
Kiely, K., & P. Butterworth. (2013). "Social disadvantage and individual vulnerability: A longitudinal investigation of welfare receipt and mental health in Australia." *Australian & New Zealand Journal of Psychiatry,* 47(7).
Maxfield, M. (2013). "The Effects of the Earned Income Tax Credit on Child Achievement and Long-Term Educational Attainment". *Unpublished*.
McClure, P. (2000). "Participation support for a more equitable society: Final report of the reference group on welfare reform." *Canberra: Department for Family and Community Services.*
McDonald, C., & L. Chenoweth. (2006). "Workfare Oz-style: Welfare reform and social work in Australia." *Journal of Policy Practice,* 5 (2/3), 109-128.
McKenzie, H., McHugh, C., & McKay, F. (2019). "Life on Newstart allowance: a new reality for low-income single mothers." *Journal of Family Studies,* 25:1, 18-33.
Meyer, B., J. Sullivan. (2008). "Changes in the consumption, income, and well-being of single mother headed families." *American Economic Review,* 98 (5), 2221–2241.
Meyer, B., & Rosenbaum, D. "Welfare, the Earned Income Tax Credit, and the Labor Supply of Single Mothers." *The Quarterly Journal of Economics*, Volume 116, Issue 3, August 2001, Pages 1063–1114,
Moffitt, R. (1998). "The effect of welfare on marriage and fertility: what do we know and what do we need to know?" *Welfare, the Family and Reproductive Behaviour: Research Perspectives, National Research Council,* 4.
Mullins, J. (2019), "Designing cash transfers in the presence of children's human capital formation." *Job Market Paper*.
Parliament of Australia. (2006). *Commonwealth child care support—what do families get?* Accessed July 11, 2020. https://parlinfo.aph.gov.au/parlInfo/download/library/prspub/S2716/upload_binary/S2716.pdf;fileType=application%2Fpdf#search=%22Welfare%20%20publications%22.
Parliament of Australia. (2009). *Social Security payments for people caring for children, 1912-2008: a chronology.* Accessed July 10, 2020. https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BN/0809/children.
Parliament of Australia. (2009). *Social security payments for the unemployed, the sick and those in special circumstances, 1942 to 2012: a chronology.* Accessed July 11, 2020. https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BN/0809/children.
Parliament of Australia. (2000). *The New Childcare Benefit.* Accessed July 10, 2020. https://parlinfo.aph.gov.au/parlInfo/download/library/prspub/S2716/upload_binary/S2716.pdf;fileType=application%2Fpdf#search=%22Welfare%20%20publications%22.
Phillips, B., Narayanan, V. 2021. Financial Stress and Social Security Settings in Australia. ANU Centre for Social Research and Methods, Canberra, Australia, 21 April 2021.
Reichman, N., Corman, H., Dave, D. M., Kalil, A., Schwartz-Soicher, O. (2020). "Effects of Welfare Reform on Parenting". National Bureau of Economic Research. Working Paper Series No. 28077, November.

Saunders, P. (2000). "Reforming the Australian Welfare State." *Melbourne: Australian Institute of Family Studies*.

Schoeni, R., & R. Blank. (2000). "What Has Welfare Reform Accomplished? Impacts on Welfare Participation, Employment, Income, Poverty, and Family Structure. *Working paper,* no 7627.

Schurer, S., Trajkovski, K., Hariharan, T. (2019). Understanding the mechanisms through which adverse childhood experiences affect lifetime economic outcomes. *Labour Economics 61, 101743.*

Sørensen, A. (1994). "Women's Economic Risk and the Economic Position of Single Mothers." *European Sociological Review*, vol. 10, no. 2, 1994, pp. 173–188.

Summerfield, M., A. Bevitt, Y. Fok, M. Hahn, N. La, N. Macalalad, M. O'Shea, N. Watson, R. Wilkins, M. Wooden. (2017). HILDA User Manual Release 17. Technical report, Melbourne Institute: Applied Economic and Social Research, The University of Melbourne, Melbourne.

Summerfield, T., Young, L., Harman, J., Flatau, P. (2010). Child support and Welfare to Work reforms: The economic consequences for single-parent families. Family Matters, 84, 68-78.

Wikle, J., & R. Wilson. (2013) "Publicly Provided Preschool and Maternal Labor Supply: Evidence from Three Head Start Experiments". *Journal of public Economics,* 123.

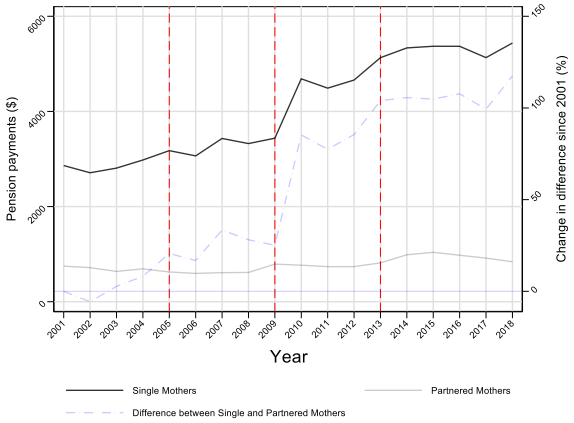
Wilkins, R. (2013). "Families, incomes and jobs: Volume 9 - A statistical report on waves 1 to 11 of the household, income and labour dynamics in Australia survey." *Melbourne, Australia: Melbourne Institute of Applied Economic and Social Research.*

Yu, M., & Daraganova, G. (2017). "Executive Functioning—Use of Cogstate measures in the Longitudinal Study of Australian Children." *LSAC Technical Paper No. 19.*

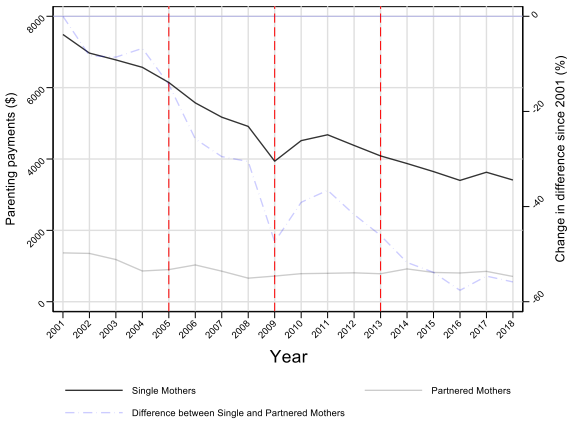
Appendix A: Additional results for HILDA analysis

Figure A1: Differences in welfare payments between single and partnered mothers

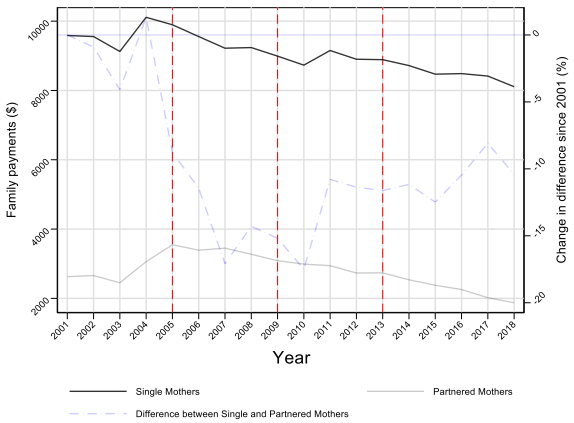
(a) Pension payments



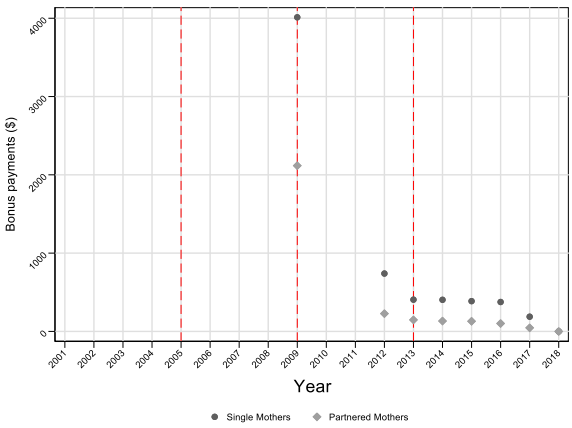
(b) Parenting payments



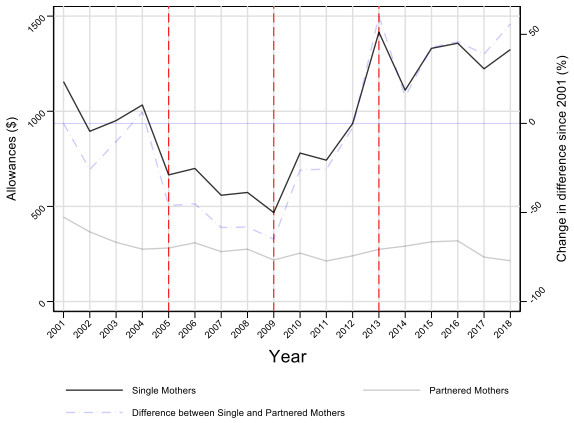
(c) Family payments



(d) Bonus payments



(e) Allowances



(f) Other non-income support

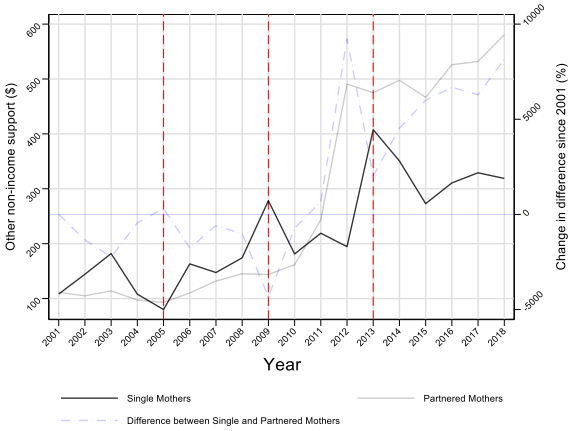
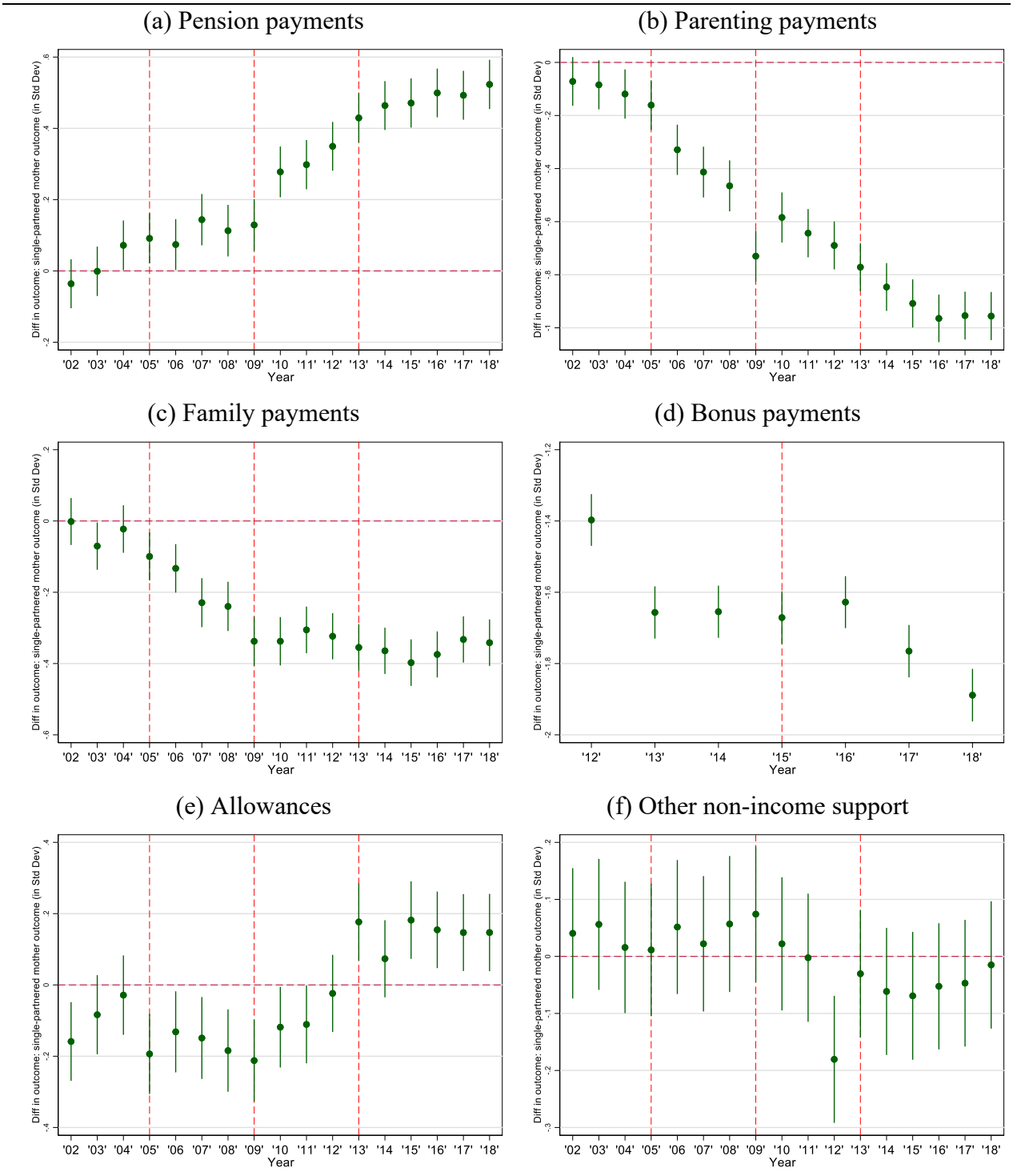


Figure A2: Estimated difference between single and partnered mothers (expressed in Standard Deviations)



Note: Reported are estimated coefficients and 95% confidence intervals of an interaction term between single mother indicator and year dummies. The estimated model is a random effects OLS model, in which we regress the the standardised outcome on a single mother binary indicator, dummy-variables for each year (relative to base 2001), and an interaction term between single motehr status and year dummies. Each model controls flexibly for age, number of own resident children, number of adult persons in household, general health status and educational attainment. Coefficients are interpreted in terms of standard deviation change in the outcome variable. Vertical dashed, red lines indicate policy regimes: 2005 Welfare to Work Atc; 2009 Bonus payment for Global Financial Crisis; 2013 suspension of Welfare to Work grandfathering rule.

Appendix B: LSAC Supporting material

Table B1: Single motherhood and skill Development at different stages of lifecycle (Std. Dev.)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Non-Cognitive		Cognitive skills					
	SDQ		Ages 5-9 (IQ)		Ages 14-15 (IQ)		Ages 18-19 (ATAR)	
	Raw	Controls	Raw	Controls	Raw	Controls	Raw	Controls
Panel A: Full estimation sample								
Single mum	-0.291***	-0.197***	-0.222***	0.003	-0.111***	-0.059***	-0.150***	-0.040
	(0.027)	(0.031)	(0.042)	(0.047)	(0.017)	(0.019)	(0.026)	(0.027)
Observations	14247	14247	5843	5843	16150	16150	5788	5788
Panel B: Girls								
Single mum	-0.295***	-0.158***	-0.264***	-0.041	-0.087***	-0.023	-0.031	0.032
	(0.041)	(0.046)	(0.058)	(0.066)	(0.019)	(0.021)	(0.028)	(0.027)
Observations	7036	7036	2859	2859	7930	7930	3287	3287
Panel C: Boys								
Single mum	-0.239***	-0.191***	-0.168***	0.049	-0.107***	-0.021	-0.080**	-0.037
	(0.040)	(0.045)	(0.060)	(0.068)	(0.020)	(0.022)	(0.031)	(0.030)
Observations	7211	7211	2984	2984	8220	8220	2501	2501
Panel D: Mum with university education								
Single mum	-0.189***	-0.115*	-0.184**	0.006	-0.101***	-0.049**	-0.229***	-0.071**
	(0.055)	(0.059)	(0.084)	(0.092)	(0.024)	(0.025)	(0.032)	(0.034)
Observations	5161	5161	2018	2018	5882	5882	2876	2876
Panel E: Mum has vocational or no training post-secondary schooling								
Single mum	-0.299***	-0.214***	-0.197***	-0.037	-0.096***	-0.103***	0.073**	-0.002
	(0.035)	(0.041)	(0.052)	(0.063)	(0.019)	(0.021)	(0.029)	(0.023)
Observations	7349	7349	3150	3150	8325	8325	2262	2262

Note: Outcomes are: Column (1) and (2): Summary SDQ scores are teacher assessed, measured in Waves 1-6; Columns (3) and (4): summary score across three test outcomes: Peabody Vocabulary Test, Matrix Reasoning, Learning outcomes; Columns (5) and (6) Summary scores across three IQ tests (executive function, memory, coding speed); Columns (7) and (8): Australian Tertiary Admission Rank. All outcomes are standardised to mean 0 and standard deviation 1.All models are estimated with a random effects GLS regression, allowing for repeat observations and clustering by person id. Single-motherhood is defined as having no partner and being a female parent. Full set of control variables include: Child female, age in months (logarithmatised), child has a medical condition, Number of siblings in the household; language spoken in the home; mother age (log); post-secondary qualification; general health status; household income (log); work hours; employment status; location; whether household is a single dad; whether household reports zero income, wave indicators; and maternal cognitive ability test measures.
* $p < .10$, ** $p < 0.05$, *** $p < 0.01$

Table B2. Full estimation results single-motherhood skill gap

	(1) NCS Waves 1-6	(2) CA Waves 2-3	(3) CA Waves 6	(4) CA Waves 8
Single mum	-0.197***	0.003	-0.059***	-0.040
	(0.031)	(0.047)	(0.019)	(0.027)
Female	0.396***	0.041	-0.157***	0.322***
	(0.021)	(0.027)	(0.016)	(0.025)
Age in months (ln)	-0.604*	0.940**	-0.537***	-0.343
	(0.312)	(0.427)	(0.202)	(0.252)
Health problem	-0.255***	-0.298***	-0.070***	-0.007
	(0.025)	(0.039)	(0.015)	(0.019)
Nr siblings in HH 0	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
Nr siblings in HH 1	0.167***	-0.129**	0.042*	0.154***
	(0.035)	(0.050)	(0.022)	(0.033)
Nr siblings in HH 2	0.216***	-0.159***	0.014	0.099***
	(0.037)	(0.053)	(0.024)	(0.036)
Nr siblings in HH 3	0.224***	-0.294***	0.016	0.218***
	(0.043)	(0.062)	(0.028)	(0.042)
Nr siblings in HH 4+	0.086	-0.375***	-0.147***	0.313***
	(0.059)	(0.083)	(0.038)	(0.064)
Other adults in HH	-0.039**	-0.045	0.008	-0.036**
	(0.019)	(0.034)	(0.011)	(0.014)
Language: English	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
Language European	-0.480***	0.134	-0.050	0.681***
	(0.173)	(0.238)	(0.118)	(0.121)
Language Slavic	-0.178*	0.204	-0.214***	0.126
	(0.099)	(0.139)	(0.066)	(0.082)
Language Others	0.031	0.284**	0.171***	0.073*
	(0.072)	(0.114)	(0.043)	(0.044)
Language confid.	-0.185***	0.275***	-0.018	-0.082
	(0.069)	(0.102)	(0.045)	(0.055)

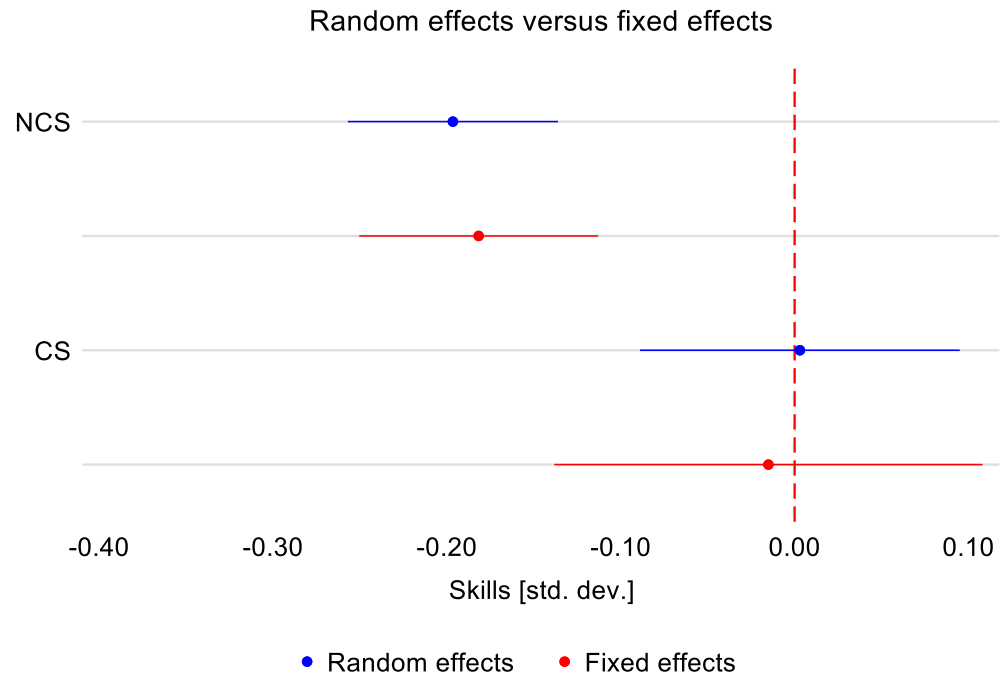
Mother age (ln)	0.200**	0.450***	0.443***	0.037
	(0.081)	(0.102)	(0.067)	(0.109)
Post-secondary qual. None	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
Postgrad	0.110***	0.448***	0.124***	0.107***
	(0.040)	(0.056)	(0.027)	(0.036)
Grad diploma	0.150***	0.299***	0.178***	0.142***
	(0.039)	(0.054)	(0.027)	(0.039)
Bachelor	0.114***	0.340***	0.087***	0.195***
	(0.031)	(0.042)	(0.021)	(0.030)
Adv. diploma	0.077**	0.182***	0.001	-0.060*
	(0.035)	(0.050)	(0.024)	(0.036)
Certificate	-0.004	-0.019	0.066***	-0.015
	(0.026)	(0.036)	(0.017)	(0.028)
Other	-0.060	0.031	0.142***	-0.153**
	(0.074)	(0.101)	(0.048)	(0.067)
Mother health: excel.	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
Mother health: good	-0.029	-0.037	-0.021	-0.013
	(0.022)	(0.032)	(0.013)	(0.015)
Mother health: satisfy	-0.098***	0.009	-0.028*	0.014
	(0.024)	(0.037)	(0.015)	(0.018)
Mother health: poor	-0.221***	-0.041	0.013	0.038
	(0.035)	(0.056)	(0.021)	(0.027)
Mother health: bad	-0.106	-0.057	-0.030	0.028
	(0.072)	(0.115)	(0.041)	(0.052)
Mother health: miss	-0.172***	-0.238***	-0.063***	-0.010
	(0.037)	(0.044)	(0.021)	(0.026)
HH disposable income (ln)	0.043**	0.161***	0.028***	0.081***
	(0.017)	(0.026)	(0.011)	(0.013)
Employed	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)

Unemployed	-0.036	-0.046	-0.098***	-0.002
	(0.051)	(0.079)	(0.030)	(0.039)
Not in labour force	-0.149***	-0.096**	-0.060***	-0.010
	(0.027)	(0.039)	(0.016)	(0.020)
Weekly work hours	-0.003***	-0.004***	-0.000	-0.002***
	(0.001)	(0.001)	(0.000)	(0.001)
Location: major city	0.000	0.000	0.000	0.000
	(.)	(.)	(.)	(.)
Inner Regional	0.000	-0.055	-0.089***	-0.074**
	(0.027)	(0.036)	(0.020)	(0.032)
Outer Regional	-0.004	-0.120***	-0.068**	-0.043
	(0.034)	(0.044)	(0.027)	(0.041)
Remote Australia	-0.151*	-0.078	0.003	0.023
	(0.077)	(0.103)	(0.058)	(0.072)
Very Remote	-0.398**	-0.054	0.338***	0.065
	(0.165)	(0.191)	(0.105)	(0.157)
Reports no income	0.383***	1.334***	0.225***	0.681***
	(0.130)	(0.198)	(0.080)	(0.100)
Executive function	0.001*	0.004***	0.006***	-0.001**
	(0.001)	(0.001)	(0.000)	(0.001)
Memory	-0.015	-0.040	-0.035**	0.342***
	(0.019)	(0.025)	(0.015)	(0.066)
Attention	-0.005	0.004	-0.009	-0.359***
	(0.019)	(0.025)	(0.015)	(0.067)
Wave 1	0.000			
	(.)			
Wave 2	0.172	0.000		
	(0.116)	(.)		
Wave 3	0.356*	0.053		
	(0.194)	(0.110)		
Wave 4	0.561**			
	(0.258)			

Wave 5	0.638**			
	(0.313)			
Wave 6	0.761**			
	(0.358)			
Constant	1.167	-8.034***		
	(1.298)	(1.922)		
Observations	14247	5843		
Number of indiv.	2,404	2,371	2,189	875
Variance due to u_i	.335	.404	.783	.886

Note: Outcomes are: Column (1): Summary SDQ scores are teacher assessed, measured in Waves 1-6; Columns (2): summary score across three test outcomes: Peabody Vocabulary Test, Matrix Reasoning, Learning outcomes; Column (3): Summary scores across three IQ tests (executive function, memory, coding speed); Column (4): Australian Tertiary Admission Rank. All outcomes are standardised to mean 0 and standard deviation 1. All models are estimated with a random effects GLS regression, allowing for repeat observations and clustering by person id. Single-motherhood is defined as having no partner and being a female parent. Full set of control variables include: Child female, age in months (logarithmatised), child has a medical condition, Number of siblings in the household; language spoken in the home; mother age (log); post-secondary qualification; general health status; household income (log); work hours; employment status; location; whether household is a single dad; whether household reports zero income, wave indicators; and maternal cognitive ability test measures. * $p < .10$, ** $p < 0.05$, *** $p < 0.01$

Figure B1. Random effects versus fixed effects estimation



Note: reported are estimates obtained from random effects GLS and fixed effects GLS and their 95% confidence intervals. The outcome for non-cognitive skills (NCS) are the summary measure for the Strength and Difficulties Questionnaire (SDQ) available in waves 1-6. The outcome for cognitive skills is the summary measure of the Matrix Reasoning test, Peabody Vocabulary Test and the Learning Outcomes. Each model controls for the full set of controls as described in Table B1.

Table B3. Oaxaca blinder Decomposition – full estimation results NCS and CS

	(1) NCS	(2) CS Childhood	(3) CS early adolescence	(4) CS late adolescence
Differential				
Partnered mother	34.54***	0.134***	0.0261***	77.83***
	(0.05)	(0.01)	(0.01)	(0.19)
Single mother	32.63***	-0.0880**	-0.0469**	72.99***
	(0.16)	(0.04)	(0.02)	(0.68)
Difference	1.905***	0.222***	0.0730***	4.841***
	(0.16)	(0.04)	(0.02)	(0.71)
Total Explained	0.686***	0.237***	0.0926***	2.959***
	(0.10)	(0.03)	(0.01)	(0.37)
Total Unexplained	1.219***	-0.0154	-0.0196	1.882***
	(0.18)	(0.05)	(0.02)	(0.73)
Explained				
Female	-0.0209	-0.000302	0.000537	0.125
	(0.03)	(0.00)	(0.00)	(0.09)
Age months (ln)	-0.0250***	-0.00128	0.00466**	0.0385
	(0.01)	(0.01)	(0.00)	(0.06)
Health problem	0.0173	0.0110**	0.00347*	0.00709
	(0.02)	(0.01)	(0.00)	(0.01)
Inner Regional	-0.00450	0.00234	0.00281***	-0.0259
	(0.00)	(0.00)	(0.00)	(0.06)
Outer Regional	0.00213	-0.000568	-0.000668	-0.000357
	(0.00)	(0.00)	(0.00)	(0.02)
Remote Australia	-0.00436	-0.00158	0.00108**	-0.00255
	(0.00)	(0.00)	(0.00)	(0.02)
Very Remote	-0.00259	-0.000154	0.000297	0.0185***
	(0.00)	(0.00)	(0.00)	(0.01)
Siblings: 1	0.0318**	-0.00270	-0.000567	0.0307
	(0.01)	(0.00)	(0.00)	(0.04)
Siblings: 2	0.0802***	-0.0148***	-0.00218	0.223**
	(0.02)	(0.01)	(0.00)	(0.10)
Siblings: 3	0.0248**	-0.00650	-0.000717	0.0203

	(0.01)	(0.00)	(0.00)	(0.04)
Siblings: 4+	0.00909*	-0.00350	-0.00284***	0.00626
	(0.01)	(0.00)	(0.00)	(0.03)
Other adults in HH:	0.0349***	0.00817	0.00170	0.0155
	(0.01)	(0.00)	(0.00)	(0.04)
Language European	-0.000905	-0.000354	-0.000537	0.0175
	(0.00)	(0.00)	(0.00)	(0.01)
Language Slavic	-0.00165	-0.0000241	-0.000746	-0.0163
	(0.00)	(0.00)	(0.00)	(0.03)
Language Others	0.0161**	0.000823	0.00212***	0.0792
	(0.01)	(0.00)	(0.00)	(0.06)
Disposable HH income (ln)	0.0517**	0.0307***	0.00987***	0.0682
	(0.02)	(0.01)	(0.00)	(0.17)
No income	0.195***	0.126***	0.0444***	2.108***
	(0.06)	(0.02)	(0.01)	(0.30)
Mother age (ln)	0.0258***	0.00778**	0.00603***	-0.0660
	(0.01)	(0.00)	(0.00)	(0.08)
No qualification	0.0158*	0.00921**	0.0000621	0.00303
	(0.01)	(0.00)	(0.00)	(0.01)
Postgrad	0.000516	0.00437	0.000100	-0.159*
	(0.00)	(0.00)	(0.00)	(0.08)
Grad diploma	0.00456	0.00273	0.000656	-0.101
	(0.00)	(0.00)	(0.00)	(0.07)
Bachelor	0.0279*	0.0131***	0.000929	0.338***
	(0.01)	(0.00)	(0.00)	(0.10)
Certificate	0.0398***	0.0146***	0.000122	-0.0105
	(0.01)	(0.01)	(0.00)	(0.02)
Other	-0.00284	-0.000107	0.000175	-0.0000755
	(0.00)	(0.00)	(0.00)	(0.01)
Mother health: good	-0.0117	-0.00417	-0.00236*	-0.0236
	(0.01)	(0.00)	(0.00)	(0.02)
Mother health: satisf	0.0129*	-0.0000144	0.00131*	0.00546

	(0.01)	(0.00)	(0.00)	(0.02)
Mother health: poor	0.0563***	0.00339	0.000339	0.0768*
	(0.01)	(0.00)	(0.00)	(0.04)
Mother health: bad	0.0116*	0.000913	0.000665	0.0207
	(0.01)	(0.00)	(0.00)	(0.02)
Mother health: miss	0.0201**	0.0168***	0.000755	0.00134
	(0.01)	(0.01)	(0.00)	(0.01)
Employed	0.0496***	0.00983**	0.00309**	-0.00118
	(0.01)	(0.00)	(0.00)	(0.01)
Unemployed	-0.0155	0.000937	0.00269*	0.0413
	(0.01)	(0.00)	(0.00)	(0.04)
Mother work hours	0.00481	-0.000547	-0.000177	0.188***
	(0.01)	(0.00)	(0.00)	(0.07)
Executive function	-0.00849	-0.00728	-0.00329	0.0108
	(0.01)	(0.01)	(0.00)	(0.02)
Memory	0.0855*	0.0320**	0.0181***	0.0765
	(0.05)	(0.02)	(0.01)	(0.13)
Attention	-0.0313	-0.0122	-0.000852	-0.112
	(0.05)	(0.01)	(0.00)	(0.16)
Unexplained				
Female	-0.253	-0.00777	0.0170	-1.142
	(0.16)	(0.04)	(0.02)	(0.75)
Age months (ln)	3.226	-0.661	-0.866***	-13.77
	(2.31)	(1.36)	(0.30)	(10.87)
Health problem	0.0420	0.00110	0.000376	-0.200
	(0.06)	(0.02)	(0.01)	(0.17)
Inner Regional	-0.214**	-0.0123	0.0234**	-0.0985
	(0.09)	(0.02)	(0.01)	(0.32)
Outer Regional	0.121*	0.0258*	0.00785	1.515***
	(0.06)	(0.01)	(0.01)	(0.25)
Remote Australia	-0.00372	0.00844**	0.000181	0.00122
	(0.02)	(0.00)	(0.00)	(0.00)
Very Remote	0.0120	0.0000399	0.00124**	0.000699
	(0.01)	(0.00)	(0.00)	(0.00)

Siblings: 1	0.117	-0.0186	-0.125***	-0.0384
	(0.21)	(0.05)	(0.03)	(0.88)
Siblings: 2	0.0817	0.0103	-0.0242	-0.501
	(0.14)	(0.03)	(0.02)	(0.37)
Siblings: 3	-0.0164	0.0129	-0.00411	-0.380*
	(0.06)	(0.01)	(0.01)	(0.20)
Siblings: 4+	0.0528*	-0.00253	0.0134***	-0.0459
	(0.03)	(0.01)	(0.00)	(0.05)
Other adults in HH:	-0.0829	-0.0124	0.0154	2.175**
	(0.14)	(0.03)	(0.03)	(0.87)
Language European	-0.00486	-0.000222	0.000276	-0.0225
	(0.00)	(0.00)	(0.00)	(0.04)
Language Slavic	-0.00575	-0.00480	0.00604**	0.224*
	(0.02)	(0.01)	(0.00)	(0.13)
Language Others	-0.0109	-0.0119	-0.00924**	0.0208
	(0.04)	(0.01)	(0.00)	(0.17)
Disposable HH income (ln)	-4.910**	0.178	-0.149	-2.725
	(1.95)	(0.62)	(0.26)	(7.67)
No income	-0.213**	-0.00588	0.000340	0.0398
	(0.09)	(0.02)	(0.01)	(0.45)
Mother age (ln)	6.038*	1.177	2.736***	11.09
	(3.55)	(0.82)	(0.45)	(15.89)
No qualification	0.250	0.120***	0.00601	0.805**
	(0.16)	(0.04)	(0.02)	(0.38)
Postgrad	0.0885	0.0455***	0.0249***	-0.0550
	(0.05)	(0.01)	(0.01)	(0.37)
Grad diploma	0.106*	0.0270**	0.0103	0.0383
	(0.06)	(0.01)	(0.01)	(0.30)
Bachelor	0.0124	0.0390**	0.00692	-0.229
	(0.07)	(0.02)	(0.01)	(0.42)
Certificate	0.341*	0.117**	0.0526**	1.112**
	(0.19)	(0.05)	(0.02)	(0.46)

Other	-0.00607	0.00244	0.00591**	0.00604
	(0.01)	(0.00)	(0.00)	(0.05)
Mother health: good	0.118	0.0405	-0.00864	0.0950
	(0.15)	(0.04)	(0.02)	(0.72)
Mother health: satisf	0.294**	-0.00155	0.0163	-0.0357
	(0.13)	(0.03)	(0.02)	(0.51)
Mother health: poor	0.105	-0.00565	-0.00989	-0.926***
	(0.07)	(0.01)	(0.01)	(0.27)
Mother health: bad	0.0120	0.0149***	0.00655*	-0.195*
	(0.03)	(0.01)	(0.00)	(0.11)
Mother health: miss	0.0306	0.0396*	-0.00116	-0.336**
	(0.05)	(0.02)	(0.01)	(0.14)
Employed	-0.899**	-0.207**	0.0219	0.0240
	(0.42)	(0.09)	(0.06)	(1.92)
Unemployed	-0.0980**	-0.00798	-0.00511	-0.288**
	(0.04)	(0.01)	(0.00)	(0.12)
Mother work hours	0.615*	0.0589	-0.00362	-2.108
	(0.35)	(0.07)	(0.04)	(1.55)
Executive function	-1.668	-1.779***	-0.463**	-17.94**
	(1.58)	(0.38)	(0.23)	(8.32)
Memory	-1.684***	0.158	0.00365	-48.84***
	(0.42)	(0.14)	(0.05)	(11.89)
Attention	1.916***	-0.0203	0.0191	50.47***
	(0.40)	(0.13)	(0.05)	(11.84)
Constant	-2.288	0.666	-1.345**	24.14
	(4.93)	(1.77)	(0.64)	(21.64)
Observations	14247	5843	20626	7570