

Children's participation in early childhood education and care, and their developmental outcomes by Year 5: A comparison between disadvantaged and advantaged children

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Executive Summary

A large body of international literature indicates that quality early childhood education and care (ECEC) arrangements can facilitate the improvement of children's cognitive and non-cognitive skills, in particular for disadvantaged children. However, the majority of the current evidence, particularly from Australia, is not specific to children from disadvantaged families. In addition, only a few published studies have investigated specifically how children's ECEC experiences (hours of attendance, age of entry) affect their long-term cognitive and non-cognitive outcomes.

This report contributes to filling these gaps and in particular aims to:

1. Identify socio-demographic profile of families associated with different patterns of ECEC participation, including children who do not participate in any form of formal ECEC.
2. Investigate how cognitive and non-cognitive outcomes vary between children from disadvantaged and advantaged families with different patterns of ECEC participation (i.e. hours of attendance, types of ECEC, age of entry).

We measure disadvantage in terms of income, using as the cut-off for disadvantage the highest income at which families are still eligible for the full Child Care Benefit (CCB) payment. The report covers a wide range of outcomes, including measures of learning and socio-emotional development; teacher-assessed academic performance; and (for a subsample of children) the NAPLAN reading, writing and numeracy test scores in Year 3 and Year 5.

This report contributes to the literature by combining three important aspects of the effect of child care on child outcomes. First, we study the effects of both formal and informal child care arrangements (and a mixture of the two care types). Second, we investigate the effects of child care on both cognitive and non-cognitive skills. Third, our study contrasts the outcomes of children from disadvantaged and non-disadvantaged families, allowing for a comparison of the outcomes and the role of child care programmes in these outcomes. It is important to note that the data used in the analyses predate the National Quality Framework and can therefore not be interpreted in the current policy context.

Data and Methodology

The empirical analysis conducted in this report is based on data from the Longitudinal Survey of Australian Children (LSAC). This survey follows two cohorts of children over time starting in 2004. The first cohort, B-cohort, consists of newborn children aged 0-1 in the first wave of the survey, while the second cohort, K-cohort, consists of children aged 4-5 in the first wave. The LSAC data contain extensive information on the family, child care environment, child care use, school environment and the child, as well as assessments on how well the child is doing with regard to health, cognitive skills and non-cognitive skills. The sample is representative of the Australian population, and has followed the study children for 6 years over 4 waves (each wave is two years apart). Furthermore, for the children in the K-cohort whose parents gave permission, the LSAC data have been matched with individual scores from Year 3 and Year 5 NAPLAN tests.

In the project we use wave 1 to wave 4 of the B-cohort and the K-cohort. We start our empirical study with an extensive descriptive analysis of the dataset. This analysis serves two purposes: first, learning about the socio-demographic characteristics of the sample; and second, informing the investigation of the relation between child care arrangements for disadvantaged and non-disadvantaged children, and the children's cognitive and non-cognitive outcomes. The multivariate analysis of the relationship between child care arrangements and children's outcomes represents the core of the second part of our empirical study in which we employ more sophisticated econometric tools. In particular, we introduce linear regression models and propensity score matching (PSM) procedures. These methods allow us to focus on the relationship between ECEC participation, and cognitive and non-cognitive outcomes while controlling simultaneously for numerous other observable characteristics of the children and their families. The aim is to reduce the bias in estimated effects due to non-random selection into child care. However, it should be noted that the analyses are based on relatively small sample sizes, which affect the significance and robustness of the results. In the discussion below we indicate when particular observed patterns are insignificant or vary over different specifications.

Empirical Findings

Descriptive Analysis

The descriptive analysis conducted on the B-cohort children indicates that care by relatives is the most common form of first child care arrangement until the age of 9 months. After that

age, centre day care and other forms of formal arrangements gain importance. Formal arrangements are particularly relevant until the child is aged 2 to 3 years. As the child approaches 4 years of age, fewer children use formal or informal child care arrangements with most children attending preschool (and later on, school) as the first non-parental care arrangement. This reflects the type of child care most likely to be used at different ages.

While almost 25% of children from low- and middle-income families have not attended any form of child care by the age of 3, high-income families and families in which only one parent is present are much more likely to rely on some forms of child care, either formal or informal, early on in their child's life. The analysis also indicates that, in comparison to non-Indigenous families, a higher percentage of Indigenous families do not use any child care arrangement in the first three years of the child's life. Furthermore, the patterns of child care usage by Indigenous families differ depending on the gender of the child. We observe that in the case of girls, the proportion of Indigenous families that use a formal type of child care is very high, well above the percentage for non-Indigenous families, while the opposite result is found for informal arrangements. However, note that the number of Indigenous families in the LSAC is quite low, so this would need to be explored further with more data.

The descriptive results from the K-cohort sample differ from those obtained from the B-cohort with respect to two aspects: compared to children in the K-cohort, those in the B-cohort have a higher likelihood of entering a (formal or informal) child care arrangement during their first 36 months; and children in the B-cohort also have a higher likelihood of experiencing their first child care arrangement at a younger age compared to children in the K-cohort. These results suggest that early child care use has become a more common choice in recent years. This finding is in line with the results observed in the 2002 and 2006 Australian Government Census of Child Care Services.

The second part of the descriptive analysis focuses on the relation between ECEC arrangements and the child's cognitive and non-cognitive outcomes. In this respect, the descriptive analysis conducted on the B-cohort sample leads to a number of observations. The learning outcomes of children (and in particular boys) who attended any child care before the age of three are better than those of children who attended no child care at all. When also considering non-cognitive outcomes, child care use appears to be more beneficial for girls than for boys in low-income families, while the reverse appears true for girls and boys in

middle-income families. Overall positive returns from child care are most common for children from families with a middle income, although very few returns are significant.

Distinguishing different types of child care shows that high-intensity child care tends to be associated with poorer outcomes than low-intensity child care, in particular when considering boys in low- and high-income families. However, the analysis also shows that *all* levels of child care are better than no child care when considering learning outcomes, with in some cases high-intensity care being associated with better outcomes than low-intensity care. Comparing formal and informal child care indicates that, formal arrangements are more beneficial (although not always significantly so) to learning outcomes than informal arrangements. The benefits appear more pronounced for children from middle- and high-income families, particularly for boys. However, children who only attend informal child care appear to perform better in the socio-emotional/social development domain than children who attend at least some formal child care.

The data from the K-cohort sample gave us the possibility to study the evolution of the outcomes over several waves, by the type of first child care arrangement experienced by the child (if any). Although the available information on child care usage by the K-cohort children is limited, the main advantage of the use of the K-cohort sample is the availability of the Year 3 and Year 5 NAPLAN test scores for this group. The descriptive results show that in these tests children who have been exposed to child care tend to perform better than those who did not have any child care before entering preschool. Boys, in particular, appear to benefit more than girls, especially if from more affluent families. Overall, the descriptive findings from the K-cohort indicate the existence of potential long-term effects of early child care arrangements.

Multivariate analysis

The aim of the multivariate analysis is to study the relation between ECEC arrangements and children's outcomes while simultaneously controlling for other characteristics which might influence the studied measures of child development. In this respect, the first finding that emerges from our multivariate analysis is that the correlation between child care variables and outcomes becomes smaller and often insignificant when we control for socio-demographic characteristics. In particular, the PSM results for both cohorts clearly indicate that the differences in the average performance of children exposed to different child care

arrangements decrease drastically once the differences in socio-demographic characteristics are taken into account.

The linear regression analysis on the B-cohort sample indicates that the effects of day care centre attendance in wave 2 (at age 2 to 3) on the learning outcomes in wave 3 (at age 4 to 5) may vary depending on the gender of the child. Specifically, boys appear to benefit from a medium-intensive usage of child care (15 to 29 hours per week) and from a combination of different types of child care. Boys also tend to benefit more from child care provided by carers with a higher qualification, but once learning outcomes from the previous wave are included the positive effect becomes insignificant. None of these results hold for girls. With respect to children who experience some forms of disadvantage, the results, although quite fragile, indicate a negative effect of day care for low income boys (which disappears as the specification accounts for more background variables), but positive for Indigenous girls and low- to middle-income girls (although not significantly).

Some gender differences also emerge in the results for the non-cognitive skills. In general, the coefficient on attending a day care centre is negative, but the effects of hours in care are positive and compensate for the former negative coefficient, indicating that low-level usage (1 to 14 hours per week) of child care might be ideal for boys and medium-level usage might be ideal for girls. Moreover, the coefficient on using a mix of formal and informal child care indicates that combining different types of child care might be beneficial for girls. In some of the empirical specifications, marginally significant results indicate that boys from lower-income families benefit more from attending a day care centre than boys from higher-income families, and girls with an Indigenous background appear to benefit from attending centre day care.

The complementary PSM approach shows comparable results to the above analyses. Although none of the dummy variables for the use of centre day care or formal child care are significant, most are positive, indicating better learning outcomes for children using centre day care or formal child care compared to other children. In addition, most of the interactions with the low and middle income categories indicate that children in these families are expected to benefit slightly more than children from high-income families, with some of these interaction coefficients being significant for boys. Although these results are far from conclusive, the association of child care with children's outcomes seems mostly positive (although often insignificant) and the results indicate that disadvantaged groups (e.g. on low

income or from Indigenous descent) may benefit from centre day care to a greater extent than other groups.

The interpretation of the K-cohort results differs from those outlined so far as they investigate the association of the *first* child care arrangement experienced by the child to outcomes observed a few years later. Information on other child care arrangements used after this first child care and before age 4 to 5 is not available.

As for the results for the B-cohort, the multivariate analysis does not lead to a set of robust and unambiguous estimates. Specifically, the usage of day care as the first child care arrangement compared to other child care arrangements or to no child care appears to have a detrimental effect on the NAPLAN Year 3 test scores. However, these results are not confirmed in relation to the Year 5 scores. This suggests that, once we control for other confounding factors, the very first child care arrangement may exert at most a short-run effect on children's cognitive skills. The estimates suggest that day care as the first arrangement might be slightly more beneficial for children of high-income families, but the magnitude and the significance of this result varies depending on the adopted specification.

Finally, the age of first exposure to child care seems to have an effect on the measures of development: children who attend their first child care arrangement between 4 and 12 months tend to perform slightly better than those who start child care in the first three months or after turning one year of age.

Policy Implications

The aim of the empirical analysis presented in this paper was to assess the relevance of child care arrangements in children's development of cognitive and non-cognitive skills. The results we present are often not consistent across the different methodologies of analysis we employ: the findings from the descriptive study and from the multivariate analysis do not lead to a univocal picture of the effects of ECEC arrangements on the studied outcomes, and outcomes are different for different subgroups.

This result can be considered an empirical finding *per se*. The discrepancies in the results suggest that any measure implemented to foster the role of formal child care arrangements and support disadvantaged children must be developed considering the socio-demographic characteristics of the children and their families. In addition, the first step needs to be encouraging disadvantaged families to make use of high-quality child care. Disadvantaged

families currently appear to make less use of formal child care than advantaged families. Although other factors could play a role as well, this means that ensuring that this type of child care is affordable to these families is important given the low incomes of these families.

Under certain circumstances, centre day care arrangements appear to have positive effects on specific groups of children. For example, boys tend to benefit most from day care when its usage is not too intense and it is mixed with other forms of child care. The results also indicate that Indigenous girls who attend day care may benefit in terms of their cognitive and non-cognitive skills. At the same time, our estimates suggest that child care may exert the most positive long-run effects if its first use occurs after the age of 4 months, but before the first year of age.

Overall, these results suggest the need for avoiding a “one-size-fits-all” type of measure in the design of child care policies since family characteristics clearly play an important role in the development of children’s cognitive and non-cognitive skills. This means that children from advantaged families are perhaps unlikely to benefit from attending child care given their supportive home environment, so an expectation that attending child care would improve their outcomes may be unrealistic. In their case, the aim should rather be to provide child care of equal quality as parental care given the high quality of parental care in their case. Children from disadvantaged families are much more likely to benefit from high-quality formal child care, which may compensate for a less favourable home environment, but at the same time they may have more difficulty in accessing such child care, so perhaps the main target for this group should be to make such child care readily available for this group.

1. Introduction

Research suggests that exposure to a quality early childhood education and care (ECEC) programme can significantly increase learning and developmental outcomes for children, especially those from socially and/or economically disadvantaged backgrounds (Sammons *et al.*, 2007). But low uptake of ECEC programmes by children from disadvantaged families has been a concern particularly because children from disadvantaged families attending ECEC services demonstrate much better outcomes at the start of primary school when compared to similarly disadvantaged children who did not attend ECEC programmes (Sylva *et al.*, 2004). However, data on uptake of ECEC programmes is only expected to become available from 2012 onwards (Australian Institute of Health and Welfare, 2012).

Supporting disadvantaged / vulnerable children is a key focus of the Australian Government in implementing the National Early Childhood Development Strategy, and key National Partnership (NP) Agreements such as the NP on Early Childhood Education and NP on Literacy and Numeracy.

In accordance with the Australian Government's early childhood agenda, the Research and Evaluation Plan for the Office of Early Childhood Education and Child Care (OECECC) within the department has prioritised research on disadvantaged children and their families to better understand and respond to their early childhood education and child care needs with a view to improving outcomes for these children through development of policies and programmes.

The majority of the current evidence base in the early childhood field, particularly from Australia, is not specific to children from disadvantaged families. There is also a paucity of published research pertaining specifically to how children's ECEC experiences (attendance hours, age of entry) affect their long-term cognitive and non-cognitive outcomes. Section 2 provides a brief literature review.

To help address the gaps in existing evidence, this project aims to:

1. Identify the socio-demographic profile of families associated with different patterns of ECEC participation, including children who do not participate in any form of formal ECEC. The profile characteristics include (but are not limited to) income¹,

¹ The cut-off of annual income is set at the cut-off income for eligibility for the maximum amount of Child Care Benefit (CCB) in the year that the child care is used, since this is the group the department is interested in from an OECECC perspective (The cut-off points to be used are \$ 31,755 in 2003/2004 when the K cohort is aged 4-5, and \$33,361 in 2005/2006 when the birth cohort is aged 2-3).

employment, Culturally and Linguistically Diverse (CALD) and Indigenous background, location etc. The patterns of ECEC participation include hours spent in ECEC programmes, types of ECEC setting, age of entry etc.

2. Investigate how cognitive outcomes (i.e. literacy and numeracy at Year 1, Year 3 and Year 5, school readiness prior to entering school) and non-cognitive outcomes (i.e. socio-emotional development) vary between children from disadvantaged and advantaged families with different patterns of ECEC participation (i.e. hours of attendance, types of ECEC, age of entry). Disadvantage is measured in terms of income, where we use the cut-off associated with eligibility for the full CCB payment. We propose to have an advantaged group and a group in between that is neither advantaged nor disadvantaged for comparison to the disadvantaged group.

While using income, education and occupation as an index to identify disadvantaged families may be ideal, we prefer to use household income to identify disadvantaged families to ensure a policy focus. Besides, household income is very likely to act as a proxy for education and occupation, and parental occupation and education are taken into consideration in our descriptive analysis. In addition, poverty is likely to be associated with other disadvantages.² After having identified the families who belong to the advantaged, middle and disadvantaged groups on the basis of household income, we find that families belonging to the advantaged group are more likely to have completed a university degree while those belonging to the disadvantaged group are less likely to have completed at least Year 12. There is a strong link between the education of the parents and the income group to which the family belongs.

The empirical investigation is divided into two steps. The first part of the analysis concentrates on answering the first research question by employing a wide range of descriptive statistics presented through tables and graphs in Section 4 after having provided a brief literature review in Section 2 and described the data in Section 3. This approach allows us to effectively summarise the socio-demographic characteristics of the families with different patterns of child care. The descriptive section covers those elements of differentiation in the characteristics of the families and in the child care arrangements which might play a role in the cognitive and non-cognitive development of the children.

The second part of the empirical analysis relies on more sophisticated econometric analysis in order to answer the second research question. The methodology is briefly explained in

² See for example the discussions in Williams Shanks and Robinson (2013).

Section 5, while results of this analysis are presented in Section 6. Section 7 concludes with a discussion of the results.

It should be noted that the data used in the analyses in this report predate the National Quality Framework. The results can therefore not be interpreted in the current policy context.

2. Literature Review

There is a vast international literature on the effects of child care on child development. In a recent study, Hounq *et al.* (2011) discuss the literature in three areas of research: the effects of child care in formal institutions; the effects of parental care and mother's employment; and the formation of cognitive and non-cognitive skills more generally. Each of these areas has been extensively investigated by numerous papers. This Section briefly recaps the literature on the relationship between child care and child development in Section 2.1, before reviewing part of the literature which focusses on disadvantage. First, the relationship between child development and disadvantage is explored in Section 2.2, followed by a discussion of evidence for the effects of ECEC programmes on disadvantaged children's development in Section 2.3.

2.1 Child care and child development

The literature on formal child care attendance has not converged toward a unanimous evaluation of its effects. Some US contributions (see, for example, Hill *et al.* 2002; NICHD and Duncan, 2003) highlighted positive effects of participation in regular child care. Conversely, other papers indicated that enrolment in formal child care can lead to some improvements in the academic skills of children enrolled but it can also have some detrimental effects in terms of behavioural outcomes. Examples of these are Magnuson *et al.* (2007) based on UK data and Yamauchi and Leigh (2011) employing Australian data for infants and toddlers. Other contributions pointed out how results may vary depending on the gender and the age of the child. Yamauchi and Leigh found that the negative associations seemed larger for children of higher-educated or high-SES parents, and that the adverse influence could be mitigated by a smaller number of children per carer.

That said, structured formal child care, particularly when including a preschool component, is likely to be beneficial to the cognitive development of a child. A US study (Fitzpatrick *et al.*, 2011), using random assignment of test dates in the Early Childhood Longitudinal Survey (resulting in different lengths of time between tests), shows that children in Kindergarten develop their skills much more quickly in the Kindergarten environment than in the same time outside of this environment. The children in the sample are around 5 years old when they enter Kindergarten. The study finds that per standard school year (and after taking out the age effect), children gain on average 1.2 standard deviation on the reading test and 0.9 standard deviation on the math test. Over summer (when there is no Kindergarten), the rate of

learning is about one quarter less than the rate of learning during the school year. However, using a similar approach for non-parental care use of the younger cohort of children in the same US survey, Herbst (2012) finds the opposite; that is, negative effects from non-parental care use, also for disadvantaged children. These are driven by formal child care use, including centre-based care and other non-relative care. Herbst and Tekin (2010) discuss the potential low quality of many of these child care providers.

A recent Australian study, using LSAC data, by Warren and Haisken-DeNew (2013) shows the positive significant association between preschool attendance (at age 4 to 5) and NAPLAN outcomes at age 8 to 9 (Year 3). Investigating the heterogeneity of this relationship, they find that for Numeracy, the highest benefits from attending preschool are obtained by children whose test scores are at the higher end of the test score distribution. Whereas for Reading and Spelling, children whose test scores were just above the National Minimum Standard benefited most from attending preschool. Furthermore qualifications of the preschool teacher are shown to be important. Only children whose preschool teacher had at least a degree on Early Childhood Education or a Diploma in Early Childhood Education or Child Care reaped significant benefits from attending preschool.

Comparing estimated effects for those who attended preschool and those who did not attend preschool, Warren and Haisken-DeNew find that for Reading, Spelling, Writing and Numeracy (but not for Grammar), the estimated causal Average Treatment Effect on Treated (children who attended preschool) is statistically significant and of a magnitude of 13 to 20 NAPLAN points.³ The Average Treatment Effect for the Untreated (children who did not attend preschool) provides an estimate of how much higher the NAPLAN scores of children who did not attend preschool might have been if they had in fact attended preschool. These are found to be statistically significant across all five NAPLAN domains and slightly larger than the estimates for the Treated. This result implies that it is the children missing out on attending preschool who might have gained the most from attending.

The effects of parental care are often studied in relation to mother's labour supply. The main reference in this research area is the (UK-based) paper by Gregg *et al.* (2005). Their results indicate that on average, only full-time work before a child is 18 months of age seems to have any adverse consequences for children's cognitive development and these effects are

³ These estimated effects are substantial, given that one year of schooling at this level is equivalent to an average increase in test scores with 52 NAPLAN points. Thus attending preschool amounts to 25-40% of the learning impact of one additional year of schooling.

quantitatively small and often insignificant. Part-time work and work after 18 months appear not to be harmful. A recent paper by Bertrand and Pan (2011) shows how non-cognitive returns to parental inputs vary substantially by gender. Boys, in particular, appear more responsive than girls to parental inputs during the first years of their school period.

2.2 Child development and disadvantage

Williams Shanks and Robinson (2013) describe the circumstances of children in disadvantaged households in terms of the presence of toxic stress. This is clearly distinguished from positive stress arising from minor events such as learning to deal with new situations (e.g. going to a doctor or new child care centre) and from tolerable stress which is defined as difficult events (such as a death or severe illness in the family), that are manageable within a nurturing family. Toxic stress, however, is caused by extreme, prolonged adversity in the absence of a supportive network of adults. The medical literature has shown that toxic stress can have major implications for the child's development. Williams Shanks and Robinson (2013) describe this as follows "When it occurs, toxic stress can actually damage the architecture of the developing brain, leading to disrupted circuits and a weakened foundation for future cognitive, social, emotional, and physical development (McEwen and Sapolsky, 1995; McEwen, 1998, 2008; Shonkoff *et al.*, 2007)."

Three pathways through which poverty may affect a child's brain development are the parental investment pathway; the parent behaviour and stress pathway; and the type of neighbourhood and community in which poor families are more likely to live (Gershoff *et al.*, 2003). Williams Shanks and Robinson (2013) highlight that persistent poverty is often an indicator for several aligned stressors, including inadequate housing, food insecurity, neighbourhood violence, and parental unemployment. As a result they see income as central in any intervention, stating that "... in the long-term, the most valuable strategy for reducing toxic stress is to help households become more economically secure. This way, households will have more resources to provide for themselves."

An empirical study for Australia using LSAC data (Yamauchi, 2010) finds that children of higher-educated parents and parents in good mental health do better in terms of their cognitive and non-cognitive skills than other children. This appears to occur because such parents spend more time in educational activities and engage in better parenting practices, both of which are positively correlated with children's outcomes.

Another empirical study focussing on children across the spectrum of low- to high-risk starts⁴ in life (although children at risk due to complications at birth or due to their disadvantaged family background are oversampled) is Blomeyer *et al.* (2013). Their measure of disadvantage is quite broad, moving from the level of household income which is often used (e.g. Duncan and Sojourner, 2012) to an index of 11 risk factors that may adversely affect the child's development. These risk factors include for example low education of parents, early parenthood, or parental psychiatric disorder. They find that these are all significant predictors for the formation of competencies over time, distinguishing cognitive, motor, and non-cognitive competencies. Cognitive competencies include memory capacity, information processing speed, linguistic and logic skills, and general problem-solving abilities. Motor competencies include fine and gross motor skills and body coordination, while non-cognitive competency is defined as persistence. Competencies are measured at five points in time: during infancy (three-month assessment), toddlerhood (two-year assessment), preschool age (assessment at four and a half years), elementary school age (assessment at eight years) and secondary school age (assessment at eleven years).

The research, which is based on German data from the Mannheim Study of Children at Risk, is exploratory and does not address causality between income, parental investment and the initial risk matrix. Nevertheless, they carry out a counterfactual analysis to determine the most effective time of intervention when assessing competencies at the age of eleven. They find intervention is most effective in toddlerhood, followed by preschool age, infancy and finally at school age.

2.3 Effects of ECEC programmes for disadvantaged groups

An overview of the extent to which expenditures on ECEC programmes are value for money is provided by Duncan and Magnuson (2013). Although there appears to be general agreement that ECEC programmes can generate benefits well in excess of their costs, several important questions remain. These are “How do ECEC programmes work?” since there are long-term effects on outcomes but impacts on cognitive ability and achievement often fade quite soon, so “what are the channels through which the positive outcomes are achieved?”; “What is the pattern of programme effects over time?”; and “Which skills or combination of skills result in improved outcomes later in life?”. Conti and Heckman (2012) discuss child

⁴ That is, from normal birth weight without complications at/before birth to premature birth/labour but no severe complications, and to very low birth weight or severe complications such as a clear case of asphyxia or neonatal complications.

development in the context of child well-being which is multi-dimensional, including for example: material well-being, health and safety, educational well-being, family and peer relationships, behaviours and risks, and subjective well-being. Each of these may impact on later outcomes of the child.

One channel through which ECEC programmes could work, and which has received little attention so far, is peer effects. Henry and Rickman (2007) find substantial positive effects from the ability level of peers in a child's classroom at preschool on cognitive skills, pre-reading skills and expressive language skills. They controlled for preschool resources, family characteristics and the child's skills upon entering preschool. They have not been able to uncover the mechanism that can explain the peer effects nor to assess differential effects for low- and high-skill children. This would be important information when designing ECEC programmes.

As mentioned above, understanding the mechanisms through which ECEC programmes may be beneficial to children is important for effective policy development. Felfe and Lalive (2012) study young German children (0-3 years of age) in general and seek to identify which children benefit most from attending child care and through what mechanisms this is achieved. They nominate three potential pathways for consideration: a) a child spends less time with his/her mother and more time at child care, so depending on the relative quality of both this could have a positive/negative effect on child development; b) the average quality of the now smaller amount of the mother's time with the child may change due to substitution of low-quality mother's time with non-parental child care time; and c) more parental time can be spent in market work, thus increasing family income. Large regional differences in child care availability in Germany allows the authors to identify selection into child care using the scarcity of child care places to explain child care use separate from the other factors affecting use that also affect child development. Applying this strategy and using the above framework, they find that older children and children from advantaged backgrounds are more likely to use child care, and they benefit the least in terms of child development. Boys, younger children, children with low birth weight and from lower socio-economic backgrounds tend to benefit more in terms of child development. This means that the children currently not attending child care would benefit the most (similar to the finding by Warren and Haisken-DeNew (2013) for preschool attendance in Australia). Estimates based on the gains from child care experienced by the current children attending child care are therefore lower bounds of these gains. They also find that the quality of the mother's time with the

child is certainly not decreasing with less time spent on activities that are not stimulating child development.

Three aspects of child development are considered by Felfe and Lalive (2012) in their study: cognitive, non-cognitive and motor skills. There is now a considerable literature, starting with the work of Heckman and Rubinstein (2001), which focuses on the investigation of non-cognitive skills and education outcomes of children and adolescents. Recently, much of the literature on child development has focused on the effects of child care on individuals' non-cognitive skills. The well-known articles by Cunha and Heckman (2007) and Cunha *et al.* (2010) indicate that for both cognitive and non-cognitive skills, the ability gaps among individuals open up at an early age. Early interventions are then particularly important in guaranteeing high effectiveness of support programmes for disadvantaged children who often start lagging behind from birth (or even before birth).

The importance of early intervention is confirmed by a recent US study on low birth-weight children by Duncan and Sojourner (2012), who find that the Infant Health and Development Program (IHDP) improved the cognitive ability of low-income children much more than the cognitive ability of higher-income children. Despite the disadvantage of being focussed on low birth-weight children, the advantage of their analysis is that it is based on a demographically and geographically diverse sample, using a random-assignment design and strong programme treatment. They show that either a universal or an income-based targeted programme would essentially eliminate income-based gaps in IQ at age three – which is when the programme ends. Despite considerable fadeout of programme effects, the estimates suggest that income-based gaps in IQ at age five would be substantially reduced or even eliminated completely. The estimates are more imprecise for gaps in IQ and achievement at age eight, but they suggest that one-third to three-quarters of the gap would be eliminated. The effects of these forms of interventions are reinforced if followed by further investments at later ages.

The US has a long-running programme (which started in 1965) aimed at improving the school readiness, social skills and health of children from low-income families, which is called Head Start. It provides an extensive range of services, including nutritious meals and snacks, immunisations and opportunities for parental involvement. It has been evaluated by a large number of researchers, usually focussing on the outcomes for children.

Chang *et al.* (2007) extend these analyses by considering the interaction with US welfare and employment programmes for single mothers. It turns out that these employment programmes induced women to use more child care but less Head Start since the latter did not combine well with the employment requirements these mothers were facing. The part-day, part-year structure of Head Start at the time of these programmes and issues of eligibility, such as the age of the child (requiring mothers to juggle several child care arrangements if not all her children are eligible for Head Start), are discussed as potential barriers to the use of Head Start among low-income families under a welfare system that requires parents to work (Chang *et al.*, 2007). This indicates the importance of child care fitting in with the work requirements faced, if it is to serve the purpose of facilitating parents' employment as well as have benefits for children's development. Given the increased female labour force participation, providing child care that suits parents in employment is important if it is to be successful. This is particularly important if the parents' employment can alleviate the disadvantage experienced by the family at the same time as their children receive better opportunities.

A study by Herbst and Tekin (2010) is interesting in the context of this increased child care use by single mothers on US welfare and employment programmes. They find that child care subsidy receipt is associated with negative child outcomes (both cognitive and behavioural skills), and they hypothesise that this is due to the low level of child care subsidy in many States of the US, which "forces" single women to purchase low-quality child care for their children since they cannot afford high-quality care. The authors indicate that this explanation will need to be verified in future studies. In addition, the types of child care associated with these negative effects and the types of children most negatively affected by the subsidies need to be determined.

A recent Canadian study (Benzies *et al.*, forthcoming) targeted children from low-income families through special preschool programmes, complemented by programmes for their parents. The intervention occurs at age 3-5 (with a few children being just under three years of age) and last for up to two years. Measuring outcomes directly afterwards and again at age 7, clear positive effects are observed for the children at both points in time. Receptive language and global development had improved among the children, and parents had better self-esteem, better use of community resources, less parenting stress and were at lower risk

for child maltreatment. No control group is used; the effects were measured by testing the children before and after the programme.

A similar scheme targeting parents and their children through an experimentally designed programme, Preparing for Life, was set up in Ireland between 2008 and 2010. Families were randomly assigned a low or a high level of treatment. The high level treatment was administered to disadvantaged families through home visits. Results on the impact of the first 18 months of the programme on parental and child outcomes are reported in Doyle *et al.* (2013). They find that at this early stage the main impacts are on parental behaviours and the home environment and only limited impacts on children's outcomes. The programme continues for another 3.5 years in which impacts on children's outcomes will continue to be investigated.

2.4 Contribution of this report

This report contributes to the literature by combining three important aspects of the effect of child care on child outcomes. First, we study the effects of both formal and informal child care arrangements (and a mixture of the two care types). Second, we investigate the effects of child care with respect to cognitive and non-cognitive skills. Third, our study contrasts the outcomes of children from disadvantaged and non-disadvantaged families, allowing for a comparison of the outcomes and the role of child care programmes in these outcomes.

3. Data

This project uses the Longitudinal Study of Australian children (LSAC) which contains linked-in information from the National Assessment Program – Literacy and Numeracy (NAPLAN) for those children whose parents gave permission to link to these additional data. This linked dataset supports more extensive analysis than is likely to be possible with either of these datasets alone.

The Longitudinal Study for Australian Children (LSAC) follows two cohorts of children over time starting in 2004. The first cohort, cohort B, consists of newborns aged 0-1 in the first wave of the survey, while the second cohort, cohort K, consists of children aged 4-5 in the first wave. The LSAC data contain extensive information on the family, child care environment, child care use, school environment and the child, as well as assessments on how well the child is doing with regard to health, cognitive skills and non-cognitive skills. The sample is representative of the Australian population, and has followed the study children for 6 years.

For the current project, we propose to use wave 1 to wave 4 of the B-cohort and the K-cohort. For the analysis of child care use, we focus on the B-cohort, but we propose to complement the analysis of children's outcomes based on the B-cohort with analysis of the K-cohort using retrospective information on child care use. This allows analysis of children who have been in school for several years, although there is much less detail on child care use before age 4 to 5 for the K-cohort than is available for the B-cohort. Only for the K-cohort are NAPLAN data available, since the first test is done in Year 3 and there is usually some delay before the NAPLAN results become available in the LSAC.⁵ However, in the latest (recently updated) release of the wave 1 to wave 4 data, two years of NAPLAN results (for Year 3 and Year 5) are now available for the K-cohort.

To investigate the respective analytical sample sizes for the K-cohort, we select families with an annual income under \$31,755 (the CCB cut-off point at the relevant time) when the study child is aged 4-5. We find 815 disadvantaged families in cohort K. We suggest subdividing the remaining group into two categories: a middle group of households on incomes between \$31,755 and \$70,000, and an advantaged group of households on incomes over \$70,000. It is clear from Table 1a that the families with low household incomes are concentrated amongst

⁵ The data currently contain information on Year 3 NAPLAN scores for fewer than 400 B-cohort children. We cannot obtain general results for the entire cohort from the analysis of such a small sample.

the single-parent families. This is an important background characteristic that we need to account for in our analysis, and when interpreting the results.

Table 1a Household income when the child is aged 4 to 5 (K-cohort)

Household income	Couple family	Single parent	Total
Under \$31,755	314	501	815
\$31,755-\$70,000	1,613	137	1,750
Over \$70,000	1,536	12	1,548
Total	3,463	650	4,113

Using Wave 2 for Cohort B, when children are aged 2-3, using a cut-off income of \$33,361 (again, the CCB cut-off point at the relevant time), we find that 627 families in cohort B are in the disadvantaged group.

Table 1b Household income when the child is aged 2 to 3 (B-cohort)

Household income	Couple family	Single parent	Total
Under \$33,361	405	222	627
\$33,361-\$73,000	1,576	156	1,732
Over \$73,000	1,952	64	2,016
Total	3,933	442	4,375

The children in each of these groups can be followed over time. Currently four waves of data are available, which means we observe children in cohort B up to age 6-7 and children in cohort K up to age 10-11. Two years of NAPLAN results (for Year 3 and Year 5) are already available for the K-cohort in the latest release of the four waves, so we can use nationally comparable data on a range of children’s cognitive skills at ages 8 to 9 and 10 to 11 for our analyses.

4. Descriptive statistics

The first aim of this report is to identify the socio-demographic profiles of families associated with different patterns of ECEC participation, including those of children who do not participate in any form of ECEC. In Section 4.1 we describe the relation between socio-demographic characteristics of families and the type of child care arrangement they choose. Section 4.2 deals with the second aim of the report to provide a descriptive analysis of the implications of these child care choices with respect to some developmental outcomes of the children. Specifically, we study these relationships taking into account the income levels of the families, in order to identify potential differences in child care use and its relationship with child development by the extent of disadvantage experienced by the family.

Given the different age-range of the children in the two LSAC cohorts we carry out our analyses separately for the B and the K-cohorts. The definition of child care arrangement that we employ in our analysis differs between the two cohorts due to the difference in available information. The children included in the B-cohort are followed throughout their childhood since its very early stages. For these children it is therefore possible to identify potentially all child care arrangements their families choose for them from birth until they commence school. Conversely, the K-cohort children are first sampled when aged between four and five years. In their first interview, the parents are asked about *the first* child care arrangement and the current child care arrangement (that is at age 4 to 5) only. Therefore, for this cohort, we focus on the first type of child care the child ever experienced, since the current child care arrangement is likely to be preschool or school.

Throughout our analysis we distinguish different types of child care. In particular we separate formal and informal child care arrangements. Formal child care includes the following arrangements: day care centre; family day care; occasional care; gym, leisure or community centre; and mobile care unit. With the term “informal (child)care” we indicate child care activities by: a grandparent; another relative; a nanny; a child's parent living elsewhere; or another person. In our tables we also keep preschool activities separated from the different types of child care.

4.1 Child care arrangements and family characteristics

4.1.1 Results based on the B-cohort

Table 2 provides a first insight into the child care arrangements for boys and girls during the early stages of their childhood. We have information about the first type of child care for around 4,500 children, including at what age the children are exposed to their first child care arrangement and its nature. Care by relatives is the most common form of child care until the age of 9 months. After that age, day care and other forms of formal arrangements gain importance. Formal arrangements are particularly relevant until the child is aged 2 to 3 years. As the child approaches 4 years of age, fewer children use formal or informal child care arrangements with most children attending preschool (and later on, school) as the first non-parental care arrangement.

Table 2
Type of first child care arrangements by child's age (row percentage)

Age when started	Day care	Other formal	Relatives	Other informal	Preschool	School	Total obs.
Less than 3 months	8.04	7.57	67.85	16.55	0.00	0.00	423
3-6 months	22.07	11.55	55.00	11.38	0.00	0.00	580
6-9 months	29.67	13.72	48.01	8.61	0.00	0.00	627
9-12 months	38.10	16.67	37.14	7.62	0.48	0.00	420
12-18 months	41.70	17.94	31.61	7.17	1.57	0.00	446
1.5-2 years	52.83	18.48	20.43	3.70	4.57	0.00	460
2-3 years	51.71	17.12	15.14	4.50	11.17	0.36	555
3-4 years	21.59	3.65	6.98	1.66	61.79	4.32	301
4 years or older	10.16	0.23	2.77	0.92	64.67	21.25	433
Total	31.40	12.41	33.33	7.18	13.14	2.52	4,245 ^a

Source: LSAC data, B-cohort, waves 2 and 3.

Note: a) Out of 361 missing observations only 17 children never went to school nor had any non-parental care arrangement; information for others is missing because of attrition after wave 2 or missing starting age or type of arrangement.

Table 3 describes the relation between child care arrangements and family characteristics. Specifically, we group our observations by three characteristics that assist with the identification of some forms of disadvantage: whether the child is growing up in a household with only one parent; total household income; and the employment status of the parents. Tables A1 and A2 (in Appendix A) present summary statistics with respect to numerous other household characteristics, but in this section we focus on the disadvantage variables and just a few other characteristics which are presented in tables and graphically. All parental characteristics are measured in wave 2.

The general patterns tend to be very similar for boys and girls. For both groups the most common first type of child care arrangement was a formal one, although the percentage difference with respect to informal arrangement is very small, in particular for boys (39.2% versus 38.8%). Almost 20% of the sampled children have not had any form of child care by the age of 3. The latter percentage increases substantially in families where one of the two parents is not employed, while for families where both parents are employed the percentage of children who have not had any child care arrangement by the age of three is lower than 10%.

Table 3
B-cohort: first child care arrangement up to 3 years of age

	None	Preschool	Formal	Informal	Total
BOYS					
Total number of observations	464	52	922	912	2,350
Percentage	19.74	2.21	39.23	38.81	100
One parent is not present	11.95	1.59	45.42	41.04	251
<i>Family income level (wave 2)</i>					
Under \$33,361	20.32	1.27	40.63	37.78	315
\$33,361-\$73,000	22.77	2.86	38.33	36.04	874
Over \$73,000	15.65	1.94	40.23	42.18	1,029
<i>Parents labour force status</i>					
All employed	9.49	1.38	43.39	45.74	1,233
One employed (out of two present)	33.26	3.25	32.59	30.91	893
None employed	22.32	2.68	42.86	32.14	224
GIRLS					
Total number of observations	437	47	910	862	2,256
Percentage	19.37	2.08	40.34	38.21	100
One parent is not present	12.89	3.13	46.48	37.50	256
<i>Family income level (wave 2)</i>					
Under \$33,361	24.36	3.21	39.10	33.33	312
\$33,361-\$73,000	24.13	2.80	39.63	33.45	858
Over \$73,000	12.77	1.22	41.84	44.17	987
<i>Parents labour force status</i>					
All employed	8.26	0.91	44.46	46.36	1,210
One employed (out of two)	32.97	3.26	34.66	29.11	828
None employed	29.36	4.13	38.99	27.52	218

Source: LSAC data, B-cohort, waves 1 to 4.

The percentage of children without any child care arrangement by age 3 is lower when the child is growing up in a one-parent household due to the absence of a second parent to share the care. Families in the low and middle income ranges display very similar patterns of child care choice, whereas more affluent families have a higher likelihood of relying on some forms of child care. Informal child care, in particular, is relatively common among these families. In most cases, grandparents or other relatives provide this care. Two-earner families are quite common amongst the advantaged group, so children in these families are likely to start child care early (income is measured at age 2-3). In many cases this child care is initially provided by grandparents and relatives, possibly due to the unavailability of formal child care for young children or perhaps a preference for care by relatives at such a young age. As the children grow older, formal child care becomes more prevalent. The families on the lowest level of income and families where no parent is employed are slightly more likely to have been using child care than families on medium-level incomes (for boys only) and two-parent families where one parent is employed (particularly for boys). This is probably driven by the single-parent families who form a relatively large proportion of the low-income families and the jobless families.

Figures 1 and 2 show the first child care arrangement choices for Indigenous and non-Indigenous families. For both boys and girls, it is shown that, compared to non-Indigenous families, a higher percentage of Indigenous families does not use any child care arrangement in the first three years of the child's life. Compared to Table 3, there are some larger differences in the results reported for boys and girls. For boys, formal and informal child care arrangements are more common among non-Indigenous families. For girls, we observe that the proportion of Indigenous families that used a formal type of child care is very high, well above the percentage for non-Indigenous families. The opposite is found for informal arrangements. It is important to note that some of these effects may be driven by the small size of the Indigenous sample in our data (only 132 children in total).

Family characteristics may influence not only the choice of the first child care arrangement, but also the age at which the child starts the chosen arrangement. Table 4 summarises the relationships between the age of first arrangement and some of the most relevant variables that describe the family background of the child (Tables A3 and A4 in the Appendix present the results for all the other descriptive variables). Around 41% of the children in our sample first started using child care when aged between 3 and 13 months. This age choice is the most

common for higher income families and for those families in which both parents are employed. On average, children who live in households with only one parent tend to enter child care at an older age. A similar pattern is observed for children whose parents are unemployed. Furthermore, it is important to note that almost a third of the children in this last group do not attend any form of child care before they start school.

Figure 1: First child care arrangement by Indigenous status – Boys

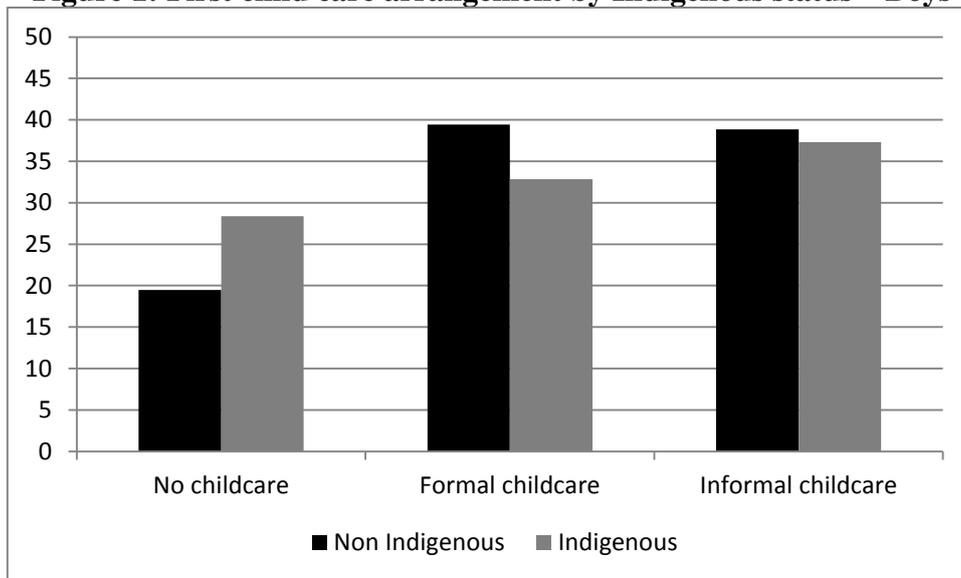


Figure 2: First child care arrangement by Indigenous status – Girls

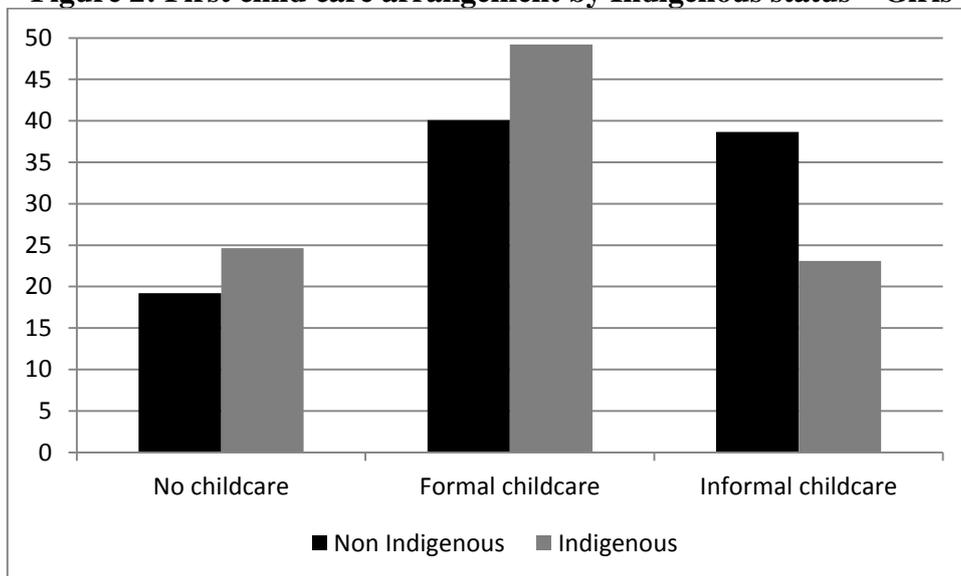


Table 4
B-cohort: Age of first child care arrangement

	Never before school	0 to 3 months	3 to 12 months	12 to 23 months	2 to 3 years	3 to 4 years	Total obs.
BOYS							
Total number of observations	477	243	977	375	253	22	2,350
Percentage	20.30	10.34	41.57	15.96	10.77	0.94	100
One parent is not present	12.75	14.74	41.83	17.13	12.35	1.20	251
<i>Family income level (wave 2)</i>							
Under \$33,361	21.27	13.02	34.29	16.19	13.65	1.59	315
\$33,361-\$73,000	23.57	9.27	37.53	16.82	11.78	0.80	874
Over \$73,000	16.23	10.59	48.98	14.87	8.55	0.68	1,029
<i>Parents' labour force status</i>							
All employed	9.16	11.84	53.85	15.57	8.60	0.81	1,233
One employed (out of two present)	34.71	7.39	28.67	15.90	12.32	0.90	893
None employed	24.11	13.84	25.45	18.30	16.52	1.79	224
Indigenous background	26.87	4.48	44.78	11.94	10.45	1.49	67
GIRLS							
Total number of observations	448	212	917	401	261	17	2,256
Percentage	19.86	9.40	40.65	17.77	11.57	0.75	100
One parent is not present	14.45	14.06	36.33	19.92	13.67	1.56	256
<i>Family income level (wave 2)</i>							
Under \$33,361	25.32	13.78	26.60	18.91	14.42	0.96	312
\$33,361-\$73,000	24.71	8.39	33.92	19.35	12.94	0.70	858
Over \$73,000	13.37	8.71	51.27	16.31	9.83	0.51	987
<i>Parents labour force status</i>							
All employed	8.10	10.00	52.56	17.77	10.58	0.99	1,210
One employed (out of two present)	33.82	7.13	28.62	17.87	12.08	0.48	828
None employed	32.11	14.68	20.18	17.43	15.14	0.46	218
Indigenous background	26.15	7.69	32.31	13.85	18.46	1.54	65

Source: LSAC data, B-cohort, waves 1 to 4.

All the results presented so far have focused on the first child care arrangement. One of the advantages of the LSAC data is that the survey is longitudinal, which means that the B-cohort children are followed since the early stages of their childhood. Thus, information is gathered on their child care arrangements from birth onwards. The results presented in Table 2 indicate that formal child care arrangements become particularly relevant after the first 9 months. In Table 5 we focus on the child care arrangement that children experience when they are 2 to 3 year old, irrespective of whether this is their first arrangement or not.

For this particular age group, as expected, formal child care is the prevalent type of arrangement, but the percentages summarised in Table 5 indicate the existence of considerable variance in the type of child care used across different groups of individuals (see Tables A5 and A6 in the Appendix for the results related to a range of other descriptive variables).

Three types of families seem to rely more on formal child care when the child is aged 2 to 3 than other families. They are one-parent families; families with a relatively high household income; and couple families in which both parents are employed. For these last two groups (which to a large extent contain the same families), the choice of formal arrangements may reflect both the need for child care that covers the entire working day and the parents' ability to afford relatively more expensive types of child care. On the other hand, the prevalence of formal arrangements for single parents is more likely to be attributable to their specific family situation, which does not allow for the sharing of child care-related chores between two parents. Exactly the opposite situation is relevant for those families in which at least one of the parents is not employed. When one parent only is employed, around 50% of the children are not in child care.

It is interesting to note that when both parents are not employed the choice of child care arrangement varies considerably depending on the gender of the child. Specifically, we observe that the percentage of boys without any form of child care is around 39%, while the corresponding figure for girls is just over 46 %. Conversely, while for boys the percentage of jobless families that rely on formal child care is almost 51%, which is quite close to the overall average of 55%, only 41% of the daughters of unemployed parents are in formal child care when aged 2 to 3 year old. The reasons behind these gender differences are not clear, but this evidence feeds into the multivariate analysis in Section 6 of the report.

Table 5
B-cohort: child care arrangement at 2-3 years of age

	None	Preschool or school	Formal & mixed	Informal only	Total obs.
BOYS					
Total number of observations	719	63	1,292	276	2,350
Percentage	30.60	2.68	54.98	11.74	100
One parent is not present	21.51	1.59	67.33	9.56	251
<i>Family income level (wave 2)</i>					
Under \$ 33,361	34.60	1.90	53.65	9.84	315
\$33,361-\$73,000	35.47	2.75	52.75	9.04	874
Over \$73,000	23.03	3.01	59.86	14.09	1,029
<i>Parents labour force status</i>					
All employed	15.00	2.35	66.34	16.30	1,233
One employed (out of two)	49.94	2.91	40.31	6.83	893
None employed	39.29	3.57	50.89	6.25	224
Indigenous background	34.33	1.49	53.73	10.45	67
<i>Hours of child care per week in wave 2</i>					
0	100.00	0.00	0.00	0.00	719
0 to 12	0.00	7.01	70.77	22.22	585
13 to 29	0.00	2.80	83.19	14.01	678
More than 30	0.00	0.82	85.75	13.42	365
GIRLS					
Total number of observations	643	73	1,271	269	2,256
Percentage	28.50	3.24	56.34	11.92	100
One parent is not present	22.66	3.52	62.11	11.72	256
<i>Family income level (wave 2)</i>					
Under \$ 33, 361	38.46	2.56	48.40	10.58	312
\$33,361-\$73,000	35.43	3.73	51.17	9.67	858
Over \$73,000	18.54	2.63	64.13	14.69	987
<i>Parents labour force status</i>					
All employed	11.82	2.15	70.25	15.79	1,210
One employed (out of two)	48.19	4.71	39.98	7.13	828
None employed	46.33	3.67	41.28	8.72	218
Indigenous background	38.46	1.54	49.23	10.77	65
<i>Hours of child care per week in wave 2</i>					
0	100.00	0.00	0.00	0.00	643
0 to 12	0.00	8.50	69.26	22.24	553
13 to 29	0.00	3.23	84.29	12.48	681
More than 30	0.00	1.06	82.71	16.22	376

Source: LSAC data, B-cohort, wave 2.

4.1.2 Results based on the K-cohort

Tables 6 and 7 below replicate the analysis we outlined in the previous section with respect to the second cohort of children, the so-called K-cohort. We emphasise again the crucial difference between the two cohorts, which determines the type of analysis we can conduct across the two datasets. The children included in the K-cohort enter the sample when aged 4 to 5 years. This implies that most of them have already entered preschool or school. However, in the first wave, the parents are asked to provide information with respect to the first child care arrangement that they chose for their children. Using this retrospective information, we can replicate the information summarised in Tables 3 and 4 for the K-cohort.

Table 6
K-cohort: first child care arrangement up to 3 years of age

	None	School or Preschool	Formal	Informal	Total obs.
BOYS					
Total number of observations	1,037	75	908	517	2,537
Percentage of observations	40.88	2.96	35.79	20.38	100
One parent is not present	40.82	3.05	35.53	20.60	2,097
<i>Family income level</i>					
Below 31,755	48.48	3.58	32.02	15.92	559
31,755 to 70,000	44.11	2.95	34.32	18.63	950
Above 70,000	31.85	2.22	40.99	24.94	810
<i>Parents labour force status</i>					
All present parents employed	29.53	2.23	40.80	27.45	1,348
1 parent employed (out of two)	53.00	3.85	30.58	12.57	411
No parents employed	55.89	3.37	29.29	11.45	363
Child is of Indigenous background	54.95	3.30	28.57	13.19	91
<i>Weekly hours of child care</i>					
0	100.00	0.00	0.00	0.00	1,037
1 to 12	0.00	6.22	54.77	39.00	723
13 to 30	0.00	4.53	66.72	28.75	574
More than 30	0.00	1.97	63.55	34.48	203
GIRLS					
Total number of observations	1,037	72	826	511	2,446
Percentage of observations	42.40	2.94	33.77	20.89	100.00
One parent is not present	41.76	2.90	33.20	22.13	2,033

Table 6
K-cohort: first child care arrangement up to 3 years of age

	None	School or Preschool	Formal	Informal	Total obs.
<i>Family income level</i>					
Below 31,755	50.29	4.19	30.29	15.24	525
31,755 to 70,000	46.01	2.84	32.13	19.02	915
Above 70,000	32.50	2.25	39.00	26.25	800
<i>Parents labour force status</i>					
All present parents employed	31.32	2.72	39.63	26.32	1,360
1 parent employed (out of two)	54.08	3.51	26.85	15.56	797
No parents employed	62.99	2.49	25.27	9.25	281
Child is of Indigenous background	51.04	2.08	30.21	16.67	96
<i>Weekly hours of child care</i>					
0	100	0	0	0	1,037
1 to 12	0	6.02	50.53	43.46	665
13 to 30	0	4.66	66.49	28.85	558
More than 30	0	3.23	63.98	32.8	100

Source: LSAC data, K-cohort, wave 1.

Table 6 presents the results that characterise the relationship between the type of first child care arrangement experienced by the child and the socio-economic characteristics of the family at the time of wave 1 (Tables A7 and A8 in the Appendix summarise the descriptive statistics for additional variables). We compare the numbers reported in this table with those summarised in Table 3. The main difference between the two tables is the year to which the numbers refer: the results reported in Table 3 refer to the period 2003-2008, while those presented in Table 6, although collected in the same interval of time, refer to a child care arrangement which possibly dates back to 1999. In this sense, we can interpret the differences in the figures summarised in the two tables as indicative of changes in the choice of child care arrangements that took place between the end of the 1990s and the middle of the 2000s.

Comparing Table 6 with Table 3 we observe a clear difference in the percentage of children who did not experience any child care arrangement before the age of 3. In the K-cohort, around 41% of children fall into this category, while the corresponding percentage for the B-cohort is 20%. As noted before, the information collected in the K-cohort is based on retrospective questions and may therefore be affected by a certain degree of inaccuracy in the answers provided by the parents. However, the magnitude of the difference observed between

the two tables cannot be simply explained by this type of consideration. The results also suggest that formal child care has become more and more a common choice in recent years. This is not an entirely surprising result: according to the Australian Government Census of Child Care Services, the number of children attending formal child care rose by 9.4% during the period from 2002 to 2006 (from 730,000 to 801,000 children in formal care).⁶ It is also important to signal that these differences are not equally important for all subgroups of the population. The results suggest that the percentages of child care usage have not changed significantly for the more affluent families and for those in which both parents are employed. This suggests that cost/quality considerations might have played a role in the determination of the first child care arrangement at the end of the 1990s, where lower income families might only have been able to afford lower-cost formal child care of relatively low quality. This may have led to lower-income families opting out of formal child care.

A second clear difference between the two cohorts emerges from the analysis of the age of first enrolment in child care. By comparing the figures presented in Table 7 with those already shown in Table 4, we observe that in this case the percentages of children without any child care arrangement before school are only slightly higher than those we saw in the previous subsection (21% versus 20% for boys and 23% versus 20% for girls). These results suggest that to some extent the gap in child care participation that we observed in comparing Table 5 and Table 2 may be due to a delayed entry in child care for the children of the K-cohort. Two other descriptive elements confirm this hypothesis. First, for the B-cohort, around 40% of the children had their first child care arrangement while aged between 3 and 12 months. Only 24% of the children in the K-cohort experienced their first arrangement at such an early age. Furthermore, the percentage of children who experienced their first child care arrangement after the age of 3 was almost negligible in the B-cohort (around 1%) but is extremely relevant for the K-cohort (19%). This difference is probably too large to be entirely attributable to a change in the age of the first child care arrangement. It seems plausible that part of the 19% of children who entered child care around the age of 4 did this in combination with some form of school/preschool arrangement and would have been in the “Never before school” category if the questions had been asked during the year of the actual arrangement (additional descriptive results are presented in Tables A9 and A10 in the Appendix). In addition, minor usage of child care early in the child’s life might have been forgotten by the

⁶ See 2006 Australian Government Census of Child Care Services (p. 7) and 2002 Australian Government Census of Child Care Services (p. 5).

parents in the K-cohort, who answer the question on age of first child care arrangement retrospectively, when the child is aged 4 to 5 years.

Table 7
K-cohort: Age of first child care arrangement

	Never before school	0 to 3 months	3 to 12 months	12 to 23 months	2 to 3 years	3 to 4 years	Total obs.
BOYS							
Total number of observations	535	118	622	481	279	502	2,537
Percentage	21.09	4.65	24.52	18.96	11.00	19.79	100.0
One parent is not present	21.59	4.32	19.77	22.50	12.27	19.55	440
<i>Family income level (wave 1)</i>							
Below 31,755	27.37	3.58	13.95	20.39	13.60	21.11	559
31,755 to 70,000	23.47	4.21	22.42	18.63	10.63	20.63	950
Above 70,000	13.21	6.17	34.57	18.52	8.89	18.64	810
<i>Parents labour force status</i>							
All employed	13.13	5.64	33.09	21.44	10.31	16.39	1,348
One employed (out of two)	29.22	3.62	16.19	15.18	12.00	23.78	883
None employed	32.66	3.37	10.77	18.52	11.45	23.23	297
Indigenous background	37.36	5.49	10.99	19.78	8.79	17.58	91
<i>Hours of child care per week in wave 1</i>							
0	51.59	0.00	0.00	0.00	0.00	48.41	1,037
0 to 12	0.00	8.02	37.07	35.41	19.50	0.00	723
13 to 29	0.00	5.92	43.03	31.01	20.03	0.00	574
More than 30	0.00	12.81	52.71	23.15	11.33	0.00	203
GIRLS							
Total number of observations	554	137	595	422	255	483	2,446
Percentage	22.65	5.60	24.33	17.25	10.43	19.75	100
One parent is not present	27.60	5.81	18.64	18.64	11.38	17.92	413
<i>Family income level (wave 1)</i>							
Under \$ 33, 361	27.24	4.95	14.29	18.67	11.81	23.05	525
\$33,361-\$73,000	26.12	5.03	20.77	16.17	12.02	19.89	915
Over \$73,000	14.50	7.12	33.38	18.50	8.50	18.00	800
<i>Parents labour force status</i>							
All employed	15.00	6.69	32.28	19.41	10.29	16.32	1,360
One employed (out of two)	28.73	4.64	16.19	13.80	11.29	25.35	797
None employed	42.35	3.20	8.90	16.01	8.90	20.64	281

Table 7
K-cohort: Age of first child care arrangement

	Never before school	0 to 3 months	3 to 12 months	12 to 23 months	2 to 3 years	3 to 4 years	Total obs.
Indigenous background	39.58	6.25	16.67	18.75	7.29	11.46	96
<i>Hours of child care per week in wave 1</i>							
0	53.42	0.00	0.00	0.00	0.00	46.58	1,03
0 to 12	0.00	10.08	38.80	31.88	19.25	0.00	665
13 to 29	0.00	7.53	42.83	30.29	19.35	0.00	558
More than 30	0.00	15.05	52.69	22.04	10.22	0.00	186

Source: LSAC data, K-cohort, wave 1.

Despite the issues around interpretation of these results, the message that we obtain from Tables 6 and 7 indicates that:

- 1) Compared to children in the K-cohort, those in the B-cohort have a higher likelihood of entering a (formal or informal) child care arrangement during their first 36 months; and
- 2) Children in the B-cohort also have a higher likelihood of experiencing their first child care arrangement at a younger age compared to the children in the K-cohort.

4.2 Child care arrangements and child development outcomes

The second part of our descriptive analysis focuses on the relationship between disadvantage and children's development outcomes. In this section we again identify disadvantage through household income, and we study the relation between income and outcomes controlling for the different types of child care arrangements experienced by the children. As in Section 4.1, we conduct this analysis on both the B and the K-cohort data. We include several outcomes in our analysis, reflecting both cognitive and non-cognitive skills of the children. A group of researchers associated with the LSAC has developed the LSAC Outcome Index using various child outcome measures in the LSAC (Sanson *et al.*, 2005). The Outcome Index is a composite measure to indicate how children are developing. The components of this index change over the waves (with the children's ages), but the meaning/interpretation of the index is broadly consistent across the waves (and children's ages). The LSAC Outcome Index consists of three domains: physical, social and emotional, and learning, with each domain consisting of several sub-domains. Since NAPLAN results (which would provide a nationally comparable measure, and which is used for the K-cohort) are not yet available for most children observed in the B-cohort, we use the Learning Outcome Index provided by LSAC.

The index is constructed in such a way that it has an average value of 100 and a standard deviation of 10.⁷ It indicates the relative position of the child within the sample of children in the same wave.

4.2.1 Child care and child development: B-cohort

Table 8 offers a first overview of the development outcomes of the B-cohort children (from age 4-5 onwards) taking into account both their child care arrangement when aged below 3 and their social background as measured by total household income. We present the average of each index separately for boys and girls. For each index we then calculate the difference in the performance for children who have attended child care and for children who did not attend any child care arrangement before the age of 3. A positive difference indicates that children exposed to some child care before the age of 3 have better outcomes compared to those who were not exposed to any child care arrangement, while a negative difference is indicative of worse outcomes for those who were exposed to child care.⁸ In the B-cohort, differently from the K-cohort, most of these indices for children aged 4 or over are either present in one wave only or, when present more than once, they are not calculated in a consistent way across different waves. Hence, we present only one measure for each of these indices, generally recorded in Wave 3 or 4. It is also important to note the fact that for the B-cohort the NAPLAN scores are recorded for only 389 children, so that the results for these scores cannot be generalised to the entire sample under consideration.

⁷ A sub-domain score is computed as the sum of standardised scores on variables contributing to it, and a domain score is the sum of standardised sub-domain scores. All three domain scores were standardised again to have a mean of 100 and a standard deviation of 10. In the first two waves the outcome measures are based on what the main carer reports. Although carers and teachers also assess the child, comparing him/her to other children, this information is of course only available when the child attends formal child care or some form of education. In the third wave some of the measures are based on tests applied by the interviewer.

⁸ While most of the presented indices are defined in such a way that a higher value of the index indicates a more advanced level of development, the opposite is true for the three “Social development” indices. In order to achieve coherence in the interpretation of the numbers presented in Table 8, we present the actual averages for these three indices multiplied by -1.

Table 8
Means of outcome indices by income group and any child care attendance by 3 years of age

	Min/Max	Low income			Medium income			High income		
		No child care (A)	Some child (B)	Diff. (B-A)	No child care (A)	Some child (B)	Diff. (B-A)	No child care (A)	Some child (B)	Diff. (B-A)
Boys										
Physical outcome (age 4/5)	42 - 119	99.16	99.2	0.04	98.75	99.67	0.93	101.8	100.68	-1.13
Socio-emotional outcome (age 4/5)	48 - 121	97.88	97.65	-0.23	98.68	98.88	0.20	102.02	101.32	-0.70
Learning outcome (age 4/5)	65 - 124	93.50	94.71	1.21	96.07	98.32	2.25***	99.92	101.22	1.30*
PEDS total (age 6/7)	22 - 100	74.13	72.66	-1.46	77.39	77.97	0.58	80.62	80.04	-0.57
PEDS social functioning (age 6/7)	0 - 100	74.60	72.50	-2.10	78.77	79.39	0.61	82.15	82.16	0.01
Social development (age 6/7, mother) ^a	4 - 35	25.38	23.94	-1.44	25.98	26.11	0.12	28.20	27.05	-1.15***
Social development (age 6/7, father) ^a	5 - 35	27.08	25.2	-1.87	26.77	26.42	-0.35	28.02	27.58	-0.44
Social development (age 6/7, teacher) ^a	0 - 35	26.91	25.06	-1.85	27.91	27.07	-0.84*	28.66	28.15	-0.51
NAPLAN numeracy score, Year 3 ^b	235 - 597	358.70	356.72	-1.98	351.22	379.16	27.94	430.10	407.50	-22.60
NAPLAN reading score, Year 3 ^b	151 - 597	355.37	344.11	-11.26	345.64	374.10	28.46	416.62	395.14	-21.48
Girls										
Physical outcome (age 4/5)	49 - 118	98.52	99.80	1.29	100.78	100.46	-0.32	100.93	100.72	-0.22
Socio-emotional outcome (age 4/5)	43 - 121	96.31	98.62	2.31	101.99	101.2	-0.79	102.4	102.69	0.28
Learning outcome (age 4/5)	57 - 125	96.64	98.74	2.09	101.36	102.48	1.12	104.75	105.50	0.75
PEDS total (age 6/7)	17 - 100	74.69	75.28	0.60	78.11	78.30	0.19	80.20	79.93	-0.28
PEDS social functioning (age 6/7)	10 - 100	76.88	77.12	0.24	81.16	80.82	-0.34	82.99	82.56	-0.43
Social development (age 6/7, mother) ^a	4 - 35	26.31	25.77	-0.54	27.57	27.43	-0.14	28.85	28.04	-0.81*
Social development (age 6/7, father) ^a	5 - 35	28.34	26.11	-2.23**	27.54	27.57	0.02	28.50	28.11	-0.38
Social development (age 6/7, teacher) ^a	0 - 35	29.09	27.73	-1.35	30.32	29.91	-0.41	30.59	30.33	-0.25
NAPLAN numeracy score, Year 3 ^b	214 - 574	367.58	362.77	-4.81	396.88	385.41	-11.47	377.02	397.63	20.61
NAPLAN reading score, Year 3 ^b	208 - 671	446.5	380.78	-65.72	414.49	405.5	-8.99	426.90	425.91	-0.99

Source: LSAC data, B-cohort, waves 1 and 2.

Note: ^a Inverted indices (35 minus the original index); ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. ^b NAPLAN results are based on very few observations since these results are only available for few of the children in the B-cohort.

There are three main results that can be inferred from the results presented in Table 8. First, for several of the socio-emotional and social development measures, the children who did not attend any child care arrangement tended to perform better than those who did attend some form of child care during their early childhood. The second element of evidence is that the learning outcomes of children (and in particular boys) who attended any child care before the age of three are better than those of children who attended no child care at all. Finally, child care use appears to be more beneficial for girls than for boys in low-income families, while the reverse appears true for girls and boys in middle-income families. Overall positive returns from child care are most common for boys from families with a middle income, although very few returns are significant.

The association of child care with outcomes is further investigated. In Section 4.1 we observed that families at different incomes use different types of child care arrangements, and that different care arrangements are characterised by different hours of attendance, so we investigate these two aspects further.⁹ Table 9 reports the differences that we obtain by dividing the child care arrangements into low intensity (less than 24 hours per week) and high intensity (more than 24 hours per week) arrangements. The interpretation of the differences is the same as in Table 8. The results indicate that high-intensity child care tends to be associated with poorer outcomes than low-intensity child care. This effect is particularly evident for boys in low- and high-income families. For children who come from medium-income families, the descriptive evidence is mixed. In this group, boys appear to perform better when exposed to high-intensity child care arrangements on most measures. However, girls in this income group who have low-intensity child care arrangements display better performance than girls without child care and girls using high-intensity child care in nearly every index reported in Table 9. Finally, the table shows clearly that *all* levels of child care are better than no child care when considering learning outcomes, with several of these differences being significant and in some cases high-intensity care being associated with better outcomes than low-intensity care.

Overall, the results presented so far indicate a possible negative effect of early high-intensity child care on some aspects of child development. Nonetheless, the differences in these results across the family income classes and between boys and girls confirm the need for a more

⁹ The total time that children have spent in child care would potentially be of interest as well, but cannot be accurately derived from the data. However, there is likely to be a high correlation between starting child care at a young age and having a long duration in child care. We have included the timing of starting child care in some of our multivariate analyses.

detailed analysis. The multivariate study in Section 6 of this report is aimed at helping us to identify the magnitude and extent of these effects after controlling for a broad range of other relevant factors.

Table 9
Difference in means of outcome indices by income group and child care usage (relative to using no child care) in wave 2

	Low income		Medium income		High income	
	Some child care - No child care	Intense child care - No child care	Some child care - No child care	Intense child care - No child care	Some child care - No child care	Intense child care - No child care
Boys						
Physical outcome	0.13	-2.40	0.42	1.64	-0.85	-1.72**
Socio-emotional outcome	0.61	-3.18	-0.81	0.91	0.10	-1.57*
Learning outcome	0.10	0.86	2.28***	1.49	1.68**	1.77**
PEDS total	0.71	-3.18	0.23	1.28	-0.66	-1.48
PEDS social functioning	1.53	-7.21	-0.16	3.03	-0.41	-1.55
Social development (mother) ^a	-0.10	-3.04**	0.08	0.65	-0.59	-2.09***
Social development (father) ^a	-1.15	-6.00***	-0.54	-0.24	-0.21	-0.97*
Social development (teacher) ^a	-0.07	-3.75**	-0.76	-0.86	-0.02	-1.66***
Girls						
Physical outcome	0.85	-0.81	0.10	0.40	0.20	-0.37
Socio-emotional outcome	3.31*	0.32	-0.65	-1.29	1.03	-0.21
Learning outcome	1.84	0.15	1.23*	1.00	0.29	0.47
PEDS total	1.84	-1.05	0.97	-2.81*	-0.07	-1.60
PEDS social functioning	0.46	-0.50	0.59	-3.89**	0.25	-2.05
Social development (mother) ^a	-0.60	-0.67	0.19	-1.49**	-0.34	-1.10**
Social development (father) ^a	-3.32***	-1.04	0.37	-0.98	0.23	-0.74
Social development (teacher) ^a	-1.31	-0.88	0.02	-0.65	-0.05	-0.87

Source: LSAC data, B-cohort, wave 2.

Note: Sample size at least 1,773 for boys and 1,650 for girls (the smallest for social development – teacher survey).

^a Inverted indices. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively.

Besides the intensity of the child care arrangement, child development outcomes could also have different associations with usage of formal and informal child care. Therefore, we repeated the same analysis summarised in Table 9 by studying the differences in the outcomes for children who do not attend any child care and those who attend either some formal child care arrangements or informal arrangements only. Table 10 presents the results of this analysis. As before, the results vary considerably across the three income groups. The evidence indicates that, in general, formal child care arrangements are more beneficial to learning outcomes than informal child care arrangements although the differences compared to no child care are not always significant. The benefits appear more pronounced for children from middle- and high-income families, particularly for boys.

Children who only attend informal child care appear to perform better in the social development domain than children who attend at least some formal child care. This is true to a lesser extent for the low-income group of children, particularly if they are boys. Children whose families are in the medium income group appear to benefit the most from attending child care. These results do not hold for children who live in higher income families. For these children, formal child care appears to lead to lower results in comparison to the results achieved by children who do not attend any child care and children who attend informal child care, with the exception of the results on learning outcomes.

Table 10
Difference in means of outcome indices by income group and child care type (relative to using no child care) in wave 2

	Low income		Medium income		High income	
	Informal child care	Formal child care	Informal child care	Formal child care	Informal child care	Formal child care
Boys						
Physical outcome	-0.05	-0.79	2.29*	0.50	-0.95	-1.22*
Socio-emotional outcome	0.67	-0.74	1.37	-0.65	0.83	-0.92
Learning outcome	-0.52	0.16	3.45***	1.84***	1.31	1.71**
PEDS total	-4.70	0.31	3.11*	0.19	0.08	-1.06
PEDS social functioning	-3.78	-0.06	2.33	0.43	0.20	-0.93
Social development (mother)*	0.31	-1.15	0.88	0.13	0.02	-1.38***
Social development (father)*	-0.47	-2.69**	0.65	-0.66	0.53	-0.76*
Social development (teacher)*	-1.24	-0.89	-0.13	-0.93*	0.75	-0.96*
Girls						
Physical outcome	1.80	-0.31	0.10	0.22	-1.35	0.35
Socio-emotional outcome	3.03	1.87	-2.58*	-0.64	1.83*	0.27
Learning outcome	1.26	1.39	0.54	1.32*	-0.30	0.55
PEDS total	2.92	-0.35	0.76	0.08	-0.77	-0.65
PEDS social functioning	1.98	-1.23	1.91	-0.55	0.44	-0.92
Social development (mother)*	-0.02	-0.91	-0.62	-0.17	0.02	-0.75*
Social development (father)*	-1.63	-3.02***	0.15	0.09	0.28	-0.22
Social development (teacher)*	-0.66	-1.33	-0.07	-0.28	0.09	-0.43

Source: LSAC data, B-cohort, wave 2.

Note: * Based on Inverted indices.

The above associations are just indications of the potential effects. To enable firmer conclusions to be drawn, multivariate analysis is required to control for the various factors affecting child outcomes as well as child care use and child care type.

4.2.2 *Child care and child development: K-cohort.*

The analysis of the relationship between child care arrangement and development performance is replicated using the data from the K-cohort to complement the results from the B-cohort. The K-cohort data allow us to:

- a) Examine outcomes that are realised later in the child's life;
- b) Include full sets of Year 3 and Year 5 NAPLAN results among the performance indicators; and
- c) Illustrate an evolution of these indices over time, as all indices of interest are observed for at least 3 waves of data (with the exception of the NAPLAN scores for which we only have two years of results).

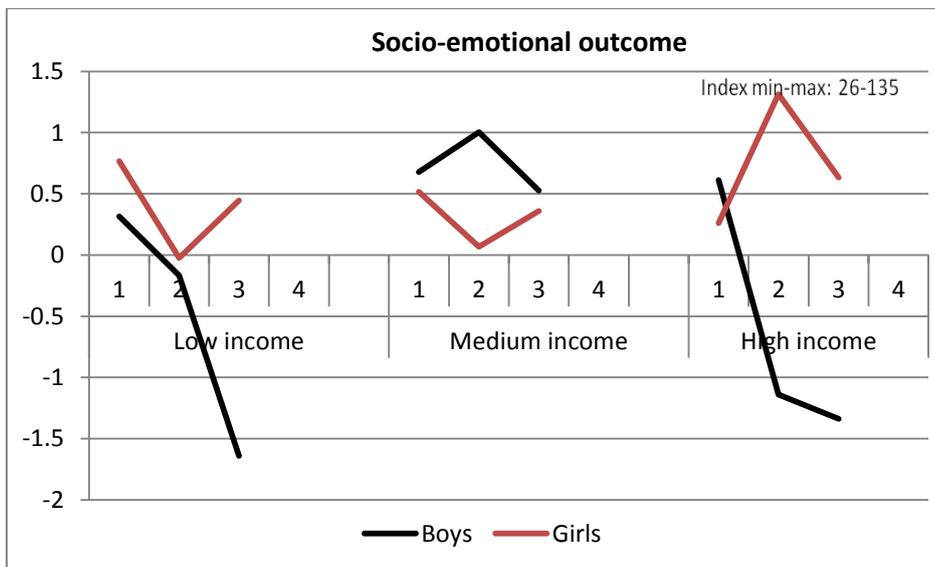
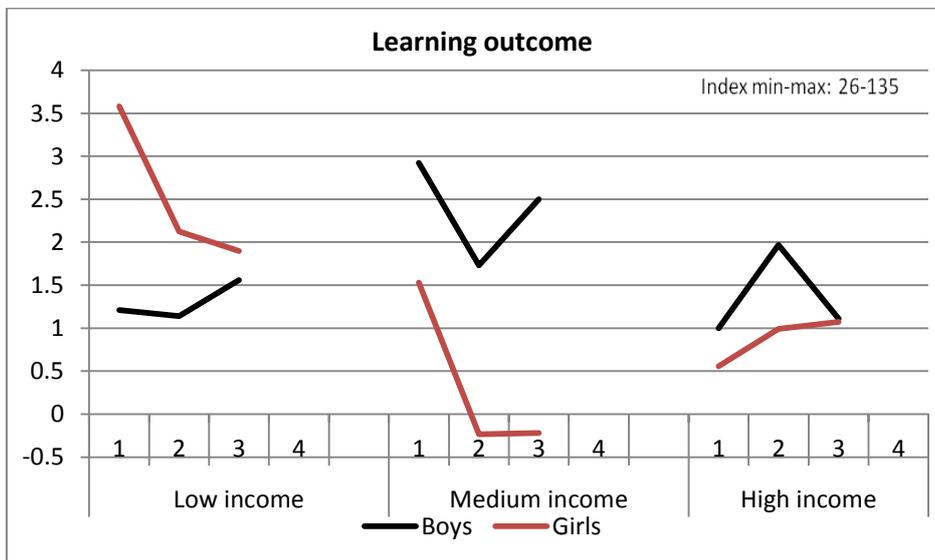
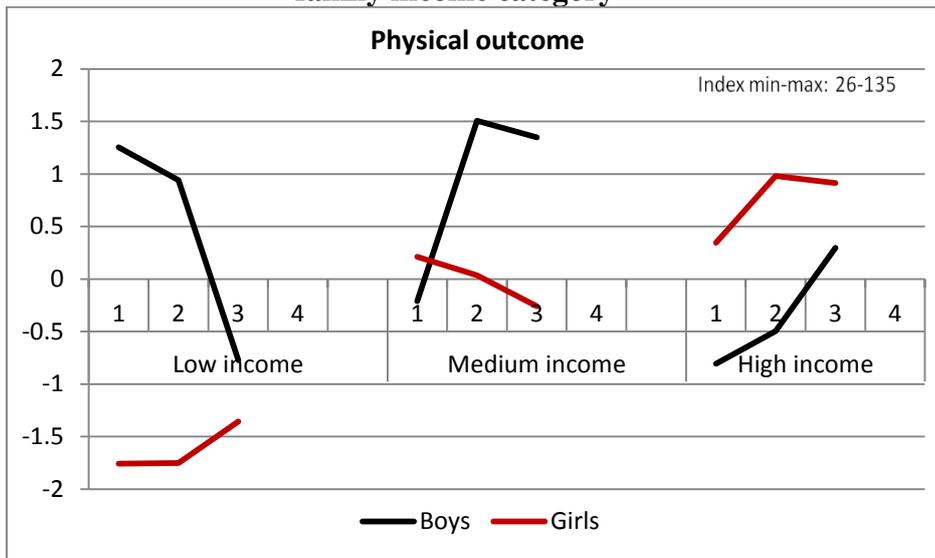
The graphs reported in Figure 3 summarise the evolution of the development indices separately for boys and girls by family income. Specifically, the graphs plot the differences in the indices between children who had a child care arrangement before the age of 3 and those who did not. As before, a positive value indicates a positive association between child care and development performance.¹⁰

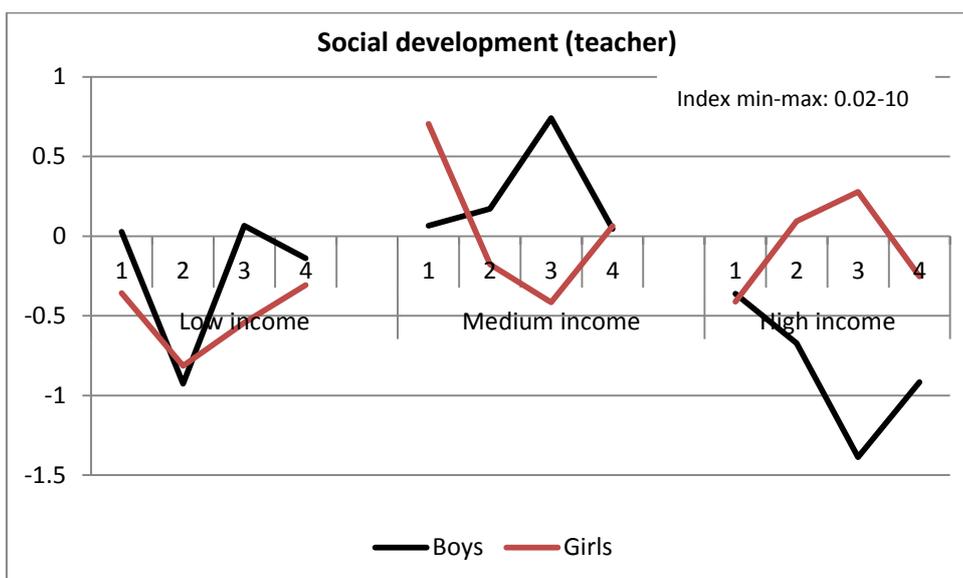
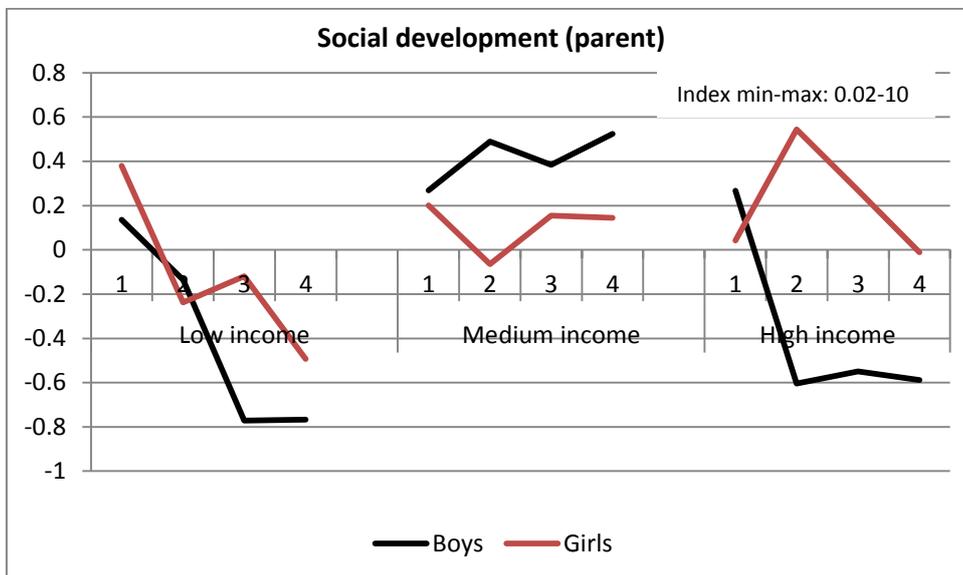
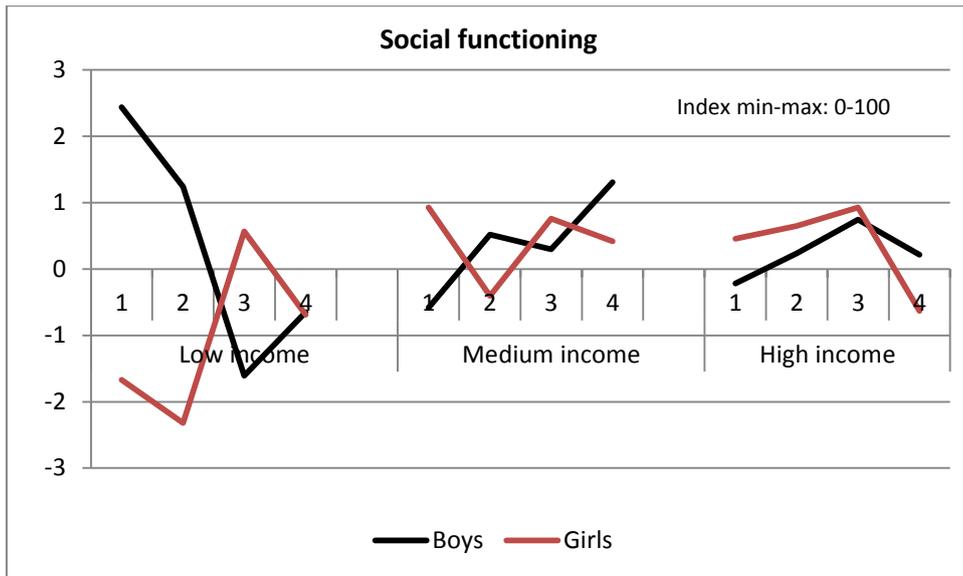
The graphs present results with a high degree of variability so that it is difficult to obtain an unambiguous message regarding the relationship between child care and development outcomes. Nevertheless, some “within gender” regularities are observed. Specifically, we observe that child care has the strongest positive associations with development indices for boys who belong to middle-income families. For this group of children, the computed differences tend to achieve positive values higher than those achieved by children in the lower and higher income groups. Furthermore, we observe that “Learning outcomes” is the only index that presents positive average differences for boys in all income groups.

The evidence for girls is quite different. For them, the positive relationship between child care usage and development outcomes is stronger for children from high-income families, except for learning outcomes, where the association is stronger for girls from low-income families. The girls' index of “Socio-emotional outcomes” shows a consistent positive relationship with child care for all income groups between the two variables.

¹⁰ The differences for the two measures of social development are based on indices multiplied by (-1).

Figure 3: Difference in development indices by child care attendance by age 3 for each family income category





Source: LSAC data, K-cohort, waves 1 to 4.

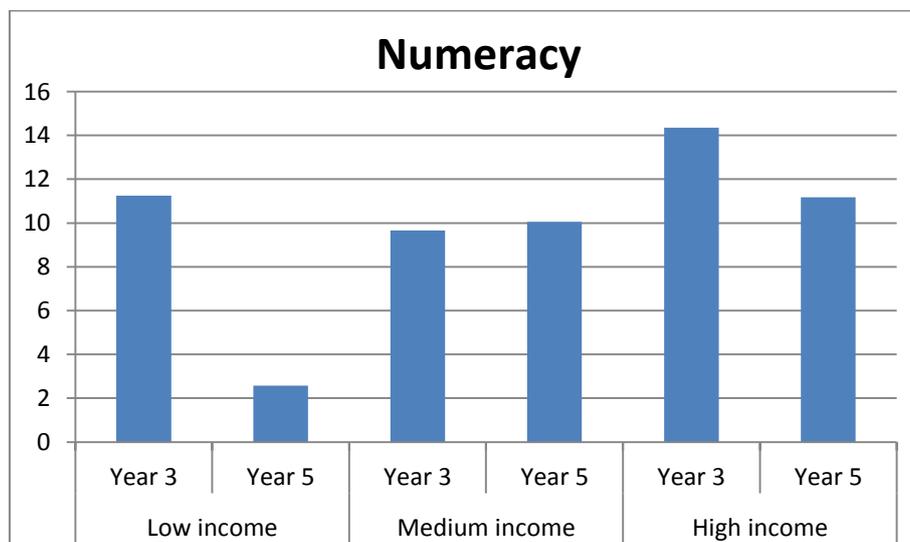
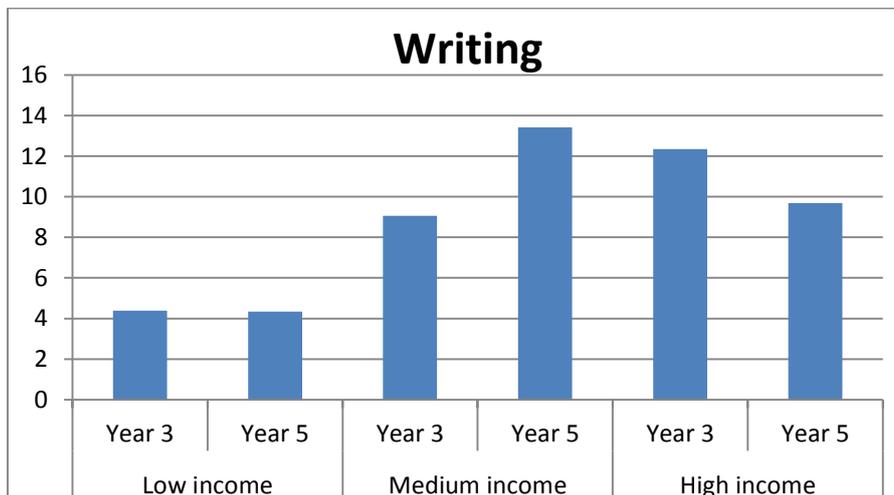
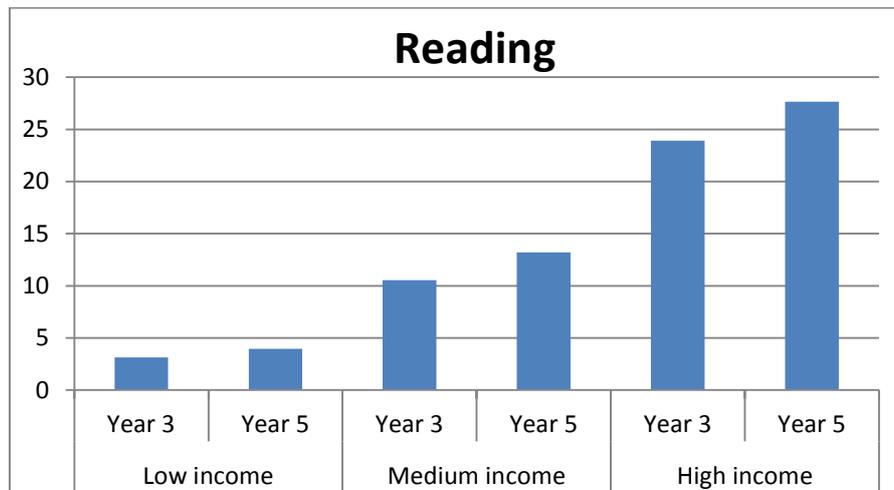
In comparison with what is observed with respect to the children in the B-cohort, the results presented in Figure 3 outline a more positive picture with respect to the potential effects that child care use may have on child development. These results seem to indicate that some of the benefits that children obtain from child care potentially exert their effects only at later stages in the life of the child, or at least, that is when the effects may become more visible.

The final element of our descriptive analysis relates to the performance of the children as represented by their NAPLAN test scores. The graphs presented in Figures 4 and 5 show the differences in the Year 3 and Year 5 reading, writing and numeracy NAPLAN test scores between children who did or did not attend any child care during their first 3 years of life. Once again, the results vary considerably between boys and girls.

For boys, the graphs indicate a clear positive effect of child care on later school performance. In the NAPLAN reading test, boys who used some form of child care in their early years score up to 27 points more on average than those who did not use any child care. This gap tends to be wider for children of families on higher income and appears to increase over time, with all differences being more pronounced for the Year 5 results than for the Year 3 results. The differences in performance are less pronounced with respect to the other components of the NAPLAN test, but in all domains, boys who attended child care still tend to outperform boys who did not attend any child care in their early childhood.

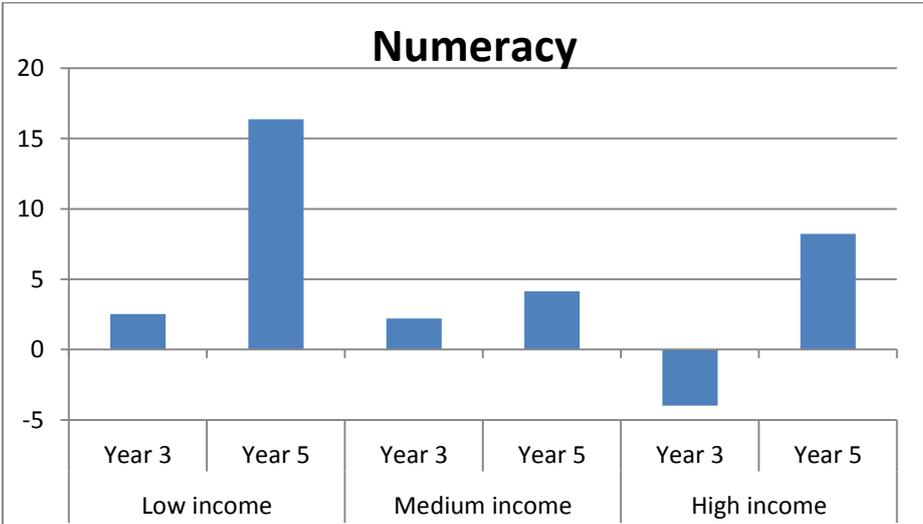
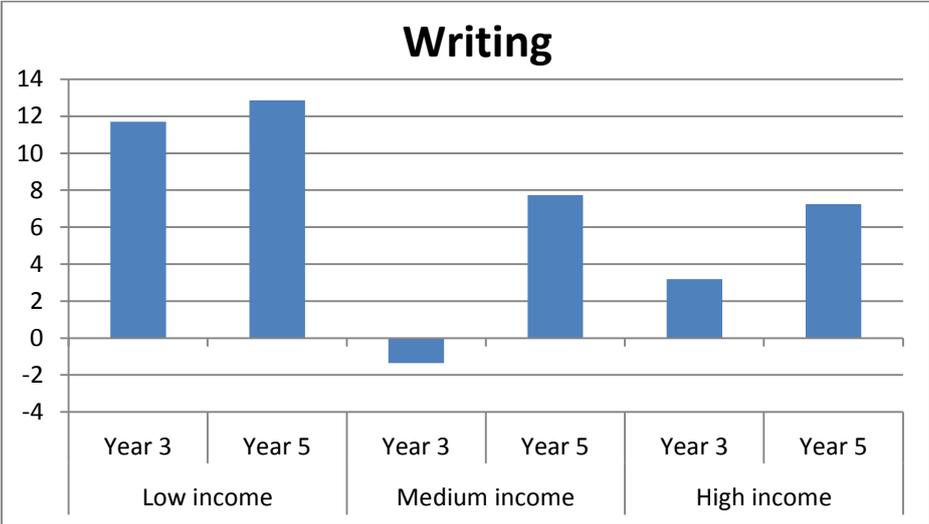
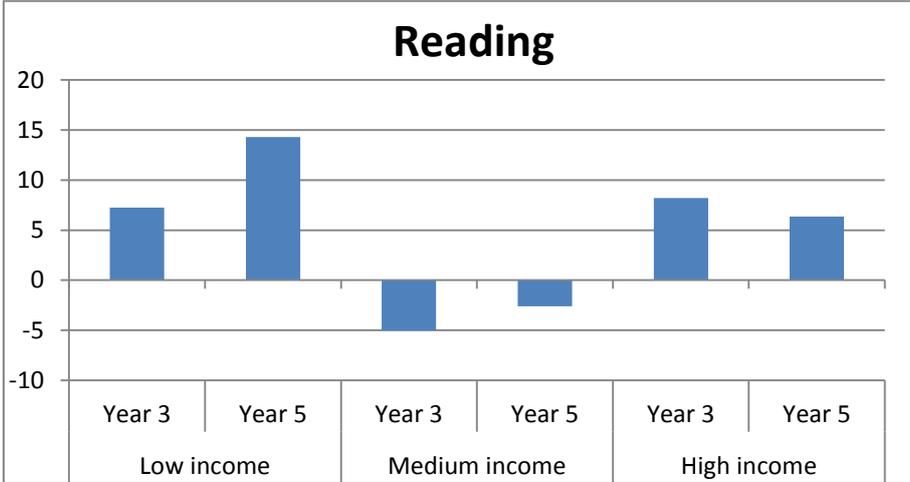
The evidence is less clear for girls. With respect to the NAPLAN reading test, the results indicate positive effects of child care only for girls whose families have high or low incomes, but not for children from medium-income families. The positive impact of early child care for children from low-income families is confirmed with respect to the writing and numeracy test results. In particular, for the Year 5 scores on numeracy, girls who attended some child care achieved on average up to 16 points more than girls from the same income group who did not attend any form of early child care. However, these differences are less evident for the other income groups and even reversed for some of the scores of children from middle- and high-income families although the negative association does not go above a 5-point reduction of the test score.

Figure 4: Difference in NAPLAN scores by child care attendance by age three for each family income category – Boys



Source: LSAC & NAPLAN data, K-cohort, waves 3 and 4.

Figure 5: Difference in NAPLAN scores by child care attendance by age three for each family income category – Girls



Source: LSAC & NAPLAN data, K-cohort, waves 3 and 4.

5. Methodology

The empirical analysis is based on a large number of linear regressions. In each regression we study the relationship between one of the child outcomes described in Section 4 and a broad range of control variables. Among the explanatory variables, we focus our attention on the combined effects of child care arrangements and sources of disadvantage. Specifically, we assess whether the type of child care, the age at which the child started the child care arrangement and the weekly hours in child care are associated with the learning and behavioural outcomes included in our analysis. In all specifications, we control for the Indigenous status of the child and for the income of their families. In order to identify the outcomes of child care for families with different economic backgrounds separately, we distinguish three different categories: low-, medium- and high-income families, representing disadvantaged and more advantaged families. The set of explanatory variables includes several interaction effects between income-categories and Indigenous status, and child care arrangements.

The outcome and control variables we employ in our analysis differ between the B-cohort and the K-cohort. This reflects the difference in age of the children included in the two samples. The main discrepancy between the two sets of regressions relates to the child care variables. While for children in the B-cohort we can identify the current and the past child care arrangements, in the case of the K-cohort the data only reports on the first child care arrangement ever used.

For the B-cohort, we focus on the following outcomes: the LSAC outcome index for learning and the index for socio-emotional skills in wave 3; and the teacher-assessed academic performance and the socio-emotional scale constructed from a range of indices on children's behaviour and interaction with others (adults and children) in wave 4. The outcomes studied in the K-cohort analysis are: the NAPLAN reading, writing and numeracy test scores in Year 3 and Year 5 of school; the LSAC outcome index for learning and the index for socio-emotional skills in wave 3; and teacher-assessed socio-development score in wave 3. We conduct all our regressions separately for boys and girls.

In addition to the explanatory variables described so far, we include controls in our regressions for the exact age of children, their health status, the number of siblings, whether the study child is the oldest child in the family, and whether both parents are present in the family. The set of regressors also includes the educational levels of both parents and the highest qualification obtained by the teacher or carer. Early childhood education and care

schemes can influence cognitive and non-cognitive outcomes later in life by increasing the accumulation of skills. Similarly, earlier outcomes (which may have been influenced by child care arrangements) can have an impact on later outcomes. In order to identify the separate contribution of each channel, wherever possible, we include the earlier outcome values in the regressions for later outcomes. In the B-cohort analysis, we also augment the set of explanatory variables by including values for some of the variables from one or two waves ago. Due to data limitations, we cannot add these variables to the analysis on the K-cohort.

Evidently, the relationship between child care use and outcomes represents the core of our empirical investigation. Therefore, it is important to note that selection into a specific type of child care can play an important role in shaping this relation. Non-random selection may occur if children with certain individual and family characteristics are more likely to attend a certain type of child care than other children. In this case, our OLS estimates may provide biased effects of child care on the selected outcomes. In order to account for the effects of this selection bias as much as possible, we implement a two-stage procedure. First, for each of our outcomes we conduct a propensity score matching analysis. This approach computes a new variable which summarises the propensity for each child to use a specific child care arrangement. This variable is then used to compute weights which make the group using a specific child care arrangement more comparable to the group not using this arrangement. These weights can be used to compute the average outcome for the group not using the child care arrangement, for comparison to the average outcome for the group using the specific child care arrangements. The weights can also be used in OLS regressions to obtain less biased estimates on the effect of a specific child care arrangement.

An intuitive explanation of propensity score matching follows. Matching procedures compare the outcomes (in our case, for example, the year 3 NAPLAN scores) of a group of children which have been exposed to a certain type of child care arrangement (the treatment group), with the outcomes of another group of individuals who did not experience that arrangement (the control group). The critical element is that the comparison takes place after the individuals of the treatment group are matched to those in the control group on the basis of a (possibly very large) set of observable characteristics through the estimated propensity score which serves as a summary measure of the observable characteristics. By controlling for these characteristics, matching procedures aim to ensure that the only observable difference between matched individuals is the participation in the treatment or in the control group. In other words, the matching techniques aim to estimate counterfactual outcomes: they estimate

what the outcome of a treated individual would have been if that individual had not been treated. This is achieved by using control group individuals which are similar to the treated ones with respect to a number of observable dimensions, except for their treatment status.

In this report, we conduct a matching analysis for every outcome presented in the OLS regressions and we select the treatment groups based on participation of the child in centre day care versus no child care, centre day care versus other child care arrangements, and (for the B-cohort only) formal child care versus no child care, formal child care versus other child care arrangements, and preschool versus no preschool. The appropriateness and the efficiency of the matching procedure can be tested. In the next sections we show that the results from our matching procedures indicate the existence of significant differences in the observable characteristics of children in the treatment and the control groups before matching. This suggests that controlling for selection may be important. Furthermore, the results show that these differences tend to become statistically insignificant after implementation of the matching procedure. This suggests that the score variable indicating the propensity to select into the control or the treatment group effectively captures the selection effect and can be employed to compute matching weights to be used in subsequent regressions.

6. Multivariate Regression Results

6.1 *The B-cohort*

The LSAC data provide rich detail on child care use in the first three waves of the B-cohort. In Section 6.1.1, we use detailed information on child care use in wave 2 as well as a range of other variables on the child, its parents and the household in which it is growing up, to explain changes in child outcomes from wave 2 to wave 3. Since NAPLAN results (which would provide a nationally comparable measure) are not yet available for most children observed in the B-cohort, we use the Learning Outcome Index provided by LSAC.

Unfortunately, this index is not available for wave 4. There we use a teacher assessment of the child. Specifically the question asked “Overall how would you rate this child's academic skills, compared to other children of the same grade level?” The teacher can choose from five answers varying between “far below average” and “far above average”, with most observations scoring “average” and “above average”. This variable contains much less information on the children’s skills than the learning outcome index in wave 3.

In addition to cognitive skills, we also explore the relationship of child care use with non-cognitive skills represented by the socio-emotional domain of the LSAC Outcome Index in wave 3 and by an aggregate index which adds together indices for conduct, interaction with peers, socio-emotional behaviour, and hyperactivity. The latter ranges in value from 0 to 35, and we have reverse-coded this index for ease of interpretation so that a higher value indicates better non-cognitive skills.

However, this detailed analysis does not explicitly control for selection into child care (e.g. if children who attend child care are more likely to be of higher ability or if they also have the advantage of a more supportive home environment). Therefore, Section 6.1.2 aims to address this as well as is possible by using the propensity matching score approach which was explained in Section 5. This artificially creates a sample of matched children who are not using child care (or preschool) that is as similar as possible on observable characteristics to the sample of children who are using child care (or preschool). This approach needs to use a simpler representation of child care use than is feasible in the detailed child care analysis; e.g. children using day care centre versus children using no child care at all, or versus children using other types of child care, but not a day care centre. We interact these simple child care variables with income category of the household and Indigenous (ATSI) background. The outcome variables considered are the same as those in the detailed analysis in Section 6.1.1.

6.1.1 Detailed child care results

As before, boys and girls are considered separately in these analyses. We first present the results on cognitive skill development in Tables 11 (boys) and 12 (girls). Each table presents the results for wave 3 and wave 4, starting with (1) including child care details only (for wave 3); (2) then adding the value of the outcome from the previous wave (so that we consider the change in outcome from wave 2 to 3); (3) then excluding the qualifications of the carer since inclusion of this variable reduces the sample considerably due to missing values,¹¹ but now including an interaction with Indigenous background (a small subgroup in the population); (4) then adding a range of individual and household characteristics (see Table B1 for the exact variables included); and (5) adding individual and household characteristics from previous waves (again see Table B1). Columns (6) to (9) repeat these columns for wave 4 with the exception of column (1), which is of less interest. We present the wave 4 results for completeness, but the information contained in the learning outcome measure for this wave is limited.

We only discuss the main variables of interest here: the child care-related variables and the income groups. However, for Table 11, wave 3, we have also presented the full set of results in Appendix Table B1. From Table 11 and Table 12 it is clear that the correlations with child care variables become smaller and less significant (often becoming insignificant), once more and more other characteristics are included. This indicates that the type of child care selected and the family's characteristics are correlated explaining at least part of the raw positive correlations of child care with children's outcomes.

Although attending a day care centre is not significant (and negative), a number of its interactions are significant and positive for boys. In particular the hours in care are positive and significant (at least once lagged learning has been taken into account), indicating that medium-level usage (15 to 29 hours per week) of child care might be ideal.¹² Also, although this is not significant, the coefficient on mixed formal and informal child care indicates that combining different types of care might be beneficial. A higher qualification of the carer seems to improve outcomes for boys although once the lagged learning outcome has been

¹¹ Furthermore, all observations that are excluded because of missing values are of children using centre day care.

¹² Lagged learning is the learning outcome in the previous wave.

Table 11
Regression results for learning outcomes of boys

	Wave 3					Wave 4			
	child care details only	+ lagged learning	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged learning index		0.290*** (0.025)	0.310*** (0.022)	0.288*** (0.022)	0.298*** (0.024)	0.040*** (0.002)	0.040*** (0.002)	0.036*** (0.002)	0.037*** (0.002)
Type of child care used in wave 2 (multiple possible)									
Day care centre	-0.965 (2.364)	-1.139 (2.464)	0.074 (1.502)	-0.892 (1.506)	-1.553 (1.646)	0.333 (0.208)	0.110 (0.124)	0.106 (0.130)	0.107 (0.133)
Other formal care	-0.138 (1.475)	-0.787 (1.532)	-0.802 (1.272)	-1.297 (1.275)	-1.949 (1.412)	0.019 (0.125)	0.045 (0.103)	0.048 (0.108)	0.052 (0.110)
Relatives	0.362 (1.476)	-0.331 (1.547)	-0.364 (1.349)	-1.175 (1.357)	-1.859 (1.513)	0.093 (0.127)	0.089 (0.110)	0.074 (0.118)	0.087 (0.121)
Other informal care	1.649 (1.631)	0.682 (1.714)	-0.032 (1.507)	-1.073 (1.522)	-0.930 (1.707)	0.197 (0.142)	0.169 (0.125)	0.207 (0.135)	0.194 (0.141)
Preschool	3.255** (1.434)	2.481* (1.490)	2.166 (1.343)	1.625 (1.353)	1.444 (1.508)	0.117 (0.123)	0.112 (0.112)	0.133 (0.119)	0.172 (0.121)
Mixed formal and informal	0.392 (1.645)	0.855 (1.706)	0.589 (1.416)	1.517 (1.422)	2.165 (1.571)	0.035 (0.142)	-0.054 (0.117)	-0.061 (0.124)	-0.044 (0.127)
Preschool in wave 3						-0.038 (0.055)	-0.037 (0.046)	-0.074 (0.048)	-0.070 (0.050)
School in wave 3						-0.283*** (0.071)	-0.273*** (0.060)	-0.288*** (0.069)	-0.295*** (0.072)
Hours in child care in wave 2									
1-14 hours/week	1.778 (1.582)	2.684 (1.658)	2.769* (1.451)	3.033** (1.462)	4.357*** (1.628)	-0.021 (0.135)	-0.013 (0.118)	-0.061 (0.125)	-0.056 (0.129)

Table 11
Regression results for learning outcomes of boys

	Wave 3					Wave 4			
	child care details only	+ lagged learning	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
15-29 hours/week	1.591 (1.688)	2.931* (1.766)	3.118** (1.537)	3.631** (1.559)	5.341*** (1.734)	-0.185 (0.146)	-0.174 (0.127)	-0.212 (0.134)	-0.212 (0.140)
30 or more hours/week	0.220 (1.764)	2.081 (1.844)	2.517 (1.585)	3.576** (1.630)	5.240*** (1.872)	-0.216 (0.153)	-0.222* (0.131)	-0.196 (0.139)	-0.173 (0.149)
any time in dcc in wave 2*income group (ref. is high income group)									
low income	-3.051* (1.819)	-1.055 (1.889)	0.880 (1.465)	1.134 (1.519)	-0.557 (1.697)	-0.047 (0.167)	-0.027 (0.126)	-0.087 (0.141)	-0.113 (0.149)
middle income	-2.307* (1.206)	-1.619 (1.269)	0.161 (0.966)	0.602 (0.981)	-0.086 (1.068)	-0.060 (0.103)	0.063 (0.079)	0.077 (0.082)	0.050 (0.085)
low income	-5.588*** (0.917)	-4.417*** (0.991)	-4.441*** (0.982)	-2.541** (1.112)	-3.326** (1.484)	-0.024 (0.082)	0.004 (0.080)	0.146 (0.096)	0.123 (0.118)
middle income	-2.507*** (0.625)	-1.918*** (0.656)	-1.922*** (0.647)	-0.601 (0.691)	-0.605 (0.823)	-0.155*** (0.054)	-0.142*** (0.053)	-0.072 (0.058)	-0.063 (0.065)
any time in dcc in wave 2*children per adult	0.177 (0.219)	0.245 (0.235)	0.088 (0.147)	0.009 (0.148)	0.002 (0.160)	-0.014 (0.019)	0.004 (0.012)	0.002 (0.013)	0.007 (0.013)
any time in dcc in wave 2 *qual. of carer (ref. is Year 12 or less)									
graduate degree	4.672** (1.905)	1.994 (1.957)				0.050 (0.159)			
diploma	1.989 (1.730)	0.649 (1.768)				0.028 (0.147)			
certificate	3.502* (1.989)	1.670 (2.050)				-0.091 (0.169)			

Table 11
Regression results for learning outcomes of boys

	Wave 3			Wave 4					
	child care details only	+ lagged learning	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
any time in dcc in wave 2*carer is qualified in related field	-0.485 (1.338)	0.242 (1.407)				-0.152 (0.113)			
any time in dcc in wave 2*ATSI descent			-6.981*** (2.703)	-6.509** (2.920)	-3.390 (3.202)		0.324 (0.215)	0.252 (0.256)	0.278 (0.263)
ATSI descent			0.295 (1.848)	1.835 (2.017)	-0.087 (2.282)		-0.375*** (0.145)	-0.248 (0.162)	-0.217 (0.168)
Age of first child care (ref. < 3 months)									
3 - 6 months	0.269 (0.989)	0.460 (1.046)	-0.268 (0.899)	0.178 (0.907)	-0.776 (0.999)	0.053 (0.085)	0.055 (0.073)	0.054 (0.076)	0.033 (0.078)
6 - 9 months	0.748 (0.995)	0.373 (1.053)	-0.068 (0.888)	0.060 (0.900)	-0.228 (0.981)	0.083 (0.086)	0.043 (0.073)	0.002 (0.076)	-0.030 (0.079)
9 - 12 months	0.140 (1.096)	0.300 (1.154)	-0.368 (0.967)	-0.672 (0.977)	-0.767 (1.061)	0.133 (0.092)	0.104 (0.078)	0.070 (0.081)	-0.034 (0.084)
1 - 1.5 years	0.870 (1.065)	0.841 (1.129)	0.224 (0.968)	0.436 (0.991)	-0.216 (1.100)	0.120 (0.089)	0.055 (0.077)	-0.005 (0.081)	-0.012 (0.084)
1.5 - 2 years	-2.648** (1.106)	-1.301 (1.199)	-1.514 (1.004)	-0.678 (1.019)	-0.222 (1.136)	0.036 (0.096)	-0.091 (0.081)	-0.096 (0.085)	-0.124 (0.089)
2 - 3 years	-1.617 (1.057)	-0.508 (1.119)	-1.257 (0.942)	-0.891 (0.956)	-0.874 (1.068)	-0.031 (0.092)	-0.139* (0.078)	-0.177** (0.082)	-0.192** (0.086)
3 - 4 years	0.760 (1.199)	1.135 (1.286)	0.661 (1.208)	0.411 (1.236)	0.706 (1.373)	0.149 (0.101)	0.112 (0.096)	0.024 (0.100)	-0.011 (0.105)
> 4 years	0.826 (1.142)	2.644** (1.229)	2.201* (1.156)	2.496** (1.182)	3.208** (1.324)	0.087 (0.098)	0.038 (0.093)	0.021 (0.098)	-0.005 (0.102)

Table 11
Regression results for learning outcomes of boys

	Wave 3						Wave 4		
	child care details only	+ lagged learning	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
Constant	98.831*** (0.995)	69.324*** (2.723)	67.812*** (2.387)	46.836*** (5.877)	44.195*** (6.430)	-0.818*** (0.237)	-0.763*** (0.210)	-1.240** (0.595)	-1.335** (0.629)
R-squared	0.097	0.177	0.184	0.239	0.270	0.274	0.267	0.290	0.302
Number of observations	1509	1192	1561	1455	1224	1165	1512	1368	1296

Source: LSAC data, B-cohort, Wave 2 to Wave 4.

Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. The addition of the word “lagged” indicates that the variable is from the previous wave. The individual and household characteristics which are included in columns 4, 5, 8 and 9 (but not presented in this table) are: Exact age of child, child health, indicator for being oldest child, number of siblings, weekly household income, single parent family, education of mother, education of father if present, part-time/full-time employment of mother, and part-time/full-time employment of father if present. Also see Table B1.

Table 12
Regression results for learning outcomes of girls

	Wave 3					Wave 4			
	child care details only	+ lagged learning	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged learning index		0.347*** (0.025)	0.335*** (0.022)	0.297*** (0.022)	0.297*** (0.024)	0.036*** (0.002)	0.036*** (0.002)	0.035*** (0.002)	0.035*** (0.002)
Type of child care used in wave 2 (multiple possible)									
Day care centre	4.922** (2.365)	1.435 (2.429)	0.277 (1.380)	1.157 (1.396)	0.139 (1.571)	0.282 (0.217)	0.085 (0.119)	0.041 (0.122)	-0.020 (0.125)
Other formal care	1.335 (1.426)	0.195 (1.447)	0.022 (1.166)	1.444 (1.185)	1.694 (1.367)	0.107 (0.128)	0.122 (0.101)	0.153 (0.103)	0.123 (0.106)
Relatives	1.802 (1.364)	0.643 (1.387)	0.433 (1.198)	1.297 (1.198)	1.014 (1.392)	0.097 (0.121)	0.123 (0.102)	0.130 (0.105)	0.047 (0.108)
Other informal care	-0.236 (1.541)	-1.317 (1.530)	-1.275 (1.360)	-1.080 (1.354)	-1.039 (1.586)	0.021 (0.136)	0.016 (0.116)	-0.033 (0.120)	-0.074 (0.122)
Preschool	1.471 (1.260)	0.435 (1.286)	0.418 (1.194)	1.388 (1.197)	1.944 (1.337)	0.200* (0.113)	0.212** (0.103)	0.191* (0.107)	0.165 (0.109)
Mixed formal and informal	0.538 (1.547)	1.031 (1.552)	0.521 (1.278)	-0.434 (1.278)	-0.619 (1.495)	-0.163 (0.136)	-0.183* (0.110)	-0.156 (0.112)	-0.070 (0.115)
Preschool in wave 3						0.007 (0.054)	-0.023 (0.045)	-0.031 (0.046)	-0.040 (0.048)
School in wave 3						-0.121* (0.064)	-0.171*** (0.054)	-0.294*** (0.064)	-0.302*** (0.066)
Hours in care in wave 2									
1-14 hours/week	-1.751 (1.501)	-1.160 (1.522)	-0.874 (1.342)	-1.721 (1.340)	-1.119 (1.526)	-0.085 (0.133)	-0.100 (0.114)	-0.074 (0.118)	0.013 (0.120)

Table 12
Regression results for learning outcomes of girls

	Wave 3					Wave 4			
	child care details only	+ lagged learning	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
15-29 hours/week	-2.229 (1.627)	-1.092 (1.655)	-1.062 (1.409)	-2.514* (1.414)	-1.773 (1.613)	-0.102 (0.146)	-0.119 (0.121)	-0.094 (0.125)	-0.045 (0.129)
30 or more hours/week	-2.760 (1.684)	-1.343 (1.724)	-0.998 (1.470)	-2.504* (1.499)	-1.087 (1.754)	-0.061 (0.152)	-0.101 (0.126)	-0.072 (0.133)	-0.037 (0.139)
any time in dcc in wave 2*income group (ref. is high income group)									
low income	-1.184 (1.858)	-0.888 (1.879)	0.976 (1.414)	2.389 (1.471)	2.018 (1.595)	0.108 (0.165)	0.057 (0.117)	0.104 (0.130)	0.126 (0.138)
middle income	-0.854 (1.141)	-0.554 (1.146)	0.805 (0.907)	1.276 (0.893)	1.738* (0.975)	0.105 (0.098)	0.128* (0.076)	0.177** (0.079)	0.137* (0.080)
low income	-7.567*** (0.850)	-6.165*** (0.922)	-6.152*** (0.925)	-3.170*** (1.039)	-3.221** (1.266)	-0.205*** (0.078)	-0.207*** (0.077)	-0.108 (0.088)	-0.007 (0.105)
middle income	-3.219*** (0.612)	-2.784*** (0.607)	-2.868*** (0.608)	-1.473** (0.629)	-1.424* (0.738)	-0.101* (0.053)	-0.104** (0.053)	-0.089 (0.057)	-0.034 (0.062)
any time in dcc in wave 2*children per adult	-0.097 (0.205)	-0.012 (0.208)	0.031 (0.132)	0.050 (0.130)	0.225 (0.138)	-0.035* (0.018)	-0.002 (0.012)	0.001 (0.012)	0.003 (0.012)
any time in dcc in wave 2*qual. of carer (ref. is Year 12 or less)									
graduate degree	-1.069 (1.972)	0.465 (1.964)				-0.076 (0.172)			
diploma	-1.111 (1.837)	0.830 (1.824)				0.026 (0.161)			
certificate	-0.855 (2.013)	1.303 (1.981)				-0.063 (0.177)			

Table 12
Regression results for learning outcomes of girls

	Wave 3			Wave 4					
	child care details only	+ lagged learning	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
any time in dcc in wave 2*carer is qualified in related field	-0.686 (1.308)	-0.585 (1.289)				-0.000 (0.108)			
any time in dcc in wave 2*ATSI descent			5.282 (3.421)	4.591 (3.461)	3.367 (3.639)		0.117 (0.217)	0.283 (0.256)	-0.039 (0.274)
ATSI descent			-3.642* (1.874)	-1.360 (1.855)	-1.463 (1.864)		-0.162 (0.138)	-0.149 (0.145)	-0.137 (0.145)
Age of first child care (ref. < 3 months)									
3 - 6 months	0.419 (1.028)	1.634 (1.050)	1.067 (0.901)	0.497 (0.901)	0.510 (0.989)	0.157* (0.091)	0.099 (0.079)	0.055 (0.082)	0.013 (0.084)
6 - 9 months	1.119 (1.011)	1.640 (1.036)	1.581* (0.886)	0.349 (0.879)	-0.210 (0.957)	0.152* (0.087)	0.161** (0.075)	0.090 (0.078)	0.057 (0.080)
9 - 12 months	2.482** (1.094)	2.055* (1.115)	1.601* (0.950)	0.735 (0.946)	-0.303 (1.046)	0.058 (0.095)	0.071 (0.081)	0.017 (0.084)	-0.010 (0.086)
1 - 1.5 years	-0.031 (1.079)	0.688 (1.087)	0.537 (0.926)	0.018 (0.917)	0.236 (1.029)	0.091 (0.095)	0.086 (0.080)	0.061 (0.084)	0.030 (0.086)
1.5 - 2 years	0.367 (1.047)	1.184 (1.055)	0.695 (0.909)	0.233 (0.902)	0.034 (1.007)	0.069 (0.092)	0.070 (0.078)	0.058 (0.082)	0.021 (0.084)
2 - 3 years	-1.864* (1.031)	-0.132 (1.045)	-0.306 (0.901)	-0.864 (0.898)	-0.461 (0.997)	0.043 (0.089)	0.011 (0.076)	-0.025 (0.080)	-0.064 (0.082)
3 - 4 years	-0.237 (1.211)	0.713 (1.234)	0.426 (1.178)	0.171 (1.160)	-0.237 (1.283)	0.228** (0.107)	0.212** (0.101)	0.206* (0.107)	0.199* (0.108)
> 4 years	-1.503 (1.140)	-0.379 (1.169)	-0.730 (1.117)	-0.283 (1.110)	-0.205 (1.216)	0.119 (0.101)	0.109 (0.095)	0.098 (0.100)	0.074 (0.101)

Table 12
Regression results for learning outcomes of girls

	Wave 3						Wave 4		
	child care details only	+ lagged learning	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
Constant	105.420*** (1.021)	69.490*** (2.750)	71.113*** (2.459)	66.124*** (5.501)	66.840*** (6.092)	-0.541** (0.261)	-0.423* (0.229)	-2.654*** (0.605)	-2.553*** (0.619)
R-squared	0.121	0.241	0.215	0.275	0.302	0.243	0.235	0.269	0.288
Number of observations	1425	1164	1518	1414	1164	1096	1435	1315	1247

Source: LSAC data, B-cohort, Wave 2 to Wave 4.

Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. The addition of the word “lagged” indicates that the variable is from the previous wave. The individual and household characteristics which are included in columns 4, 5, 8 and 9 (but not presented in this table) are: Exact age of child, child health, indicator for being oldest child, number of siblings, weekly household income, single parent family, education of mother, education of father if present, part-time/full-time employment of mother, and part-time/full-time employment of father if present. Also see Table B1.

included it is no longer significant. For girls none of these are significant and they are mostly negative.¹³ However, for them the day care centre dummy variable is positive, but only significant in column (1).

Although in most specifications, boys from lower-income families benefit less from attending a day care centre than boys from higher-income families, the significance of this effect disappears once we control for more of the other characteristics. The same is true for children with an Indigenous background, although we should note that this is a particularly small group. Girls benefit less from attending a day care centre if they are from a low-income background it seems, but this turns around once the model controls for more characteristics (although the significance is quite low). For Indigenous girls, attending a day care centre improves outcomes but not significantly.

Preschool, although it becomes insignificant in most cases after adding additional explanatory variables, is always positive. In case of the children observed in wave 3, this partly reflects these children being slightly older, since relatively few children would have attended preschool in the previous wave, and they would be mostly the older children in the cohort. Surprisingly, those observed in wave 4 who already attended school in wave 3 are doing worse than other children according to the teachers. This group could potentially consist of the youngest students in their school-year, who are perhaps at a developmental disadvantage compared to their older peers in the classroom, to whom they are compared by the teacher.

Age of first child care does not seem to have a long-lasting impact on outcomes, as is evident from the mostly non-significant results. Once the learning outcome from the previous wave is included, boys who have their first child care over 4 years of age seem to be better off than other boys. For girls none of the age categories of starting first child care are significant once household and child characteristics are included, but in the specifications with few variables, they do display a pattern of increasing benefits of first starting child care up to around 1 year of age, with the benefits decreasing when waiting until the child is over two years old.

Tables 13 and 14 present the results for non-cognitive skills. Unlike the previous tables, a number of correlations with child care variables remain significant or become more significant, once more other characteristics are included. However, the observed patterns are not straightforward to interpret.

¹³ Warren and Haisken-DeNew (2013) find significant effects from the qualification of preschool teachers, but this is for children aged 4 to 5 while in preschool, while the child care under consideration here is for children aged 2 to 3.

Table 13
Regression results for socio-emotional outcomes of boys

	child care details only	Wave 3			Wave 4				
		+ lagged socio-emot. index	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged socio-emotional index		0.481*** (0.024)	0.514*** (0.021)	0.474*** (0.022)	0.490*** (0.024)	0.140*** (0.019)	0.141*** (0.016)	0.129*** (0.017)	0.128*** (0.018)
Type of child care used in wave 2 (multiple possible)									
Day care centre	-3.538 (2.450)	-3.567* (2.147)	-3.712*** (1.371)	-3.817*** (1.383)	-4.185*** (1.513)	0.402 (1.696)	-0.363 (1.043)	-1.220 (1.093)	-0.908 (1.124)
Other formal care	-2.053 (1.560)	-2.640* (1.379)	-3.918*** (1.159)	-4.101*** (1.167)	-4.698*** (1.286)	-1.550 (1.047)	-1.702* (0.873)	-2.524*** (0.919)	-2.241** (0.936)
Relatives	-0.138 (1.561)	-0.743 (1.377)	-1.586 (1.219)	-1.941 (1.232)	-2.699** (1.362)	0.061 (1.061)	0.073 (0.935)	-0.791 (0.993)	-0.497 (1.023)
Other informal care	0.227 (1.704)	-1.879 (1.500)	-3.710*** (1.344)	-3.703*** (1.370)	-3.215** (1.508)	-0.129 (1.177)	-0.643 (1.044)	-1.363 (1.120)	-1.349 (1.173)
Preschool	1.493 (1.533)	1.224 (1.361)	0.487 (1.251)	-0.124 (1.266)	-0.974 (1.410)	0.774 (1.045)	0.574 (0.949)	-0.244 (1.015)	-0.014 (1.031)
Mixed formal and informal	1.073 (1.726)	0.543 (1.518)	1.548 (1.285)	1.633 (1.300)	1.571 (1.427)	-0.637 (1.179)	-0.211 (0.988)	0.512 (1.043)	0.068 (1.075)
Preschool in wave 3						-0.080 (0.454)	0.107 (0.384)	-0.113 (0.405)	-0.169 (0.419)
School in wave 3						-0.400 (0.592)	-0.383 (0.499)	-0.611 (0.580)	-0.670 (0.599)
Hours in child care in wave 2									
1-14 hours/week	2.407 (1.688)	2.369 (1.486)	3.359** (1.321)	3.130** (1.339)	4.148*** (1.491)	0.638 (1.144)	0.713 (1.008)	1.478 (1.065)	1.176 (1.099)

Table 13
Regression results for socio-emotional outcomes of boys

	Wave 3					Wave 4			
	child care details only	+ lagged socio-emot. index	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
15-29 hours/week	1.075 (1.793)	1.830 (1.587)	2.855** (1.401)	2.567* (1.432)	3.079* (1.598)	0.043 (1.212)	0.175 (1.070)	0.949 (1.132)	0.654 (1.179)
30 or more hours/week	0.055 (1.886)	1.005 (1.667)	2.337 (1.450)	2.488* (1.500)	3.555** (1.726)	-1.338 (1.282)	-1.217 (1.107)	-0.025 (1.186)	0.221 (1.270)
any time in dcc in wave 2*income group (ref. is high income group)									
low income	-0.925 (1.895)	2.504 (1.680)	3.185** (1.336)	4.868*** (1.411)	2.687* (1.596)	-2.627* (1.346)	-1.441 (1.064)	-1.890 (1.199)	-1.683 (1.267)
middle income	0.314 (1.273)	-0.510 (1.113)	-0.417 (0.873)	-0.085 (0.891)	-0.042 (0.986)	-0.436 (0.851)	0.109 (0.661)	0.094 (0.693)	-0.178 (0.715)
low income	-3.684*** (1.004)	-3.649*** (0.895)	-3.614*** (0.905)	-2.962*** (1.032)	-1.704 (1.398)	-1.595** (0.687)	-1.528** (0.691)	-0.255 (0.824)	-0.994 (1.012)
middle income	-2.506*** (0.672)	-1.216** (0.594)	-1.145* (0.596)	-0.774 (0.634)	-0.741 (0.772)	-0.699 (0.449)	-0.633 (0.451)	-0.170 (0.491)	-0.315 (0.546)
any time in dcc in wave 2*children per adult	-0.175 (0.230)	-0.020 (0.201)	0.121 (0.134)	0.059 (0.136)	0.045 (0.148)	-0.159 (0.159)	-0.116 (0.103)	-0.123 (0.108)	-0.120 (0.111)
any time in dcc in wave 2 *qual. of carer (ref. is Year 12 or less)									
graduate degree	3.397* (1.999)	1.689 (1.746)				0.405 (1.317)			
diploma	2.604 (1.817)	1.778 (1.582)				-0.055 (1.213)			
certificate	2.618 (2.078)	1.009 (1.821)				0.739 (1.387)			

Table 13
Regression results for socio-emotional outcomes of boys

	Wave 3			Wave 4					
	child care details only	+ lagged socio-emot. index	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
any time in dcc in wave 2*carer is qualified in related field	0.773 (1.414)	0.406 (1.234)				-0.287 (0.915)			
any time in dcc in wave 2*ATSI descent			-1.266 (2.291)	-0.446 (2.452)	-1.022 (2.730)		2.659 (1.771)	3.922* (2.077)	3.558* (2.136)
ATSI descent			-0.559 (1.638)	-0.242 (1.791)	0.645 (1.992)		-1.706 (1.218)	-0.993 (1.313)	-0.367 (1.369)
Age of first child care (ref. < 3 months)									
3 - 6 months	-0.132 (1.049)	-0.310 (0.923)	-0.857 (0.801)	-0.910 (0.811)	-1.003 (0.906)	0.143 (0.702)	0.286 (0.609)	0.179 (0.634)	0.207 (0.651)
6 - 9 months	0.336 (1.055)	0.154 (0.925)	-0.761 (0.792)	-1.438* (0.807)	-0.900 (0.894)	-0.141 (0.710)	0.284 (0.609)	-0.068 (0.632)	-0.394 (0.651)
9 - 12 months	0.398 (1.155)	0.009 (1.011)	-0.589 (0.872)	-0.938 (0.889)	-0.685 (0.986)	0.359 (0.755)	0.194 (0.652)	-0.136 (0.671)	-0.361 (0.695)
1 - 1.5 years	-0.890 (1.133)	-0.844 (0.995)	-1.435* (0.867)	-1.490* (0.889)	-1.486 (0.996)	0.893 (0.743)	0.299 (0.650)	0.084 (0.675)	-0.067 (0.693)
1.5 - 2 years	-1.431 (1.191)	-0.969 (1.053)	-1.352 (0.888)	-1.210 (0.904)	-0.378 (1.021)	-0.890 (0.802)	-1.057 (0.686)	-0.991 (0.717)	-0.872 (0.737)
2 - 3 years	-1.588 (1.139)	-0.580 (1.006)	-1.329 (0.855)	-1.318 (0.874)	-1.490 (0.992)	-0.719 (0.776)	-0.431 (0.664)	-0.946 (0.697)	-0.727 (0.720)
3 - 4 years	0.609 (1.307)	-0.379 (1.150)	-1.199 (1.100)	-1.331 (1.136)	-2.064 (1.270)	-0.367 (0.863)	-0.431 (0.829)	-0.873 (0.875)	-0.910 (0.909)
> 4 years	0.611 (1.229)	0.373 (1.079)	-0.272 (1.034)	-0.845 (1.064)	-1.214 (1.217)	-0.161 (0.823)	-0.160 (0.791)	-0.652 (0.836)	-0.513 (0.868)

Table 13
Regression results for socio-emotional outcomes of boys

		Wave 3			Wave 4				
	child care details only	+ lagged socio-emot. index	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
Constant	101.391*** (1.071)	53.185*** (2.626)	50.475*** (2.292)	46.847*** (5.400)	46.142*** (6.067)	15.051*** (2.048)	14.812*** (1.778)	10.521** (4.946)	11.918** (5.225)
R-squared	0.045	0.268	0.291	0.324	0.343	0.115	0.108	0.136	0.149
Number of observations	1336	1309	1715	1602	1342	1058	1387	1258	1204

Source: LSAC data, B-cohort, Wave 2 to Wave 4.

Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. The addition of the word “lagged” indicates that the variable is from the previous wave. The individual and household characteristics which are included in columns 4, 5, 8 and 9 (but not presented in this table) are: Exact age of child, child health, indicator for being oldest child, number of siblings, weekly household income, single parent family, education of mother, education of father if present, part-time/full-time employment of mother, and part-time/full-time employment of father if present. Also see Table B1.

Table 14
Regression results for socio-emotional outcomes of girls

	child care details only	+ lagged socio-emot. index	Wave 3			Wave 4			
			- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged socio-emotional index			0.578*** (0.027)	0.558*** (0.024)	0.522*** (0.026)	0.519*** (0.029)	0.103*** (0.016)	0.097*** (0.014)	0.082*** (0.015)
Type of child care used in wave 2 (multiple possible)									
Day care centre	-1.693 (2.858)	-2.666 (2.454)	-2.330* (1.389)	-2.778* (1.486)	-3.047* (1.646)	-2.305 (1.577)	0.087 (0.885)	-0.289 (0.905)	-0.429 (0.937)
Other formal care	-2.745 (1.704)	-3.030** (1.469)	-1.817 (1.190)	-2.578** (1.283)	-2.747* (1.443)	-0.282 (0.937)	-0.333 (0.755)	-0.737 (0.776)	-0.914 (0.804)
Relatives	-2.274 (1.656)	-3.010** (1.438)	-2.142* (1.232)	-2.535* (1.311)	-2.682* (1.481)	0.710 (0.897)	0.734 (0.767)	0.440 (0.793)	0.173 (0.821)
Other informal care	-0.920 (1.869)	-2.969* (1.612)	-2.760** (1.391)	-3.650** (1.471)	-3.751** (1.650)	-0.506 (1.007)	-0.366 (0.870)	-0.674 (0.904)	-1.147 (0.929)
Preschool	-0.531 (1.526)	-0.950 (1.337)	-0.528 (1.224)	-1.448 (1.295)	-2.343* (1.423)	-0.053 (0.833)	-0.064 (0.758)	-0.360 (0.790)	-0.375 (0.817)
Mixed formal and informal	2.971 (1.850)	4.154*** (1.605)	2.511* (1.316)	2.984** (1.395)	2.723* (1.591)	-0.899 (1.002)	-0.719 (0.821)	-0.489 (0.843)	-0.211 (0.875)
Preschool in wave 3						0.295 (0.398)	0.514 (0.330)	0.540 (0.343)	0.308 (0.356)
School in wave 3						-0.521 (0.470)	-0.220 (0.395)	-0.124 (0.475)	-0.218 (0.493)
Hours in child care in wave 2									
1-14 hours/week	3.130* (1.805)	3.277** (1.561)	2.502* (1.361)	2.901** (1.437)	3.105* (1.603)	-0.418 (0.980)	-0.266 (0.853)	0.295 (0.882)	0.329 (0.902)

Table 14
Regression results for socio-emotional outcomes of girls

	child care details only	Wave 3				Wave 4			
		+ lagged socio-emot. index	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
15-29 hours/week	3.727*	4.142**	3.057**	3.399**	3.361**	-0.076	-0.330	0.301	0.274
	(1.949)	(1.681)	(1.431)	(1.516)	(1.703)	(1.076)	(0.908)	(0.942)	(0.976)
30 or more hours/week	2.509	3.446**	2.691*	3.083*	2.219	-0.871	-0.736	0.078	-0.378
	(2.011)	(1.736)	(1.475)	(1.584)	(1.829)	(1.111)	(0.938)	(0.993)	(1.050)
any time in dcc in wave 2*income group (ref. is high income group)									
low income	1.288	0.156	0.636	0.111	-0.301	-1.958	-0.916	-0.100	-0.283
	(2.204)	(1.913)	(1.385)	(1.478)	(1.607)	(1.221)	(0.883)	(0.984)	(1.053)
middle income	0.231	0.536	0.849	0.940	0.882	-0.650	0.097	0.666	0.553
	(1.338)	(1.151)	(0.902)	(0.927)	(1.023)	(0.724)	(0.563)	(0.585)	(0.599)
low income	-4.741***	-3.098***	-3.181***	-1.900*	-1.734	-1.334**	-1.310**	-0.428	0.423
	(1.022)	(0.890)	(0.892)	(1.033)	(1.283)	(0.572)	(0.568)	(0.650)	(0.782)
middle income	-1.221*	-0.988	-1.028*	-0.225	-0.114	-0.431	-0.442	-0.359	0.023
	(0.719)	(0.620)	(0.619)	(0.666)	(0.785)	(0.390)	(0.385)	(0.418)	(0.458)
any time in dcc in wave 2*children per adult	-0.271	-0.114	-0.121	-0.139	-0.115	0.188	-0.000	-0.034	-0.045
	(0.247)	(0.212)	(0.132)	(0.135)	(0.145)	(0.135)	(0.086)	(0.089)	(0.091)
any time in dcc in wave 2*qual. of carer (ref. is Year 12 or less)									
graduate degree	-0.212	-1.336				1.470			
	(2.333)	(1.997)				(1.257)			
diploma	-1.098	-0.965				0.980			
	(2.164)	(1.849)				(1.171)			
certificate	-0.038	0.055				2.384*			
	(2.361)	(2.021)				(1.278)			

Table 14
Regression results for socio-emotional outcomes of girls

	Wave 3			Wave 4					
	child care details only	+ lagged socio-emot. index	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
any time in dcc in wave 2*carer is qualified in related field	0.293 (1.542)	-0.048 (1.319)				-0.071 (0.783)			
any time in dcc in wave 2*ATSI descent			3.636 (2.708)	4.915* (2.897)	3.451 (3.004)		-2.249 (1.703)	-2.457 (2.038)	-1.345 (2.130)
ATSI descent			-1.381 (1.821)	-0.702 (1.835)	0.164 (1.903)		-0.163 (1.095)	0.391 (1.168)	0.344 (1.174)
Age of first child care (ref. < 3 months)									
3 - 6 months	1.639 (1.213)	-0.170 (1.046)	-0.994 (0.886)	-0.327 (0.924)	-0.050 (1.016)	1.248* (0.682)	1.220** (0.585)	1.011* (0.608)	0.987 (0.628)
6 - 9 months	1.645 (1.183)	0.166 (1.017)	-1.277 (0.863)	-1.529* (0.898)	-1.845* (0.977)	0.857 (0.650)	1.307** (0.552)	0.798 (0.578)	0.715 (0.597)
9 - 12 months	3.005** (1.290)	1.719 (1.109)	1.007 (0.930)	0.876 (0.969)	0.519 (1.077)	0.256 (0.707)	1.052* (0.596)	0.737 (0.618)	0.614 (0.642)
1 - 1.5 years	4.026*** (1.266)	2.273** (1.088)	0.261 (0.913)	0.666 (0.942)	0.119 (1.064)	0.452 (0.707)	0.757 (0.594)	0.616 (0.621)	0.498 (0.638)
1.5 - 2 years	1.168 (1.221)	0.544 (1.053)	-0.962 (0.900)	-0.590 (0.931)	-0.705 (1.040)	1.025 (0.679)	1.652*** (0.578)	1.471** (0.603)	1.468** (0.624)
2 - 3 years	2.127* (1.217)	0.763 (1.047)	0.088 (0.889)	0.582 (0.927)	0.447 (1.027)	0.233 (0.664)	0.612 (0.566)	0.448 (0.592)	0.397 (0.613)
3 - 4 years	3.126** (1.444)	1.730 (1.248)	0.581 (1.180)	0.486 (1.218)	0.161 (1.365)	0.512 (0.807)	1.006 (0.753)	0.783 (0.797)	0.608 (0.813)
> 4 years	2.213 (1.366)	0.727 (1.176)	-0.360 (1.118)	-0.089 (1.152)	-0.170 (1.271)	0.890 (0.759)	1.250* (0.712)	1.377* (0.745)	1.126 (0.758)

Table 14
Regression results for socio-emotional outcomes of girls

		Wave 3			Wave 4				
	child care details only	+ lagged socio-emot. index	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.	Lag + child care details	- qual. carer + ATSI	+ ind. and hh char.	+ lagged ind. and hh char.
Constant	100.192*** (1.222)	41.827*** (2.928)	44.989*** (2.589)	44.978*** (5.689)	45.146*** (6.336)	19.618*** (1.733)	19.633*** (1.538)	18.296*** (4.342)	16.458*** (4.469)
R-squared	0.042	0.304	0.283	0.311	0.323	0.096	0.082	0.119	0.136
Number of observations	1264	1243	1650	1533	1273	994	1303	1202	1143

Source: LSAC data, B-cohort, Wave 2 to Wave 4.

Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. The addition of the word “lagged” indicates that the variable is from the previous wave. The individual and household characteristics which are included in columns 4, 5, 8 and 9 (but not presented in this table) are: Exact age of child, child health, indicator for being oldest child, number of siblings, weekly household income, single parent family, education of mother, education of father if present, part-time/full-time employment of mother, and part-time/full-time employment of father if present. Also see Table B1.

In general, the coefficient on attending a day care centre is negative, and significant for the more extensive model specifications. However, as for the cognitive skills, a number of its interactions are significant and positive for boys and girls. In particular the hours in care are positive and significant (at least for the specifications excluding the qualification of the carer), indicating that low-level usage (1 to 14 hours per week) of child care might be ideal for boys and medium-level usage might be ideal for girls. Also, although this is only significant for girls, the coefficient on mixed formal and informal child care indicates that combining different types of child care might be beneficial. Again, a higher qualification of the carer seems to improve outcomes for boys although once the learning outcome from the previous wave has been included as an explanatory variable, it is no longer significant. For girls the latter is negative and insignificant.

In the specifications excluding the qualification of the carer, boys from lower-income families benefit more from attending a day care centre than boys from higher-income families. Girls from low-income families do not appear to obtain any extra benefits from attending a day care centre than girls from higher-income families. For girls with an Indigenous background, but not boys, attending a day care centre appears to improve outcomes but this is only marginally significant in one of the specifications.

Preschool is mostly negatively correlated with socio-emotional outcomes, although it is also mostly insignificant. Similarly, age of first child care does not seem to have much impact on socio-emotional outcomes, as seems evident from the mostly non-significant results. No patterns are evident, not even insignificant ones.

6.1.2 Propensity Score Matching (PSM) results based on simple child care use variables

Using the same outcome variables as in Section 6.1.1, we define two treatment and control groups for each of these outcomes. First we split the sample between children who attended centre day care as opposed to those who did not use any child care in the previous wave, leaving out all other observations. Then we distinguish between children who attended centre day care as opposed to those who attended any other form of child care arrangement, again leaving out all other children (Table 15). We use the same approach to assess the use of formal child care more generally (Table 16), and to assess the use of preschool (Table 17).

Tables 15 to 17 report the main results of these propensity score analyses. The column “Difference in outcome” indicates the average difference in outcome between the treatment and the control group before the propensity score matching is performed (“Raw”) and after

(“Matched”). In Table 15, for example, we see that if we do not take the effects of other observable characteristics into account, children who attended centre day care score 2.73 higher on the learning index than those who did not use any child care in wave 2. This difference is statistically significant, as shown by the t-statistic reported in the table. This difference decreases to 1.86, becoming statistically insignificant after the matching (that is, once the other characteristics are taken into account and the two groups are made to be more similar in these characteristics).

The columns “Mean value of absolute bias” and “Likelihood ratio test: P-value” in Table 15 to Table 17 indicate the effectiveness of the matching procedure. Specifically they report the overall magnitude and statistical significance of bias in the distribution of all the observable characteristics employed in the PSM procedure between the treatment and the control group, before and after the matching. In all specifications, the overall bias decreases considerably after the matching and in most cases the difference in characteristics between the two groups becomes statistically insignificant, except in Table 15 for centre day care use. This result confirms both the need for controlling for selection based on the observable characteristics and the validity of the employed procedure.

Table 15 presents the results for use of centre day care in the previous wave. Compared against not using child care, all the learning outcomes are significantly better for the children using child care when comparing the raw data. However this positive correlation disappears in all cases after using the matched data. The differences in socio-emotional outcomes are all insignificant, and often outcomes appear worse for children using centre day care than for children not using any child care. In a few cases, the results become marginally significant at the 5 or 10% significance level after matching.

The results for formal child care in Table 16 are mostly insignificant. Only boys who use formal child care do significantly better on the learning outcome index in wave 3, and this effect remains after applying the matching approach, although significance is only at the 10% level. The results for boys when comparing against using any other forms of child care but not formal child care are negative and mostly insignificant for learning but significant for socio-emotional outcomes. None of the differences for girls are significant when using the raw data.

Table 15

B-cohort: mean differences in outcomes (before/after propensity score matching (PSM)) and PSM balancing test (by day care centre)

		Boys				Girls			
		Difference in outcome	T-stat	Mean value of absolute bias	Likelihood ratio test: P-value	Difference in outcome	T-stat	Mean value of absolute bias	Likelihood ratio test: P-value
Day care vs. no child care									
<i>Outcome variable:</i>									
Index for learning in Wave 3	<i>Raw</i>	2.73	4.73	16.8	0.000	2.76	4.86	18.9	0.000
	<i>Matched</i>	1.86	1.66	7.6	0.056	0.84	0.82	6.5	0.002
Index for socio-emotional skills	<i>Raw</i>	0.05	0.08	16.8	0.000	0.37	0.56	18.6	0.000
	<i>Matched</i>	1.02	1.01	7.6	0.005	-0.53	-0.45	6.9	0.003
Teacher-assessed academic performance in wave 4 (from well below to well above average)	<i>Raw</i>	0.12	2.22	17.2	0.000	0.10	1.95	18.7	0.000
	<i>Matched</i>	0.08	0.95	4.2	0.899	-0.06	-0.72	5.8	0.003
Socio-emotional scale from 0 to 35 (wave 4)	<i>Raw</i>	-0.62	-1.63	17.4	0.000	-0.32	-0.97	18.8	0.000
	<i>Matched</i>	-0.02	-0.03	4.1	0.895	-1.00	-1.88	5.6	0.002
Day care vs. other forms of child care									
Index for learning in Wave 3	<i>Raw</i>	-0.44	-0.76	15.8	0.000	2.64	4.89	17.6	0.000
	<i>Matched</i>	-0.15	-0.24	4.6	0.118	0.93	0.97	6.0	0.000
Index for socio-emotional skills	<i>Raw</i>	-1.00	-1.57	16.1	0.000	0.42	0.69	17.3	0.000
	<i>Matched</i>	-0.84	-1.26	6.0	0.001	-0.51	-0.47	6.8	0.000
Teacher-assessed academic performance in wave 4 (from well below to well above average)	<i>Raw</i>	0.08	1.55	16.4	0.000	0.11	2.24	17.7	0.000
	<i>Matched</i>	0.05	0.92	3.7	0.774	-0.04	-0.47	5.2	0.000
Socio-emotional scale from 0 to 35 (wave 4)	<i>Raw</i>	-0.55	-1.43	16.5	0.000	-0.32	-1.00	17.7	0.000
	<i>Matched</i>	-0.48	-1.18	3.5	0.842	-1.00	-1.99	5.2	0.000

Source: LSAC data, B-cohort, Wave 2 and Wave 3. If T-stat is larger than 2.58, 1.96 or 1.65 the difference in outcome is statistically significant at 1%, 5% and 10% respectively.

Table 16

B-cohort: mean differences in outcomes (before/after propensity score matching (PSM)) and PSM balancing test (by formal care)

		Boys				Girls			
		Difference in outcome	T-stat	Mean value of absolute bias	Likelihood ratio test: P-value	Difference in outcome	T-stat	Mean value of absolute bias	Likelihood ratio test: P-value
Formal child care vs. no child care									
<i>Outcome variable:</i>									
Index for learning in Wave 3	<i>Raw</i>	2.65	4.82	6.6	0.030	0.65	1.16	5.5	0.017
	<i>Matched</i>	1.50	1.85	1.8	1.000	0.09	0.16	1.4	1.000
Index for socio-emotional skills	<i>Raw</i>	0.00	0.00	6.4	0.089	-0.75	-1.22	6.3	0.009
	<i>Matched</i>	0.44	0.47	1.9	1.000	-1.07	-1.62	1.6	1.000
Teacher-assessed academic performance in wave 4 (from well below to well above average)	<i>Raw</i>	0.08	1.65	5.2	0.474	0.00	-0.03	5.4	0.100
	<i>Matched</i>	0.04	0.54	1.6	1.000	-0.02	-0.46	1.2	1.000
Socio-emotional scale from 0 to 35 (wave 4)	<i>Raw</i>	-0.74	-2.02	5.1	0.514	-0.21	-0.61	5.4	0.121
	<i>Matched</i>	-0.27	-0.51	1.3	1.000	-0.42	-1.14	1.2	1.000
Formal child care vs. other forms of child care									
Index for learning in Wave 3	<i>Raw</i>	-1.23	-1.74	7.9	0.181	0.62	0.92	7.5	0.112
	<i>Matched</i>	-1.02	-1.28	2.4	0.998	0.48	0.66	1.5	1.000
Index for socio-emotional skills	<i>Raw</i>	-2.17	-2.78	7.4	0.363	-1.17	-1.57	7.8	0.118
	<i>Matched</i>	-1.69	-2.20	2.2	1.000	-1.34	-1.66	2.3	0.999
Teacher-assessed academic performance in wave 4 (from well below to well above average)	<i>Raw</i>	0.00	-0.09	6.0	0.470	0.04	0.66	6.6	0.060
	<i>Matched</i>	-0.01	-0.21	2.5	1.000	0.02	0.33	1.7	1.000
Socio-emotional scale from 0 to 35 (wave 4)	<i>Raw</i>	-1.71	-3.64	6.1	0.482	-0.38	-0.93	6.5	0.064
	<i>Matched</i>	-1.78	-3.93	2.4	1.000	-0.64	-1.42	1.6	1.000

Source: LSAC data, B-cohort, Wave 2 and Wave 3. If T-stat is larger than 2.58, 1.96 or 1.65 the difference in outcome is statistically significant at 1%, 5% and 10% respectively.

Table 17

B-cohort: mean differences in outcomes (before/after propensity score matching (PSM)) and PSM balancing test (by preschool in wave 2 for wave 3 outcomes , and in wave 3 for wave 4 outcomes)

		Boys				Girls			
		Difference in outcome	T-stat	Mean value of absolute bias	Likelihood ratio test: P-value	Difference in outcome	T-stat	Mean value of absolute bias	Likelihood ratio test: P-value
Preschool vs. no preschool									
<i>Outcome variable:</i>									
Index for learning in Wave 3	<i>Raw</i>	4.90	4.08	12.1	0.014	0.87	0.82	8.5	0.152
	<i>Matched</i>	3.76	3.03	4.4	1.000	0.89	0.83	3.0	1.000
Index for socio-emotional skills	<i>Raw</i>	1.86	1.41	12.7	0.036	0.19	0.16	9.5	0.052
	<i>Matched</i>	1.08	0.85	4.9	1.000	0.06	0.05	3.1	1.000
Teacher-assessed academic performance in wave 4 (from well below to well above average)	<i>Raw</i>	0.09	1.91	12.2	0.000	0.09	2.09	11.8	0.000
	<i>Matched</i>	-0.07	-1.30	1.8	1.000	0.05	0.98	1.9	1.000
Socio-emotional scale from 0 to 35 (wave 4)	<i>Raw</i>	0.80	2.51	12.2	0.000	1.03	3.67	11.7	0.000
	<i>Matched</i>	-0.02	-0.06	1.8	1.000	0.71	2.11	2.0	1.000

Source: LSAC data, B-cohort, Wave 2 and Wave 3.

Note: the matching sample for wave 3 is very small since few children go to preschool in wave 2. If T-stat is larger than 2.58, 1.96 or 1.65 the difference in outcome is statistically significant at 1%, 5% and 10% respectively.

Preschool attendance in the previous wave is associated with better outcomes according to the raw data in all cases; that is, for boys and girls, and for learning and socio-emotional outcomes. Only for boys' socio-emotional skills in wave 3, it is insignificant using the raw data as well as the matched data. For girls, the difference is insignificant for both skills in wave 3. This is most likely due to the small number of children who are attending preschool in wave 2. As a result, the treatment group is very small. Most other differences turn insignificant after applying the PSM approach, except for the boys' learning outcomes in wave 3 and the socio-emotional outcome in wave 4 for girls.

In addition to computing these simple differences, we have run regressions (using weights obtained through the PSM approach) based on the same outcomes, interacting the simple child care use variable with income, children per adult in child care, and being from Indigenous descent. Given the small number of observations for the preschool analysis in wave 3 (around 70 observations per regression), we only include the analyses for centre day care and formal child care in the report. Although the number of observations for the preschool analysis in wave 4 is higher (around 900), the less informative measures available make the results less interesting than they would otherwise be. Once the NAPLAN Year 3 results for the B-cohort become available, we have a better measure to assess the correlation of preschool attendance with learning outcomes.

Table 18 presents the results on the learning outcomes for boys and girls in wave 3. We have controlled for all the characteristics that were included in the detailed child care analysis in Section 6.1.1 as well (see Appendix Table B1), but we only discuss the coefficients corresponding to the child care use variables here.

Although none of the dummy variables for the use of centre day care or formal child care are significant, most are positive, with all coefficients for the comparison of centre day care to no child care being positive, indicating better learning outcomes for children using centre day care or formal child care compared to other children. In addition, most of the interactions with the low and middle income categories are positive, indicating that children in these families are expected to benefit slightly more than children from high-income families, with some of these interaction coefficients being significant for boys. The interaction between formal child care and being from a middle-income family is negative and significant for boys when boys using formal child care are compared to boys using other types of child care.

Table 18
PSM results for learning outcomes in wave 3

	any centre day care in wave 2				any formal child care in wave 2			
	boys		girls		boys		girls	
	vs. no care	vs. other care	vs. no care	vs. other care	vs. no care	vs. other care	vs. no care	vs. other care
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged learning index	0.219*** (0.026)	0.346*** (0.024)	0.313*** (0.024)	0.285*** (0.025)	0.221*** (0.022)	0.323*** (0.021)	0.300*** (0.021)	0.315*** (0.022)
Any time in day care centre (dcc)/formal child care (fc)	1.087 (1.062)	0.558 (0.969)	0.168 (0.836)	-1.188 (0.923)	0.540 (0.926)	-0.867 (0.834)	0.819 (0.727)	0.537 (0.800)
any time in dcc/fc*income group (ref. is high income group)								
low income	1.278 (1.892)	0.743 (1.640)	0.094 (1.643)	2.355 (1.704)	1.799 (1.693)	3.194** (1.467)	-0.596 (1.467)	-1.485 (1.497)
middle income	2.325** (1.138)	-1.269 (1.073)	0.735 (0.915)	0.695 (1.001)	2.425** (1.008)	-2.335** (0.942)	0.086 (0.815)	-0.369 (0.890)
any time in dcc/fc*children per adult	-0.053 (0.150)	0.005 (0.146)	0.168 (0.120)	0.196 (0.133)	0.016 (0.139)	0.112 (0.131)	0.087 (0.108)	0.110 (0.120)
any time in dcc/fc*ATSI descent	-5.679 (4.598)	0.329 (3.119)	2.648 (4.212)	1.701 (3.726)	-5.524 (4.087)	2.000 (2.828)	2.546 (3.431)	3.215 (2.841)
low income	-3.589* (1.836)	-4.950*** (1.588)	-1.368 (1.441)	-4.810*** (1.427)	-3.807** (1.642)	-8.150*** (1.412)	-1.509 (1.295)	-1.803 (1.295)
middle income	-3.276*** (0.924)	0.775 (0.878)	-0.948 (0.742)	-0.416 (0.788)	-3.059*** (0.819)	1.801** (0.777)	-0.310 (0.673)	0.317 (0.717)
ATSI descent	3.746 (3.985)	-3.730 (2.341)	-0.629 (3.177)	-0.006 (2.069)	3.309 (3.477)	-4.826** (2.141)	-1.776 (2.735)	-2.072 (1.752)
Constant	52.654*** (7.150)	43.309*** (7.083)	72.919*** (6.068)	70.614*** (6.380)	51.348*** (6.478)	49.655*** (6.623)	70.870*** (5.506)	69.108*** (5.681)
R-squared	0.264	0.305	0.410	0.263	0.242	0.333	0.382	0.293
Number of observations	1081	1151	1058	1061	1375	1442	1364	1318

Source: LSAC data, B-cohort, Wave 2 and Wave 3.

Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. The addition of the word “lagged” indicates that the variable is from the previous wave. We also control for exact age of child, child health, indicator for being oldest child, number of siblings, weekly household income, single parent family, education of mother, education of father if present, part-time/full-time employment of mother, and part-time/full-time employment of father if present. Also see Table B1.

Table 19
PSM results for socio-emotional outcomes in wave 3

	any centre day care in wave 2				any formal child care in wave 2			
	boys		girls		boys		girls	
	vs. no care	vs. other care	vs. no care	vs. other care	vs. no care	vs. other care	vs. no care	vs. other care
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged socio-emotional index	0.511*** (0.025)	0.509*** (0.025)	0.560*** (0.031)	0.508*** (0.031)	0.502*** (0.021)	0.512*** (0.022)	0.555*** (0.027)	0.504*** (0.027)
Any time in day care centre (dcc)/formal child care (fc)	0.125 (1.008)	-1.961** (0.930)	0.779 (0.979)	-1.106 (0.944)	-0.113 (0.855)	-2.392*** (0.773)	1.254 (0.823)	-0.650 (0.803)
any time in dcc/fc*income group (ref. is high income group)								
low income	1.916 (1.583)	3.435** (1.559)	-0.440 (1.774)	-0.779 (1.668)	1.587 (1.395)	1.655 (1.401)	-0.337 (1.516)	0.063 (1.503)
middle income	-1.524 (1.053)	0.040 (0.990)	-0.165 (1.084)	1.948* (1.031)	-1.071 (0.905)	-0.606 (0.855)	-0.511 (0.938)	1.815** (0.917)
any time in dcc/fc*children per adult	0.110 (0.142)	0.165 (0.140)	-0.107 (0.140)	-0.077 (0.137)	0.074 (0.125)	0.115 (0.120)	-0.173 (0.123)	-0.193 (0.121)
any time in dcc/fc*ATSI descent	-2.770 (3.185)	2.773 (2.703)	0.421 (4.148)	3.312 (3.275)	-3.316 (2.829)	6.762*** (2.489)	-0.782 (3.388)	2.505 (2.744)
low income	-0.690 (1.460)	-3.631** (1.494)	-3.679** (1.554)	-1.236 (1.411)	-1.380 (1.302)	-3.343** (1.344)	-2.968** (1.306)	-2.415* (1.309)
middle income	1.125 (0.861)	-1.016 (0.816)	-0.670 (0.909)	-1.472* (0.822)	0.740 (0.744)	-0.743 (0.704)	-0.359 (0.779)	-2.204*** (0.745)
ATSI descent	2.392 (2.576)	-2.799 (2.054)	2.442 (3.467)	-0.993 (2.320)	3.279 (2.257)	-6.043*** (1.966)	1.530 (2.812)	-2.006 (2.030)
Constant	42.008*** (6.735)	48.236*** (6.982)	43.760*** (7.005)	53.420*** (6.702)	46.070*** (6.051)	53.244*** (6.477)	40.934*** (6.108)	58.916*** (5.877)
R-squared	0.419	0.351	0.361	0.281	0.407	0.384	0.358	0.287
Number of observations	1255	1287	1073	1165	1596	1563	1392	1478

Source: LSAC data, B-cohort, Wave 2 and Wave 3.

Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. The addition of the word “lagged” indicates that the variable is from the previous wave. We also control for exact age of child, child health, indicator for being oldest child, number of siblings, weekly household income, single parent family, education of mother, education of father if present, part-time/full-time employment of mother, and part-time/full-time employment of father if present. Also see Table B1.

Table 20
PSM results for learning outcomes in wave 4

	any centre day care in wave 2				any formal child care in wave 2			
	boys		girls		boys		girls	
	vs. no care	vs. other care	vs. no care	vs. other care	vs. no care	vs. other care	vs. no care	vs. other care
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged learning index	0.029*** (0.002)	0.038*** (0.002)	0.032*** (0.003)	0.033*** (0.002)	0.030*** (0.002)	0.038*** (0.002)	0.032*** (0.002)	0.036*** (0.002)
Any time in day care centre (dcc)/formal child care (fc)	0.117 (0.087)	0.011 (0.081)	-0.171** (0.081)	-0.046 (0.078)	0.044 (0.075)	-0.043 (0.070)	-0.081 (0.067)	-0.031 (0.066)
any time in dcc/fc*income group (ref. is high income group)								
low income	-0.127 (0.157)	-0.190 (0.155)	-0.233 (0.159)	0.094 (0.147)	-0.149 (0.142)	-0.320** (0.146)	-0.187 (0.138)	0.046 (0.130)
middle income	-0.196** (0.092)	-0.006 (0.087)	0.170** (0.084)	0.024 (0.081)	-0.174** (0.081)	0.044 (0.079)	0.146** (0.073)	0.116 (0.075)
any time in dcc/fc*children per adult	0.002 (0.013)	0.005 (0.012)	0.010 (0.012)	-0.003 (0.012)	0.014 (0.011)	0.016 (0.011)	0.001 (0.010)	-0.004 (0.010)
any time in dcc/fc*ATSI descent	0.174 (0.291)	0.732** (0.289)	-0.010 (0.433)	-0.204 (0.324)	-0.021 (0.248)	0.143 (0.273)	0.202 (0.309)	0.544* (0.290)
low income	0.041 (0.146)	0.183 (0.137)	0.282** (0.129)	0.050 (0.121)	0.039 (0.133)	0.468*** (0.136)	0.265** (0.114)	-0.042 (0.108)
middle income	0.117 (0.076)	-0.027 (0.071)	-0.175*** (0.068)	0.068 (0.064)	0.078 (0.067)	-0.038 (0.064)	-0.125** (0.059)	-0.097 (0.059)
ATSI descent	-0.182 (0.212)	-0.679*** (0.217)	-0.237 (0.369)	0.059 (0.230)	-0.196 (0.184)	-0.301 (0.219)	-0.160 (0.257)	-0.523** (0.230)
Constant	0.654 (0.607)	-0.679 (0.614)	-0.213 (0.590)	-0.682 (0.563)	0.754 (0.552)	-1.221** (0.576)	-0.765 (0.515)	-0.786 (0.521)
R-squared	0.226	0.305	0.325	0.263	0.218	0.316	0.300	0.281
Number of observations	1109	1171	1103	1133	1462	1436	1423	1375

Source: LSAC data, B-cohort, Wave 2 and Wave 4.

Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. We also control for exact age of child, child health, indicator for being oldest child, number of siblings, weekly household income, single parent family, education of mother, education of father if present, part-time/full-time employment of mother, and part-time/full-time employment of father if present. Also see Table B1.

Table 21
PSM results for socio-emotional outcomes in wave 4

	any centre day care in wave 2				any formal child care in wave 2			
	boys		girls		boys		girls	
	vs. no care	vs. other care	vs. no care	vs. other care	vs. no care	vs. other care	vs. no care	vs. other care
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged socio-emotional index	0.145*** (0.020)	0.139*** (0.020)	0.071*** (0.016)	0.069*** (0.017)	0.154*** (0.017)	0.131*** (0.017)	0.071*** (0.014)	0.071*** (0.015)
Any time in day care centre (dcc)/formal child care (fc)	0.825 (0.766)	-0.193 (0.693)	-1.015* (0.585)	0.306 (0.618)	-0.001 (0.653)	-1.965*** (0.570)	-0.929* (0.491)	0.010 (0.516)
any time in dcc/fc*income group (ref. is high income group)								
low income	-3.152** (1.362)	-1.029 (1.326)	-0.507 (1.140)	-0.858 (1.167)	-2.483** (1.209)	1.176 (1.187)	-0.649 (1.000)	-2.258** (1.015)
middle income	-1.158 (0.795)	-0.198 (0.740)	0.495 (0.605)	-0.265 (0.642)	-0.774 (0.691)	0.722 (0.632)	-0.004 (0.537)	-0.777 (0.575)
any time in dcc/fc*children per adult	-0.061 (0.108)	-0.032 (0.105)	0.006 (0.084)	-0.048 (0.091)	0.019 (0.096)	0.030 (0.089)	0.029 (0.073)	0.005 (0.078)
any time in dcc/fc*ATSI descent	5.868*** (2.273)	4.316* (2.371)	2.071 (2.964)	-1.528 (2.602)	4.495** (1.963)	2.632 (2.013)	3.421 (2.239)	5.393** (2.393)
low income	0.382 (1.260)	-0.932 (1.185)	0.536 (0.903)	1.009 (0.933)	0.591 (1.134)	-1.152 (1.104)	0.728 (0.812)	1.511* (0.828)
middle income	1.178* (0.649)	-0.189 (0.610)	0.117 (0.483)	0.495 (0.509)	1.123** (0.567)	-1.031** (0.519)	0.477 (0.428)	0.599 (0.459)
ATSI descent	-2.930* (1.657)	-1.130 (1.847)	-3.416 (2.439)	-0.334 (1.819)	-2.561* (1.443)	-0.365 (1.598)	-2.883 (1.862)	-5.184*** (1.953)
Constant	14.054*** (5.349)	7.423 (5.263)	23.783*** (3.998)	20.585*** (4.430)	8.600* (4.800)	9.411** (4.651)	22.282*** (3.535)	26.709*** (3.985)
R-squared	0.161	0.149	0.234	0.134	0.165	0.181	0.222	0.127
Number of observations	1018	1110	1022	1045	1326	1380	1316	1284

Source: LSAC data, B-cohort, Wave 2 and Wave 4.

Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. The addition of the word “lagged” indicates that the variable is from the previous wave. We also control for exact age of child, child health, indicator for being oldest child, number of siblings, weekly household income, single parent family, education of mother, education of father if present, part-time/full-time employment of mother, and part-time/full-time employment of father if present. Also see Table B1.

Table 19 for socio-emotional outcomes shows more negative values for the coefficients for centre day care and formal child care. These coefficients are negative in all the comparisons to other types of child care. For boys, these coefficients are also significant. These negative coefficients are at least partly counteracted by the coefficients on the interaction of child care use and income category. Three of these estimates in the specifications which compare against use of other types of child care are significant.

As expected, children living in low-income families have less favourable outcomes (which are often significant) than children from high-income families. The results for middle-income families are more ambiguous. A similar result is observed in Table 19 for socio-emotional outcomes. Again, these coefficients are generally significant. Children from Indigenous descent are also observed to have less favourable learning outcomes in most of the specifications, while for socio-emotional outcomes positive and negative coefficients (mostly insignificant) alternate. In the “no care” comparison, they are positive and in the “other care” comparison they are negative.

Tables 20 and 21 present the results for outcomes in wave 4. These results are counterintuitive in some respects. For example, living in a low-income family does have a significant positive effect on learning outcomes for three specifications. Most child care use dummies are negative, as are most interactions with the low-income category. This could be an issue that is related to the poor-quality measure of cognitive skills in wave 4, but a similar pattern is observed for the socio-emotional regressions which are based on a better defined measure. Only the child care dummy variables which are interacted with being from Indigenous descent are mostly positive and significant on four occasions (three times for boys) for the socio-emotional outcome regressions and on two occasions (both times when comparing to another type of care) for the learning outcome regressions.

Although these results are far from conclusive, the association of child care with children’s outcomes seems mostly positive (although often insignificant) and the results seem to indicate that disadvantaged groups (e.g. on low income or from Indigenous descent) may benefit from centre day care to a greater extent than other groups.

6.2 The K-cohort

We first report the empirical analysis of the K-cohort sample using the propensity score matching procedure outlined in Section 5. Specifically, we focus on the following nine

outcomes: reading, writing and numeracy scores from the NAPLAN Year 3 and Year 5 tests; the socio-emotional index as reported in wave 3; the learning index, also from wave 3; and the wave 3 teacher socio-development score. For each of these outcomes we define two treatment and control groups. First we split the sample between children who had centre day care as their first child care arrangement as opposed to those who did not have any child care arrangement until they started preschool. Second we distinguish between children who had centre day care as their first child care arrangement and those who experienced any other form of child care arrangement. The sample size for the K-cohort analysis is relatively small. This is due to the fact that for several children the information about the first child care arrangement is missing. This implies that, differently from what is observed with respect to the B-cohort, in this case we cannot distinguish the sampled children across additional treatment and control groups.

Tables 22 and 23 report the main results of the propensity score analysis. The column “Difference in outcome” indicates the average difference in outcome between the treatment and the control group before the matching is performed (“Raw”) and after (“Matched”). In Table 22, for example, we can see that if we do not take the effects of other observable characteristics into account, children who attended day care as their first child care arrangement score 11.6 points more on the NAPLAN Year 5 reading test than those who did not have any first child care arrangement. This difference is statistically significant, as shown by the t-statistic reported in the table. This is not a surprising result, as we have already seen in the descriptive section that the average NAPLAN score is positively associated with the attendance of child care in early ages. However, once the other characteristics are taken into account, this difference shrinks to 8 points and it becomes statistically insignificant.

The columns “Mean value of absolute bias” and “Likelihood ratio test: P-value” in Tables 22 and 23 indicate the effectiveness of the matching procedure. Specifically they report the overall magnitude and statistical significance of bias in the distribution of all observable characteristics to be employed in the PSM procedure between the treatment and the control group, before and after matching. We observe that the overall bias decreases considerably after the matching and becomes insignificant in each case. This result confirms both the need for controlling for selection and the validity of the procedure used.

Table 22
K-cohort: Propensity score matching results and balancing test

		Boys				Girls			
		Difference in outcome	T-stat	Mean value of absolute bias	Likelihood ratio test: P-value	Difference in outcome	T-stat	Mean value of absolute bias	Likelihood ratio test: P-value
Day care vs. no child care									
<i>Outcome variable</i>									
NAPLAN Year 3 - Reading	<i>Raw</i>	5.723	0.967	11.718	0.000	-4.254	-0.709	14.972	0.000
	<i>Matched</i>	2.726	0.440	2.176	1.000	-8.477	-1.296	1.382	1.000
NAPLAN Year 3 - Writing	<i>Raw</i>	4.523	0.909	11.560	0.000	-2.030	-0.454	14.858	0.000
	<i>Matched</i>	0.281	0.054	2.156	1.000	-5.535	-1.121	1.380	1.000
NAPLAN Year 3 - Numeracy	<i>Raw</i>	7.681	1.386	11.694	0.000	-3.408	-0.657	14.923	0.000
	<i>Matched</i>	4.589	0.777	2.141	1.000	-9.983	-1.744	1.363	1.000
NAPLAN Year 5 - Reading	<i>Raw</i>	11.611	2.365	16.721	0.000	-2.507	-0.510	13.351	0.000
	<i>Matched</i>	8.409	1.592	1.431	1.000	-9.861	-1.844	1.377	1.000
NAPLAN Year 5 - Writing	<i>Raw</i>	3.601	0.769	16.722	0.000	0.650	0.165	13.318	0.000
	<i>Matched</i>	-3.638	-0.728	1.423	1.000	-3.524	-0.832	1.378	1.000
NAPLAN Year 5 - Numeracy	<i>Raw</i>	3.499	0.712	16.748	0.000	3.149	0.692	13.369	0.000
	<i>Matched</i>	-3.447	-0.672	1.458	1.000	-2.434	-0.501	1.402	1.000
Socio-emotional index, wave 3	<i>Raw</i>	-1.762	-2.812	14.519	0.000	-0.992	-1.825	17.414	0.000
	<i>Matched</i>	-2.139	-3.205	1.492	1.000	-1.620	-2.744	1.580	0.999
Learning index, wave 3	<i>Raw</i>	1.502	2.565	14.807	0.000	0.156	0.269	17.970	0.000
	<i>Matched</i>	0.627	0.979	1.888	0.999	-1.037	-1.641	1.548	0.998
Teacher socio-development score, wave 3	<i>Raw</i>	-0.757	-1.950	14.479	0.000	-0.338	-1.021	17.432	0.000
	<i>Matched</i>	-1.245	-3.002	2.339	0.999	-0.506	-1.374	1.815	0.997

Source: LSAC data, K-cohort, waves 3 and 4.

Note: If T-stat is larger than 2.58, 1.96 or 1.65 the difference in outcome is statistically significant at 1%, 5% and 10% respectively.

Table 23
K-cohort: Propensity score matching results and balancing test

		Boys				Girls			
		Difference in outcome	T-stat	Mean value of absolute bias	Likelihood ratio test: P-value	Difference in outcome	T-stat	Mean value of absolute bias	Likelihood ratio test: P-value
Outcome variable: Day care vs. other forms of child care									
<i>Outcome variable</i>									
NAPLAN Year 3 - Reading	<i>Raw</i>	-13.413	-2.316	6.368	0.325	-15.086	-2.649	6.181	0.283
	<i>Matched</i>	-9.540	-1.624	1.558	1.000	-12.788	-2.212	1.766	1.000
NAPLAN Year 3 - Writing	<i>Raw</i>	-12.377	-2.520	6.558	0.283	-3.430	-0.793	6.237	0.294
	<i>Matched</i>	-8.375	-1.676	1.631	1.000	-0.985	-0.221	1.808	1.000
NAPLAN Year 3 - Numeracy	<i>Raw</i>	-8.433	-1.602	6.683	0.251	-5.394	-1.089	6.140	0.286
	<i>Matched</i>	-3.883	-0.729	1.657	1.000	-3.829	-0.754	1.785	1.000
NAPLAN Year 5 - Reading	<i>Raw</i>	-6.262	-1.265	5.058	0.538	-6.769	-1.413	6.791	0.128
	<i>Matched</i>	-3.399	-0.672	1.954	1.000	-4.715	-0.950	1.073	1.000
NAPLAN Year 5 - Writing	<i>Raw</i>	-10.901	-2.291	5.562	0.387	-13.009	-3.295	7.121	0.103
	<i>Matched</i>	-7.448	-1.530	1.798	0.999	-10.112	-2.462	1.104	1.000
NAPLAN Year 5 - Numeracy	<i>Raw</i>	0.182	0.037	5.072	0.448	-7.315	-1.614	6.873	0.126
	<i>Matched</i>	3.339	0.679	2.039	0.999	-4.761	-1.020	1.003	1.000
Socio-emotional index, wave 3	<i>Raw</i>	-1.229	-2.036	6.431	0.196	-1.001	-1.892	5.312	0.459
	<i>Matched</i>	-0.956	-1.598	2.090	0.999	-0.835	-1.577	1.664	0.994
Learning index, wave 3	<i>Raw</i>	-0.403	-0.717	5.675	0.306	-1.369	-2.428	5.138	0.290
	<i>Matched</i>	-0.245	-0.435	2.462	0.990	-0.953	-1.666	1.408	0.992
Teacher socio-development score, wave 3	<i>Raw</i>	-1.203	-3.359	6.749	0.099	-0.670	-2.224	5.275	0.456
	<i>Matched</i>	-1.048	-2.994	2.644	0.994	-0.663	-2.209	1.526	0.999

Source: LSAC data, K-cohort, waves 3 and 4.

Note: If T-stat is larger than 2.58, 1.96 or 1.65 the difference in outcome is statistically significant at 1%, 5% and 10% respectively.

The figures summarised in Tables 22 and 23 reveal three distinct patterns in the results. First, when comparing the outcomes of boys who have attended day care versus those of boys who did not have any child care arrangement, we observe that most of the raw differences are positive, suggesting a beneficial effect of day care. However, most of these differences become insignificant or even negative after matching children on the basis of their observable characteristics. This indicates that these socio-demographic characteristics are relevant to the cognitive and non-cognitive outcomes under consideration. The second aspect that emerges from Table 22 is the completely different trend in the results for girls. For them, most of the differences are negative both before and after the matching, although generally not statistically significant. Finally, the results from Table 23 indicate that both boys and girls tend to have better outcomes if their first child care arrangement was different from day care. With respect to this latter result, two aspects need to be highlighted. First, as we are only focusing on *first* child care arrangements here, the results from Table 23 cannot be interpreted as negative for day care arrangements *per se*. Instead, these results indicate that day care may not be the most appropriate type of *first* child care arrangement (possibly also depending on the age of the child when child care is first used). Second, the matching procedure leads to a drastic decrease in the statistical significance of the estimated differences basically rendering them to zero.

In addition to comparing the mean outcomes in the previous tables, we also study the relationship between child care arrangements and children's outcomes through a set of linear regressions. We use the propensity score variable that we obtain from the PSM procedure to compute weights and use these in our regressions to limit the effect of selection into child care arrangements on the estimated effects of child care. Tables 24 to 26 summarise the main results from the multivariate analysis for the K-cohort of the LSAC sample. In interpreting these results, we must recall that we can only study *first* child care arrangements for this cohort. These arrangements might have been in place several years before the realisation of the outcomes we are interested in. Since the first child care arrangements, several other child care arrangements may have been used. Therefore, the multivariate analysis only informs us on the existence of long term effects of the *first* child care arrangement on children's outcomes. However, we do not observe the other child care arrangements used between the first child care arrangement and the moment at which the outcomes were recorded. This implies that we can interpret our results as an indication of what the effects of early child care on future outcomes might be, but we cannot obtain a precise quantification of these effects.

Table 24
Regression results, matched sample

	NAPLAN YEAR 3, READING				NAPLAN YEAR 3, WRITING				NAPLAN YEAR 3, NUMERACY			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Day care vs. no child care	-8.748 (9.454)		-16.161* (9.082)		-1.334 (7.986)		-14.361** (6.753)		-8.956 (8.930)		-16.555** (7.738)	
Day care vs. no child care X low income	3.134 (26.248)		5.098 (30.381)		-2.394 (22.184)		10.852 (22.649)		-1.859 (24.794)		-3.101 (25.889)	
Day care vs. no child care X middle income	7.660 (15.137)		-6.389 (16.132)		14.062 (12.734)		5.988 (11.957)		-8.674 (14.307)		6.832 (13.718)	
Day care vs. other child care arrangement		-12.989* (7.275)		-18.195** (7.143)		-12.253* (6.258)		0.576 (5.478)		-1.270 (6.504)		-0.806 (6.230)
Day care vs. other child care arrangement X low income		33.411 (25.272)		-16.810 (29.490)		67.631*** (21.552)		30.568 (22.571)		1.820 (22.697)		-30.436 (25.668)
Day care vs. other child care arrangement X middle income		-3.619 (14.782)		15.811 (15.054)		6.931 (12.624)		5.704 (11.515)		-10.666 (13.115)		14.262 (13.121)
Disadvantaged	-2.178 (20.050)	-33.440* (18.996)	-11.628 (20.958)	16.460 (20.620)	13.225 (16.901)	-47.663*** (16.091)	-1.755 (15.748)	-11.375 (15.812)	-23.690 (18.864)	-18.042 (17.223)	-2.449 (17.871)	28.070 (17.938)
Medium advantaged	-8.634 (11.949)	-0.596 (11.708)	8.250 (12.849)	-4.649 (11.954)	-11.319 (10.076)	-0.186 (10.049)	-0.182 (9.512)	7.725 (9.146)	-4.994 (11.292)	-1.663 (10.373)	3.801 (10.933)	-3.573 (10.424)

Cont.

Table 24 – continued

	NAPLAN YEAR 3, READING				NAPLAN YEAR 3, WRITING				NAPLAN YEAR 3, NUMERACY			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>Age of first child care arrangement (ref. category: 3 to 12 months)</i>												
Less than 3 months	-22.547	-5.747	-6.222	29.001**	0.825	11.531	-6.758	23.595**	-26.953	0.089	-3.731	16.373
	(35.126)	(13.987)	(29.448)	(13.797)	(29.751)	(11.906)	(21.863)	(10.534)	(33.290)	(12.524)	(25.060)	(12.042)
12 to 24 months	-3.593	-0.829	-9.138	6.062	2.967	-0.307	-8.071	-2.165	-10.773	-11.889*	-9.352	2.842
	(11.666)	(7.921)	(12.087)	(7.587)	(9.842)	(6.798)	(9.019)	(5.815)	(10.983)	(7.078)	(10.301)	(6.614)
24 to 36 months	-14.791	-7.110	-8.690	-4.884	11.010	2.513	-13.601	-3.414	-18.273*	-14.344*	-11.442	-3.191
	(11.157)	(8.732)	(12.056)	(9.264)	(9.424)	(7.489)	(8.985)	(7.091)	(10.571)	(7.804)	(10.264)	(8.072)
More than 36 months	-19.267*	-13.859	-6.944	11.233	5.535	2.754	-12.732	-5.512	-28.706***	-19.937**	-12.829	-0.522
	(11.290)	(9.424)	(11.853)	(9.460)	(9.555)	(8.088)	(8.829)	(7.242)	(10.698)	(8.422)	(10.091)	(8.243)
Is child Indigenous	4.822	46.001	-70.818*	-33.924	-9.454	66.221**	-44.243	23.808	-5.639	-18.383	-93.425***	-36.733
	(25.994)	(35.489)	(40.752)	(28.705)	(22.531)	(30.123)	(29.618)	(21.933)	(25.127)	(31.393)	(34.899)	(24.983)
Child Indigenous X day care usage	-15.538	-33.376	39.252	11.110	-10.972	-72.323*	26.660	-39.832	-33.976	12.361	63.603	7.511
	(39.812)	(48.734)	(48.675)	(38.963)	(34.052)	(40.451)	(35.610)	(29.767)	(38.060)	(42.121)	(41.588)	(33.922)
<i>Health status (ref. category: excellent)</i>												
Very good or good	-1.292	6.925	-6.662	-7.557	2.062	1.094	-7.534	-4.120	-7.253	-1.326	-9.694*	-1.156
	(6.441)	(6.329)	(6.823)	(6.310)	(5.427)	(5.428)	(5.083)	(4.843)	(6.065)	(5.660)	(5.812)	(5.499)
Fair or poor	-86.163***	-28.554	34.694	9.449	-45.094**	-21.883	-13.851	20.748	-61.228**	-26.685	-11.640	13.500
	(25.287)	(21.529)	(34.708)	(32.852)	(21.566)	(18.476)	(25.964)	(25.119)	(23.989)	(19.102)	(29.383)	(28.662)
<i>R-squared</i>	0.182	0.168	0.144	0.165	0.101	0.115	0.097	0.122	0.159	0.177	0.176	0.127
<i>Observations</i>	705	769	640	688	709	774	637	686	709	771	638	687

Source: LSAC data, K-cohort, Wave 3. Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. See Table B2 for coefficients on additional individual and household variables.

Table 25
Regression results, matched sample

	NAPLAN YEAR 5, READING				NAPLAN YEAR 5, WRITING				NAPLAN YEAR 5, NUMERACY			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Day care vs. no child care	4.548		-8.919		2.661		-6.378		4.451		6.027	
	(6.800)		(7.436)		(6.840)		(6.371)		(6.352)		(6.406)	
Day care vs. no child care X low income	-10.675		-5.358		27.189		-21.692		-9.175		6.597	
	(19.120)		(20.944)		(19.158)		(17.605)		(18.185)		(17.538)	
Day care vs. no child care X middle income	7.477		-9.411		4.709		5.616		-19.542		-15.564	
	(13.766)		(12.858)		(14.023)		(10.830)		(12.739)		(11.045)	
Day care vs. other child care arrangement		-1.576		0.986		-2.575		-12.426**		5.667		8.180*
		(5.304)		(5.426)		(5.753)		(5.195)		(5.053)		(4.878)
Day care vs. other child care arrangement X low income		10.486		1.755		-3.621		14.918		17.621		6.549
		(17.747)		(21.356)		(19.141)		(20.227)		(16.859)		(18.957)
Day care vs. other child care arrangement X middle income		-7.535		-18.568		6.799		10.048		-6.681		-26.291**
		(13.424)		(12.299)		(14.529)		(11.859)		(12.802)		(11.045)
Disadvantaged	23.492	6.362	3.974	-12.193	-28.020*	7.337	6.587	-39.596**	11.055	-19.041	-0.439	1.310
	(15.941)	(13.705)	(14.847)	(16.255)	(15.903)	(15.068)	(12.779)	(15.586)	(15.251)	(13.058)	(12.583)	(14.634)
Medium advantaged	-0.417	17.655	21.605**	24.943***	-15.558	-11.671	-1.905	-3.865	21.052**	3.340	6.121	17.563**
	(10.882)	(10.739)	(9.707)	(9.509)	(11.192)	(11.710)	(8.138)	(9.149)	(10.055)	(10.182)	(8.408)	(8.543)

Cont.

Table 25 – continued

	NAPLAN YEAR 5, READING				NAPLAN YEAR 5, WRITING				NAPLAN YEAR 5, NUMERACY			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>Age of first child care arrangement (ref. category: 3 to 12 months)</i>												
Less than 3 months	22.045	5.099	-58.230**	-14.477	25.000	8.741	-23.925	-23.756**	28.618	22.136**	-21.626	-3.450
	(27.171)	(10.998)	(23.713)	(10.791)	(27.338)	(11.734)	(20.099)	(10.449)	(25.431)	(10.437)	(20.189)	(9.696)
12 to 24 months	15.700*	8.215	-0.283	-6.381	-4.455	-9.776	6.586	7.137	3.512	1.838	3.940	-5.124
	(8.918)	(5.938)	(9.398)	(5.950)	(8.974)	(6.456)	(7.997)	(5.732)	(8.289)	(5.685)	(8.043)	(5.354)
24 to 36 months	5.236	1.890	-3.382	-0.550	-9.670	-4.838	-11.621	-0.191	7.696	-0.263	4.202	-2.474
	(8.560)	(6.720)	(9.467)	(7.127)	(8.588)	(7.234)	(8.038)	(6.803)	(8.003)	(6.384)	(8.089)	(6.398)
More than 36 months	2.660	-3.113	2.119	-5.063	2.493	-10.282	-7.552	-8.705	7.235	-3.542	4.541	0.413
	(8.567)	(7.159)	(9.221)	(7.408)	(8.584)	(7.760)	(7.871)	(7.125)	(7.997)	(6.852)	(7.915)	(6.677)
Is child Indigenous	-74.951***	-50.719**	-77.411***	-19.380	-25.965	-34.930	-63.831**	-54.063**	-4.805	-16.817	-60.172**	-6.122
	(23.976)	(25.733)	(29.790)	(24.507)	(24.513)	(24.511)	(24.922)	(23.586)	(22.340)	(23.653)	(25.535)	(22.063)
Child Indigenous X day care usage	57.131*	40.550	109.735***	50.881	10.238	17.260	30.278	21.811	11.985	34.807	37.746	-14.508
	(30.383)	(32.511)	(39.963)	(35.397)	(30.836)	(34.287)	(33.720)	(34.055)	(28.408)	(33.514)	(34.171)	(31.796)
<i>Health status (ref. category: excellent)</i>												
Very good or good	-2.842	-2.181	-4.997	-4.527	-8.780*	-13.720***	-0.604	-2.843	-4.624	-5.087	2.932	4.352
	(4.810)	(4.574)	(5.153)	(4.709)	(4.866)	(4.968)	(4.349)	(4.526)	(4.500)	(4.376)	(4.384)	(4.237)
Fair or poor	-9.528	-8.598	-35.316*	-16.810	-21.162	-10.125	-0.348	-6.607	-4.450	-11.350	-20.945	-6.856
	(14.656)	(16.132)	(18.156)	(17.837)	(14.527)	(17.405)	(15.119)	(17.074)	(13.187)	(15.293)	(15.445)	(16.037)
Year 3 NAPLAN score	0.524***	0.519***	0.602***	0.608***	0.498***	0.481***	0.566***	0.506***	0.618***	0.632***	0.712***	0.713***
	(0.029)	(0.028)	(0.033)	(0.031)	(0.035)	(0.035)	(0.038)	(0.038)	(0.029)	(0.030)	(0.032)	(0.031)
<i>R- squared</i>	0.452	0.460	0.490	0.474	0.357	0.351	0.367	0.319	0.504	0.502	0.550	0.539
<i>Observations</i>	616	660	584	599	611	655	581	596	619	654	580	598

Source: LSAC data, K-cohort, Wave 4. Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. See Table B3 for coefficients on additional individual and household variables.

Table 26
Regression results, matched sample

	SOCIO-EMOTIONAL INDEX, WAVE 3				LEARNING INDEX, WAVE 3				TEACHER SOCIO-DEVELOPMENT SCORE, WAVE 3			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Day care vs. no child care	-1.104*		-0.277		0.312		-0.814		-0.060		-0.369	
	(0.661)		(0.627)		(0.701)		(0.684)		(0.525)		(0.460)	
Day care vs. no child care X low income	-1.686		-2.361		0.667		-2.288		-1.150		-0.203	
	(2.024)		(2.046)		(1.988)		(2.232)		(1.507)		(1.520)	
Day care vs. no child care X middle income	1.122		-0.962		0.876		0.908		0.955		1.135	
	(1.066)		(1.033)		(1.129)		(1.150)		(0.822)		(0.786)	
Day care vs. other child care arrangement		-0.613		0.185		0.223		-0.483		-0.879**		-0.391
		(0.526)		(0.477)		(0.527)		(0.548)		(0.376)		(0.349)
Day care vs. other child care arrangement X low income		2.812		-0.010		2.785		-4.248*		0.338		-0.385
		(2.079)		(2.108)		(1.982)		(2.344)		(1.407)		(1.610)
Day care vs. other child care arrangement X middle income		0.737		-2.513**		0.651		0.264		0.546		0.318
		(1.086)		(1.000)		(1.093)		(1.113)		(0.785)		(0.743)
Disadvantaged	0.487	-3.064**	0.759	-2.060	1.081	-0.704	-0.014	2.529	0.893	-1.197	-0.706	-0.162
	(1.435)	(1.475)	(1.442)	(1.559)	(1.436)	(1.474)	(1.557)	(1.765)	(1.029)	(0.995)	(1.040)	(1.226)
Medium advantaged	-0.725	0.342	-0.872	0.609	-0.215	-0.066	-0.687	0.134	-0.339	-0.251	-0.753	0.013
	(0.852)	(0.872)	(0.805)	(0.796)	(0.892)	(0.875)	(0.898)	(0.883)	(0.661)	(0.639)	(0.609)	(0.587)

Cont.

Table 26 - continued

	SOCIO-EMOTIONAL INDEX, WAVE 3				LEARNING INDEX, WAVE 3				TEACHER SOCIO-DEVELOPMENT SCORE, WAVE 3			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>Age of first child care arrangement (ref. category: 3 to 12 months)</i>												
Less than 3 months	-0.804	-0.604	0.619	1.896**	0.244	1.115	2.796	1.585	0.978	0.785	0.414	0.640
	(1.966)	(0.929)	(1.722)	(0.919)	(2.196)	(0.958)	(1.976)	(1.065)	(1.576)	(0.692)	(1.264)	(0.727)
12 to 24 months	-0.270	0.403	0.872	1.246**	-0.106	-0.334	0.933	0.946	0.101	0.360	0.565	0.556
	(0.823)	(0.589)	(0.802)	(0.516)	(0.877)	(0.587)	(0.898)	(0.590)	(0.637)	(0.415)	(0.599)	(0.380)
24 to 36 months	-0.410	0.390	-0.750	-0.055	-0.693	-0.649	0.437	0.455	-0.345	-0.286	-0.050	0.248
	(0.812)	(0.645)	(0.791)	(0.613)	(0.866)	(0.648)	(0.886)	(0.695)	(0.635)	(0.456)	(0.595)	(0.450)
More than 36 months	0.311	1.039	0.245	0.199	-0.719	-0.761	0.362	0.510	0.488	0.586	0.126	0.410
	(0.798)	(0.685)	(0.784)	(0.621)	(0.857)	(0.692)	(0.866)	(0.715)	(0.628)	(0.488)	(0.586)	(0.464)
Is child Indigenous	1.624	3.605	3.116	-4.634**	-0.037	-3.701	-0.244	-0.548	0.391	-1.098	0.430	-1.985
	(1.940)	(2.324)	(2.557)	(1.798)	(2.075)	(2.361)	(2.707)	(2.161)	(1.818)	(1.574)	(1.807)	(1.400)
Child Indigenous X day care usage	-0.632	-2.896	-3.124	4.014	-4.392	-0.149	0.645	1.362	-0.319	0.852	-2.167	0.065
	(2.955)	(3.288)	(3.115)	(2.489)	(3.087)	(3.264)	(3.433)	(3.007)	(2.408)	(2.139)	(2.226)	(1.875)
<i>Health status (ref. category: excellent)</i>												
Very good or good	-1.674***	-2.215***	-1.447***	-1.605***	-0.118	0.200	-0.285	-0.602	-0.461	0.124	-0.342	-0.410
	(0.452)	(0.462)	(0.445)	(0.426)	(0.476)	(0.455)	(0.491)	(0.476)	(0.351)	(0.325)	(0.331)	(0.312)
Fair or poor	-4.291**	-4.367***	0.232	-6.563***	-3.934*	-2.418	-2.576	-1.017	-1.782	0.135	1.226	0.339
	(1.796)	(1.638)	(2.079)	(2.020)	(2.101)	(1.777)	(2.301)	(2.311)	(1.759)	(1.289)	(1.555)	(1.661)
Lagged value of the index	0.710***	0.685***	0.611***	0.614***	0.696***	0.675***	0.667***	0.708***	0.603***	0.552***	0.461***	0.446***
	(0.024)	(0.023)	(0.025)	(0.024)	(0.026)	(0.024)	(0.027)	(0.026)	(0.032)	(0.028)	(0.034)	(0.033)
<i>R-squared</i>	0.564	0.555	0.478	0.520	0.503	0.521	0.491	0.512	0.353	0.371	0.264	0.249
<i>Observations</i>	900	955	859	873	1013	1066	970	986	833	876	814	824

Source: LSAC data, K-cohort, Wave 3. Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. The addition of the word “lagged” indicates that the variable is from the previous wave. See Table B4 for coefficients on additional individual and household variables.

The tables are structured as follows: Each table includes three sets of results, for both boys and girls. For each outcome we report two separate sets of estimates, presented in columns (1) and (2). In the first one the main explanatory variable is a dummy that takes the value of one in case the first child care arrangement was in a day care facility, and zero if the child never had a child care arrangement before preschool. In the second column, the child care dummy takes the value of one for day care arrangements and of zero if the first child care arrangement was any child care arrangement other than day care.

Tables 24 and 25 show the results for the reading, writing, and numeracy scores of the Year 3 and Year 5 NAPLAN tests respectively. Table 26 presents the results for the socio-emotional and the learning index, and on the score of socio-development based on teachers' answers as reported in wave 3. As the socio-emotional and the learning indices are only available in the first three waves of the K-cohort survey, choosing wave 3 makes the results most comparable, time-wise, to the results in the other tables in this subsection. The regressions include a wide range of explanatory variables. In all regressions we include interaction effects between the child care arrangement used and the level of income of the families (using high-income families as the reference category). Tables 24 to 26 present the estimates for the most relevant explanatory variables. We present results for all parameters in Appendix Tables B2 to B4.

The results in Tables 24 to 26 are based on a relatively small number of observations. This is due to several factors. The dependent variables have numerous missing values, especially in the case of the NAPLAN scores. Furthermore, the variables describing the first child care arrangements lack reliable information on several individuals. This is probably due to the intertemporal gap between the occurrence of the first child care arrangement and the LSAC interview. Finally, in our analysis we are mostly relying on information collected in the last two waves of the survey. Therefore, our data also suffer from a (limited) degree of attrition which reduces the number of complete observations.

The results reported in Table 24 indicate that using centre day care as the first child care arrangement influences the Year 3 NAPLAN scores negatively. This result holds independently of whether the alternative to day care is no child care or other forms of child care, and its magnitude is particularly evident with respect to the reading scores. In comparison to boys who did not attend any child care arrangement, boys who attended day care score between 1.3 and 9 points less in the Year 3 NAPLAN tests (with none of these

coefficients being significant). For girls, the gap is wider and significant, reaching between 14.4 and 16.6 points. The results also indicate the existence of a gap in the comparison between day care and other forms of child care. In particular, scores in the reading tests are between 13 and 18 points lower for children who attended day care instead of other forms of child care as a first arrangement. It is of course important to observe that half of the estimated results are statistically insignificant, so that their policy implications should not be overestimated.

The evidence from the interaction effects between child care arrangements and income levels is mixed. All coefficients for these variables are presented relative to the interaction between child care arrangement and high income which is the reference category. Overall, it appears that children from medium-income families benefit more from day care as their first child care arrangement than children from high-income families. For children from low-income families, there is no clear pattern in the results. Once again, the statistical significance of these estimates is low.

With respect to the estimated effects of other variables, children from low-income families, those who suffer from relatively poor health conditions and Indigenous children tend to score lower on the NAPLAN tests. Included in the set of regressors is a set of dummies for the age of first child care arrangement (with children who had their first child care experience at an age between 3 and 12 months as the reference group). The results associated with these variables are not entirely consistent across all regressions presented in Table 24. Nevertheless, we note that having the first child care arrangement after the age of 24 months is generally associated with lower scores in the NAPLAN Year 3 results, in particular with respect to the numeracy test scores.

The estimates with respect to the Year 5 NAPLAN scores confirm that individual characteristics such as health, Indigenous status, and family income have a clear influence on the scores across all dimensions of the test. Conversely, the dummies for day care and their interactions with the income categories do not outline a clear (negative or positive) effect of this type of child care arrangement. This result can be interpreted as evidence of the fact that if having day care as first child care arrangement in early ages potentially leads to lower outcomes on cognitive measures, this effect does not hold in the long run and tends to vanish by the time the child has reached Year 5. Similarly, the age of first child care arrangement does not exert any statistically significant effect on the Year 5 NAPLAN scores. As for the

Year 3 scores, the coefficients associated with the age dummies indicate a negative effect of starting child care after the 12th month. Differently from the previous set of results, our estimates also indicate that for girls, beginning child care before the age of four months can lead to lower scores in the NAPLAN test. Once again, this result is not very robust and the estimated effect is positive for boys, although generally not significant. A further result that emerges from our analysis of Year 5 scores is the persistence in the NAPLAN scores from Year 3 to Year 5. We included Year 3 scores among our regressors and we observe that an increase in the Year 3 score is always significantly associated to an increase in the Year 5 score. The magnitude of this effect is between 0.5 and 0.7 of a point for each additional point in the NAPLAN Year 3 score.

The importance of controlling for the previous values of our measures of development is also confirmed by the results shown in Table 26, in relation to the estimated effects on the additional indices of development observed in wave 3. As observed in Section 6.1 with respect to the results based on the B-cohort sample, the values of the indices in wave 2 appear to be one of the few regressors which show a robust association with the indices in wave 3. A health status of less than excellent has a significant and detrimental effect on the socio-emotional index only. Once again, the nature of the first child care arrangement does not appear to have any explanatory power with respect to the three indices. The few significant estimates point in the direction of a negative effect of day care as the first child care arrangement relative to other forms of child care or to no child care. This result appears to be stronger for children who live in families with low and medium income.

We highlight a few additional findings from the analysis presented in Table 26. First, it is interesting to note that the estimated coefficient for the socio-emotional index based on parents' answers and for the socio-development score reported by the teacher follow similar patterns. Thus, these measures seem to provide us with a good, consistent, description of the behavioural development of the children in the survey. In contrast, the signs of the effects estimated with respect to the learning index, are not in line with those we obtained on the Year 3 and Year 5 NAPLAN test scores. This result suggests that the learning index may capture elements of cognitive development other than those summarised in the NAPLAN tests. It is therefore important to include both the learning index and the NAPLAN score, to obtain a more complete picture of the relationship between child care and development outcomes. Finally, it is worth noting that similar to what is observed for the B-cohort, the

effects of child care arrangements on the outcomes of Indigenous children do not show any robust and consistent pattern across the different indices and specifications.

The results presented in Appendix Tables B2 to B4 indicate that among the other control variables included in our regressions, parental education (and maternal education in particular) has an important effect on children's outcomes. Children with a mother with an education level equal to or below Year 10 score up to 68 points less in the Year 3 NAPLAN tests in comparison to children whose mothers have a University degree. This gap is less relevant in terms of magnitude for higher levels of education and shrinks further with respect to the Year 5 scores, but it is almost always statistically significant, independent of which of the outcomes is studied.

7. Conclusion

The aim of the empirical analysis presented in this paper is to assess the relevance of child care arrangements in children's development of cognitive and non-cognitive skills. In this final section, we discuss a few key findings and their implications.

The results we present are often not consistent across the different methodologies of analysis we employ: the findings from the descriptive study and from the multivariate analysis do not lead to a univocal picture of the effects of ECEC arrangements on the studied outcomes, and outcomes are different for different subgroups.

This result can be considered an empirical finding *per se*. The discrepancies in the results suggest that any measure implemented to foster the role of formal child care arrangements and support disadvantaged children must be developed considering the socio-demographic characteristics of the children and their families. In addition, the first step needs to be encouraging disadvantaged families to make use of high-quality child care. Disadvantaged families currently appear to make less use of formal child care than advantaged families. Although other factors could play a role as well, this means that ensuring that this type of child care is affordable to these families is an important consideration given the low incomes of these families.

Under certain circumstances, centre day care arrangements appear to have positive effects on specific groups of children. For example, boys tend to benefit most from day care when its usage is not too intense and it is mixed with other forms of child care. The results also indicate that Indigenous girls who attend day care may benefit in terms of their cognitive and non-cognitive skills. At the same time, our estimates suggest that child care may exert the most positive long-run effects if first used after the age of 4 months, but before the first year of age.

Overall, these results suggest the need for avoiding a "one-size-fits-all" type of measure in the design of child care policies since family characteristics clearly play an important role in the development of children's cognitive and non-cognitive skills. This means that children from advantaged families are perhaps unlikely to benefit from attending child care given their supportive home environment, so an expectation that attending child care at age 2 to 3 would improve their outcomes substantially may be unrealistic. In their case, the aim should rather be to provide child care of equal quality as parental care given the high quality of parental

care in their case. Children from disadvantaged families are much more likely to benefit from high-quality formal child care, which may compensate for a less favourable home environment, but at the same time they may have more difficulty in accessing such child care, so perhaps the main target for this group should be to make such child care readily available for this group.

The research discussed in this report could be extended in a number of ways. The number of children from Indigenous backgrounds is relatively small in the LSAC, so we were limited with regard to the type of analysis we could do in this report. Therefore an obvious future project could investigate similar questions to those that have been considered in this report but using the Longitudinal Study for Indigenous Children to reveal more detail regarding Indigenous families' child care use, and how it may affect their early childhood outcomes than was possible in the current study.

Another example would be to analyse the impact of the home-learning environment by focussing on activities that the parent undertakes with the child, such as reading to the child, taking the child to a museum, etc. This would be interesting in its own right, but could also be extended by considering the activities that are undertaken with children while in child care (for those children for whom this information is available), and the relative impact that these activities at home and in the child care environment have on children's outcomes. That is, can activities in a child care centre (partly) make up for a lack of stimulating activities at home?

Another example in this certainly not exhaustive list of interesting possible future research directions is a study into the role of a child's temperament or personality in cognitive and non-cognitive outcomes. The longitudinal aspect of the LSAC allows for a study in the development of a child's temperament over time, and how this is associated with their outcomes over time. A related question of interest is what factors affect a child's temperament, and can these factors be influenced.

More generally, this research could be followed up by a number of in-depth studies. These could examine subpopulations in detail, or specific aspects of child care. For example, within formal child care what is the influence of the number of children per carer or educational qualifications of the carer.

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Appendix A

Table A1

B-cohort: first child care arrangement up to 3 years of age - BOYS (row percentages)

	None	Preschool	Formal	Informal	Total obs.
Total number of observations	464	52	922	912	2,350
<i>Percentage</i>	<i>19.74</i>	<i>2.21</i>	<i>39.23</i>	<i>38.81</i>	<i>100</i>
Number of people in the household					
2	7.41	0.00	46.30	46.30	54
3	13.13	3.34	39.86	43.68	419
4	16.33	1.67	41.65	40.35	1,078
5	22.90	2.54	38.94	35.62	511
6	39.78	2.21	32.04	25.97	181
7	37.38	2.80	22.43	37.38	107
Number of siblings in the household					
0	12.17	2.83	40.43	44.57	460
1	16.25	1.65	40.57	41.53	1,151
2	23.98	2.51	40.04	33.46	517
3	45.95	2.03	30.41	21.62	148
4	39.19	5.41	22.97	32.43	74
Highest education of the mother					
Year 9 or below	17.24	2.16	41.38	39.22	232
Year 10	22.76	3.45	42.07	31.72	145
Year 11	26.87	2.99	29.85	40.30	67
Year 12	23.81	2.86	39.52	33.81	210
Certificate	19.55	2.53	35.86	42.05	711
Diploma	17.76	2.63	42.11	37.50	152
Bachelor	17.76	0.62	42.37	39.25	321
Graduate	16.96	1.79	49.11	32.14	112
Postgraduate	17.76	1.32	36.84	44.08	152
Highest education of the father					
Year 9 or below	41.03	2.56	23.08	33.33	39
Year 10	24.78	6.19	34.51	34.51	113
Year 11	35.29	1.47	36.76	26.47	68
Year 12	23.62	2.58	38.38	35.42	271
Certificate	19.26	1.97	39.39	39.39	457
Diploma	22.34	1.60	34.57	41.49	188
Bachelor	14.32	1.91	41.53	42.24	419
Graduate	21.90	2.92	39.42	35.77	137
Postgraduate	15.89	1.99	38.41	43.71	151
Immigrant status parents					
No parents immigrant	17.70	1.61	39.17	41.52	1,616
1 parent immigrant (out of 2 present)	21.46	3.2	43.15	32.19	438
All present parents immigrant	28.38	4.05	33.78	33.78	296

Table A1**B-cohort: first child care arrangement up to 3 years of age - BOYS (row percentages)**

	None	Preschool	Formal	Informal	Total obs.
Child is spoken to in non-English					
No	18.52	2.09	41.50	37.89	1,911
Yes	25.06	2.73	29.38	42.82	439
SEIFA advantage/disadvantage					
Lowest	23.06	1.43	37.55	37.96	490
Second	21.06	2.15	37.25	39.54	698
Third	17.13	2.19	42.23	38.45	502
Highest	17.88	2.88	40.30	38.94	660
SEIFA disadvantage quartile					
Lowest	23.68	2.23	36.23	37.85	494
Second	19.97	1.90	38.03	40.10	631
Third	17.59	1.58	43.68	37.15	506
Highest	18.36	2.92	39.22	39.50	719
Area Remoteness					
Highly accessible	19.66	2.74	38.37	39.23	1,277
Accessible	19.57	2.31	41.10	37.01	562
Moderately accessible	18.27	0.76	41.62	39.34	394
Remote	26.44	1.15	29.89	42.53	87

Source: LSAC data, B-cohort, waves 1 to 4.

Table A2**B-cohort: first child care arrangement up to 3 years of age – GIRLS (row percentages)**

	None	Preschool	Formal	Informal	Total
Total number of observations	437	47	910	862	2,256
<i>Percentage</i>	<i>19.37</i>	<i>2.08</i>	<i>40.34</i>	<i>38.21</i>	<i>100</i>
Number of people in the household					
2	9.09	0.00	43.18	47.73	44
3	12.08	2.83	41.9	43.19	389
4	17.61	2.12	41.96	38.31	1,039
5	21.35	1.73	41.15	35.77	520
6	31.07	1.69	32.2	35.03	177
7	42.53	2.30	24.14	31.03	87
Number of siblings in the household					
0	12.06	1.86	38.98	47.10	431
1	17.57	2.34	41.89	38.20	1,110
2	21.62	2.02	40.61	35.76	495
3	31.06	1.86	39.75	27.33	161
4	55.93	0.00	20.34	23.73	59
Highest education of the mother					
Year 9 or below	17.50	2.50	40.83	39.17	240
Year 10	21.01	2.52	42.02	34.45	119
Year 11	25.42	0.00	33.90	40.68	59
Year 12	18.42	2.11	38.95	40.53	190
Certificate	20.87	1.71	44.24	33.18	642
Diploma	18.54	1.69	40.45	39.33	178
Bachelor	12.58	1.61	37.42	48.39	310
Graduate	19.49	3.39	44.07	33.05	118
Postgraduate	13.64	1.52	37.12	47.73	132
Highest education of the father					
Year 9 or below	31.58	0.00	42.11	26.32	38
Year 10	32.77	2.52	40.34	24.37	119
Year 11	25.33	2.67	36.00	36.00	75
Year 12	20.86	3.60	43.53	32.01	278
Certificate	20.19	2.09	40.84	36.89	431
Diploma	19.88	1.81	35.54	42.77	166
Bachelor	13.28	1.63	36.31	48.78	369
Graduate	13.39	1.57	44.09	40.94	127
Postgraduate	7.64	0.69	43.75	47.92	144
Immigrant status parents					
No parents immigrant	17.43	2.26	42.22	38.09	1,549
1 parent immigrant (out of 2 present)	18.64	2.05	37.95	41.36	440
All present parents immigrant	31.84	1.12	33.33	33.71	267

Table A2**B-cohort: first child care arrangement up to 3 years of age – GIRLS (row percentages)**

	None	Preschool	Formal	Informal	Total
Child is spoken to in non-English					
No	17.90	1.95	42.91	37.24	1,799
Yes	25.16	2.63	30.20	42.01	457
SEIFA advantage/disadvantage quartile					
Lowest	25.05	1.47	39.37	34.11	475
Second	22.96	1.85	40.22	34.98	649
Third	16.89	1.69	42.40	39.02	533
Highest	13.19	3.17	39.40	44.24	599
SEIFA disadvantage quartile					
Lowest	25.36	2.29	34.93	37.42	481
Second	21.21	1.68	44.61	32.49	594
Third	17.72	1.18	41.34	39.76	508
Highest	14.71	2.97	39.67	42.64	673
Area Remoteness					
Highly accessible	18.03	2.02	36.82	43.13	1,187
Accessible	18.93	2.75	44.06	34.25	581
Moderately accessible	22.64	1.35	44.2	31.81	371
Remote	27.17	2.17	42.39	28.26	92

Source: LSAC data, B-cohort, waves 1 to 4.

Table A3
B-cohort: Age of first child care arrangement - BOYS (row percentages)

	Never before school	0 to 3 months	3 to 12 months	12 to 23 months	2 to 3 years	3 to 4 years	Total obs.
Total number of observations	477	243	977	375	253	22	2,350
<i>Percentage</i>	20.30	10.34	41.57	15.96	10.77	0.94	100
Number of people in the household							
2	5.56	16.67	48.15	18.52	9.26	1.85	54
3	14.80	11.22	50.12	14.80	8.59	0.24	419
4	16.79	9.65	45.83	16.60	10.11	0.83	1,078
5	23.09	11.74	32.09	17.81	14.09	1.17	511
6	39.23	7.73	25.97	13.26	11.05	2.76	181
7	39.25	8.41	33.64	8.41	10.28	0.00	107
Number of siblings in the household							
0	13.48	11.30	49.57	16.09	8.91	0.43	460
1	16.42	10.17	46.39	16.25	9.73	0.87	1,151
2	24.76	10.83	31.14	17.21	14.89	1.16	517
3	45.27	8.11	21.62	12.84	9.46	2.70	148
4	41.89	8.11	29.73	8.11	12.16	0.00	74
Highest education of the mother							
Year 9 or below	18.97	14.66	37.07	14.66	13.79	0.86	232
Year 10	24.83	6.90	31.03	26.21	10.34	0.69	145
Year 11	28.36	11.94	32.84	17.91	8.96	0.00	67
Year 12	23.81	7.62	39.52	14.76	13.81	0.48	210
Certificate	20.39	9.99	45.71	14.35	8.44	0.98	711
Diploma	18.42	11.84	42.11	11.18	15.79	0.66	152
Bachelor	18.07	10.90	42.06	17.76	9.97	0.62	321
Graduate	15.18	9.82	47.32	14.29	11.61	1.79	112
Postgraduate	17.76	11.84	43.42	17.11	9.21	0.66	152
Highest education of the father							
Year 9 or below	43.59	15.38	25.64	12.82	2.56	0.00	39
Year 10	25.66	9.73	25.66	21.24	17.70	0.00	113
Year 11	35.29	4.41	32.35	14.71	11.76	1.47	68
Year 12	23.62	8.12	39.48	16.61	11.44	0.74	271
Certificate	20.35	12.91	40.48	15.32	10.07	0.88	457
Diploma	22.34	12.23	40.43	14.36	9.57	0.53	188
Bachelor	15.04	10.26	48.21	15.75	9.79	0.72	419
Graduate	20.44	5.84	45.99	16.06	9.49	2.19	137
Postgraduate	15.89	11.26	45.03	16.56	10.60	0.66	151
Immigrant status parents							
No parents immigrant	18.32	10.40	43.69	16.21	10.40	0.99	1,616
1 parent immigrant (out of 2 present)	21.92	10.27	40.87	15.53	10.27	1.14	438
All present parents immigrant	28.72	10.14	31.08	15.2	13.51	0.34	296

Table A3
B-cohort: Age of first child care arrangement - BOYS (row percentages)

	Never before school	0 to 3 months	3 to 12 months	12 to 23 months	2 to 3 years	3 to 4 years	Total obs.
Child is spoken to in non-English							
No	19.10	9.89	42.44	16.38	11.15	0.99	1,911
Yes	25.51	12.30	37.81	14.12	9.11	0.68	439
SEIFA advantage/disadvantage quartile							
Lowest	22.65	10.61	40.20	14.90	10.20	1.43	490
Second	22.21	10.74	39.54	15.90	10.46	0.86	698
Third	18.53	10.36	43.23	16.53	10.96	0.40	502
Highest	17.88	9.70	43.48	16.36	11.36	1.06	660
SEIFA disadvantage quartile							
Lowest	23.48	10.32	40.69	14.37	9.11	1.62	494
Second	21.39	10.14	38.99	17.75	11.09	0.63	631
Third	18.58	10.28	44.47	14.82	11.26	0.59	506
Highest	18.36	10.57	42.42	16.27	11.27	0.97	719
Area Remoteness							
Highly accessible	20.36	10.81	40.72	15.97	10.73	1.17	1,277
Accessible	20.11	9.96	41.28	17.26	10.85	0.53	562
Moderately accessible	18.27	9.14	44.67	16.24	10.66	1.02	394
Remote	27.59	11.49	42.53	6.90	11.49	0.00	87

Source: LSAC data, B-cohort, waves 1 to 4.

Table A4
B-cohort: Age of first child care arrangement - GIRLS (row percentages)

	Never before school	0 to 3 months	3 to 12 months	12 to 23 months	2 to 3 years	3 to 4 years	Total obs.
Total number of observations	448	212	917	401	261	17	2,256
<i>Percentage</i>	<i>19.86</i>	<i>9.40</i>	<i>40.65</i>	<i>17.77</i>	<i>11.57</i>	<i>0.75</i>	<i>100</i>
Number of people in the household							
2	13.64	9.09	50.00	15.91	11.36	0.00	44
3	13.37	10.03	46.27	20.05	10.28	0.00	389
4	17.81	8.18	44.08	17.81	11.45	0.67	1,039
5	21.54	10.19	35.77	18.27	12.69	1.54	520
6	32.20	10.73	31.64	14.69	10.17	0.56	177
7	41.38	13.79	17.24	11.49	14.94	1.15	87
Number of siblings in the household							
0	13.23	10.21	47.80	19.03	9.74	0.00	431
1	18.02	9.10	43.06	17.93	11.26	0.63	1,110
2	22.02	10.51	35.35	17.58	13.13	1.41	495
3	31.06	7.45	30.43	18.01	11.80	1.24	161
4	54.24	5.08	15.25	6.78	16.95	1.69	59
Highest education of the mother							
Year 9 or below	19.17	12.08	35.00	16.25	16.25	1.25	240
Year 10	21.01	10.92	35.29	23.53	9.24	0.00	119
Year 11	22.03	10.17	44.07	15.25	5.08	3.39	59
Year 12	18.95	8.95	41.05	17.89	13.16	0.00	190
Certificate	21.18	7.17	37.23	20.40	13.24	0.78	642
Diploma	19.66	5.62	51.12	11.80	10.67	1.12	178
Bachelor	13.55	9.68	47.74	17.10	11.61	0.32	310
Graduate	20.34	6.78	46.61	20.34	5.08	0.85	118
Postgraduate	13.64	10.61	51.52	15.91	7.58	0.76	132
Highest education of the father							
Year 9 or below	31.58	13.16	7.89	15.79	31.58	0.00	38
Year 10	34.45	7.56	29.41	17.65	10.92	0.00	119
Year 11	26.67	6.67	33.33	16.00	17.33	0.00	75
Year 12	20.50	9.35	34.17	23.74	11.51	0.72	278
Certificate	20.65	6.26	33.87	23.67	14.39	1.16	431
Diploma	21.08	9.04	47.59	10.24	12.05	0.00	166
Bachelor	14.09	8.94	53.39	14.91	7.86	0.81	369
Graduate	13.39	7.09	51.18	17.32	10.24	0.79	127
Postgraduate	8.33	9.72	61.81	13.19	6.94	0.00	144
Immigrant status parents							
No parents immigrant	17.95	8.33	43.25	18.21	11.36	0.90	1,549
1 parent immigrant (out of 2 present)	19.55	12.95	37.73	17.5	11.82	0.45	440
All present parents immigrant	31.46	9.74	30.34	15.73	12.36	0.37	267

Table A4
B-cohort: Age of first child care arrangement - GIRLS (row percentages)

	Never before school	0 to 3 months	3 to 12 months	12 to 23 months	2 to 3 years	3 to 4 years	Total obs.
Child is spoken to in non-English							
No	18.51	8.78	42.25	18.12	11.56	0.78	1,799
Yes	25.16	11.82	34.35	16.41	11.60	0.66	457
SEIFA advantage/disadvantage quartile							
Lowest	25.47	11.37	31.58	18.95	12.00	0.63	475
Second	23.11	8.01	39.45	15.72	12.48	1.23	649
Third	17.82	9.57	41.09	19.51	11.44	0.56	533
Highest	13.69	9.18	48.75	17.53	10.35	0.50	599
SEIFA disadvantage quartile							
Lowest	25.36	12.27	31.39	17.46	12.47	1.04	481
Second	22.39	8.59	38.72	16.84	12.96	0.51	594
Third	18.11	7.87	44.88	18.31	10.04	0.79	508
Highest	15.01	9.21	45.77	18.42	10.85	0.74	673
Area Remoteness							
Highly accessible	18.62	10.61	41.95	17.35	10.87	0.59	1,187
Accessible	19.45	7.75	41.14	18.59	11.88	1.20	581
Moderately accessible	22.64	8.36	37.47	17.25	13.48	0.81	371
Remote	28.26	8.70	29.35	20.65	13.04	0.00	92

Source: LSAC data, B-cohort, waves 1 to 4.

Table A5
B-cohort: child care arrangement at 2-3 years of age – BOYS (row percentages)

	None	Preschool or school	Formal & mixed	Informal only	Total obs.
Total number of observations	719	63	1,292	276	2,350
<i>Percentage</i>	<i>30.60</i>	<i>2.68</i>	<i>54.98</i>	<i>11.74</i>	<i>100</i>
Number of people in the household					
2	14.81	0.00	77.78	7.41	54
3	22.43	3.10	63.25	11.22	419
4	27.37	2.88	57.42	12.34	1,078
5	35.23	2.35	50.29	12.13	511
6	48.62	2.76	38.67	9.94	181
7	50.47	1.87	36.45	11.21	107
Number of siblings in the household					
0	23.04	2.17	63.26	11.52	460
1	26.41	2.95	58.38	12.25	1,151
2	36.56	2.51	49.13	11.80	517
3	55.41	2.70	33.11	8.78	148
4	51.35	2.70	35.14	10.81	74
Highest education of the mother					
Year 9 or below	27.59	2.59	61.21	8.62	232
Year 10	35.86	2.07	48.97	13.10	145
Year 11	38.81	1.49	52.24	7.46	67
Year 12	33.81	3.33	54.29	8.57	210
Certificate	32.07	2.67	52.88	12.38	711
Diploma	26.97	1.97	58.55	12.50	152
Bachelor	25.23	2.80	58.57	13.40	321
Graduate	25.00	1.79	58.04	15.18	112
Postgraduate	25.00	3.29	57.89	13.82	152
Highest education of the father					
Year 9 or below	58.97	5.13	25.64	10.26	39
Year 10	38.94	4.42	45.13	11.50	113
Year 11	48.53	0.00	50.00	1.47	68
Year 12	34.32	1.85	52.40	11.44	271
Certificate	30.20	2.63	54.92	12.25	457
Diploma	32.45	1.60	53.72	12.23	188
Bachelor	25.30	3.34	59.67	11.69	419
Graduate	29.20	2.19	54.01	14.60	137
Postgraduate	21.19	3.97	56.29	18.54	151
Immigrant status parents					
No parents immigrant	29.08	2.41	56.62	11.88	1,616
1 parent immigrant (out of 2 present)	29.22	3.2	56.16	11.42	438
All present parents immigrant	40.88	3.38	44.26	11.49	296

Table A5
B-cohort: child care arrangement at 2-3 years of age – BOYS (row percentages)

	None	Preschool or school	Formal & mixed	Informal only	Total obs.
Child is spoken to in non-English					
No	29.46	2.67	57.14	10.73	1,911
Yes	35.54	2.73	45.56	16.17	439
SEIFA advantage/disadvantage quartile					
Lowest	35.92	1.22	48.57	14.29	490
Second	32.23	3.44	53.87	10.46	698
Third	29.28	2.19	57.97	10.56	502
Highest	25.91	3.33	58.64	12.12	660
SEIFA disadvantage quartile					
Lowest	35.02	2.83	48.99	13.16	494
Second	32.49	2.69	53.25	11.57	631
Third	28.46	1.38	60.08	10.08	506
Highest	27.40	3.48	57.02	12.10	719
Area Remoteness					
Highly accessible	29.52	3.29	54.58	12.61	1,277
Accessible	30.25	3.02	57.47	9.25	562
Moderately accessible	31.22	1.02	54.31	13.45	394
Remote	42.53	0.00	48.28	9.20	87

Source: LSAC data, B-cohort, wave 2.

Table A6
B-cohort: child care arrangement at 2-3 years of age – GIRLS (row percentages)

	None	Preschool or school	Formal & mixed	Informal only	Total obs.
Total number of observations	643	73	1271	269	2,256
<i>Percentage</i>	28.50	3.24	56.34	11.92	100
Number of people in the household					
2	20.45	0.00	68.18	11.36	44
3	19.54	3.34	61.95	15.17	389
4	26.18	2.98	60.25	10.59	1,039
5	31.73	4.04	52.88	11.35	520
6	41.81	3.39	40.68	14.12	177
7	54.02	2.30	31.03	12.64	87
Number of siblings in the household					
0	20.42	2.78	61.02	15.78	431
1	26.67	3.06	59.55	10.72	1,110
2	31.52	4.04	52.53	11.92	495
3	41.61	3.11	45.34	9.94	161
4	61.02	3.39	23.73	11.86	59
Highest education of the mother					
Year 9 or below	28.33	4.58	54.58	12.50	240
Year 10	29.41	3.36	58.82	8.40	119
Year 11	37.29	1.69	52.54	8.47	59
Year 12	30.53	3.16	53.68	12.63	190
Certificate	28.97	2.96	58.26	9.81	642
Diploma	26.40	3.37	55.06	15.17	178
Bachelor	21.29	2.90	59.68	16.13	310
Graduate	30.51	2.54	55.08	11.86	118
Postgraduate	20.45	3.79	64.39	11.36	132
Highest education of the father					
Year 9 or below	39.47	0.00	52.63	7.89	38
Year 10	41.18	2.52	47.06	9.24	119
Year 11	36.00	4.00	48.00	12.00	75
Year 12	29.14	5.04	55.40	10.43	278
Certificate	29.70	2.55	56.38	11.37	431
Diploma	27.11	1.81	60.84	10.24	166
Bachelor	24.12	3.52	55.56	16.80	369
Graduate	22.05	2.36	59.84	15.75	127
Postgraduate	16.67	2.78	69.44	11.11	144
Immigrant status parents					
No parents immigrant	26.53	3.68	58.36	11.43	1,549
1 parent immigrant (out of 2 present)	26.59	2.05	57.27	14.09	440
All present parents immigrant	43.07	2.62	43.07	11.24	267

Table A6
B-cohort: child care arrangement at 2-3 years of age – GIRLS (row percentages)

	None	Preschool or school	Formal & mixed	Informal only	Total obs.
Child is spoken to in non-English					
No	26.74	3.39	59.20	10.67	1,799
Yes	35.45	2.63	45.08	16.85	457
SEIFA advantage/disadvantage quartile					
Lowest	36.84	3.58	48.21	11.37	475
Second	30.97	2.16	54.70	12.17	649
Third	25.89	2.25	60.98	10.88	533
Highest	21.54	5.01	60.43	13.02	599
SEIFA disadvantage quartile					
Lowest	37.01	3.95	45.53	13.51	481
Second	29.63	2.36	57.91	10.10	594
Third	26.57	1.77	60.04	11.61	508
Highest	22.88	4.61	59.88	12.63	673
Area Remoteness					
Highly accessible	26.12	2.95	57.71	13.23	1,187
Accessible	29.78	4.13	55.77	10.33	581
Moderately accessible	31.27	3.23	54.99	10.51	371
Remote	40.22	2.17	46.74	10.87	92

Source: LSAC data, B-cohort, wave 2.

Table A7
K-cohort: first child care arrangement up to 3 years of age - BOYS (row percentages)

	None	School or Pre- school	Formal	Informal	Total
Total number of observations	1037	75	908	517	2537
<i>Percentage of observations</i>	<i>40.88</i>	<i>2.96</i>	<i>35.79</i>	<i>20.38</i>	<i>100</i>
Number of people in the household					
2	27.27	0.00	46.97	25.76	66
3	35.74	4.08	39.18	21.00	319
4	35.66	2.68	38.87	22.79	1119
5	43.81	3.02	35.80	17.37	662
6	55.92	2.45	26.12	15.51	245
7 or more	62.70	4.76	12.70	19.84	126
Number of siblings in the household					
0	31.16	3.42	42.47	22.95	292
1	36.11	2.59	37.73	23.56	1235
2	43.34	2.81	36.83	17.01	676
3	59.31	3.46	25.11	12.12	231
4 or more	67.96	5.83	10.68	15.53	103
Highest education of the mother					
Postgraduate	24.49	1.36	47.62	26.53	147
Graduate Diploma	35.06	2.60	37.01	25.32	154
Bachelor	30.73	1.71	43.90	23.66	410
Diploma	34.76	3.86	42.06	19.31	233
Certificate	41.78	3.60	33.65	20.97	639
Year 12	46.51	3.13	31.57	18.80	415
Year 11	43.37	3.61	34.94	18.07	166
Year 10 or below	56.29	3.14	26.57	14.00	350
Highest education of the father					
Postgraduate	31.36	0.59	44.97	23.08	169
Graduate Diploma	35.00	5.00	34.29	25.71	140
Bachelor	34.69	2.81	42.50	20.00	320
Diploma	38.64	2.27	38.64	20.45	176
Certificate	42.78	3.29	33.54	20.38	790
Year 12	33.02	3.72	38.60	24.65	215
Year 11	49.41	4.71	30.59	15.29	85
Year 10 or below	51.07	2.14	28.57	18.21	280
Immigration status parents					
No parents immigrant	38.74	3.22	36.55	21.49	1740
1 parent immigrant (out of 2 present)	40.88	3.16	35.52	20.44	411
All present parents immigrant	50.41	1.65	32.51	15.43	363

Table A7
K-cohort: first child care arrangement up to 3 years of age - BOYS (row percentages)

	None	School or Pre- school	Formal	Informal	Total
Does child speak a language different from English at home?					
No	39.21	3.02	37.36	20.41	2219
Yes	52.52	2.52	24.84	20.13	318
SEIFA quartile (advantage / disadvantage)					
Highest quartile	45.27	2.97	33.38	18.38	740
Third quartile	42.74	2.77	32.79	21.70	613
Second quartile	40.06	3.07	35.70	21.16	619
Lowest quartile	33.98	3.01	42.30	20.71	565
SEIFA quartile (disadvantage)					
Highest quartile	45.39	2.68	33.18	18.75	672
Third quartile	41.71	2.94	33.56	21.79	748
Second quartile	40.11	2.47	36.12	21.29	526
Lowest quartile	35.36	3.72	41.29	19.63	591
Accessibility of area					
Highly accessible	38.84	3.37	36.80	20.99	1367
Accessible	42.57	2.34	35.73	19.37	599
Moderately accessible	41.12	2.80	36.45	19.63	428
Remote	52.99	2.56	21.37	23.08	117

Source: LSAC data, K-cohort, wave 1.

Table A8
K-cohort: first child care arrangement up to 3 years of age – GIRLS (row percentages)

	None	School or Pre- school	Formal	Informal	Total
Total number of observations	1037	72	826	511	2446
<i>Percentage of observations</i>	<i>42.40</i>	<i>2.94</i>	<i>33.77</i>	<i>20.89</i>	<i>100.00</i>
Number of people in the household					
2	42.19	4.69	29.69	23.44	64
3	34.87	2.96	40.46	21.71	304
4	36.77	2.46	36.29	24.48	1058
5	45.18	3.22	33.23	18.38	653
6	56.78	4.66	25.00	13.56	236
7 or more	65.65	1.53	18.32	14.50	131
Number of siblings in the household					
0	32.37	3.24	39.21	25.18	278
1	37.61	2.46	36.08	23.85	1178
2	45.88	3.20	32.62	18.29	656
3	56.71	4.76	25.97	12.55	231
4 or more	69.90	1.94	17.48	10.68	103
Highest education of the mother					
Postgraduate	21.62	6.76	40.54	31.08	148
Graduate Diploma	35.44	1.90	36.08	26.58	158
Bachelor	34.95	1.79	34.95	28.32	392
Diploma	37.50	4.33	39.42	18.75	208
Certificate	41.68	2.86	35.46	20.00	595
Year 12	41.99	2.21	35.36	20.44	362
Year 11	50.94	3.14	27.67	18.24	159
Year 10 or below	59.75	2.96	25.43	11.85	405
Highest education of the father					
Postgraduate	30.41	4.68	39.77	25.15	171
Graduate Diploma	33.61	2.52	43.70	20.17	119
Bachelor	37.27	3.03	31.52	28.18	330
Diploma	38.01	1.17	35.09	25.73	171
Certificate	46.81	2.71	31.34	19.13	737
Year 12	35.74	4.26	37.02	22.98	235
Year 11	50.54	2.15	29.03	18.28	93
Year 10 or below	49.22	1.95	29.69	19.14	256
Immigration status parents					
No parents immigrant	41.85	2.59	33.77	21.79	1620
1 parent immigrant (out of 2 present)	36.46	4.37	36.46	22.71	458
All present parents immigrant	52.52	2.67	30.27	14.54	337

Table A8
K-cohort: first child care arrangement up to 3 years of age – GIRLS (row percentages)

	None	School or Pre- school	Formal	Informal	Total
Does child speak a language different from English at home?					
No	40.56	2.90	35.37	21.17	2,140
Yes	55.23	3.27	22.55	18.95	306
SEIFA quartile (advantage / disadvantage)					
Highest quartile	50.07	2.96	29.62	17.35	709
Third quartile	42.18	3.82	32.55	21.45	550
Second quartile	44.09	2.83	32.11	20.97	601
Lowest quartile	31.57	2.22	41.64	24.57	586
SEIFA quartile (disadvantage)					
Highest quartile	47.31	2.76	31.49	18.43	651
Third quartile	44.49	3.48	31.59	20.43	690
Second quartile	41.37	3.42	34.54	20.68	527
Lowest quartile	35.29	2.08	38.24	24.39	578
Accessibility of area					
Highly accessible	40.67	2.70	34.23	22.40	1,335
Accessible	40.25	4.08	35.64	20.04	564
Moderately accessible	47.20	2.57	30.61	19.63	428
Remote	58.59	2.02	29.29	10.10	99

Source: LSAC data, K-cohort, wave 1.

Table A9
K-cohort: Age of first child care arrangement – BOYS (row percentages)

	Never before school	0 to 3 months	3 to 12 months	12 to 23 months	2 to 3 years	3 to 4 years	Total obs.
Total number of observations	535	118	622	481	279	502	2,537
<i>Percentage of observations</i>	21.09	4.65	24.52	18.96	11.00	19.79	100.0
Number of people in the household							
2	9.09	7.58	33.33	21.21	10.61	18.18	66
3	19.12	5.02	23.82	21.63	13.79	16.61	319
4	16.35	5.00	27.88	21.00	10.46	19.30	1,119
5	24.32	3.63	23.87	17.07	11.63	19.49	662
6	31.02	5.71	12.65	13.88	11.84	24.90	245
7 or more	38.10	2.38	18.25	12.70	3.97	24.60	126
Number of siblings in the household							
0	16.78	5.14	28.42	21.23	14.04	14.38	292
1	16.84	5.10	27.45	20.97	10.36	19.27	1,235
2	22.63	3.85	23.08	18.05	11.69	20.71	676
3	35.93	5.63	12.55	11.26	11.26	23.38	231
4 or more	40.78	0.97	14.56	11.65	4.85	27.18	103
Highest education of the mother							
Postgraduate	8.84	8.84	41.50	17.69	7.48	15.65	147
Graduate Diploma	16.23	5.84	28.57	22.73	7.79	18.83	154
Bachelor	12.93	3.41	34.15	21.46	10.24	17.80	410
Diploma	14.59	4.29	26.61	21.89	12.45	20.17	233
Certificate	20.81	3.44	23.94	19.25	11.58	20.97	639
Year 12	27.23	6.27	20.24	14.70	12.29	19.28	415
Year 11	19.88	4.22	18.67	19.88	13.86	23.49	166
Year 10 or below	35.71	4.86	12.57	16.86	9.43	20.57	350
Highest education of the father							
Postgraduate	11.83	5.92	32.54	19.53	10.65	19.53	169
Graduate Diploma	20.00	5.71	31.43	19.29	8.57	15.00	140
Bachelor	16.25	5.00	26.88	20.94	12.50	18.44	320
Diploma	17.05	3.98	30.68	14.20	12.50	21.59	176
Certificate	23.16	4.30	23.67	18.61	10.63	19.62	790
Year 12	14.42	6.98	32.56	14.88	12.56	18.60	215
Year 11	22.35	1.18	18.82	20.00	10.59	27.06	85
Year 10 or below	30.00	3.93	15.71	19.64	9.64	21.07	280
Immigration status parents							
No parents immigrant	19.02	4.66	24.89	20.52	11.21	19.71	1,740
1 parent immigrant (out of 2 present)	20.68	6.33	26.03	15.82	10.95	20.19	411
All present parents immigrant	30.30	3.03	21.49	14.33	10.74	20.11	363

Table A9
K-cohort: Age of first child care arrangement – BOYS (row percentages)

	Never before school	0 to 3 months	3 to 12 months	12 to 23 months	2 to 3 years	3 to 4 years	Total obs.
Does child speak a language different from English at home?							
No	19.11	4.78	25.55	19.56	10.91	20.10	2219.
Yes	34.91	3.77	17.30	14.78	11.64	17.61	318.0
SEIFA quartile (advantage /							
Lowest quartile	26.35	4.86	21.22	17.03	11.62	18.92	740
Second quartile	21.70	5.38	22.84	20.72	8.32	21.04	613
Third quartile	19.71	4.36	24.39	17.93	13.25	20.36	619
Highest quartile	15.04	3.89	30.80	20.71	10.62	18.94	565
SEIFA quartile (disadvantage)							
Highest quartile	26.64	4.76	22.32	16.37	11.16	18.75	672
Third quartile	20.86	5.35	22.33	20.05	10.56	20.86	748
Second quartile	20.53	3.80	24.90	20.53	10.65	19.58	526
Lowest quartile	15.57	4.40	29.44	19.12	11.68	19.80	591
Accessibility of area							
Highly accessible	19.82	4.02	25.60	19.90	11.63	19.02	1,367
Accessible	20.53	5.84	23.04	17.36	11.19	22.04	599
Moderately accessible	23.60	4.91	23.60	19.39	10.98	17.52	428
Remote	27.35	4.27	26.50	11.97	4.27	25.64	117

Source: LSAC data, K-cohort, wave 1.

Table A10
K-cohort: Age of first child care arrangement – GIRLS (row percentages)

	Never before school	0 to 3 months	3 to 12 months	12 to 23 months	2 to 3 years	3 to 4 years	Total obs.
Total number of observations	554	137	595	422	255	483	2,446
<i>Percentage of observations</i>	<i>22.65</i>	<i>5.60</i>	<i>24.33</i>	<i>17.25</i>	<i>10.43</i>	<i>19.75</i>	<i>100</i>
Number of people in the household							
2	25.00	7.81	12.50	23.44	14.06	17.19	64
3	19.74	7.57	25.66	20.39	11.51	15.13	304
4	17.67	5.39	28.07	19.38	10.40	19.09	1,058
5	23.28	4.75	25.57	13.63	10.87	21.90	653
6	32.63	4.66	13.98	14.83	9.75	24.15	236
7 or more	47.33	7.63	9.16	12.21	5.34	18.32	131
Number of siblings in the household							
0	19.78	7.55	27.70	23.02	9.35	12.59	278
1	18.17	5.18	27.76	18.76	10.70	19.44	1,178
2	23.78	5.64	23.63	13.72	11.13	22.10	656
3	32.90	5.63	12.55	14.72	10.39	23.81	231
4 or more	51.46	4.85	6.80	12.62	5.83	18.45	103
Highest education of the mother							
Postgraduate	10.81	10.14	39.19	21.62	7.43	10.81	148
Graduate Diploma	12.66	6.33	33.54	15.82	8.86	22.78	158
Bachelor	17.60	6.12	31.12	19.64	8.16	17.35	392
Diploma	17.31	4.81	27.88	15.87	13.94	20.19	208
Certificate	19.33	5.38	20.34	20.00	12.61	22.35	595
Year 12	22.38	5.25	27.90	15.47	9.39	19.61	362
Year 11	30.19	5.03	17.61	11.32	15.09	20.75	159
Year 10 or below	40.49	4.44	12.59	14.57	8.64	19.26	405
Highest education of the father							
Postgraduate	16.37	5.85	37.43	19.30	7.02	14.04	171
Graduate Diploma	15.13	6.72	21.01	26.89	11.76	18.49	119
Bachelor	13.64	5.76	31.21	16.67	9.09	23.64	330
Diploma	19.88	6.43	28.65	18.13	8.77	18.13	171
Certificate	23.34	3.53	22.39	16.96	10.31	23.47	737
Year 12	22.98	9.79	28.51	14.47	11.49	12.77	235
Year 11	33.33	5.38	20.43	13.98	9.68	17.20	93
Year 10 or below	29.69	6.25	18.75	13.28	12.50	19.53	256
Immigration status parents							
No parents immigrant	21.36	5.56	26.11	16.54	9.94	20.49	1,620
1 parent immigrant (out of 2 present)	20.96	6.77	24.45	19.00	13.32	15.50	458
All present parents immigrant	31.16	4.15	16.32	18.40	8.61	21.36	337

Table A10
K-cohort: Age of first child care arrangement – GIRLS (row percentages)

	Never before school	0 to 3 months	3 to 12 months	12 to 23 months	2 to 3 years	3 to 4 years	Total obs.
Does child speak a language different from English at home?							
No	21.17	5.84	25.56	17.57	10.47	19.39	2,140
Yes	33.01	3.92	15.69	15.03	10.13	22.22	306
SEIFA quartile (advantage /							
Lowest quartile	28.91	4.51	18.62	14.53	12.27	21.16	709
Second quartile	22.00	6.36	24.55	17.09	9.82	20.18	550
Third quartile	24.79	5.49	23.46	16.81	10.15	19.3	601
Highest quartile	13.48	6.31	31.91	21.16	9.04	18.09	586
SEIFA quartile (disadvantage)							
Highest quartile	26.42	5.22	17.97	16.44	13.06	20.89	651
Third quartile	25.22	5.51	24.64	15.36	10	19.28	690
Second quartile	20.87	5.31	24.67	18.41	10.25	20.49	527
Lowest quartile	16.96	6.40	30.80	19.38	8.13	18.34	578
Accessibility of area							
Highly accessible	20.37	5.99	25.24	17.98	10.11	20.3	1,335
Accessible	18.26	5.67	24.82	16.67	12.59	21.99	564
Moderately accessible	32.48	4.67	21.26	16.82	10.05	14.72	428
Remote	37.37	3.03	20.20	12.12	6.06	21.21	99

Source: LSAC data, K-cohort, wave 1.

Appendix B

Table B1
Regression results for learning outcomes of boys in Wave 3

	lag and constant only	+ child care details (incl. qual. Carer)	+ child care details	+ ind. and hh char.	+ lagged ind. and hh char.
	(1)	(2)	(3)	(4)	(5)
Lagged learning index	0.314*** (0.021)	0.290*** (0.025)	0.310*** (0.022)	0.288*** (0.022)	0.298*** (0.024)
Age of first child care (ref. < 3 months)					
3 - 6 months		0.460 (1.046)	-0.268 (0.899)	0.178 (0.907)	-0.776 (0.999)
6 - 9 months		0.373 (1.053)	-0.068 (0.888)	0.060 (0.900)	-0.228 (0.981)
9 - 12 months		0.300 (1.154)	-0.368 (0.967)	-0.672 (0.977)	-0.767 (1.061)
1 - 1.5 years		0.841 (1.129)	0.224 (0.968)	0.436 (0.991)	-0.216 (1.100)
1.5 - 2 years		-1.301 (1.199)	-1.514 (1.004)	-0.678 (1.019)	-0.222 (1.136)
2 - 3 years		-0.508 (1.119)	-1.257 (0.942)	-0.891 (0.956)	-0.874 (1.068)
3 - 4 years		1.135 (1.286)	0.661 (1.208)	0.411 (1.236)	0.706 (1.373)
> 4 years		2.644** (1.229)	2.201* (1.156)	2.496** (1.182)	3.208** (1.324)
Type of child care used in t-1 (multiple possible)					
Day care centre		-1.139 (2.464)	0.074 (1.502)	-0.892 (1.506)	-1.553 (1.646)
Other formal care		-0.787 (1.532)	-0.802 (1.272)	-1.297 (1.275)	-1.949 (1.412)
Relatives		-0.331 (1.547)	-0.364 (1.349)	-1.175 (1.357)	-1.859 (1.513)
Other informal care		0.682 (1.714)	-0.032 (1.507)	-1.073 (1.522)	-0.930 (1.707)
Preschool		2.481* (1.490)	2.166 (1.343)	1.625 (1.353)	1.444 (1.508)
Mixed formal and informal		0.855 (1.706)	0.589 (1.416)	1.517 (1.422)	2.165 (1.571)
Hours in child care in t-1					
1-14 hours/week		2.684 (1.658)	2.769* (1.451)	3.033** (1.462)	4.357*** (1.628)
15-29 hours/week		2.931* (1.766)	3.118** (1.537)	3.631** (1.559)	5.341*** (1.734)

Table B1
Regression results for learning outcomes of boys in Wave 3

	lag and constant only	+ child care details (incl. qual. Carer)	+ child care details	+ ind. and hh char.	+ lagged ind. and hh char.
30 or more hours/week		2.081 (1.844)	2.517 (1.585)	3.576** (1.630)	5.240*** (1.872)
any time in dcc*income group (ref. is high income group)					
low income		-1.055 (1.889)	0.880 (1.465)	1.134 (1.519)	-0.557 (1.697)
middle income		-1.619 (1.269)	0.161 (0.966)	0.602 (0.981)	-0.086 (1.068)
any time in dcc*children per adult		0.245 (0.235)	0.088 (0.147)	0.009 (0.148)	0.002 (0.160)
any time in dcc*qualification of carer (ref. is Year 12 or less)					
graduate degree		1.994 (1.957)			
diploma		0.649 (1.768)			
certificate		1.670 (2.050)			
any time in dcc*carer is qualified in related field		0.242 (1.407)			
low income		-4.417*** (0.991)	-4.441*** (0.982)	-2.541** (1.112)	-3.326** (1.484)
middle income		-1.918*** (0.656)	-1.922*** (0.647)	-0.601 (0.691)	-0.605 (0.823)
any time in dcc*ATSI descent			-6.981*** (2.703)	-6.509** (2.920)	-3.390 (3.202)
ATSI descent			0.295 (1.848)	1.835 (2.017)	-0.087 (2.282)
Exact age of child				3.608*** (1.012)	4.103*** (1.119)
Child health is (ref. is excellent)					
poor/fair				1.054 (1.796)	0.102 (2.091)
very good/good				-0.255 (0.460)	-0.061 (0.534)
child is oldest				0.183 (0.520)	0.323 (0.580)
number of siblings				-0.539** (0.272)	-0.753** (0.321)
Weekly household income				0.000* (0.000)	0.000 (0.000)

Table B1
Regression results for learning outcomes of boys in Wave 3

	lag and constant only	+ child care details (incl. qual. Carer)	+ child care details	+ ind. and hh char.	+ lagged ind. and hh char.
Two parents (father: Year 9 or less, not working)				-3.267 (2.256)	-4.888* (2.820)
Education (ref. is Year 9 or less)					
Mother: Year 10 or 11				1.334 (2.352)	0.603 (2.544)
Mother: Year 12				3.582 (2.317)	3.373 (2.501)
Mother: certificate				3.934* (2.251)	4.071* (2.434)
Mother: diploma				4.852** (2.318)	3.786 (2.509)
Mother: graduate degree				3.819* (2.273)	3.840 (2.455)
Father: Year 10 or 11				3.087 (2.044)	4.512* (2.396)
Father: Year 12				3.708* (2.039)	4.072* (2.405)
Father: certificate				2.617 (1.917)	4.151* (2.279)
Father: diploma				3.350 (2.059)	5.100** (2.422)
Father: graduate degree				6.223*** (1.957)	6.961*** (2.318)
Employment mother (ref. is not working)					
Part time				0.729 (0.534)	0.986 (0.637)
Full time				-0.529 (0.707)	-0.127 (0.864)
Employment father (ref. is not working)					
Part time				2.332 (1.758)	0.824 (2.074)
Full time				0.568 (1.234)	0.701 (1.589)
<i>Lagged characteristics:</i>					
Child health: poor/fair in t-1					1.280 (1.764)
Child health: very good/good in t-1					-0.510 (0.533)

Table B1
Regression results for learning outcomes of boys in Wave 3

	lag and constant only	+ child care details (incl. qual. Carer)	+ child care details	+ ind. and hh char.	+ lagged ind. and hh char.
Child health: poor/fair in t-2					2.048 (1.414)
Child health: very good/good in t-2					0.000 (0.532)
Weekly household income in t-1					-0.000 (0.001)
Weekly household income in t-2					0.001* (0.000)
Employment mother in t-1 (ref. is not working)					
Part time					-0.597 (0.678)
Full time					0.007 (1.052)
Employment father in t-1 (ref. is not working)					
Part time					0.068 (2.011)
Full time					-2.153 (1.702)
Employment mother in t-2 (ref. is not working)					
Part time					0.032 (0.628)
Full time					-1.320 (0.990)
Employment father in t-2 (ref. is not working)					
Part time					2.346 (1.890)
Full time					1.529 (1.516)
Constant	68.269*** (2.053)	69.324*** (2.723)	67.812*** (2.387)	46.836*** (5.877)	44.195*** (6.430)
R-squared	0.115	0.177	0.184	0.239	0.270
Number of observations	1781	1192	1561	1455	1224

Source: LSAC data, B-cohort, Wave 1 to Wave 3.

Note: standard errors in parentheses. ***, ** and * indicate statistical significance at 1%, 5% and 10% respectively. The addition of the word “lagged” indicates that the variable is from the previous wave.

Table B2
Regression results, matched sample, additional results

	NAPLAN YEAR 3, READING				NAPLAN YEAR 3, WRITING				NAPLAN YEAR 3, NUMERACY			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>Mother education (ref. category: University degree)</i>												
Year10 or below	-55.902*** (12.844)	-68.782*** (12.169)	-49.060*** (12.825)	-42.167*** (11.764)	-51.013*** (10.853)	-46.697*** (10.439)	-27.724*** (9.524)	-31.611*** (8.997)	-46.121*** (12.244)	-61.999*** (10.915)	-45.983*** (10.963)	-38.638*** (10.297)
Year11/12	-23.843** (10.933)	-17.815* (10.512)	-22.084* (11.621)	-24.114** (10.529)	-22.603** (9.248)	-7.425 (9.036)	-20.780** (8.634)	-17.766** (8.054)	-19.436* (10.349)	-33.835*** (9.416)	-21.094** (9.942)	-14.483 (9.178)
Certificate	-33.633*** (8.150)	-36.662*** (7.977)	-37.324*** (8.524)	-33.119*** (8.037)	-18.838*** (6.875)	-22.932*** (6.845)	-19.946*** (6.344)	-23.635*** (6.158)	-29.719*** (7.679)	-46.925*** (7.124)	-31.168*** (7.258)	-19.687*** (7.002)
Diploma	-17.214 (11.839)	-29.922*** (11.122)	-42.880*** (12.701)	-27.424** (11.783)	-18.168* (10.030)	-23.071** (9.561)	-14.191 (9.450)	-23.817*** (9.015)	-25.661** (11.148)	-43.091*** (9.896)	-16.676 (10.792)	-11.065 (10.266)
<i>Father education (ref. category: University degree)</i>												
Year10 or below	-35.917*** (12.867)	-35.926*** (13.279)	-31.249** (13.412)	-50.175*** (12.464)	-22.161** (10.859)	-23.506** (11.314)	-17.680* (9.973)	-18.649* (9.534)	-28.431** (12.161)	-19.072 (11.848)	-40.849*** (11.473)	-33.721*** (10.928)
Year11/12	-8.982 (9.445)	-9.374 (9.447)	-13.713 (10.610)	-17.947* (9.672)	-2.503 (7.970)	-15.567* (8.128)	-9.562 (7.888)	-10.606 (7.390)	-5.288 (8.921)	-3.979 (8.452)	-14.045 (9.028)	-17.242** (8.440)
Certificate	-43.239*** (8.416)	-25.535*** (8.144)	-27.853*** (8.385)	-17.411** (7.935)	-21.758*** (7.092)	-17.349** (6.990)	-5.481 (6.237)	-10.019* (6.082)	-34.841*** (7.911)	-11.653 (7.274)	-28.672*** (7.144)	-21.566*** (6.913)
Diploma	-30.548*** (10.200)	-27.149*** (9.941)	-27.038** (11.026)	-14.460 (11.501)	-12.849 (8.601)	-12.944 (8.514)	-10.398 (8.192)	-1.976 (8.803)	-19.425** (9.653)	-11.493 (8.896)	-20.994** (9.382)	-12.138 (10.015)

Cont.

Table B2, continued

	NAPLAN YEAR 3, READING				NAPLAN YEAR 3, WRITING				NAPLAN YEAR 3, NUMERACY			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Annual family income	0.000*	0.000*	0.000	0.000**	0.000	0.000	0.000	0.000**	0.000	0.000	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Is mother employed	-5.916	-18.129**	-3.704	-15.697*	9.888	-9.302	-5.312	-10.149	1.441	-10.566	-2.873	-12.318*
	(8.375)	(7.887)	(9.086)	(8.351)	(7.061)	(6.733)	(6.778)	(6.413)	(7.901)	(7.025)	(7.743)	(7.275)
Is father employed	-6.411	-1.706	-18.900	5.480	-19.158	10.604	-19.309	10.340	-22.791	7.402	-18.499	-29.853*
	(16.376)	(15.979)	(19.484)	(19.472)	(13.632)	(13.386)	(14.487)	(14.856)	(15.283)	(13.960)	(16.557)	(16.983)
Exact age of the child	17.955**	15.470*	4.538	7.571	8.240	5.842	9.570	13.083*	23.750***	16.042**	0.607	3.617
	(8.622)	(8.649)	(8.936)	(8.817)	(7.261)	(7.389)	(6.639)	(6.739)	(8.213)	(7.772)	(7.605)	(7.681)
Child is the oldest child	32.163	3.345	-31.661	-30.312	-10.396	5.197	-0.821	0.858	-16.484	-3.403	-12.990	-15.704
	(37.072)	(21.168)	(28.153)	(29.538)	(31.393)	(18.199)	(20.940)	(22.637)	(35.130)	(18.892)	(23.927)	(25.695)
Child's number of siblings	-1.565	-1.837	-1.689	-10.600***	0.056	-0.218	-4.773*	-7.516***	0.800	-1.815	-1.357	-6.607**
	(3.522)	(3.411)	(3.812)	(3.613)	(2.974)	(2.918)	(2.839)	(2.763)	(3.329)	(3.036)	(3.248)	(3.149)
<i>Teacher qualification (ref. category: Post-graduate degree)</i>												
Certificate	-51.610**	-28.473	-2.972	-18.183	-16.373	-25.176	-6.407	-8.669	-15.538	0.550	16.060	-27.997
	(21.866)	(21.475)	(33.115)	(24.306)	(18.544)	(18.443)	(24.677)	(18.512)	(20.721)	(19.239)	(30.236)	(21.233)
Diploma	-10.520	9.257	15.576	8.637	-12.471	-1.462	12.130	2.036	-20.381**	-1.641	21.134**	1.854
	(10.172)	(9.641)	(10.189)	(9.570)	(8.588)	(8.248)	(7.550)	(7.317)	(9.649)	(8.607)	(8.675)	(8.340)
Bachelor	-12.999*	1.805	-0.683	0.107	-5.313	-5.122	-2.715	-2.094	-6.646	1.464	1.781	-4.913
	(7.373)	(7.174)	(7.701)	(7.096)	(6.234)	(6.151)	(5.719)	(5.429)	(6.978)	(6.416)	(6.556)	(6.185)
Constant	350.069***	358.336***	482.337***	431.087***	389.794***	403.904***	433.832***	359.192***	323.588***	350.261***	494.289***	458.867***
	(76.205)	(73.921)	(78.448)	(77.448)	(64.078)	(63.131)	(58.291)	(59.238)	(72.405)	(66.255)	(66.796)	(67.457)
<i>R-squared</i>	0.182	0.168	0.144	0.165	0.101	0.115	0.097	0.122	0.159	0.177	0.176	0.127
<i>Observations</i>	705	769	640	688	709	774	637	686	709	771	638	687

Source: LSAC data, K-cohort, wave 3.

Table B3
Regression results, matched sample, additional results

	NAPLAN YEAR 5, READING				NAPLAN YEAR 5, WRITING				NAPLAN YEAR 5, NUMERACY			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>Mother education (ref. category: University degree)</i>												
Year10 or below	-21.735**	-19.192**	-18.812*	-5.846	-10.680	-36.629***	-8.728	-13.485	-16.411*	-19.923**	-7.800	-13.747
	(9.760)	(9.404)	(10.534)	(10.018)	(9.824)	(10.077)	(8.983)	(9.619)	(9.118)	(8.928)	(8.949)	(8.956)
Year11/12	0.581	-11.435	-6.040	-3.717	-12.974	-16.272*	-5.107	-9.826	-7.453	-12.595	-2.537	1.828
	(8.230)	(8.292)	(9.419)	(8.624)	(8.293)	(8.965)	(7.965)	(8.208)	(7.692)	(7.910)	(8.095)	(7.739)
Certificate	-10.259*	-16.828***	0.591	-3.520	0.936	-20.015***	-13.040**	-18.385***	-6.720	-7.618	-3.615	-2.692
	(5.980)	(5.965)	(6.693)	(6.244)	(6.010)	(6.452)	(5.649)	(5.939)	(5.576)	(5.700)	(5.721)	(5.599)
Diploma	-14.285*	0.187	5.055	-8.465	-1.946	-20.016**	-9.431	-14.662*	-14.589*	-6.929	-6.834	-15.181*
	(8.264)	(8.285)	(10.144)	(9.170)	(8.315)	(8.932)	(8.541)	(8.842)	(7.720)	(7.818)	(8.715)	(8.254)
<i>Father education (ref. category: University degree)</i>												
Year10 or below	-10.024	-18.438*	-18.457*	-8.681	-27.954***	-32.021***	-7.116	-1.376	-13.104	-6.703	-2.811	-12.973
	(10.204)	(10.078)	(10.821)	(9.553)	(10.281)	(10.765)	(9.061)	(9.138)	(9.479)	(9.588)	(9.286)	(8.571)
Year11/12	-5.159	-8.270	-7.986	0.650	-13.303*	-5.520	4.560	12.474*	-6.295	-3.244	-6.538	-8.239
	(7.639)	(7.219)	(8.591)	(7.562)	(7.744)	(7.897)	(7.372)	(7.296)	(7.187)	(6.910)	(7.370)	(6.793)
Certificate	-5.252	-11.513*	-8.827	4.133	-21.828***	-15.151**	5.711	4.283	-10.146*	-4.121	-10.523*	-8.726
	(6.378)	(6.304)	(6.545)	(6.371)	(6.384)	(6.800)	(5.566)	(6.131)	(5.918)	(5.952)	(5.624)	(5.717)
Diploma	-2.459	-12.247	-14.071	-10.023	-8.985	-15.006*	6.941	3.849	1.275	1.515	-2.714	0.342
	(8.015)	(7.857)	(8.920)	(8.708)	(8.010)	(8.529)	(7.561)	(8.401)	(7.495)	(7.433)	(7.616)	(7.803)

Cont.

Table B3, continued

	NAPLAN YEAR 5, READING				NAPLAN YEAR 5, WRITING				NAPLAN YEAR 5, NUMERACY			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Annual family income	0.000 (0.000)	0.000 (0.000)	0.000*** (0.000)	0.000*** (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Is mother employed	-7.726 (6.497)	-3.065 (6.508)	-4.291 (6.855)	-2.172 (6.681)	-9.955 (6.584)	-3.987 (7.070)	-5.204 (5.808)	-7.181 (6.421)	-4.217 (6.053)	-9.271 (6.158)	-4.421 (5.862)	-4.987 (5.968)
Is father employed	16.209 (12.970)	8.927 (11.688)	10.131 (12.166)	-3.072 (11.585)	-7.264 (13.103)	1.816 (12.474)	-13.547 (10.279)	-20.911* (11.081)	16.341 (11.865)	16.013 (10.974)	8.736 (10.607)	12.392 (10.422)
Exact age of the child	-6.115 (5.686)	0.601 (5.756)	2.279 (6.320)	-0.258 (5.951)	-5.566 (5.734)	3.377 (6.221)	-6.808 (5.398)	-10.233* (5.730)	-14.153*** (5.309)	-3.044 (5.496)	10.739** (5.418)	3.007 (5.357)
Child is the oldest child	-85.589 (66.214)	-25.433 (16.877)	-0.735 (20.678)	15.299 (19.332)	-47.012 (66.689)	-16.789 (19.572)	21.363 (17.519)	-0.119 (18.409)	-84.662 (61.828)	-4.638 (17.235)	10.652 (17.643)	13.529 (17.359)
Child's number of siblings	-1.494 (2.626)	-3.699 (2.657)	-1.671 (3.050)	-1.431 (2.820)	-1.946 (2.649)	-1.714 (2.896)	5.072* (2.619)	2.181 (2.718)	-3.830 (2.432)	-1.488 (2.524)	4.869* (2.601)	3.647 (2.532)
<i>Teacher qualification (ref. category: Post-graduate degree)</i>												
Certificate	10.181 (20.861)	4.205 (19.920)	36.470 (25.748)	27.305 (24.112)	-6.379 (20.050)	-16.514 (19.406)	5.411 (21.881)	6.992 (24.467)	-15.153 (18.696)	-32.188* (18.133)	6.181 (22.043)	-15.534 (21.695)
Diploma	4.204 (7.922)	3.313 (7.711)	-9.778 (8.599)	-12.646 (7.997)	2.236 (8.038)	-2.273 (8.402)	7.102 (7.353)	-9.999 (7.660)	1.060 (7.424)	-4.938 (7.442)	-8.161 (7.364)	0.552 (7.216)
Bachelor	6.698 (5.606)	-3.134 (5.544)	-2.065 (5.874)	3.048 (5.367)	-7.020 (5.725)	-2.806 (6.037)	7.037 (5.050)	-0.901 (5.182)	-1.724 (5.232)	-5.471 (5.264)	-3.255 (5.039)	0.867 (4.832)
Constant	325.507*** (63.461)	288.966*** (61.621)	233.697*** (69.707)	254.350*** (63.784)	393.892*** (64.426)	314.912*** (66.297)	344.086*** (58.995)	435.420*** (61.546)	389.430*** (58.973)	279.819*** (58.592)	88.190 (60.003)	164.694*** (57.752)
<i>R-squared</i>	0.452	0.460	0.490	0.474	0.357	0.351	0.367	0.319	0.504	0.502	0.550	0.539
<i>Observations</i>	616	660	584	599	611	655	581	596	619	654	580	598

Source: LSAC data, K-cohort, wave 4.

TABLE B4
Regression results, matched sample, additional results

	SOCIO-EMOTIONAL INDEX, WAVE 3				LEARNING INDEX, WAVE 3				TEACHER SOCIO-DEVELOPMENT SCORE, WAVE 3			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
<i>Mother education (ref. category: University degree)</i>												
Year10 or below	-2.726***	-2.359***	-1.104	-0.391	-1.688*	-2.151**	-1.865**	-2.505***	-0.721	-1.618**	-1.400**	-0.269
	(0.893)	(0.911)	(0.872)	(0.806)	(0.956)	(0.913)	(0.948)	(0.917)	(0.717)	(0.636)	(0.619)	(0.591)
Year11/12	-0.746	-0.586	-0.606	0.523	-1.131	-2.258***	-1.521*	-1.702**	-1.480**	-0.960*	-0.608	-0.516
	(0.782)	(0.770)	(0.804)	(0.724)	(0.837)	(0.771)	(0.893)	(0.815)	(0.614)	(0.539)	(0.599)	(0.527)
Certificate	-2.038***	-0.924	-0.163	-0.164	-1.122*	-1.732***	-2.533***	-2.023***	-1.038**	-0.973**	-1.488***	-0.347
	(0.578)	(0.588)	(0.560)	(0.540)	(0.613)	(0.592)	(0.625)	(0.626)	(0.443)	(0.413)	(0.412)	(0.399)
Diploma	-0.446	-0.510	-0.006	0.111	-1.568*	-1.633**	-1.301	-1.245	0.322	-0.866	-0.516	-0.360
	(0.828)	(0.804)	(0.798)	(0.749)	(0.905)	(0.818)	(0.893)	(0.863)	(0.659)	(0.567)	(0.603)	(0.550)
<i>Father education (ref. category: University degree)</i>												
Year10 or below	0.417	0.204	0.482	-0.468	-1.705*	-2.965***	-2.357**	-0.966	0.287	0.402	-0.441	0.186
	(0.896)	(0.950)	(0.843)	(0.871)	(0.945)	(0.953)	(0.934)	(0.962)	(0.692)	(0.655)	(0.629)	(0.623)
Year11/12	0.639	0.142	0.081	0.429	-0.357	-1.194*	-0.946	0.466	0.477	-0.611	-0.610	0.111
	(0.671)	(0.697)	(0.682)	(0.644)	(0.715)	(0.692)	(0.745)	(0.730)	(0.511)	(0.486)	(0.495)	(0.469)
Certificate	-0.196	-0.051	-0.277	-0.159	-1.499**	-0.467	-1.078*	-0.387	-0.204	-0.394	-0.270	-0.495
	(0.595)	(0.588)	(0.550)	(0.529)	(0.633)	(0.596)	(0.619)	(0.616)	(0.464)	(0.420)	(0.416)	(0.397)
Diploma	-1.650**	-0.629	0.630	0.908	1.033	0.774	-0.284	-0.530	-0.543	-0.317	0.245	0.431
	(0.719)	(0.743)	(0.719)	(0.761)	(0.781)	(0.753)	(0.815)	(0.877)	(0.582)	(0.535)	(0.535)	(0.565)

Cont.

Table B4, continued

	SOCIO-EMOTIONAL INDEX, WAVE 3				LEARNING INDEX, WAVE 3				TEACHER SOCIO-DEVELOPMENT SCORE, WAVE 3			
	BOYS		GIRLS		BOYS		GIRLS		BOYS		GIRLS	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Annual family income	0.000	0.000**	-0.000	0.000	0.000	0.000	-0.000	0.000	0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Is mother employed	0.510	1.470**	-0.437	-0.028	0.288	-0.335	-1.067*	0.090	0.241	-0.358	-0.609	-0.382
	(0.583)	(0.571)	(0.573)	(0.551)	(0.615)	(0.575)	(0.636)	(0.617)	(0.450)	(0.409)	(0.430)	(0.416)
Is father employed	-1.162	-1.154	2.450**	1.214	-1.612	0.519	1.020	0.743	0.500	1.156	2.432***	2.259***
	(1.253)	(1.523)	(1.225)	(1.160)	(1.151)	(1.337)	(1.370)	(1.266)	(0.824)	(0.957)	(0.940)	(0.824)
Exact age of the child	-0.384	0.012	-0.512	-0.264	-0.025	-0.464	1.184**	1.383***	-0.052	-0.150	0.444	0.819**
	(0.519)	(0.532)	(0.480)	(0.472)	(0.548)	(0.528)	(0.530)	(0.530)	(0.393)	(0.369)	(0.354)	(0.340)
Child is the oldest child	-0.917	-0.597	1.315	-0.347	2.352	0.015	2.672	0.220	1.011	0.590	1.581	-3.199***
	(2.209)	(1.841)	(1.426)	(1.425)	(2.267)	(1.756)	(1.686)	(1.731)	(1.475)	(1.166)	(1.055)	(1.070)
Child's number of siblings	-0.161	0.012	-0.174	0.062	0.112	-0.157	-0.503*	-0.301	0.289	0.197	-0.085	0.063
	(0.258)	(0.260)	(0.255)	(0.250)	(0.265)	(0.251)	(0.277)	(0.278)	(0.193)	(0.178)	(0.186)	(0.183)
<i>Teacher qualification (ref. category: Post-graduate degree)</i>												
Certificate	0.585	1.792	-3.002	2.636	0.309	-0.290	-0.238	-0.771	0.992	0.863	0.547	0.465
	(1.520)	(1.557)	(2.313)	(1.707)	(1.618)	(1.645)	(2.605)	(1.963)	(1.149)	(1.120)	(1.706)	(1.146)
Diploma	-0.216	0.034	0.340	0.988	-0.912	0.727	0.910	1.358*	-0.148	0.084	1.408***	0.017
	(0.713)	(0.698)	(0.654)	(0.652)	(0.773)	(0.709)	(0.745)	(0.748)	(0.570)	(0.509)	(0.493)	(0.482)
Bachelor	0.288	-0.244	0.373	0.622	-0.188	0.428	0.302	0.464	-0.008	-0.166	0.677*	-0.016
	(0.522)	(0.529)	(0.508)	(0.482)	(0.557)	(0.529)	(0.568)	(0.549)	(0.412)	(0.375)	(0.384)	(0.360)
Constant	35.491***	31.197***	43.523***	40.476***	33.055***	37.804***	26.933***	19.044***	-3.096	-1.383	-6.811**	-10.696***
	(5.196)	(5.341)	(5.013)	(4.659)	(5.610)	(5.203)	(5.822)	(5.468)	(3.520)	(3.248)	(3.224)	(3.043)
<i>R-squared</i>	0.564	0.555	0.478	0.520	0.503	0.521	0.491	0.512	0.353	0.371	0.264	0.249
<i>Observations</i>	900	955	859	873	1013	1066	970	986	833	876	814	824

Source: LSAC data, K-cohort, wave 4.

