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### The impact of expanding access to early childhood services in rural Indonesia: evidence from two cohorts of children

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# The Impact of Expanding Access to Early Childhood Services in Rural Indonesia

Evidence from Two Cohorts of Children

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## Abstract

This paper uses three waves of longitudinal data to examine the impact of expanding access to preschool services in rural areas of Indonesia on two cohorts of children. One cohort was children aged 4 at the start of the project and was immediately eligible for project-provided services when they began operation in 2009. The other cohort was children aged 1 at the start of the project and became eligible for project-provided services two years later. The paper presents intent-to-treat estimates of impact in the short term (first year of the project) and medium term (three years after the project started), using experimental and quasi-experimental methods. For the cohort of 4-year-olds, while the magnitude of the enrollment impact is similar across children from different backgrounds, the impact on child outcomes is larger

for children from more disadvantaged backgrounds in the short and medium terms. However, for this cohort of children, it seems that project-provided playgroups encouraged substitution away from existing kindergartens, suggesting that future interventions should incorporate such possibilities into their design. For the average child in the younger cohort, the project led to improvements in physical health and well-being as well as language and cognitive development. For this cohort, there is little evidence of differential impact. This can be explained by the fact that children who enrolled soon after the centers opened (the older cohort) were generally poorer, compared with children who enrolled later (the younger cohort). This may be because of fee increases in project centers as project funding ended.

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# **The Impact of Expanding Access to Early Childhood Services in Rural Indonesia: Evidence from Two Cohorts of Children**

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**Keywords:** Early Childhood Development and Education (ECED), early intervention, inequality, playgroups, Human Development, Human Capital, Indonesia

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## 1. Introduction

A growing body of research shows that a child's early life has consequences for their educational outcomes (A.T. Bhutta et al., 2002, L. M. Brennan et al., 2012, G. Duncan et al., 2007, L. Feinstein and K. Duckworth, 2006, E. Melhuish, 2011, E.C. Melhuish et al., 2008, S. E. Moser et al., 2012), health outcomes (C. Hertzman, 2013, J.W. Lynch and G. Davey-Smith, 2005), and social outcomes (T.E. Moffitt et al., 2011) later in their adult years. Healthy child development is an enabler of human capability allowing children to reach physical maturity and participate productively in economic, social and civic life (G. Conti and J. Heckman, 2012, Amartya Sen, 1999). Many of the problems arising in early childhood have associated social and financial costs that cumulatively represent a considerable drain on a country's resources (L. Feinstein and K. Duckworth, 2006, C.G. Victora et al., 2008). There is increasing realization that opportunities for interventions must be based on a sound understanding of the early pathways toward later human capital and capability (J.P. Shonkoff and D. Phillips, 2000).

Preschool programs provide a chance to mitigate the risk factors that many children face (W.S. Barnett, 2011, G. Duncan, A. Claessens, A. Huston, L. Pagani, M. Engel, H. Sexton, C. Dowsett, K. Magnusson, P. Klebanov, L. Feinstein, J. Brooks-Gunn and K. Duckworth, 2007, G. Duncan and K. Magnusson, 2013, J. Heckman, 2006). The impacts are likely to be greater for children growing up in middle- and low- income countries (P.L. Engle et al., 2011). The evidence on the effectiveness of preschool programs and the mechanisms behind causal pathways is growing (G. Duncan and K. Magnusson, 2013, J.P. Shonkoff, 2014). The vast majority of research on preschool approaches to support early child development has been focused on three "iconic" projects: Perry Preschool, Abecedarian, and the Nurse Family Partnerships (J.P. Shonkoff, 2014). These studies were begun in America with small sample sizes in the late 1960s to early 1970s, although all have had longitudinal follow-ups. Unfortunately there are fewer high quality studies evaluating early childhood care and education interventions outside of the US. However, of those that do exist, the results seem range from no effect in some settings (Bouguen, Filmer, Macours and Naudeau, 2013) to positive effects in others (K. Burger, 2010, S. Martinez, S. Naudeau and V. Pereira, 2012, M. Nores and S. Barnett, 2010).

In this paper we analyze the impact of expanding access to community-based early childhood services – specifically playgroups – in rural Indonesia under the Early Childhood Education and Development Project, using experimental and quasi-experimental methods. This project provided selected communities with the services of a community facilitator to raise community awareness on the importance of child development. In addition, communities received block grants (USD 18,000 over 3 years) to establish or strengthen preschool services of their choosing to cater to children between the ages of 0-6. The overwhelming majority of communities chose to establish playgroups – group programs typically intended for children between the ages of 3 and 6. Most communities (79%) established new services. The project also included 200 hours of training for individuals from the community who were selected to be teachers. The project was implemented in 3,000 villages in 50 districts across Indonesia.

We employ two comparisons in our analysis. The first comparison is experimental and takes advantage of the fact that the project was rolled out in three batches and that villages were assigned to batches by lottery. This allows us to compare villages that received block grants in the first batch (Batch 1) with those that received block grants in the last batch (Batch 3) using the randomized phase-in of villages into the project as an instrumental variable (IV). This comparison

allows us to examine the impact of 11 months difference in duration of exposure to treatment. The second comparison is non-experimental and compares villages in the last batch to villages that never participated in the project (See Pradhan et al., 2013 for details). This comparison allows us to examine the impact of receiving the project compared to the counterfactual of never having received the project.

The first comparison has the usual advantages of an experimental evaluation using IV methods but has the drawback of looking at impacts in the short term (less than one year). The second comparison has the advantage that pre-intervention baseline data are available, thus making a Difference-in-Differences (DID) analysis feasible and allows for an examination of impacts in the medium term (three years).

Using three waves of longitudinal data, we examine the impact of the project on these two cohorts of children: a cohort of 4-year-olds who were immediately eligible for project-provided playgroups when they began operation in 2009 and a cohort of 1-year-olds who were not immediately age-eligible but became eligible 2 years later when they turned 3 years old. Existing instruments to measure child development in various cognitive and non-cognitive dimensions were adapted for the Indonesian context (A. Hasan et al., 2013) and used to assess these children's development outcomes.

We find that having the project in the village led to a village-wide average net increase in preschool enrollment rates of 7 – 15 percentage points and an increase in duration of enrollment by 2 – 6 months for the 4- and 1-year-old cohorts respectively. Project-provided playgroups to some extent crowded out existing services, including kindergartens, with greater crowding out for the older cohort. Changes to how playgroups operated may have had implications for which families chose to enroll their children in project-provided services over time. We find that children from the older cohort (the early beneficiaries) were generally poorer and that their development outcomes improved more as a result of the project than those of children in the younger cohort (the later beneficiaries) who were from relatively better-off households.

Specifically, we find that children who lived in project villages had improved language and cognitive development and socio-emotional skills. Among early beneficiaries, project impact is higher for disadvantaged children from poor households with estimated impacts ranging from 0.140 standard deviations to 0.243 standard deviations respectively. It is also higher for children whose parents reported low-parenting skills – ranging from 0.096 standard deviations to 0.198 standard deviations. For later beneficiaries, there is less evidence of differential impact, in part because centers began charging fees – making it more difficult for the poorer children to attend.

We attempt to unpack the channels by which these impacts may have operated by comparing the relative contribution of attending different kinds of preschool services available in the communities (particularly playgroups and kindergartens). For the older cohort, enrollment in project playgroups is associated with improved cognitive skills, while for the younger cohort enrollment in project playgroups is associated with improved cognitive and socio-emotional skills. It would thus appear that the age of a child when they start to attend these services matters.<sup>1</sup> We also explore assessments of center quality through classroom observations using the Early

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<sup>1</sup> The production function analysis reported in this paper does not take the child's age when they attended a particular service into account.

Childhood Environment Rating Scale (discussed in detail elsewhere).<sup>2</sup> This indicates that project playgroups have significantly better quality than non-project playgroups in terms of physical space and furnishings, activities and teacher-child interactions. Furthermore, while shares of trained teachers are similar across various services, only project playgroup teachers receive 200 hours of training developed specifically under the project. All other available modalities of training in the country at the time of the project were of substantially shorter duration. It is possible that the more in-depth training under the project may have contributed to the impacts documented in this paper. Given the design of the evaluation, this claim cannot be established causally.

Following this overview, the paper proceeds in 10 major sections. In section 2, we discuss meta-studies on the effects on preschool services on child development. Section 3 provides more details on the intervention, and the context in which it operated. Section 4 explains the evaluation design, the implementation of the project, the surveys and the outcomes we assess. Section 5 describes the children, the centers they attended and how the project evolved. Section 6 presents the descriptive statistics, our empirical strategy and results for the 4-year-old cohort – children who were immediately age-eligible for project-provided services. Section 7 does the same for the 1-year-old cohort – children who became age-eligible for these services 2 years after the project began. Section 8 presents a brief summary of the impact estimates. Section 9 examines possible channels and section 10 presents a cost-benefit analysis of the intervention. Section 11 concludes by discussing the implications of our findings.

## **2. Literature Review**

Recent systematic reviews examining the impact of preschool programs show surprisingly similar results and conclusions despite the fact that they draw on different disciplines (education, health and social economics) and have different outcomes of interest. However, these reviews have some important points of deviation that are particularly relevant to the results presented in this paper. Burger (2010) found that the majority of the 32 studies he reviewed report small to moderate effects of preschools on later cognitive outcomes. Burger also found that these studies showed that children from differing socioeconomic backgrounds improved in equal measure in absolute terms, i.e., that these programs did not reduce inequality. The review also indicated that the results were not strong enough to conclude that preschool programs were able to compensate for developmental deficits (K. Burger, 2010).

D’Onise et al. (2010a) undertook a systematic review of preschool interventions and their ability to impact child health outcomes. The papers reviewed examined a range of interventions from center-based preschool alone to interventions that also included parenting programs with and without health services. D’Onise et al. found that the majority of interventions evaluated were targeted to populations at risk of school failure. Of the 37 manuscripts reviewed in relation to child health outcomes, the authors found generally null effects, with some evidence for obesity reduction, greater social competence, and improved mental health (K. D’Onise et al., 2010). Two of the studies in their review examined intensity and length of intervention. These found adverse effects on externalizing behavior from interventions with greater intensity and those with an earlier age of entry into the intervention. D’Onise found that the majority of beneficial outcomes arose

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<sup>2</sup> See Sally Brinkman, Amer Hasan, Haeil Jung, Angela Kinnell, Nozomi Nakajima and Menno Pradhan. Forthcoming. Promoting child development in rural Indonesia: The role of preschool service quality and teacher characteristics.

from evaluating comprehensive interventions that included both parenting components and direct educational services to children. The majority of null effects were for preschool-only interventions.

Both reviews concluded that most papers on preschool focus on child-level outcomes, but few attempt to disentangle the distinctive aspects of preschool experiences by taking into account the effects of quality, age at entry, duration and intensity of attendance. Additionally all systematic reviews concluded that the quality of the research was generally poor, with moderate to high risks of bias due to poor research design, lack of sample representativeness, and poor initial recruitment that resulted in systematic differences that were then often further undermined by attrition of the study samples. Of the studies that were reviewed, few reported factors such as adherence to program fidelity or even reported the proportion of participants that received the intervention. These flaws in study design, quality and reporting make it especially difficult to generalize results outside of the study contexts and settings, particularly to developing countries like Indonesia.

A meta-analysis undertaken by Nores and Barnett specifically reviewed studies on non-U.S. early childhood interventions using an experimental or quasi-experimental design. Their review considered 38 contrasts of 30 interventions in 23 countries with a much wider interventional scope for inclusion than the reviews summarized above. Despite raising similar methodological concerns, their conclusions are more heartening for those investing in early childhood initiatives. The analysis found, on average, moderate and sustained effects on outcomes such as cognitive, behavioral, health and amount of schooling. The focus of their review was primarily on the question of what amount of treatment yields what amount of gain. The interventions reviewed included cash-transfer, nutritional, educational or mixed approaches. They concluded that educational or mixed interventions with components of education, care or stimulation had the greatest impact (M. Nores and S. Barnett, 2010). However, in contrast to what might be expected, they found smaller average effect sizes for studies conducted in low-income countries compared to middle-income countries. This result is surprising, as most people working in the field would surmise that the lower base level of child health and development in low-income countries should lead to greater impact of the interventions. The authors suggested that there may be a threshold that needs to be crossed. They argued that crossing the threshold might be more difficult when the economic level is low or because these interventions may require environmental supports that are rare in less developed economies.

Another surprising finding from their meta-analysis was that longer-lasting interventions had positive effects on health outcomes, but a negative effect on educational outcomes. Further, results were better for interventions starting with either infants or preschoolers, but not for programs starting with both. For this reason, even though they generally found moderate effect sizes, their conclusions remain similar to those of the other systematic reviews mentioned above, i.e., there is lack of clarity around what dimensions of the interventions matter, and how much they matter for whom and for what reasons. Deeper understanding of the human capabilities that are strengthened by interventions as well as the causal mechanisms that explain program impact—taking into account dose, quality and cost—are required for continued and enhanced confidence by policy makers to invest in early childhood initiatives (J.W. Lynch et al., 2010). This paper seeks to examine whether child development outcomes are improved by exposure to a low-cost community-based pre-school intervention and the channels through which any impacts may have been generated.



### **3. The Indonesia ECED project and the context in which it operated**

In order to understand the project described here, it is important to first understand the context in which it operated. This section describes the state of early childhood development at the time the project was developed and how districts and villages were selected for inclusion in the project.

#### **3.1. The context**

ECED services in Indonesia are intended to cater to children from birth to age six. Different types of early childhood education services are intended to cater to children of a specific age. Playgroups are intended for children aged three and four. Kindergartens are intended for children aged five and six. In practice, these age cut-offs are hard to enforce. Some children may continue in playgroups after the intended age of four and others may enroll in primary school at the age of six or even five. The incentive to do so is strong because attending kindergarten is not yet mandatory and most kindergartens charge fees while primary school is compulsory and free. Once children have reached the age of seven, they are expected to begin primary school. Almost all children are enrolled in primary school by age seven.

ECED services in the country take a variety of forms and are overseen by various ministries. Toddler family groups (BKB) are overseen by the National Family Planning Board and provide parenting education services. The Ministry of Education and Culture (MoEC) regulates playgroups (KB) and day care centers (TPA) although the latter are largely an urban phenomenon. Kindergartens are regulated either by MoEC or by the Ministry of Religious Affairs (MoRA) depending on whether they are regular (TK) or Islamic kindergartens (RA). This paper will focus on playgroups and kindergartens.

Historically, MoEC has drawn a distinction between non-formal (playgroup) and formal (kindergarten) early childhood services. Since 2010, this distinction has been abandoned – at least on paper. Now both kindergartens and playgroups are under the purview of the Directorate General of Early Childhood and Development at the MoEC. In practice, however, the distinction between formal and non-formal services continues with different types of services and teachers eligible for different forms and levels of government support.

Not all ECED services are equally intensive. Playgroups (KB) and kindergartens (TK) both operate from 8 to 11 in the morning. However, playgroups typically meet only 3 days a week while kindergarten services are available daily (5–6 times per week). Thus when interpreting the findings it is important to keep in mind that children attending playgroups receive fewer hours of intervention each week than children attending kindergartens.

Despite the fact that there are a variety of early childhood services in Indonesia, the provision of these services has historically been beset by several challenges: 1) low levels of coverage; 2) largely private provision of services in the face of low levels of public investment; and 3) volunteer teachers with little or no training since very few institutions provide training for early childhood teachers.

### 3.2. The intervention: The Early Childhood Development and Education Project

In an effort to address some of these challenges, the government of Indonesia, in partnership with the World Bank and the government of the Kingdom of the Netherlands, developed the ECED project. The goals of the project were to increase access to early childhood services and increase children's readiness for school in relatively poor districts with generally low ECED participation. Of Indonesia's 422 districts, 50 districts (12%) were selected on the basis of a composite score created using a weight average of district level:

- poverty rates,
- gross enrollment rates in ECED,
- Human Development Index (HDI) rankings,
- geographical remoteness,
- whether or not as district is a border district<sup>3</sup> and
- district assurance of being "committed" to early childhood services.

Within each of the 50 selected districts, 60 priority villages were identified on the basis of (a) their poverty rate, (b) a sufficiently large population of children between the ages of 0–6, (c) a sufficiently large overall population and (d) the village's willingness to contribute financially to the project. Consequently project services were implemented in 3,000 villages (4 percent of all 69,000 villages in the country).

Each participating district had or was required to set up a district early childhood services office. Each village that participated in the project received the following:

- The services of a community facilitator whose job was to raise community awareness on the importance of early childhood services and share information on the benefits available under the project. Community facilitators also provided communities with training on how to prepare proposals for the block grants available through the project.
- Block grants for three years in the amount of \$18,000 USD per village which were to be spent on establishing or supporting two centers. Thus villages received \$3,000 USD per center per year for three years. These funds came with the requirement that no more than 20 percent could be spent on building new infrastructure. This limit meant that most of the centers established under the project involved rehabilitating existing buildings rather than constructing new ones. The remaining 80 percent could be spent on learning activities, health & nutrition, and management & administration of the center (including teacher salaries).
- Teacher training of 200 hours duration for two teachers per center. Teacher training was delivered via a two-tiered cascade training model. 192 master trainers were trained for 500 hours and went on to provide 200 hours of training to approximately 12,000 teachers. Teachers were predominantly women from the village who often had children of their own. Some had prior work experience in health and education. Others had no such prior experience.

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<sup>3</sup> Districts with higher poverty rates, lower enrollment rates and lower HDI rankings were preferred. The government of Indonesia designates some of its poorest performing districts as 3T districts: *Terpencil* (isolated/remote), *Terluar* (border), *Tertinggal* (lagging).

These three key components were designed to encourage bottom-up community services that would be sustainable and suited for each village. While the original intent of the project had been to offer services to all children ages 0–6, in practice, the most common form of service provision selected by communities was the establishment of a playgroup for three to six-year-olds, typically offered two hours a day, three times a week. This package (community facilitation, block grants, teacher training and playgroups) is effectively the intervention evaluated in this paper.

#### **4. Evaluation Design, Implementation and Surveys**

The evaluation design and the measures which were taken to address non-compliance are described in detail in (Pradhan et al., 2013) Here we summarize the main features.

##### **4.1. The evaluation design**

The evaluation is based on a comparison of three groups of villages (two groups of villages that received the ECED project at different points in time and one group of villages that did not receive the ECED project). At the time the evaluation was designed, the project was to be rolled out in three batches, starting with villages in batch 1, then villages in batch 2 nine months later, followed by villages in batch 3 18 months later. Therefore, in 10 districts, 20 randomly selected villages were allocated to batches 1 and 3 through a public lottery attended by officials from the central and local education offices. In that same meeting, participants were asked to suggest names of villages that would not get the project, but were similar to the sampled project villages.

However, one district was dropped from the evaluation because it rejected the outcome of the lottery, while another district decided to use the lottery to allocate all 60 priority villages to each of the three batches. Thus instead of having 30 villages from this district (10 in batch 1, 10 in batch 2 and 10 matched comparison villages), we ended up with 20 villages in batch 1, 20 villages in batch 2, 20 villages in batch 3 and 10 matched comparisons. In order to make up the sample that had been lost, we decided to retain these extra villages. The final evaluation sample therefore consists of 310 villages: An experimental sample of 100 villages allocated to batch 1, 20 allocated to batch 2, 100 allocated to batch 3 and a comparison group of 90 villages. These are the original batches.

##### **4.2. Changes to the evaluation during implementation**

This original allocation of villages to groups was affected by unforeseen changes in program implementation. Deviations from the original plan were the result of financial and procurement problems. In practice, the project was implemented in two batches 11 months apart. In addition, some villages were moved by district governments between the original batches, including, in some rare cases, between the experimental and comparison group.

We use the following terminology for the remainder of the paper to explain the groups utilized for the various analyses: the first group of villages that received project services is called the actual *batch 1* and the second group of villages that received the project 11 months later is called the actual *batch 3*. The group of villages that never received project services is called the *comparison group*. Thus the evaluation is based on 310 villages comprised of 105 actual batch 1 villages, 113 actual batch 3 villages and 92 comparison villages. Table 1 documents the changes between original batches and actual batches. 87 percent of the villages remained in the group they were originally allocated to through the randomization.

### **4.3. The surveys**

The analysis is based on three rounds of data collected about 6, 20 and 51 months after the start of the project. The original plan was to conduct a baseline survey before the start of implementation, a midline survey 18 months later when batch 3 villages would start implementation, and an endline survey around closure of the project. Figure 1 and Table 2 describe the implementation stage at the time of the surveys. At baseline all villages in batch 1 had received their block grant, on average 6 months before the survey was conducted. At this time, villages in batch 3 were still mostly unaffected, with only 7 out of 113 villages having received their block grant just 2 months earlier. By midline almost all villages in batches 1 and 3 had received their block grant, and by the endline all villages in batches 1 and 3 had received their block grant. The average difference in exposure between batch 1 and 3 villages is 11 months. By definition, none of the comparison villages received the project. The project closed on December 31, 2013, seven months after the endline survey. Most districts followed through on their commitment to sustain services. By the endline, virtually all playgroups established by the project in the sampled villages were still up and running.

### **4.4. The outcomes assessed**

We investigate the effect of the availability of project services on enrollment in preschool programs and primary school by analyzing whether the child was ever enrolled in the service and the number of months of enrollment. The project could result in substitution from existing services to the playgroups established under the project, and this could, in turn, affect child development outcomes because of the differences in dose and quality of the programs. We analyze the effect on child development outcomes using the Early Development Instrument (EDI)<sup>4</sup> and the Strengths and Difficulties Questionnaire (SDQ) – both outcomes were reported by the caregiver.<sup>5</sup> Higher EDI scores and lower SDQ scores represent better progress in child development.

Because higher quality parenting is associated with better developmental outcomes, a 24-item parenting practices interview assessed mothers' (or other primary caregivers') warmth, consistency, and hostility in relation to their children. Mothers of older and younger children reported using similar practices, with wide variations across parents in their child-rearing techniques. These are also self-reports by the primary caregivers.

## **5. The children, the centers they attended and how the project evolved**

For a correct interpretation of the results, it is important to view the timing of the project and surveys in relation to the age of the cohort of children that was followed.

### **5.1. The children, their ages and eligibility for different services**

Typically, in Indonesia children do not enroll in center-based services when they are 1 or 2 years old. By age 3 children are eligible to enroll in playgroups and may stay enrolled in

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<sup>4</sup> At baseline and midline, the EDI data were collected using a short-form questionnaire, while the endline EDI data were from a long-form questionnaire. In order to make all measures comparable and for ease of interpretation, we standardized them among all children over the three years.

<sup>5</sup> For all aspects relating to the child's health and development, the primary caregiver, usually the mother, responded to a series of individually-administered questionnaires during an at-home interview.

playgroups until age 4. From age 5 children also have the option to go to kindergartens. Some stay in kindergartens till age 6, though, increasingly many enroll in primary school at age 6 despite the fact that the official school-starting age is 7.

In Figure 2 we highlight this using the two cohorts followed in this study. At the time of the baseline survey, 4 years old were immediately eligible for project-provided playgroups. In contrast, the cohort of children that was 1 years old was not age-eligible for project-provided playgroups, they became eligible 2 years later.

By midline the children in the older cohort were about 5 years old, when their families essentially had a choice between continuing to enroll them in playgroups or enrolling them in non-project kindergartens. All of the children in the older cohort were enrolled in primary school by the time of the endline. The younger children however, were only about 2 years old at the time of the midline and still ineligible for project-provided services. By endline these children were between 4 and 5 years old and age-eligible for playgroups or kindergartens.

Figure 2: Children’s ages, the timing of the intervention and their eligibility for various services

	<b>Baseline</b>	<b>Midline</b>	<b>Endline</b>		
<b>Early beneficiaries / 4-year-old cohort</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
Age	4	5	6	7	8
Type of service child is eligible to enroll in	Children are eligible to enroll in playgroups	Children are eligible to enroll in kindergartens		Children are eligible to enroll in primary school	
<b>Later beneficiaries / 1-year-old cohort</b>					
Age	1	2	3	4	5
Type of service child is eligible to enroll in	Children are too young to enroll in playgroups		Children are eligible to enroll in playgroups		Children are eligible to enroll in kindergartens

Note: Figure depicts ages of the two cohorts studied and what types of services they are eligible for at each age.

## 5.2. The centers they attend

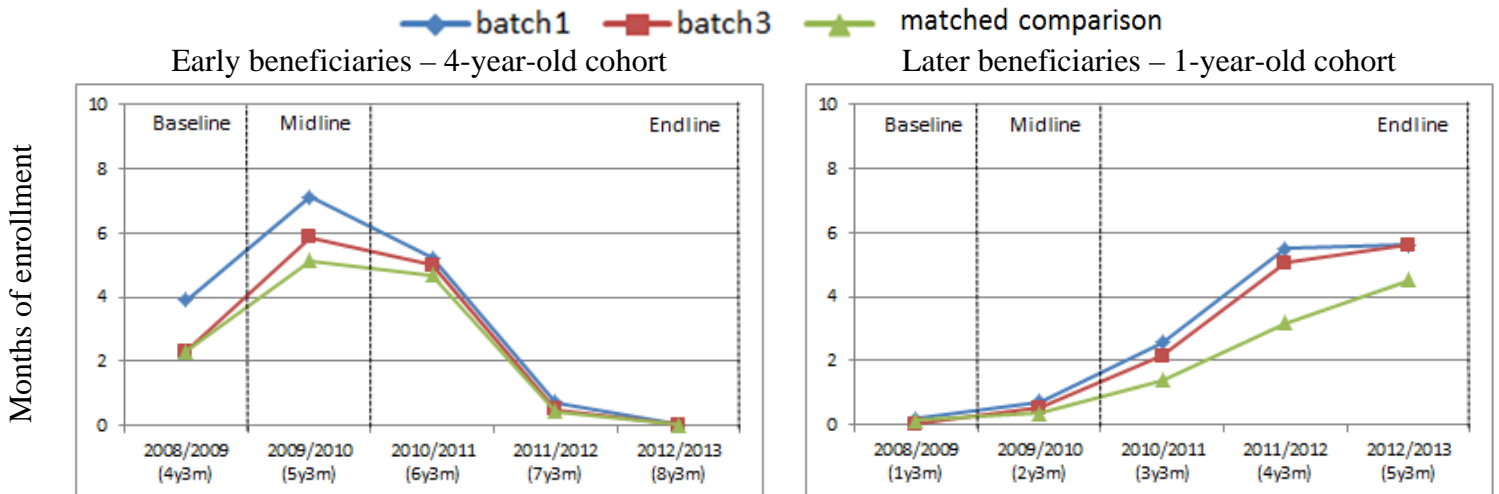
We corroborate these assertions in Figure 3, which compares the enrollment trends over time for the two cohorts side by side.<sup>6</sup> Each figure plots year-by-year trends in months of enrollment. The first panel displays the net enrollment patterns over time for children of different ages over all types of services and then presents the patterns separately for each type of service.

<sup>6</sup> At the endline, parents were asked to report their children’s enrollment status in each year since the project started. We combine these event histories with their ages and report the year-by-year impacts on duration of enrollment.

This breakdown confirms that as children get older, their eligibility and hence their enrollment in different types of services changes.

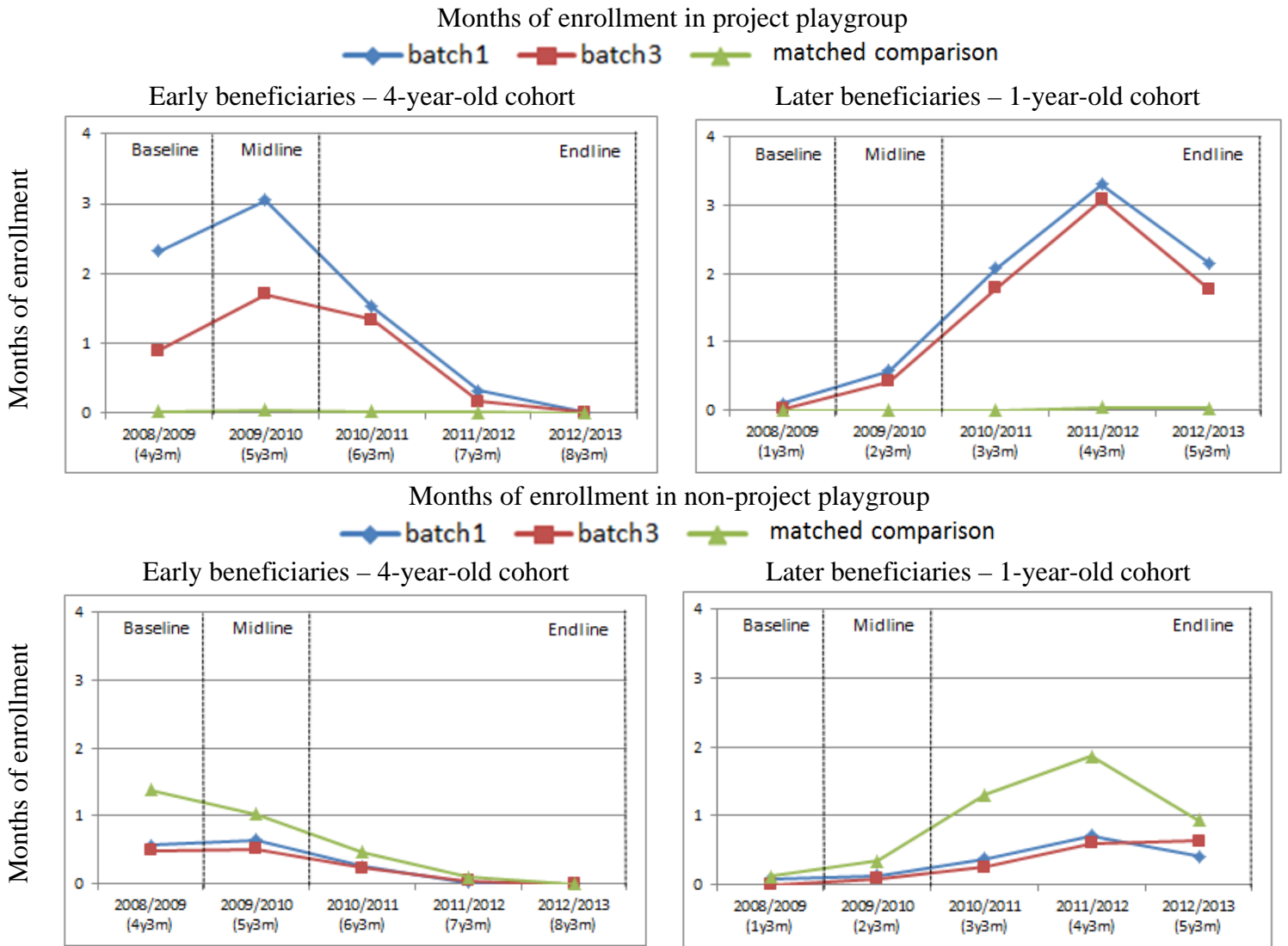
As asserted earlier, the older cohort of children is able to benefit immediately: enrollments for this cohort rise in the first year and then as children get older and transition into primary school, the enrollments decline. In contrast, the younger cohort benefit later: the enrollment rates for this cohort are essentially zero in the first two years and then pick up markedly.

Figure 3: Enrollment patterns by age and year  
Months of enrollment in any type of ECED center



Note: Vertical axis is months of enrollment. Horizontal axis is school year and age of child. Vertical dashed lines show when baseline, midline and endline surveys were collected.

Figure 3 (Continued): Enrollment patterns by age and year



Note: Vertical axis is months of enrollment. Horizontal axis is school year and age of child. Vertical dashed lines show when baseline, midline and endline surveys were collected.

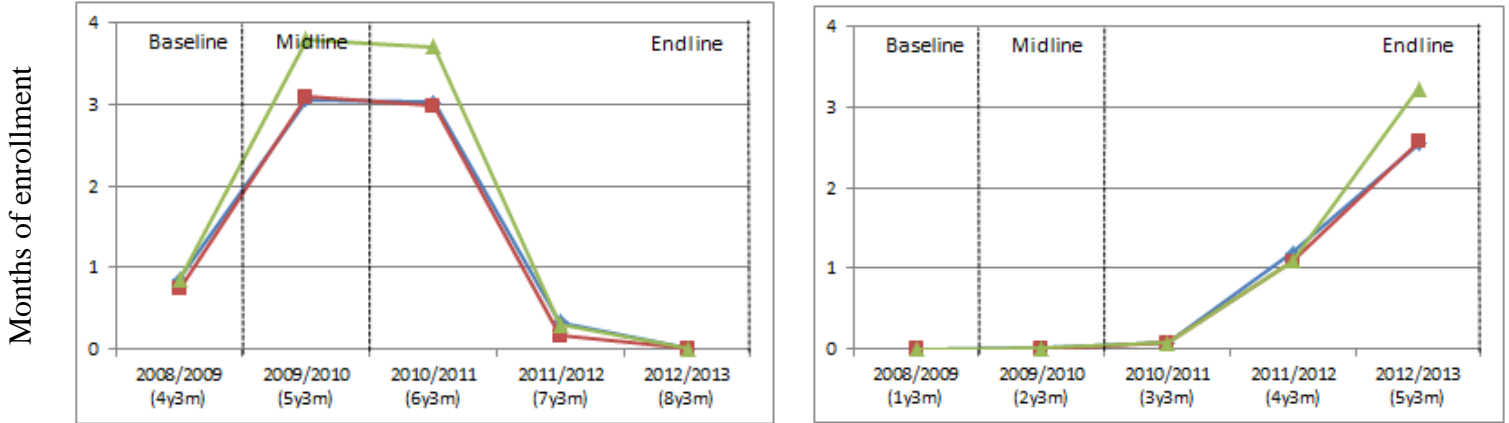
Figure 3 (continued): Enrollment patterns by age and year

Months of enrollment in Kindergarten (TK)

—◆— batch1 —■— batch3 —▲— matched comparison

Early beneficiaries – 4-year-old cohort

Later beneficiaries – 1-year-old cohort

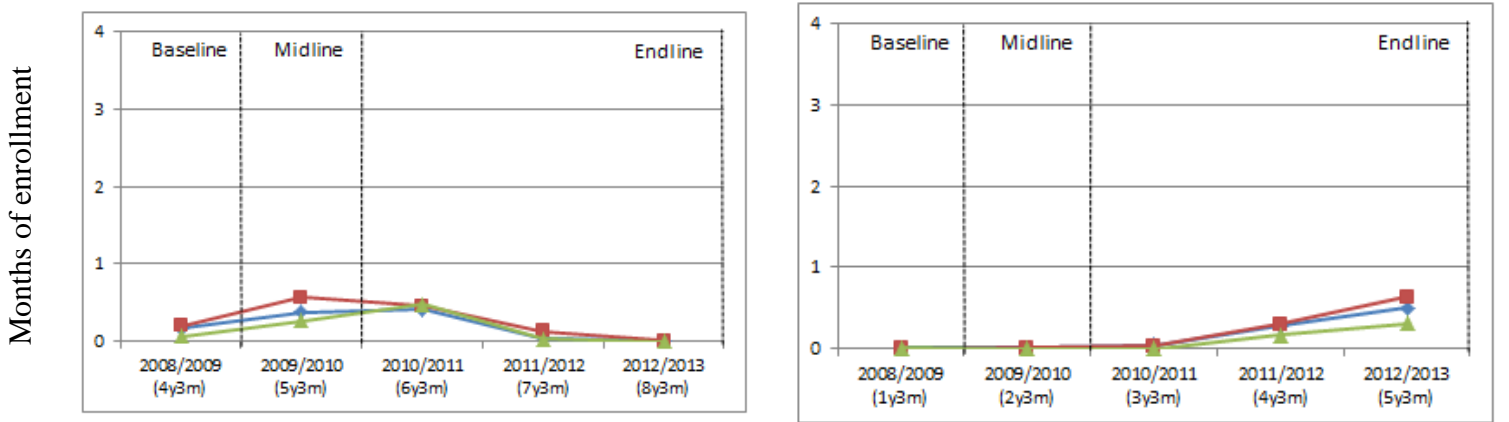


Months of enrollment in Islamic Kindergarten (RA)

—◆— batch1 —■— batch3 —▲— matched comparison

Early beneficiaries – 4-year-old cohort

Later beneficiaries – 1-year-old cohort



Note: Vertical axis is months of enrollment. Horizontal axis is school year and age of child. Vertical dashed lines show when baseline, midline and endline surveys were collected.

Besides affecting enrollment patterns, differences in ages across these two cohorts also meant that each cohort was assessed with different instruments at baseline and midline. The older cohort's development at baseline was measured using an array of child development instruments including the Early Development Instrument (EDI) and the Strengths and Difficulties Questionnaire (SDQ).<sup>7</sup> In contrast, the younger cohort's development at baseline and midline was

<sup>7</sup> The Early Development Instrument (EDI) was developed to assess children's school readiness and focuses on the areas of physical health and wellbeing, social competence, emotional maturity, language and cognitive skills as well as communication and general knowledge. The Strengths and Difficulties Questionnaire (SDQ) focuses on various



measured through a series of child demonstrations of tasks and caregiver reports. Elsewhere we have analyzed and reported the impact of the project as assessed by all measures administered in its first year. (A. Hasan et. al. eds., 2013; H. Jung and A. Hasan, 2014).

By the time of the endline, the younger cohort had outgrown the measures administered when they were younger; therefore, they were also assessed using the EDI and the SDQ. Thus, over the course of the evaluation children were assessed with a variety of instruments. At the endline both cohorts were assessed using a common set of child development instruments: the SDQ and the EDI as reported by their caregiver. As a result, in this paper, we assess the impact of the project on child development using only the EDI and SDQ, rather than including the measures used when cohort 1 was younger.

### 5.3. How the project evolved

One last complication arises when we consider that while the majority of project-supported playgroups did not charge a fee at the beginning of the project, more than two thirds had begun to charge fees by the time the 1-year-old cohort came to be eligible to enroll. Thus in the beginning project-provided playgroups gave families who could not afford to pay an opportunity to enroll their children. In contrast, by the time the younger cohort was old enough to attend playgroups, the project playgroups had begun to charge fees. As shown in Table 3, by the time of the endline not only were two-thirds of project playgroups charging fees, they were charging at a level similar to that of non-project centers.

Since fees were not charged at the outset of the project but were charged later we consider whether the children who were enrolled in project centers at the time of the baseline are different from the children who were enrolled in project centers by the time of the endline. We compare the characteristics of 4 year olds who report having enrolled to the characteristics of the 1 year olds who do so and find that this is indeed the case (see Table 4).

While the 1-year-olds and 4-year-olds who attended ECED services had mothers with very similar levels of education, there were substantial differences among them in terms of household wealth.<sup>8</sup> Specifically, those families of children in the 1-year-old cohort who reported ever-attending project playgroup services come from households whose wealth is 0.16 standard deviations **above** the mean. In contrast, those whose children were in the 4-year-old cohort and who reported ever-attending project playgroup services have a level of wealth 0.42 standard deviations **below** the mean. A similar difference is apparent when looking at children who combined enrollment in project and non-project playgroup services with enrollment in other types of services (i.e. regular or Islamic Kindergartens). Thus it would appear that in its early years the project induced families living in greater poverty to enroll their children in ECED services. As more centers began to charge fees, fewer poor children enrolled. As a result, by the time of the

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dimensions of children's emotional and social development. A detailed discussion of these instruments and how they were adapted for use in Indonesia is provided in Alatas et al., 2013.

<sup>8</sup> Household wealth was measured using an asset index which was standardized to have a mean of 0 and a standard deviation of 1. We define "poor" children as those whose household wealth is below average and "nonpoor" children as those whose household wealth is above average.

endline the children who were enrolled came from relatively better-off backgrounds. Children who were never-enrolled in any type of service were generally the poorest children in either cohort.

For this confluence of reasons, we analyze the impacts on the two cohorts of children separately below. Section 6 describes the approach and results for the early beneficiaries – the 4-year-olds while Section 7 describes the approach and results for the later beneficiaries – the 1-year-olds. Each section considers three broad sets of outcomes: enrollment rates, duration of enrollment and child development outcomes – measured using the EDI and the SDQ.

## **6. Analyzing impacts for the early beneficiaries – the 4-year-olds**

We begin our analysis of the impacts of project services with the children who were in the 4-year-old cohort at baseline and were therefore age-eligible to participate in the services as soon as they were available in their villages.

### **6.1. Data and Descriptive Statistics**

Table 5 shows the descriptive statistics for four-year-old children who were assessed in all three periods. The table presents three sets of variables. The first set of variables includes whether or not children were enrolled in different types of ECED programs or elementary school each survey period, plus how many months the children were enrolled. As expected, when children got older, the rates and total months of enrollment in various programs increased. Particularly, the enrollment rate for project playgroups increased from 11.7% in 2009, to 24.5% in 2010, and to 31.8% in 2013. In all three years, the enrollment rates in project playgroups are larger than those in non-project playgroups. As children got older, enrollment rates in kindergarten also increased and surpassed enrollment rates of project playgroups in 2010 and 2013. As discussed before, this is expected because playgroups typically target three to four year old children and kindergarten targets five to six year old children before they enter primary school. In 2013, about 82.5% of children in the sample had been enrolled in some type of preschool program. The average duration was about 15 months after accounting for children who never enrolled. The enrollment rates in elementary schools were none or small in 2009 and 2010, but were near universal in 2013, when children were 7 or 8 years old, because children usually begin elementary school at age 6.

The second set of variables includes child development outcomes as measured by the EDI and the SDQ. As expected, as children got older between baseline and midline their development also improved. However, there was some regression in EDI scores from midline to endline. This regression is because we used the long-form EDI questionnaire at endline (more questions allowing for better interpretation of questions and a more valid assessment of development). Our Difference-in-Differences method, with time-trend dummies, should control for this type of measurement error inherent in using different questionnaires (Heckman et al. 1999).

The third set of descriptive statistics includes variables related to child and household background. Children's age, household size, household wealth Z-scores and parenting scores are time-varying variables, while mothers' education and children's gender are time invariant variables. It is notable that about 50% of mothers have primary school education or less. Children were on average about 4.4 years old at baseline, 5.5 years old at midline, and 8.1 years old at endline.

## 6.2. Empirical strategy

We conduct two analyses – each of which compares two different sets of villages to each other to estimate the intent-to-treat effect of the project. Our first analysis uses an IV method that compares actual batches 1 to 3 where the initial random assignment of original batches provides experimental evidence of six months of project exposure at baseline vs no exposure, 20 vs nine months of project exposure in the midline, and 51 vs 40 months of project exposure at the endline. Children in batch 1 were already exposed to the project by the time of baseline survey. As a result, we cannot use outcomes observed at baseline as a control when analyzing the midline and endline data. The estimation is based on outcomes observed at the time of the survey, correcting for time invariant characteristics, and time variant characteristics which are not influenced by project services (such as household wealth, household size, and age).

Our second analysis uses a difference-in-difference approach to compare actual batch 3 with the comparison group over time. This comparison is non-experimental, but has the advantage that neither group had been exposed to the project at baseline. Moreover, the comparison group never received the project, making it an ideal comparison group in the classical sense. This comparison provides evidence of the impact of nine months of project exposure at midline, and 40 months of project implementation at endline, both compared against no project in the comparison villages.

These two sets of estimates not only look at different durations of exposure to the project but they also compare different groups of villages to each other.

More formally, first, our IV estimate compares actual batch 1 to batch 3 using the 2 Stage Least Squares model (2SLS) as follows:

First stage regression:

$$I_j^a = I_j^o \gamma_t + X_{ijt} \theta_t + \epsilon_{ijt} \quad (1.1)$$

Second stage regression:

$$Y_{ijt} = \hat{I}_j^a \alpha_t + X_{ijt} \beta_t + \varepsilon_{ijt} \quad (1.2)$$

where  $Y_{ijt}$  is the outcome variable of child  $i$  in village  $j$  at time  $t$  (takes values of 0, 1 or 2 for baseline, midline and endline respectively).  $X_{ijt}$  is a vector of child and household characteristics observed at time  $t$ .  $I_j^a$  is the actual batch allocation which takes on the values 1 for batch 1, and 0 for batch 3 while  $I_j^o$  is the vector of the original batch allocation variables indicating original batches 2 and 3 with original batch 1 as the reference group.  $\hat{I}_j^a$  is the predicted value from the first stage equation (1.1). We run this 2SLS for each time period. Thus,  $\alpha_t$  indicates the impact of the project implementation at time  $t$ . In order to obtain the consistent IV estimator in this analysis, we assume that the random assignment of the three original batches affects children's outcomes only through the actual batch assignment.

The difference-in-differences model is estimated on the sample of villages that ended up in actual batch 3 and the comparison group of villages.

$$Y_{ijt} = \varphi_i + \sum_{t=1}^2 D_t \tau_t + I_j^a \alpha + \sum_{t=1}^2 I_j^a D_t \delta_t + X_{ijt} \beta + u_{ijt} \quad (2)$$

where  $I_j^a$  is the actual batch allocation which takes on the values 1 for batch 3, and 0 for comparison villages. Thus,  $\alpha$  indicates baseline ( $t = 0$ ) difference between two groups.  $\varphi_i$  is a child fixed effect.  $D_t$  is the time dummy for  $t = 1$  or  $2$ , which controls for age and time effects in the model. Thus, the coefficient  $\delta_t$  at  $t = 1$  or  $2$  is the Difference-in-Differences estimator. The model is estimated on the sample of villages that ended up in batch 3 or comparison group based on actual allocation.

### 6.3. Results

Before reporting IV analysis results, we check the strength of our IVs. Each row in Table A1 reports the first stage regression outcome of a particular group of children at different waves. For example, the first three rows report the first stage regression outcomes of all children at baseline, midline, and endline. We report the estimated coefficients and other statistical outcomes in each column. In the first stage regression, our outcome variable is the actual batch 1 indicator that is 1 for the actual batch 1 and 0 for the actual batch 3. We use two indicator variables for the original batches 2 and 3 as instrumental variables; the original batch 1 is a reference group. We also control for the child and household characteristics that are included in the outcome equation (as reported in Table 3). Across all first stage regression results, it is clear that children in the original batch 2 are less likely to be in the actual batch 1 by about 32 to 49 percentage points. Also, the chance to be in the actual batch 1 is much lower for children in the original batch 3 by about 81 to 85 percentage points. This is as expected based on the implementation process. To measure the strength of two instrumental variables, we report the  $F$ -test statistics under the null hypothesis that the coefficients of two instrumental variables are 0. Also, in all first stage regression results,  $F$ -test statistics for these two instrumental variables range from 135 to 191, which easily exceed the normal threshold of 10 for a strong IV (Stock, Wright, and Yogo, 2002). Thus, the first stage regression results indicate that our IVs are strong enough to run the second stage regression.

Table 6 presents the IV estimated impact on enrollment and child development outcomes from the second stage regression. There are three regression outcomes at the baseline, midline, and endline surveys. We control for children and their household characteristics as listed in Table 3. Thus, assuming that the randomization of original batches 1, 2 and 3 is valid, the estimated difference in enrollment and child development outcomes between children in batches 1 and 3 yields the unbiased estimate of the impact of the project.<sup>9</sup>

Children in batch 1 were more likely to be enrolled in project playgroups than those in batch 3 at all three survey periods; 15.4, 20.6, and 24.5 percentage points higher, respectively. The durations of enrollment in the project playgroups are also longer for children in batch 1 than for those in batch 3 at all three data collection periods; 1.5, 3, and 4.1 months longer, respectively. There is no significant difference in participation rates in non-project services, kindergartens, or primary schools between children living in batch 1 and 3 villages.

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<sup>9</sup> As mentioned earlier, batch 1 villages had implemented the project six months before the baseline survey while batch 3 villages had implemented the project nine months before the midline survey. In Tables A2, we examine the characteristics of children in different batches at baseline. This table presents the statistical tests on children in batches 1 and 3, as well as batch 3 and the comparison group of villages. It shows there are no differences in child backgrounds, not only between children in batches 1 and 3 but also between children in batch 3 and the comparison group of villages. Tests for village level characteristics using data from the PODES 2008 are available in Hasan, Hyson and Chang (eds). 2013. From these various pieces of evidence we are confident that randomization was valid.

In terms of child development outcomes, there were two statistically significant differences between batches 1 and 3. One difference is in the emotional symptoms domain of the SDQ at baseline, which shows better development for children in batch 1 compared to those in batch 3. At baseline this is an impact after 6 months. The other statistically significant outcome was on the communication and general knowledge domain of the EDI, which shows that children in batch 1 were doing worse than children in batch 3. This negative outcome is not what we would expect. However, with 33 child outcome variables considered, and only one result significant at the 10 percent level and another at the 5 percent level, these results are likely attributable to chance. As a result, we conclude that we cannot detect any significant difference in overall child development between children in batch 1 and 3 – two groups of villages that both received treatment at different times about 11 months apart.

We also examine whether project impact over time is different for children with different levels of household wealth and for those who are exposed to different parenting practices. Such subgroup analyses are essential to examine whether the ECED project's impacts differ for children with various backgrounds and characteristics. Particularly, we are interested in assessing whether disadvantaged children benefit more from living in villages that provided an opportunity to participate in the ECED project. Our subsample IV analyses by children's household wealth at baseline are presented in Tables 6.1 and 6.2. Using the household wealth Z-score, we define poor children as those whose household wealth is below the sample average and nonpoor children as those whose household wealth is above the sample average. Because all children in the sample are from poor rural areas, the definition of poor or nonpoor children is relative, not absolute. When we compare the results of poor children in Table 6.1 with those of nonpoor children in Table 6.2 we see no striking difference in utilization of project services between the two groups of children. On the other hand, Table 6.2 shows that among nonpoor children at midline and endline, children in batch 1 were less likely to enroll in regular kindergarten (TK) than children in batch 3, by about 12.8 and 13.9 percentage points respectively. In terms of enrollment durations, they were enrolled for about 1.5 and 2.8 months less in kindergarten than children in batch 3. Also, in Table 6.2, among nonpoor children, most estimates of differences in outcomes between children in batch 1 and batch 3 are statistically insignificant. As in the case of the full sample, we do observe two point estimates that are statistically significant. As before, we conclude that we cannot detect any significant difference in overall child development outcomes between non-poor children in batch 1 and 3.

Tables 6.3 and 6.4 present subsample IV analyses by the parenting practices score at the baseline. Here too, there is no noticeable difference in utilization of the ECED project between children of parents whose parenting score is above- and below- average. One interesting finding is that among children exposed to above-average parenting, children in batch 1 are scoring about 0.3 standard deviations higher in physical health and well-being than those in batch 3 – though given the large number of outcomes under consideration, this finding, too, is likely the result of chance.

In Table 7, we present the DID estimates as specified in equation (2). These estimates are very different from the IV estimates just reported because they compare a group of villages that received the project to a group of villages that did not. The DID estimates from the OLS and fixed effects models are presented side by side to see whether the two regression models yield different estimates. For all practical purposes, the estimates from the OLS and fixed effects models are very

similar, while the latter estimates are often statistically significant because of smaller standard errors.

For each regression model, there are DID estimates at midline and endline. The midline DID estimates indicate the impact of the ECED project for children in actual batch 3 villages versus children in comparison villages between baseline and midline – impacts in the short term. The endline estimates indicate the impact of the project after it had been implemented for about 3 years – impacts in the medium term. The key identification assumption is that at the time of midline (and endline), differences in enrollment and child development outcomes between project villages and comparison villages would have been the same as those at baseline if there had not been an intervention or if the intervention had had no effect. Also, the fixed effects model controls for both observed and unobserved time-invariant individual characteristics.

Our preferred specification is the fixed effects model. This is also the specification we focus on in the discussion and subgroup analyses that follow. Compared with children living in comparison villages, children living in project villages had higher rates of enrollment in project playgroups but lower enrollment rates in non-project playgroups and kindergarten programs at midline and endline. These estimates are in line with the IV estimates reported earlier. Overall, the ECED project increased the enrollment in preschool services (i.e., playgroups and kindergarten programs combined) by 9.3 and 7.5 percentage points at the midline and endline, respectively. The DID estimates from the fixed effects model also suggests that the impact on the enrollment duration in preschool services overall (i.e., playgroups and kindergarten programs combined) is about 0.68 and 1.37 months at the midline and endline, respectively.

In the OLS and fixed effects regression results, we find a statistically significant impact of the ECED project on the EDI social competence domain in the first year and the emotional maturity domain by the time of the endline three years later. The point estimates are 0.21 and 0.17 standard deviations, respectively. Because of lower standard errors, the fixed effects model yields statistically significant estimates at  $p < 0.1$  for the language and cognitive development domain after the first year (0.08 standard deviations). There is also evidence of children in project villages having fewer conduct problems (as measured by the SDQ) after the first year (0.14 standard deviations).

Tables 7.1 to 7.3 present the subgroup DID estimates by baseline levels of household wealth, enrollment status, and parenting skills. All estimates described here are obtained from the fixed effects model.

In Table 7.1, we present the DID estimates by household wealth. The DID estimates for enrollment and child development outcomes of poor and nonpoor children suggest that the ECED project's impact on enrollment in project playgroups is not much higher for poor children than for nonpoor children. However, poor children clearly benefited more from the ECED project compared to nonpoor children. Early indications of this are visible in the midline estimates which capture impacts after the first year. These show that poor children in project villages had made greater progress than poor children in non-project villages on the following EDI domains after the first year: social competence (0.4 SD) and language and cognitive development (0.18 SD). They also reported fewer conduct problems (0.16 SD). Poor children in project villages also had higher development outcomes compared to poor children in non-project villages at the endline – three years after project implementation started. We find evidence of positive impacts on poor children living in project villages in social competence (0.25 SD), emotional maturity (0.24 SD), language

and cognitive development (0.13 SD) as well as evidence that children in project villages had fewer emotional symptoms (0.17 SD as measured by the SDQ). We find no evidence of an impact of the ECED project on nonpoor children. Instead, nonpoor children in project villages show worse scores in social competence (0.27 SD) and language and cognitive development (0.09 SD) and pro-social behavior (0.225 SD) at the endline than their counterparts in non-project villages. We hypothesize that this has to do with the fact that children in project villages did not transition to kindergartens as they should have. Thus the project led to an unintended substitution effect for this group of children. We discuss the implications of this in the section 11.

Table 7.2 presents the DID estimates by pre-school enrollment status at baseline. Never-enrolled children defined in the analysis are those who had never been enrolled in any pre-school at baseline. As noted earlier, (Table 4) baseline enrollment and wealth are correlated. We thus view the results in table 8.2 as a check on our estimates in Table 8.1. We focus our discussion on the impact on EDI and SDQ scores. Never-enrolled children in project villages show better progress in several EDI domains both in the short- and medium terms. In the short term, social competence (0.22 standard deviations) and language and cognitive development (0.12 standard deviations) improved more for never-enrolled children living in project villages than for their counterparts living in non-project villages. In the medium term, physical health and well-being (0.15 standard deviations) and emotional maturity (0.18 standard deviations) were also higher. Never-enrolled children in project villages also make greater advances in terms of SDQ scales such as conduct problems (0.19 standard deviations lower in the short-term), and peer problems (0.18 standard deviations lower in the medium-term). In each case the sizes of the impacts are more than 0.1 standard deviations and sometimes over 0.2 standard deviations. Given that these are intent-to-treat estimates these results indicate that the program may have had a community-wide impact.

In Table 7.3, we present the DID estimates by parenting scores at the baseline. We have separate regression analyses for children whose parents reported above-average parenting scores and below-average parenting scores at baseline. As shown in the enrollment estimates, there is no striking difference in DID estimates between children whose parents have above- and below-average parenting scores. Most of the interesting results are in their development outcomes - the EDI and SDQ scores. While there is no significant impact of the ECED project on children from parents with above-average parenting scores, we find large and statistically significant impacts on child development outcomes of children from parents with below-average parenting scores. Such disadvantaged children in project villages show better development outcomes on the EDI in terms of social competence (0.27 SD), and language and cognitive development (0.12 SD) domains than their counterparts in non-project villages even after only one year of project exposure. This group also reports fewer conduct problems (0.18 SD) and fewer peer problems (0.25 SD). By the time these children are re-interviewed three years later (at endline), the impacts on social competence (0.2 SD), emotional maturity (0.21 SD), language and cognitive development (0.1 SD) and fewer peer problems (0.2 SD) are still detectable. While these children displayed greater hyperactivity and attention problems (0.19 SD) after the first year than their counterparts in non-project villages –by the time they are re-interviewed at endline there is no difference between the two groups on this outcome.

In summary, our subgroup analyses clearly suggest that the impacts of the ECED project are visible in both the short- and medium term. They are largest for (a) children who live in poorer households; (b) children who had never been enrolled in any playgroups at the baseline and (c) children whose parents had lower parenting scores at the baseline. Such findings are encouraging

because the services provided through the ECED project seem to supplement limited household resources of disadvantaged children and to help such children reach their potential in many important domains of child development.

## **7. Analyzing impacts for the later beneficiaries – the 1-year-olds**

Next we turn to the impact of the cohort of children who were the 1-year-olds at baseline and did not become eligible for project-provided services until two years after the project began.

### **7.1. Data and descriptive statistics**

The study interviewed the caregivers (again, usually mothers) of 3,185 children in the 1-year-old-cohort at the outset. Table 8 contains a description of this sample. At endline, caregivers of 2,842 were reached and able to provide information on their children's enrollment in early childhood services. Of these, we obtained developmental outcome data for 2,725 children while 2,457 provided information on all covariates considered in the analysis. By the endline, this cohort is approximately 4.8 years old, and 37.4% come from poorer households. 45.5 percent of the children had mothers with at most an elementary school education. When they were 1 (at baseline) 21.4 percent were moderately stunted and 5 percent were severely stunted. 24.7 percent were moderately wasted and 8.9 percent were severely wasted.<sup>10</sup> Lastly the parents of these children reported parenting practices that were 0.17 standard deviations above the mean.

### **7.2. Empirical strategy**

Had there been no deviations from the design and had villages chosen to offer services for children of all ages, our statistical analysis would have compared the outcomes of children in Batches 1 and 3. However, we are unable to show substantial differences between outcomes for children in Batches 1 and 3 since most communities decided to invest project funds in services which catered to children aged 3-6 rather than including services for 0-3. Thus the children in the 1-year-old cohort were too young to benefit from an increased provision of services when the project was first phased in (See also Figure 2).

We confirm this through instrumental variables analyses reported in Tables 9-12. As in the case of the 4-year-old cohort, these models are estimated using Equations 1.1 and 1.2. Across the range of outcome variables considered, while all point estimates are in the expected direction, there is no evidence of any statistical difference between children in batches 1 and 3.

In order to estimate whether or not the project had any impact on children in the younger cohort, we switch approaches and instead compare these children to children living in villages which never received the project.

To do so, two models were estimated. The unadjusted model controls only for the district to which each village belonged. The adjusted model added covariates for child, household, and background characteristics to the unadjusted model. The main coefficients of interest in both models are the coefficients on indicator variables for whether or not the child is from a village in

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<sup>10</sup> Stunting and wasting are defined using the 2007 World Health Organization Child Growth Charts.



batch 1 or a village in batch 3. The comparison group villages (non-project villages) are the reference group.

$$y_{ij} = I[\text{Child's village is Batch 1} = 1] * \beta_1 + I[\text{Child's village is Batch 3} = 1] * \beta_2 + \sum_{j=3}^9 I[\text{District} = j] * \beta_j + \epsilon \quad (3)$$

In equation (3),  $y_{ij}$  indicates the outcome for child  $i$  in village  $j$ .<sup>11</sup>

The second model (Equation 4) is adjusted for child's age, gender, household size, household wealth and a series of indicator variables indicating parenting practices and mother's level of education. In order to control for the child's baseline levels of development, controls were included for whether or not the child was stunted (and if so whether the stunting was moderate or severe) and for whether or not the child was wasted. For all models robust standard errors clustered at the village level are reported.

$$y_{ij} = I[\text{Child's village is Batch 1} = 1] * \beta_1 + I[\text{Child's village is Batch 3} = 1] * \beta_2 + \sum_{j=3}^9 I[\text{District} = j] * \beta_j + \sum_{j=10}^J X_{ij} * \beta_j + \epsilon \quad (4)$$

### 7.3. Results

Table 13 shows the results on enrollment for the younger cohort. On average, at endline children living in batch 1 villages were 57.5 percentage points more likely to be enrolled in project playgroups than children living in non-project villages. Children living in batch 3 villages were 53.9 percentage points more likely to be enrolled in project playgroups than children living in non-project villages. However children living in batch 1 and batch 3 villages were 23.7 and 21.9 percentage points less likely to be enrolled in non-project playgroups respectively and 11.6 and 8.2 percentage points less likely to be enrolled in kindergartens run by the Ministry of Education and Culture (MoEC) respectively than children living in villages without the project. There was no difference found in enrollment rates in Ministry of Religious Affairs (MoRA) kindergartens. There were no statistical differences between the estimated coefficients for batch 1 and batch 3 for any of the services. Taken together, these results would suggest that enrollment rates in any type of services in project villages were therefore about 22.2 percentage points higher than in non-project villages.

Table 14 shows the results for duration of enrollment. Children living in batch 1 villages were on average enrolled in project playgroups for 9.2 months and children living in batch 3 villages are on average enrolled in project playgroups for 8 months. The p-value of the test of equality of coefficients is 0.082 suggesting that they are different at the 10 percent significance level. In contrast to children living in non-project villages, they are enrolled in non-project playgroups for 3.3 and 3.1 months less and kindergartens for 0.7 and .5 months less respectively. We find no evidence of a difference between these coefficients. We find that there was no difference in duration of enrollment in MoRA kindergartens between children from project and

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<sup>11</sup> As before, there are two enrollment outcomes: (1) whether or not a child has ever enrolled in one of the following types of services between 2008 and 2013: a project-provided playgroup, a non-project playgroup, a kindergarten run by Ministry of Education and Culture (MoEC) or a kindergarten run by the Ministry of Religious Affairs (MoRA) and (2) how long a child has been enrolled in each of these services.

non-project villages. This is as expected, considering there was no difference in enrollment rates in these services either. Taken together this suggests that in this cohort of children who were age 1 at baseline children in project villages are receiving about 6 months a year of additional early childhood education and stimulation when compared to children living in non-project villages.

Table 15 examines the impact of living in a project village compared to living in a non-project village for each of the five domains of the EDI. The results indicate clear impacts on the physical health and well-being domain of the EDI (adjusted estimated impact for children living in batch 1 villages is 0.108 with a standard error of 0.055, and the adjusted impact for children living in batch 3 villages is 0.207 with a standard error of 0.051) and the language and cognitive development domain of the EDI (adjusted estimated impact for batch 1 is 0.151 with a standard error of 0.049, and an adjusted impact of 0.099 for batch 3 with a standard error of 0.048). In the case of physical health and well-being the estimated coefficients for batch 1 and batch 3 are different ( $p$ -value = 0.056) while the coefficients for language and cognitive development are not statistically different from each other. Small but positive impact is found for the social competence and communication skills and general knowledge domains after adjusting for covariates but these results are not statistically different from zero. In the case of emotional maturity, the estimates are also small and statistically insignificant but are negatively signed.

Table 15.1 reports the estimated impacts of the project for the poor. The point estimates on enrollment rates are very similar to those of the sample overall – suggesting little differential impact on the poorer children in this cohort. In addition, the impact in terms of duration of enrollment is also very similar to that of the overall sample, suggesting no differential impact in this cohort. The bottom half of the table corroborates this finding – we see no evidence of differential impact on the poorer sub-sample.

Table 15.2 repeats this exercise for the sub-sample of children whose caregivers report below-average parenting practices. The estimated impact both in terms of enrollment rates and in terms of duration of enrollment is virtually identical to that of the overall sample. In terms of development outcomes, this sub-group does not display any differential impacts either.<sup>12</sup>

## 8. Summarizing the impacts

Taken together, the evidence in sections 6 and 7 suggests that exposure to the project (that is, living in villages where the project services were implemented) improved poor children's overall development and readiness for further education. The extent of the improvement in children's outcomes that can be attributed to the project varies depending on the aspect of school readiness under consideration. It also varies depending on the cohort of children being studied. Specifically:

- Having these services in villages led to an improvement in the physical health and well-being as well as the language and cognitive development of the 1-year-old cohort at endline.
- Having the project services available led to improvements in the emotional maturity of children in the 4-year-old cohort when compared to children from villages without these

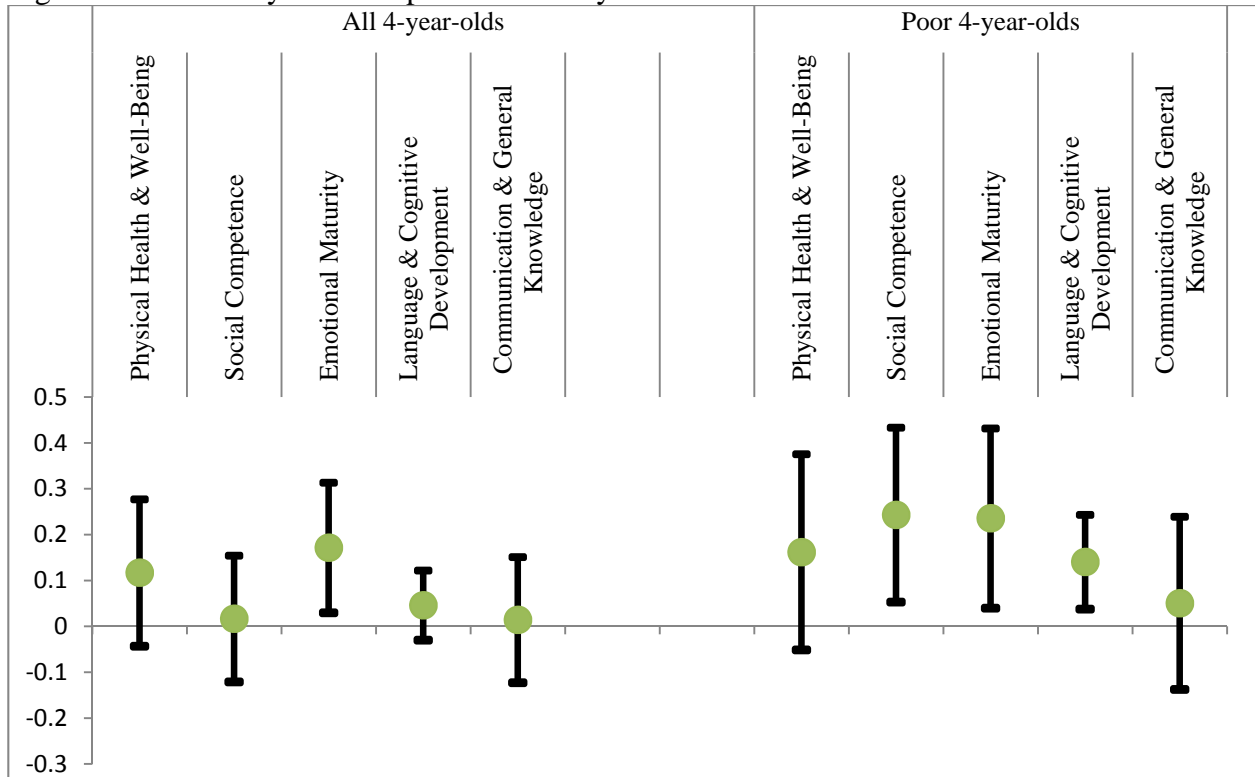
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<sup>12</sup> We do not attempt to estimate the impacts for children never enrolled at the baseline – since virtually no one in this cohort would be eligible to enroll in playgroups at the time of the baseline.

services. For the average child in the 4-year-old cohort, other point estimates, though positively signed, are not statistically distinguishable from zero.<sup>13</sup>

- However, when the data are disaggregated for the older cohort, they reveal that these average results mask substantial improvements for the poorer children in the 4-year-old cohort compared to non-poor children. There is compelling evidence that the project led to improvements in poorer children’s social competence, language and cognitive development as well as their emotional maturity.<sup>14</sup>

Figure 4: A summary of the impacts for the 4 year old cohort



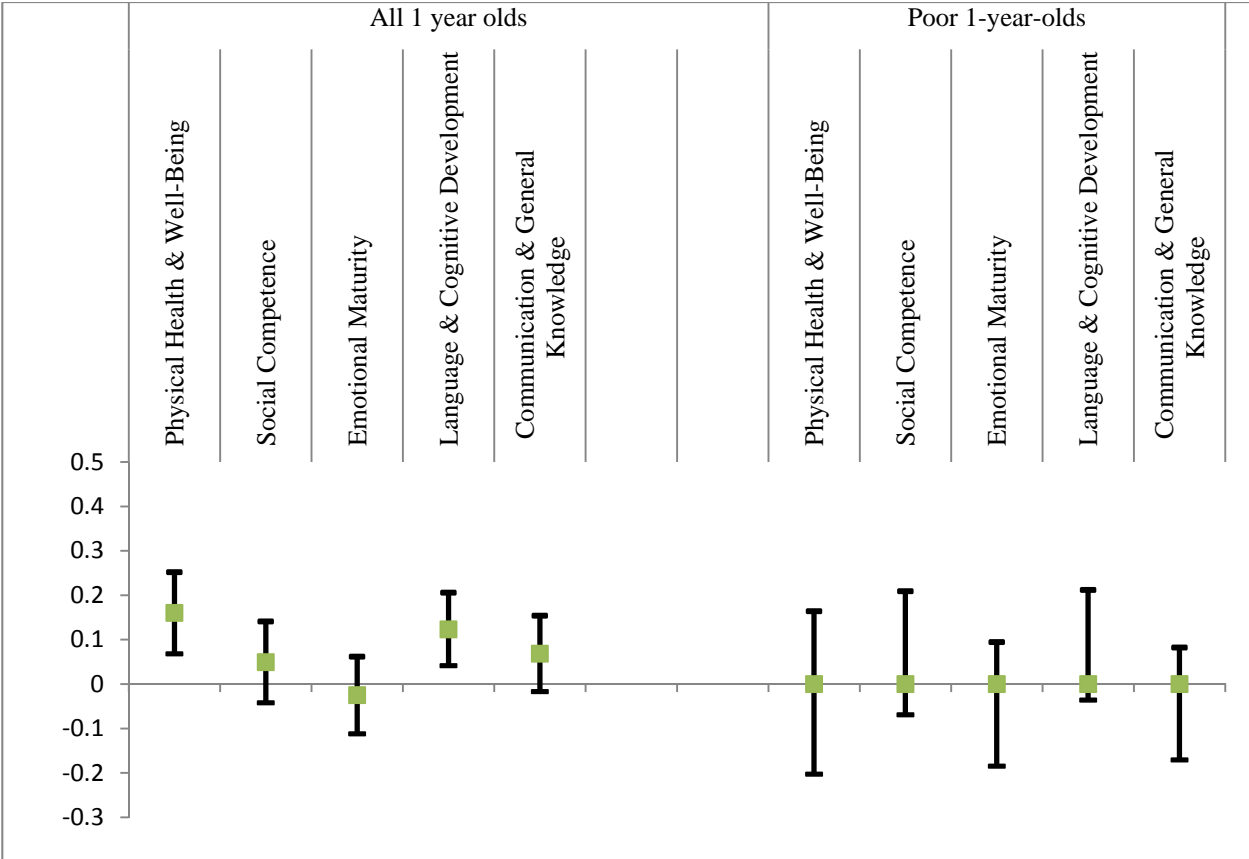
Note: Estimated coefficients and associated 95% confidence intervals shown. Estimates are reported in Tables 7 and 8.1 and are the point estimates under the column labelled endline.

- When the results for the 1-year-olds are similarly disaggregated, however, there is no such differential impact between poor and non-poor children. As noted above, this may have to do with the fact that as the project neared its conclusion, many project centers began charging fees, making it more difficult for poorer families to enroll their children.

Figure 4 continued: A summary of the impacts for the 1-year-old cohort

<sup>13</sup> This lack of statistical significance is a reflection of the fact that the evaluation was designed to be able to detect a minimum effect size larger than the one obtained in reality. Thus the design does not have enough statistical power to detect the effect sizes actually observed.

<sup>14</sup> These results are robust to alternative approaches. Comparing the evolution of outcomes between children whose parents report having poor parenting practices at baselines reveals a similar story. Together these results are consistent with the project having improved outcomes for the most vulnerable groups.



Note: Estimated coefficients and associated 95% confidence intervals shown. Estimates are based on those reported in Tables 15 and 15.1.

### 9. Understanding the channels behind the impacts

We cannot estimate the causal effect of attending the different types of services as the intervention did not assign individuals to services. Instrumental variables cannot be applied in this case because we require one instrument for every type of service – something we do not have.

We are however interested in this question, as it may help us unpack the why behind any impact estimates. For this reason, we estimate a child skill development production function (P. E. Todd and K. I. Wolpin, 2003). As we expect the program will also affect outcome through substitution effects, we apply a value-added specification relating current child development to child development in the previous period and inputs received over the intermittent period.

$$Y_{ij,t+2}^D = Z_{ijt}\beta^D + \gamma^D Y_{ij,t}^D + \varepsilon_{ijt}^3 \quad t = 0 \quad (4)$$

where  $Z$  is a vector of child and village variables that contribute to child development  $Y$  in domain  $D$  in between baseline ( $t=0$ ) and endline ( $t=2$ ). In our specification,  $Z$  includes the months the child went to each type of ECED service and primary school and household and personal characteristics. Specifications of this type are commonly used to analyze the formation of skills of

children, including in developing countries. We estimate a separate such function for both cohorts of beneficiaries.<sup>15</sup>

Table 16 presents the result of the child development production function as specified in equation (4) for the 4-year-old cohort of beneficiaries. The estimated coefficients for the EDI suggest that project playgroups support physical development of children. Project playgroups also do better than non-project playgroups in developing language and cognitive skills. On the SDQ, we find that participation in project playgroups increases social problems, while participation in non-project playgroups does not appear to have any effect (positive or negative). It thus seems that for this cohort the focus of the project playgroups on developing cognitive skills may have come at the cost of developing social and emotional skills. As expected, primary school participation has a very strong correlation with language and cognitive skills development. This is no surprise, as the kind of classroom setting that is used in kindergartens and primary schools lends itself better for developing cognitive skills. Moreover, these types of education services meet daily for usually around 6 hours per day, while playgroups meet every other day and only for about 2 hours per day.

Table 17 repeats this exercise and presents the result of the child development production function as specified in equation (4) for the younger cohort. The estimated coefficients for the EDI suggest that both project and non-project playgroups support development on multiple domains: physical, socio-emotional and cognitive. On the SDQ, we find that participation in playgroups lowers hyperactivity, peer problems and pro-social behavior problems, while participation in non-project playgroups increases social conduct problems. Here too, participation in kindergartens has strong effects on children's development. For this group of children we do not have information on the role of primary schools as most of the children are not yet age-eligible for primary school.

What aspects of the centers might lead to this? Assessments of center quality carried out using the Early Childhood Environment Rating Scales – Revised edition (ECERS-R) would indicate that project playgroups have significantly better physical space and furnishings than non-project playgroups and receive higher scores on activities and teacher-child interactions (Table 18).<sup>16</sup> Overall this translates to a higher total ECERS-R score for project playgroups than for non-project playgroups. These differences are not evident in the case of kindergartens. Similarly in terms of training, while shares of trained teachers are similar across the various types of services, only project playgroup teachers receive the 200 hours of training developed specifically under the project. All other available modalities of training in the country are of substantially shorter duration. Combined with the fact that project playgroup teachers typically have fewer years of teaching experience than their non-project counterparts, this suggests that the more in-depth training under the project may have been one of the channels through which impacts manifest. Given the design of this evaluation, however, there is no way to causally establish this claim.

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<sup>15</sup> A critical drawback of this approach is that we are unable to isolate the impact of attending different services at the correct age for that service. Our sample sizes are too small for this approach to work. Thus we are left with correlations that mix together both the effect of attending a particular service and any effects that one's age when attending a given service may have.

<sup>16</sup> See Sally Brinkman, Amer Hasan, Haeil Jung, Angela Kinnell, Nozomi Nakajima and Menno Pradhan. Forthcoming. Promoting child development in rural Indonesia: The role of preschool service quality and teacher characteristics.

## 10. Cost-benefit analysis

Having established the impact of the ECED project and the channels which may have led to them, we turn to a remaining critical question: was the ECED project a worthwhile investment? This section argues that it was. Comparable interventions range in cost from US\$37 per child in India to US\$289 in Colombia. The Indonesian intervention, on the other hand, cost approximately US\$30 per child (all amounts in 2014 dollars).

Using the actual number of children reached by the project (673,162 as of June 2013) and the actual observed increase in educational attainment (0.1 years on average for the 4-year-olds and 0.4 years for the 1-year-olds) allows us to present a rudimentary cost-benefit analysis (Table 19). It uses a conservative set of estimates of rates of return to education: which range from 6.8-10.6 percent as estimated by Duflo (2001) and from 6.1-12.3 percent as estimated by Patrinos et al. (2006). We assume that:

- there is a 6.5 percent rate of return to education (averaging the bottom end of the rates of return reported in the papers above)
- children do not begin to realize the benefits of increased wages until age 18
- they do so for 40 years

Under these assumptions, a 0.1 year increase in schooling results in a benefit-cost ratio of 1.3.<sup>17</sup> Similarly, a 0.4 year increase in schooling results in a benefit-cost ratio of 4.3. Using higher rates of return as assumed in the World Bank Project Appraisal Document (11.2 percent) suggests a correspondingly much higher benefit-cost ratio of 2.1 – 7.3. Thus even the most conservative cost-benefit estimates would suggest that the project did far better than break even. This is an underestimate of the benefit given the conservative estimates of returns to education used, the shorter-than-usual time horizon for accrual of benefits as well as the fact that these are only private returns for selected cohorts. Social returns to education have not been factored in.

## 11. Discussion and conclusion

While evidence of the impacts of preschool are growing, gaps in knowledge about the state of child development in marginalized, diverse communities remain. This unequal distribution of evidence constitutes a major challenge for increasing global awareness of the importance of early child development in shaping future human capital.

This paper adds to the literature by evaluating a low-cost center-based early childhood education project in rural areas in a large middle-income country using quasi-experimental techniques. Because the study design relied on two cohorts of beneficiaries – one that benefitted almost immediately after the project began (the 4-year-old cohort) and one that benefitted later (the 1-year-old cohort), the results must be interpreted with the distinctive aspects of preschool experiences, age at enrollment, and duration of enrollment taken into account. We are able to identify the impact of the project in the short term by comparing the outcomes of children in two groups of villages that received the project about a year apart. We are also able to use difference-in-difference estimates to identify the impact of the project in the medium term by comparing the

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<sup>17</sup> The 2012 GDP per capita in PPP terms was US\$4876. In our calculations of rate of return, we assume that rural wages are a third of this number.

outcomes of children in a group of villages that received the project to the outcomes of children in a group of villages that never received the project. A number of interesting patterns emerge.

For both cohorts, the evidence suggests that project services increased enrollment in ECED services and increased the duration of children's enrollment in these services. The data also show that there was some substitution away from existing types of preschool services, particularly kindergarten, probably because the project playgroups were free, at least initially. This substitution effect was larger in the case of the older cohort than the younger cohort.

For both cohorts, the estimates suggest that on average there were improvements in children's development outcomes. However whether these improvements were in cognitive or non-cognitive skills varies depending on the cohort being studied. Improvements were larger and covered more domains when exposure to the project (availability of services in the village) was longer. The evidence of the benefits of longer exposure emerges from comparisons which look at villages with and without project services.

Classroom observations suggest important differences in physical space, infrastructure and teaching practices between project playgroups and other services. Thus despite the fact that project playgroups meet less frequently than other types of services, children who attended these services showed improvements in development outcomes. One possibility is that the intensive 200 hours of teacher training provided by the project helped teachers – who had much less experience than teachers in other services.

An important consideration in interpreting the findings from the two cohorts is that at the outset of the project, about half the centers did not charge fees. Thus for the 4-year-old cohort in particular, children from poorer households, children whose parents reported having poor parenting practices and children who had never been enrolled in a preschool service prior to the start of the project experienced large gains as a result of the project services being available in their villages. Over time, as project funds diminished, centers began charging fees to ensure sustainability. This resulted in a different population of enrolled children: one which was slightly better off than their predecessors in earlier years of the project. For this group, the substitution away from kindergarten was smaller, in part perhaps because they were from wealthier households.

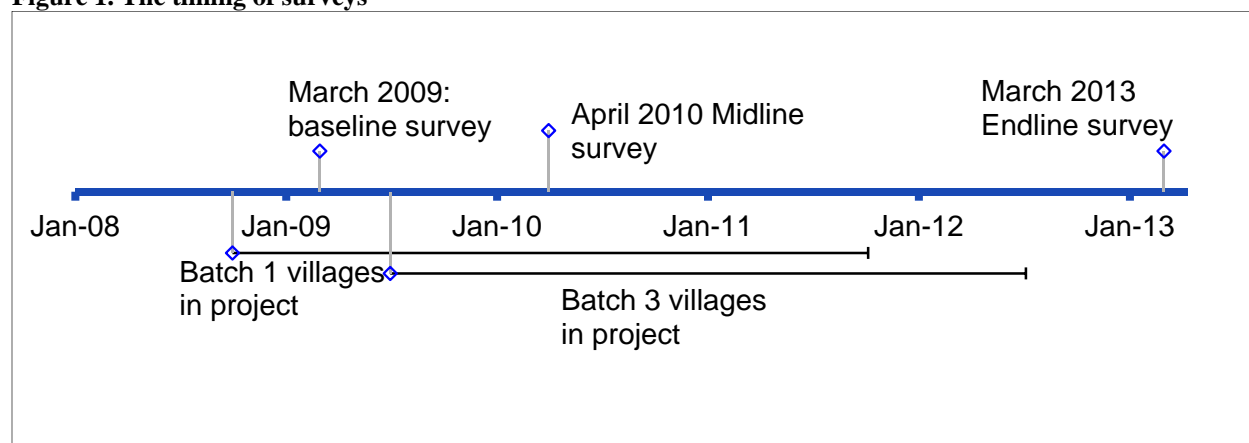
Indonesia has rapidly moved from a developing to a middle-income country in recent years. As the country has grown economically, so too have concerns about inequality, and in particular, concerns for children and families living in poor rural communities. The results from this study would indicate that a low cost, community-based early childhood program can have an impact on child development even when delivered in the kind of low-dose center-based environment studied here. Existing literature indicates that programs with a strong parenting component and nutrition support for very young children, including children aged 0-3 years, can reinforce the advances documented in this paper. As governments around the world, including Indonesia, consider approaches to tackle inequality in early childhood, approaches such as those studied in this paper would appear to be fruitful avenues for further exploration.

**Table 1. Original and actual allocation of villages to batches (number of villages)**

Actual allocation	Original allocation			matched comparison	Total
	batch 1	batch 2	batch 3		
Batch 1	89	10	6	0	105
batch 3	9	10	93	1	113
matched comparison	2	0	1	89	92
Total	100	20	100	90	310

Note: Each cell shows number of villages

**Figure 1. The timing of surveys**



Note: Comparison group villages that never receive the project are interviewed at the same time but are not show in the figure above. The baseline survey were fielded 6 months after batch 1 villages received their block grants. Most of batch 3 villages received their block grants about five months after the baseline survey which is about nine months before the midline survey. Thus, the average difference in exposure between batch 1 and 3 villages is about 11 months while the average difference in exposure between batch 3 and the comparison group is about nine months at midline, and 40 months at endline with no project exposure in the comparison group villages.

**Table 2. Timing of project and surveys**

		baseline	midline	endline
batch 1 villages				
(actual allocation)	Percent of villages that received block grant	100	100	100
	Avg. Nr of months since receipt of block grant <sup>a</sup>	6	20	51
batch 3 villages	Percent of villages that received block grant	7	96	100
	Avg. Nr of months since receipt of block grant <sup>a</sup>	2	9	39

a: Note: We include villages that did receive block grant



**Table 3: Centers started charging fees**

	Project centers		Non-project centers
	2010 Midline	2013 Endline	2013 Endline
<b>Percent of centers charging</b>			
No fee	52	30	19
Mandatory fee	42	61	67
Voluntary fee	6	4	1
Both mandatory and voluntary fee	-	5	13
<b>Mandatory fee: amount charged if charging</b>			
Less than 10,000 IDR	76	46	24
10,000-25,000 IDR	23	48	64
25,000-50,000 IDR	1	3	9
More than 50,000 IDR	-	3	3

Note: All numbers are percent of centers surveyed. Not necessarily the same centers in midline and endline but information is from the same villages over time. 1 USD = approximately 10,000 IDR in 2010.

**Table 4: The wealth profile of the two cohorts is different even though the maternal education levels are very similar**

	Mother's years of education		Household wealth Z-score	
	1-year-olds	4-year-olds	1-year-olds	4-year-olds
No ECED	7.4 <i>2.8</i> <b>634</b>	7.3 <i>2.9</i> <b>599</b>	0.05 <i>0.83</i> <b>494</b>	-0.54 <i>1.11</i> <b>536</b>
Project playgroup only	8.2 <i>2.9</i> <b>536</b>	7.8 <i>2.8</i> <b>484</b>	0.16 <i>0.84</i> <b>536</b>	-0.42 <i>0.98</i> <b>451</b>
Non-project playgroup only	8.5 <i>3.1</i> <b>216</b>	7.5 <i>3.0</i> <b>137</b>	0.23 <i>0.75</i> <b>216</b>	-0.47 <i>1.12</i> <b>129</b>
MoEC Kindergarten (TK) only	8.7 <i>3.0</i> <b>502</b>	8.7 <i>2.9</i> <b>943</b>	0.46 <i>0.78</i> <b>502</b>	0.06 <i>1.02</i> <b>883</b>
MoRA Kindergarten (RA) only	9.1 <i>2.9</i> <b>110</b>	8.7 <i>2.8</i> <b>161</b>	0.29 <i>0.75</i> <b>110</b>	-0.08 <i>0.85</i> <b>152</b>
Project playgroup & other services	8.9 <i>2.7</i> <b>350</b>	8.6 <i>2.8</i> <b>326</b>	0.41 <i>0.81</i> <b>350</b>	-0.03 <i>1.00</i> <b>300</b>
Non-project playgroup & other services	9.8 <i>2.7</i> <b>210</b>	9.1 <i>2.8</i> <b>238</b>	0.65 <i>0.83</i> <b>210</b>	0.18 <i>0.96</i> <b>228</b>

Notes: Standard deviations are in italics. Sample size is in bold. Sample means are reported for children in each cohort who report attendance of various types of services and those who report no ECED.

**Table 5. Descriptive statistics of children in the balanced panel data**

	Baseline (2009)		Midline (2010)		Endline (2013)	
	mean	sd	mean	sd	mean	sd
<b>Enrollment in ECED Programs</b>						
Was child enrolled in project playgroups in survey year (1=Yes)	0.117	0.321	0.245	0.430	0.318	0.466
Was child enrolled in non-project playgroups in survey year (1=Yes)	0.069	0.254	0.117	0.321	0.142	0.350
Was child enrolled in Islamic Kindergarten in survey year (1=Yes)	0.013	0.111	0.037	0.188	0.070	0.255
Was child enrolled in Kindergarten in survey year (1=Yes)	0.050	0.219	0.294	0.456	0.515	0.500
Was child enrolled in any ECED programs in survey year (1=Yes)	0.249	0.432	0.605	0.489	0.825	0.380
Was child enrolled in Primary school in survey year (1=Yes)	0.000	0.000	0.013	0.114	0.992	0.087
Cumulated number of months of project playgroup <sup>a</sup>	1.132	3.145	3.078	5.934	4.590	7.662
Cumulated number of months of non-project playgroup <sup>a</sup>	0.675	2.493	1.377	4.068	1.821	4.992
Cumulated number of months of Islamic Kindergarten <sup>a</sup>	0.126	1.115	0.485	2.650	1.074	4.253
Cumulated number of months of Kindergarten <sup>a</sup>	0.492	2.152	3.385	5.630	7.767	8.579
Cumulated number of months of any ECED programs <sup>a</sup>	2.424	4.260	8.325	7.800	15.252	9.683
Cumulated number of months of Primary school <sup>a</sup>	0.000	0.000	0.131	1.137	18.613	6.113
<b>Standardized Child Development Outcomes</b>						
EDI: Physical Health & Well-Being	-0.288	1.100	-0.143	1.022	0.145	0.974
EDI: Social Competence	0.013	0.995	0.385	0.917	-0.053	0.994
EDI: Emotional Maturity	-0.190	1.065	0.092	1.026	0.014	0.979
EDI: Language & Cognitive Development	-1.339	0.595	-0.590	0.807	0.696	0.443
EDI: Communication & General Knowledge	0.531	0.612	0.581	0.498	-0.295	1.052
SDQ: Emotional Symptoms	-0.043	0.957	-0.101	0.951	0.057	1.034
SDQ: Conduct Problems	0.099	0.972	0.094	1.016	0.021	1.007
SDQ: Hyperactivity & Inattention	0.374	0.970	0.062	0.968	-0.065	1.034
SDQ: Peer Problems	0.168	1.027	0.003	1.034	-0.007	0.985
SDQ: Pro-social Behavior	0.341	0.998	0.186	1.023	-0.200	0.958
SDQ: Total Difficulties	0.185	0.972	0.012	0.977	0.014	1.024
<b>Child and Household Background</b>						
Age of child (in years)	4.361	0.229	5.521	0.272	8.130	0.289
Household size	4.697	1.554	4.966	1.647	4.759	1.525
Wealth Z-score	-0.236	1.082	-0.102	1.039	0.193	0.905
Parenting Skills Z-Score	0.034	0.987	-0.058	0.954	0.037	0.988
Mother's Education= 1 for Not yet/never go to school	0.033	0.178	0.033	0.178	0.033	0.178
Mother's Education = 1 for Did not finish primary school	0.086	0.281	0.086	0.281	0.086	0.281
Mother's Education = 1 for Primary school	0.406	0.491	0.406	0.491	0.406	0.491
Mother's Education = 1 for Junior high school	0.243	0.429	0.243	0.429	0.243	0.429
Mother's Education = 1 for Senior high school	0.175	0.380	0.175	0.380	0.175	0.380
Mother's Education = 1 for 1/2/3 year diploma	0.021	0.142	0.021	0.142	0.021	0.142
Mother's Education = 1 for 4 year diploma/Bachelor degree	0.032	0.175	0.032	0.175	0.032	0.175
Mother's Education = 1 for Master's/PhD	0.002	0.040	0.002	0.040	0.002	0.040
Mother's Education = 1 for Don't know	0.003	0.052	0.003	0.052	0.003	0.052
Children's Gender: Male = 1	0.494	0.500	0.494	0.500	0.494	0.500

Notes: <sup>a</sup>calculated from recall data collected in last round of survey. Notes: Sample sizes for each year are 1841 to 1987 depending on variables. Wealth Z-score is constructed on the basis of an index which incorporates information on asset ownership, construction of home and receipt of social assistance. Data are from 310 villages.

**Table 6. IV estimated impact on enrollment and child development outcomes <sup>a</sup>**

	IV Model: Baseline		IV Model: Midline		IV Model: Endline	
	Actual Batch 1		Actual Batch 1		Actual Batch 1	
	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE
<b>Enrollment in ECED Programs</b>						
Was child enrolled in project playgroups in survey year (1=Yes)	0.154***	(0.034)	0.206***	(0.050)	0.245***	(0.058)
Was child enrolled in non-project playgroups in survey year (1=Yes)	0.008	(0.022)	0.006	(0.032)	-0.002	(0.035)
Was child enrolled in Islamic Kindergarten in survey year (1=Yes)	-0.010	(0.011)	-0.032	(0.023)	-0.052	(0.038)
Was child enrolled in Kindergarten in survey year (1=Yes)	-0.008	(0.016)	-0.075	(0.047)	-0.097	(0.065)
Was child enrolled in any ECED programs in survey year (1=Yes)	0.142***	(0.040)	0.045	(0.046)	0.003	(0.034)
Was child enrolled in Primary school in survey year (1=Yes)	NA	NA	0.015	(0.010)	0.004	(0.005)
Cumulated number of months of project playgroup	1.516***	(0.335)	3.029***	(0.661)	4.087***	(0.932)
Cumulated number of months of non-project playgroup	0.072	(0.220)	0.106	(0.383)	-0.160	(0.463)
Cumulated number of months of Islamic Kindergarten	-0.100	(0.108)	-0.423	(0.315)	-0.758	(0.567)
Cumulated number of months of Kindergarten	-0.094	(0.154)	-0.868	(0.555)	-1.770	(1.092)
Cumulated number of months of any ECED programs	1.394***	(0.392)	1.844**	(0.766)	1.399	(1.030)
Cumulated number of months of Primary school	NA	NA	0.154	(0.104)	0.256	(0.541)
<b>Standardized Child Development Outcomes</b>						
EDI: Physical Health & Well-Being	0.113	(0.095)	0.072	(0.080)	0.001	(0.098)
EDI: Social Competence	0.054	(0.099)	-0.089	(0.073)	-0.099	(0.079)
EDI: Emotional Maturity	0.018	(0.095)	0.019	(0.072)	-0.010	(0.083)
EDI: Language & Cognitive Development	0.067	(0.048)	0.050	(0.071)	-0.031	(0.030)
EDI: Communication & General Knowledge	-0.022	(0.057)	-0.103**	(0.044)	0.012	(0.100)
SDQ: Emotional Symptoms	-0.166*	(0.094)	-0.048	(0.077)	-0.036	(0.091)
SDQ: Conduct Problems	-0.121	(0.085)	-0.004	(0.074)	-0.094	(0.082)
SDQ: Hyperactivity & Inattention	0.012	(0.091)	-0.034	(0.074)	0.007	(0.089)
SDQ: Peer Problems	0.009	(0.101)	0.067	(0.089)	-0.016	(0.082)
SDQ: Pro-social Behavior	0.057	(0.093)	0.040	(0.086)	-0.077	(0.086)
SDQ: Total Difficulties	-0.122	(0.102)	-0.011	(0.076)	-0.059	(0.095)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; <sup>a</sup> IVs are two dummy variables indicating original batches 2 or 3 with original batch 1 as a reference group. Each row is the result of a separate regression. Models are estimated separately for baseline, midline and endline. Controls include: child's age, gender, household size, household wealth and mother's education level. Robust standard errors are clustered at the village level. Sample size for each year varies from 1,311 to 1,317.

**Table 6.1 IV estimated impact on enrollment and child development outcomes (Poor children at baseline) <sup>a</sup>**

	IV Model: Baseline		IV Model: Midline		IV Model: Endline	
	Actual Batch 1		Actual Batch 1		Actual Batch 1	
	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE
<b>Enrollment in ECED Programs</b>						
Was child enrolled in project playgroups in survey year (1=Yes)	0.160***	(0.040)	0.237***	(0.059)	0.235***	(0.070)
Was child enrolled in non-project playgroups in survey year (1=Yes)	-0.015	(0.015)	-0.032	(0.029)	-0.047	(0.035)
Was child enrolled in Islamic Kindergarten in survey year (1=Yes)	-0.008	(0.011)	-0.019	(0.025)	-0.068*	(0.038)
Was child enrolled in Kindergarten in survey year (1=Yes)	-0.015	(0.017)	-0.053	(0.055)	-0.072	(0.077)
Was child enrolled in any ECED programs in survey year (1=Yes)	0.122***	(0.045)	0.075	(0.058)	0.006	(0.049)
Was child enrolled in Primary school in survey year (1=Yes)	NA	NA	0.014	(0.013)	0.004	(0.010)
Cumulated number of months of project playgroup	1.517***	(0.386)	3.450***	(0.781)	4.438***	(1.168)
Cumulated number of months of non-project playgroup	-0.153	(0.151)	-0.418	(0.363)	-0.852	(0.536)
Cumulated number of months of Islamic Kindergarten	-0.077	(0.109)	-0.267	(0.330)	-0.814	(0.568)
Cumulated number of months of Kindergarten	-0.145	(0.172)	-0.645	(0.648)	-1.247	(1.262)
Cumulated number of months of any ECED programs	1.142***	(0.439)	2.120**	(0.911)	1.524	(1.269)
Cumulated number of months of Primary school	NA	NA	0.142	(0.134)	0.353	(0.669)
<b>Standardized Child Development Outcomes</b>						
EDI: Physical Health & Well-Being	0.100	(0.116)	0.100	(0.102)	0.041	(0.115)
EDI: Social Competence	0.190	(0.132)	-0.079	(0.081)	-0.036	(0.102)
EDI: Emotional Maturity	0.066	(0.114)	0.089	(0.095)	0.111	(0.107)
EDI: Language & Cognitive Development	0.066	(0.055)	0.042	(0.087)	-0.047	(0.043)
EDI: Communication & General Knowledge	0.019	(0.083)	-0.090*	(0.054)	-0.032	(0.122)
SDQ: Emotional Symptoms	-0.189*	(0.100)	-0.031	(0.103)	0.025	(0.112)
SDQ: Conduct Problems	-0.113	(0.106)	-0.039	(0.097)	-0.152	(0.116)
SDQ: Hyperactivity & Inattention	0.011	(0.108)	-0.069	(0.095)	-0.053	(0.108)
SDQ: Peer Problems	-0.036	(0.115)	0.005	(0.112)	-0.083	(0.105)
SDQ: Pro-social Behavior	0.026	(0.112)	0.077	(0.103)	-0.124	(0.118)
SDQ: Total Difficulties	-0.145	(0.106)	-0.047	(0.098)	-0.095	(0.115)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; <sup>a</sup> IVs are two dummy variables indicating original batches 2 or 3 with original batch 1 as a reference group. Each row is the result of a separate regression. Models are estimated separately for baseline, midline and endline. Controls include: child's age, gender, household size, household wealth and mother's education level. Robust standard errors are clustered at the village level. Sample size for each year varies from 760 to 763.

**Table 6.2 IV estimated impact on enrollment and child development outcomes (Nonpoor children at baseline) <sup>a</sup>**

	IV Model: Baseline		IV Model: Midline		IV Model: Endline	
	Actual Batch 1		Actual Batch 1		Actual Batch 1	
	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE
<b>Enrollment in ECED Programs</b>						
Was child enrolled in project playgroups in survey year (1=Yes)	0.157***	(0.052)	0.195***	(0.066)	0.272***	(0.069)
Was child enrolled in non-project playgroups in survey year (1=Yes)	0.033	(0.039)	0.050	(0.051)	0.052	(0.052)
Was child enrolled in Islamic Kindergarten in survey year (1=Yes)	-0.015	(0.017)	-0.050	(0.032)	-0.032	(0.053)
Was child enrolled in Kindergarten in survey year (1=Yes)	-0.004	(0.024)	-0.128**	(0.064)	-0.139*	(0.078)
Was child enrolled in any ECED programs in survey year (1=Yes)	0.167***	(0.054)	0.006	(0.058)	-0.011	(0.029)
Was child enrolled in Primary school in survey year (1=Yes)	NA	NA	0.014	(0.011)	0.003	(0.003)
Cumulated number of months of project playgroup	1.628***	(0.518)	2.889***	(0.914)	3.888***	(1.106)
Cumulated number of months of non-project playgroup	0.307	(0.384)	0.711	(0.580)	0.666	(0.619)
Cumulated number of months of Islamic Kindergarten	-0.147	(0.174)	-0.664	(0.469)	-0.681	(0.811)
Cumulated number of months of Kindergarten	-0.062	(0.237)	-1.493*	(0.765)	-2.788**	(1.346)
Cumulated number of months of any ECED programs	1.726***	(0.544)	1.443	(0.972)	1.086	(1.202)
Cumulated number of months of Primary school	NA	NA	0.143	(0.113)	0.145	(0.693)
<b>Standardized Child Development Outcomes</b>						
EDI: Physical Health & Well-Being	0.140	(0.143)	0.036	(0.113)	-0.075	(0.123)
EDI: Social Competence	-0.127	(0.104)	-0.141	(0.108)	-0.225**	(0.105)
EDI: Emotional Maturity	-0.064	(0.135)	-0.069	(0.102)	-0.148	(0.109)
EDI: Language & Cognitive Development	0.038	(0.071)	-0.005	(0.094)	-0.008	(0.039)
EDI: Communication & General Knowledge	-0.062	(0.054)	-0.113*	(0.062)	0.026	(0.121)
SDQ: Emotional Symptoms	-0.145	(0.134)	-0.052	(0.100)	-0.148	(0.129)
SDQ: Conduct Problems	-0.122	(0.117)	0.040	(0.107)	-0.033	(0.114)
SDQ: Hyperactivity & Inattention	0.042	(0.130)	0.018	(0.109)	0.117	(0.127)
SDQ: Peer Problems	0.075	(0.148)	0.177	(0.112)	0.071	(0.119)
SDQ: Pro-social Behavior	0.095	(0.125)	0.013	(0.120)	0.011	(0.101)
SDQ: Total Difficulties	-0.082	(0.154)	0.055	(0.101)	-0.025	(0.136)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; <sup>a</sup> IVs are two dummy variables indicating original batches 2 or 3 with original batch 1 as a reference group. Each row is the result of a separate regression. Models are estimated separately for baseline, midline and endline. Controls include: child's age, gender, household size, household wealth and mother's education level. Robust standard errors are clustered at the village level. Sample size for each year varies from 551 to 554.

**Table 6.3 IV estimated impact on enrollment and child development outcomes (Below-average parenting score at baseline) <sup>a</sup>**

	IV Model: Baseline		IV Model: Midline		IV Model: Endline	
	Actual Batch 1		Actual Batch 1		Actual Batch 1	
	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE
<b>Enrollment in ECED Programs</b>						
Was child enrolled in project playgroups in survey year (1=Yes)	0.153***	(0.039)	0.207***	(0.062)	0.265***	(0.071)
Was child enrolled in non-project playgroups in survey year (1=Yes)	-0.002	(0.018)	-0.027	(0.033)	-0.029	(0.035)
Was child enrolled in Islamic Kindergarten in survey year (1=Yes)	-0.016	(0.015)	-0.026	(0.027)	-0.060	(0.042)
Was child enrolled in Kindergarten in survey year (1=Yes)	-0.003	(0.020)	-0.083	(0.051)	-0.141*	(0.075)
Was child enrolled in any ECED programs in survey year (1=Yes)	0.128***	(0.045)	0.042	(0.063)	0.004	(0.049)
Was child enrolled in Primary school in survey year (1=Yes)	NA	NA	0.007	(0.012)	-0.001	(0.009)
Cumulated number of months of project playgroup	1.445***	(0.386)	3.148***	(0.809)	4.398***	(1.110)
Cumulated number of months of non-project playgroup	-0.038	(0.173)	-0.181	(0.369)	-0.467	(0.480)
Cumulated number of months of Islamic Kindergarten	-0.159	(0.145)	-0.407	(0.373)	-0.689	(0.602)
Cumulated number of months of Kindergarten	-0.085	(0.195)	-0.958	(0.629)	-2.267*	(1.261)
Cumulated number of months of any ECED programs	1.163***	(0.447)	1.603*	(0.940)	0.975	(1.303)
Cumulated number of months of Primary school	NA	NA	0.070	(0.116)	0.156	(0.649)
<b>Standardized Child Development Outcomes</b>						
EDI: Physical Health & Well-Being	-0.115	(0.128)	0.044	(0.110)	-0.007	(0.138)
EDI: Social Competence	0.059	(0.132)	-0.139	(0.103)	-0.137	(0.106)
EDI: Emotional Maturity	-0.046	(0.129)	0.058	(0.106)	-0.112	(0.119)
EDI: Language & Cognitive Development	0.071	(0.068)	-0.005	(0.087)	-0.037	(0.046)
EDI: Communication & General Knowledge	0.006	(0.096)	-0.091	(0.060)	0.049	(0.128)
SDQ: Emotional Symptoms	-0.174	(0.120)	-0.066	(0.106)	-0.040	(0.127)
SDQ: Conduct Problems	-0.154	(0.111)	0.044	(0.107)	-0.111	(0.109)
SDQ: Hyperactivity & Inattention	-0.003	(0.115)	-0.099	(0.111)	0.009	(0.109)
SDQ: Peer Problems	-0.081	(0.127)	0.029	(0.123)	0.043	(0.113)
SDQ: Pro-social Behavior	0.013	(0.127)	0.065	(0.106)	0.002	(0.115)
SDQ: Total Difficulties	-0.175	(0.123)	-0.028	(0.113)	-0.049	(0.120)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; <sup>a</sup> IVs are two dummy variables indicating original batches 2 or 3 with original batch 1 as a reference group. Each row is the result of a separate regression. Models are estimated separately for baseline, midline and endline. Controls include: child's age, gender, household size, household wealth and mother's education level. Robust standard errors are clustered at the village level. Sample size for each year varies from 669 to 675.

**Table 6.4 IV estimated impact on enrollment and child development outcomes (Above-average parenting score at baseline) <sup>a</sup>**

	IV Model: Baseline		IV Model: Midline		IV Model: Endline	
	Actual Batch 1		Actual Batch 1		Actual Batch 1	
	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE
<b>Enrollment in ECED Programs</b>						
Was child enrolled in project playgroups in survey year (1=Yes)	0.150***	(0.047)	0.199***	(0.060)	0.221***	(0.065)
Was child enrolled in non-project playgroups in survey year (1=Yes)	0.015	(0.035)	0.037	(0.044)	0.027	(0.046)
Was child enrolled in Islamic Kindergarten in survey year (1=Yes)	-0.005	(0.013)	-0.040	(0.028)	-0.047	(0.044)
Was child enrolled in Kindergarten in survey year (1=Yes)	-0.014	(0.023)	-0.070	(0.060)	-0.055	(0.072)
Was child enrolled in any ECED programs in survey year (1=Yes)	0.147***	(0.056)	0.036	(0.051)	-0.004	(0.032)
Was child enrolled in Primary school in survey year (1=Yes)	NA	NA	0.023	(0.015)	0.009	(0.006)
Cumulated number of months of project playgroup	1.537***	(0.457)	2.822***	(0.826)	3.721***	(1.116)
Cumulated number of months of non-project playgroup	0.151	(0.353)	0.364	(0.551)	0.115	(0.622)
Cumulated number of months of Islamic Kindergarten	-0.046	(0.129)	-0.473	(0.375)	-0.866	(0.701)
Cumulated number of months of Kindergarten	-0.109	(0.231)	-0.823	(0.696)	-1.326	(1.232)
Cumulated number of months of any ECED programs	1.533***	(0.555)	1.891**	(0.916)	1.644	(1.122)
Cumulated number of months of Primary school	NA	NA	0.231	(0.150)	0.222	(0.669)
<b>Standardized Child Development Outcomes</b>						
EDI: Physical Health & Well-Being	0.300**	(0.127)	0.096	(0.103)	0.001	(0.101)
EDI: Social Competence	-0.010	(0.091)	-0.056	(0.090)	-0.080	(0.099)
EDI: Emotional Maturity	0.048	(0.109)	-0.026	(0.103)	0.060	(0.088)
EDI: Language & Cognitive Development	0.047	(0.060)	0.076	(0.089)	-0.034	(0.037)
EDI: Communication & General Knowledge	-0.071	(0.046)	-0.119**	(0.053)	-0.035	(0.125)
SDQ: Emotional Symptoms	-0.141	(0.115)	-0.027	(0.098)	-0.010	(0.106)
SDQ: Conduct Problems	-0.064	(0.111)	-0.042	(0.090)	-0.049	(0.100)
SDQ: Hyperactivity & Inattention	0.040	(0.110)	0.028	(0.098)	0.021	(0.114)
SDQ: Peer Problems	0.121	(0.111)	0.095	(0.108)	-0.069	(0.108)
SDQ: Pro-social Behavior	0.131	(0.103)	0.018	(0.120)	-0.143	(0.096)
SDQ: Total Difficulties	-0.042	(0.119)	0.009	(0.095)	-0.041	(0.112)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; <sup>a</sup> IVs are two dummy variables indicating original batches 2 or 3 with original batch 1 as a reference group. Each row is the result of a separate regression. Models are estimated separately for baseline, midline and endline. Controls include: child's age, gender, household size, household wealth and mother's education level. Robust standard errors are clustered at the village level. Sample size for each year is 641.



**Table 7. Impact on enrollment and child development outcomes using the DID methods for all children**

	OLS: All				FE: All			
	Midline*Actual Batch3		Endline*Actual Batch3		Midline*Actual Batch3		Endline*Actual Batch3	
	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE
<b>Enrollment in ECED Programs</b>								
Was child enrolled in project playgroups in survey year (1=Yes)	0.153***	(0.019)	0.268***	(0.030)	0.153***	(0.015)	0.269***	(0.018)
Was child enrolled in non-project playgroups in survey year (1=Yes)	-0.044**	(0.018)	-0.071***	(0.026)	-0.044***	(0.014)	-0.069***	(0.017)
Was child enrolled in Islamic Kindergarten in survey year (1=Yes)	0.019	(0.015)	0.037	(0.024)	0.019**	(0.009)	0.038***	(0.014)
Was child enrolled in Kindergarten in survey year (1=Yes)	-0.078**	(0.036)	-0.172***	(0.053)	-0.077***	(0.026)	-0.166***	(0.028)
Was child enrolled in any ECED programs in survey year (1=Yes)	0.092***	(0.032)	0.065	(0.045)	0.093***	(0.028)	0.075***	(0.028)
Was child enrolled in Primary school in survey year (1=Yes)	-0.003	(0.006)	-0.002	(0.006)	-0.003	(0.006)	-0.002	(0.005)
Cumulated number of months of project playgroup	1.915***	(0.218)	3.839***	(0.417)	1.914***	(0.158)	3.855***	(0.254)
Cumulated number of months of non-project playgroup	-0.649***	(0.209)	-0.947**	(0.383)	-0.647***	(0.156)	-0.943***	(0.238)
Cumulated number of months of Islamic Kindergarten	0.241	(0.210)	0.537	(0.451)	0.244**	(0.106)	0.537**	(0.224)
Cumulated number of months of Kindergarten	-0.846**	(0.405)	-2.127**	(0.841)	-0.834***	(0.264)	-2.083***	(0.446)
Cumulated number of months of any ECED programs	0.661	(0.431)	1.302*	(0.791)	0.676**	(0.283)	1.366***	(0.443)
Cumulated number of months of Primary school	-0.027	(0.113)	0.310	(0.414)	-0.028	(0.066)	0.319	(0.343)
<b>Standardized Child Development Outcomes</b>								
EDI: Physical Health & Well-Being	-0.030	(0.091)	0.113	(0.101)	-0.029	(0.083)	0.114	(0.082)
EDI: Social Competence	0.208**	(0.091)	0.017	(0.092)	0.208***	(0.070)	0.022	(0.070)
EDI: Emotional Maturity	0.014	(0.085)	0.172**	(0.082)	0.015	(0.075)	0.169**	(0.072)
EDI: Language & Cognitive Development	0.083	(0.051)	0.038	(0.047)	0.083*	(0.045)	0.036	(0.039)
EDI: Communication & General Knowledge	0.039	(0.054)	0.014	(0.105)	0.040	(0.042)	0.008	(0.070)
SDQ: Emotional Symptoms	0.015	(0.078)	-0.117	(0.089)	0.015	(0.068)	-0.116	(0.074)
SDQ: Conduct Problems	-0.137	(0.084)	-0.061	(0.080)	-0.138*	(0.072)	-0.054	(0.071)
SDQ: Hyperactivity & Inattention	0.115	(0.088)	0.052	(0.089)	0.115	(0.074)	0.055	(0.077)
SDQ: Peer Problems	-0.124	(0.098)	-0.134	(0.103)	-0.125	(0.083)	-0.134	(0.082)
SDQ: Pro-social Behavior	-0.029	(0.103)	0.065	(0.087)	-0.035	(0.079)	0.062	(0.072)
SDQ: Total Difficulties	-0.059	(0.087)	-0.108	(0.093)	-0.059	(0.070)	-0.104	(0.073)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Robust standard errors are clustered at the village level. This analysis is based on the three rounds of data for 1,170 children in batch 3 and the comparison group.

**Table 7.1 Impact on enrollment and child development outcomes using the DID methods by household wealth at baseline**

	FE: Poor				FE: Nonpoor			
	Midline*Actual Batch3		Endline*Actual Batch3		Midline*Actual Batch3		Endline*Actual Batch3	
	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE
<b>Enrollment in ECED Programs</b>								
Was child enrolled in project playgroups in survey year (1=Yes)	0.151***	(0.020)	0.293***	(0.025)	0.161***	(0.022)	0.240***	(0.026)
Was child enrolled in non-project playgroups in survey year (1=Yes)	-0.055***	(0.020)	-0.089***	(0.024)	-0.031*	(0.018)	-0.046**	(0.023)
Was child enrolled in Islamic Kindergarten in survey year (1=Yes)	0.016	(0.011)	0.041**	(0.017)	0.023	(0.015)	0.034	(0.022)
Was child enrolled in Kindergarten in survey year (1=Yes)	-0.076**	(0.032)	-0.192***	(0.037)	-0.080*	(0.042)	-0.119***	(0.043)
Was child enrolled in any ECED programs in survey year (1=Yes)	0.082**	(0.036)	0.071*	(0.038)	0.110**	(0.043)	0.088**	(0.043)
Was child enrolled in Primary school in survey year (1=Yes)	-0.009	(0.009)	-0.004	(0.009)	0.008	(0.006)	0.001	(0.006)
Cumulated number of months of project playgroup	1.791***	(0.209)	4.094***	(0.352)	2.145***	(0.249)	3.620***	(0.375)
Cumulated number of months of non-project playgroup	-0.687***	(0.216)	-1.198***	(0.360)	-0.604***	(0.225)	-0.649**	(0.287)
Cumulated number of months of Islamic Kindergarten	0.216*	(0.127)	0.598**	(0.278)	0.298	(0.187)	0.473	(0.368)
Cumulated number of months of Kindergarten	-0.790**	(0.333)	-2.459***	(0.589)	-0.947**	(0.422)	-1.484**	(0.686)
Cumulated number of months of any ECED programs	0.530	(0.376)	1.036*	(0.622)	0.891**	(0.426)	1.959***	(0.622)
Cumulated number of months of Primary school	-0.106	(0.103)	0.600	(0.489)	0.129*	(0.074)	-0.037	(0.474)
<b>Standardized Child Development Outcomes</b>								
EDI: Physical Health & Well-Being	0.013	(0.112)	0.157	(0.109)	-0.032	(0.125)	0.098	(0.124)
EDI: Social Competence	0.399***	(0.099)	0.248**	(0.097)	-0.045	(0.098)	-0.274***	(0.102)
EDI: Emotional Maturity	0.034	(0.102)	0.238**	(0.100)	-0.020	(0.113)	0.074	(0.106)
EDI: Language & Cognitive Development	0.183***	(0.061)	0.128**	(0.052)	-0.022	(0.065)	-0.095*	(0.057)
EDI: Communication & General Knowledge	0.064	(0.059)	0.047	(0.096)	0.014	(0.058)	-0.046	(0.101)
SDQ: Emotional Symptoms	-0.006	(0.091)	-0.170*	(0.100)	0.049	(0.102)	-0.033	(0.112)
SDQ: Conduct Problems	-0.162*	(0.097)	-0.084	(0.097)	-0.090	(0.108)	0.003	(0.105)
SDQ: Hyperactivity & Inattention	0.116	(0.097)	0.073	(0.102)	0.144	(0.118)	0.026	(0.118)
SDQ: Peer Problems	-0.092	(0.111)	-0.110	(0.109)	-0.156	(0.128)	-0.127	(0.122)
SDQ: Pro-social Behavior	-0.154	(0.107)	-0.066	(0.096)	0.140	(0.119)	0.225**	(0.111)
SDQ: Total Difficulties	-0.069	(0.093)	-0.129	(0.096)	-0.024	(0.106)	-0.047	(0.113)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Children and their household characteristics in Table 2 are controlled. Robust standard errors are clustered at the village level.

This analysis is based on the three rounds of data for 664 poor and 506 nonpoor children in batch 3 and the comparison group.

**Table 7.2 Impact on enrollment and child development outcomes using the DID methods by playgroup enrollment at baseline**

	FE: Never-Enrolled at baseline				FE: Ever-Enrolled at baseline			
	Midline*Actual Batch3		Endline*Actual Batch3		Midline*Actual Batch3		Endline*Actual Batch3	
	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE
<b>Enrollment in ECED Programs</b>								
Was child enrolled in project playgroups in survey year (1=Yes)	0.173***	(0.016)	0.304***	(0.020)	(dropped)		(dropped)	
Was child enrolled in non-project playgroups in survey year (1=Yes)	-0.052***	(0.016)	-0.081***	(0.019)	(dropped)		(dropped)	
Was child enrolled in Islamic Kindergarten in survey year (1=Yes)	0.017*	(0.010)	0.040***	(0.015)	0.027	(0.019)	0.012	(0.023)
Was child enrolled in Kindergarten in survey year (1=Yes)	-0.037	(0.026)	-0.143***	(0.030)	-0.274***	(0.081)	-0.276***	(0.069)
Was child enrolled in any ECED programs in survey year (1=Yes)	0.097***	(0.030)	0.068**	(0.029)	(dropped)		(dropped)	
Was child enrolled in Primary school in survey year (1=Yes)	-0.003	(0.006)	-0.002	(0.006)	0.001	(0.018)	0.000	(0.002)
Cumulated number of months of project playgroup	1.600***	(0.156)	3.606***	(0.264)	4.133***	(0.615)	5.753***	(0.885)
Cumulated number of months of non-project playgroup	-0.488***	(0.151)	-0.779***	(0.244)	-1.800***	(0.638)	-2.037***	(0.751)
Cumulated number of months of Islamic Kindergarten	0.228*	(0.119)	0.543**	(0.252)	0.266	(0.194)	0.250	(0.320)
Cumulated number of months of Kindergarten	-0.467*	(0.272)	-1.614***	(0.465)	-2.605***	(0.826)	-4.592***	(1.288)
Cumulated number of months of any ECED programs	0.873***	(0.301)	1.757***	(0.475)	-0.006	(0.177)	-0.626	(0.854)
Cumulated number of months of Primary school	-0.048	(0.069)	0.213	(0.370)	0.057	(0.182)	1.258	(0.860)
<b>Standardized Child Development Outcomes</b>								
EDI: Physical Health & Well-Being	-0.057	(0.088)	0.149*	(0.088)	0.254	(0.252)	-0.033	(0.224)
EDI: Social Competence	0.222***	(0.076)	0.054	(0.076)	0.045	(0.191)	-0.227	(0.189)
EDI: Emotional Maturity	-0.006	(0.081)	0.182**	(0.078)	0.145	(0.214)	0.071	(0.199)
EDI: Language & Cognitive Development	0.115**	(0.047)	0.045	(0.042)	-0.101	(0.132)	-0.042	(0.104)
EDI: Communication & General Knowledge	0.036	(0.046)	0.015	(0.076)	0.064	(0.097)	0.007	(0.176)
SDQ: Emotional Symptoms	0.019	(0.073)	-0.109	(0.080)	-0.004	(0.199)	-0.153	(0.204)
SDQ: Conduct Problems	-0.191**	(0.077)	-0.092	(0.078)	0.220	(0.202)	0.178	(0.182)
SDQ: Hyperactivity & Inattention	0.098	(0.080)	0.011	(0.083)	0.216	(0.207)	0.353	(0.215)
SDQ: Peer Problems	-0.120	(0.090)	-0.179**	(0.088)	-0.087	(0.214)	0.227	(0.212)
SDQ: Pro-social Behavior	-0.061	(0.084)	0.026	(0.078)	0.191	(0.245)	0.309	(0.201)
SDQ: Total Difficulties	-0.083	(0.076)	-0.144*	(0.079)	0.127	(0.183)	0.181	(0.185)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Children and their household characteristics in Table 2 are controlled. Robust standard errors are clustered at the village level.

**Table 7.3 Impact on enrollment and child development outcomes using the DID methods by parenting score reported at baseline**

	FE: Below-Average Parenting Score				FE: Above-Average Parenting Score			
	Midline*Actual Batch3		Endline*Actual Batch3		Midline*Actual Batch3		Endline*Actual Batch3	
	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE	Coeff	Robust SE
<b>Enrollment in ECED Programs</b>								
Was child enrolled in project playgroups in survey year (1=Yes)	0.155***	(0.021)	0.269***	(0.026)	0.151***	(0.021)	0.270***	(0.027)
Was child enrolled in non-project playgroups in survey year (1=Yes)	-0.018	(0.018)	-0.041*	(0.022)	-0.072***	(0.021)	-0.098***	(0.026)
Was child enrolled in Islamic Kindergarten in survey year (1=Yes)	0.001	(0.012)	0.022	(0.019)	0.039***	(0.014)	0.052***	(0.020)
Was child enrolled in Kindergarten in survey year (1=Yes)	-0.089**	(0.035)	-0.183***	(0.039)	-0.066*	(0.038)	-0.143***	(0.042)
Was child enrolled in any ECED programs in survey year (1=Yes)	0.113***	(0.037)	0.099**	(0.040)	0.068	(0.041)	0.049	(0.041)
Was child enrolled in Primary school in survey year (1=Yes)	-0.004	(0.010)	0.000	(0.008)	-0.001	(0.005)	-0.006	(0.007)
Cumulated number of months of project playgroup	1.879***	(0.219)	3.785***	(0.347)	1.966***	(0.234)	3.935***	(0.379)
Cumulated number of months of non-project playgroup	-0.343*	(0.200)	-0.561*	(0.316)	-0.973***	(0.247)	-1.354***	(0.359)
Cumulated number of months of Islamic Kindergarten	0.108	(0.142)	0.283	(0.306)	0.404**	(0.160)	0.804**	(0.332)
Cumulated number of months of Kindergarten	-1.038***	(0.362)	-2.270***	(0.609)	-0.607	(0.395)	-1.802***	(0.663)
Cumulated number of months of any ECED programs	0.606	(0.389)	1.236**	(0.619)	0.790*	(0.416)	1.583**	(0.633)
Cumulated number of months of Primary school	0.009	(0.111)	0.799	(0.502)	-0.061	(0.079)	-0.216	(0.470)
<b>Standardized Child Development Outcomes</b>								
EDI: Physical Health & Well-Being	0.012	(0.115)	0.087	(0.113)	-0.057	(0.120)	0.166	(0.121)
EDI: Social Competence	0.265***	(0.095)	0.197**	(0.098)	0.110	(0.102)	-0.204**	(0.101)
EDI: Emotional Maturity	-0.039	(0.105)	0.215**	(0.102)	0.046	(0.108)	0.117	(0.104)
EDI: Language & Cognitive Development	0.124*	(0.064)	0.097*	(0.053)	0.024	(0.065)	-0.054	(0.055)
EDI: Communication & General Knowledge	0.070	(0.062)	-0.008	(0.099)	-0.017	(0.056)	0.005	(0.098)
SDQ: Emotional Symptoms	-0.084	(0.094)	-0.118	(0.104)	0.121	(0.098)	-0.117	(0.108)
SDQ: Conduct Problems	-0.181*	(0.101)	-0.057	(0.099)	-0.059	(0.102)	-0.047	(0.105)
SDQ: Hyperactivity & Inattention	0.193**	(0.098)	-0.001	(0.097)	0.073	(0.114)	0.148	(0.122)
SDQ: Peer Problems	-0.245**	(0.113)	-0.201*	(0.111)	0.029	(0.125)	-0.044	(0.123)
SDQ: Pro-social Behavior	-0.052	(0.103)	0.022	(0.096)	0.024	(0.121)	0.117	(0.108)
SDQ: Total Difficulties	-0.140	(0.095)	-0.146	(0.100)	0.061	(0.102)	-0.045	(0.108)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Children and their household characteristics in Table 2 are controlled. Robust standard errors are clustered at the village level.

This analysis is based on the three rounds of data for 545 and 624 children with above- and below-parenting scores, respectively, in batch 3 and the comparison group.

**Table 8: Descriptive Statistics for 1-year-old cohort Enrollment in ECED programs**

	Mean	SD	N
Whether enrolled in project playgroups	0.361	0.480	2842
Whether enrolled in non-project playgroups	0.182	0.386	2842
Whether enrolled in RA programs	0.408	0.492	2842
Whether enrolled in TK programs	0.068	0.252	2842
Total Number of Months of project playgroup	5.582	8.864	2842
Total Number of Months of non-project playgroup	2.561	6.472	2842
Total Number of Months of RA programs	4.031	5.827	2842
Total Number of Months of TK programs	0.781	3.345	2842
<b>Standardized Child Development Outcomes</b>			
EDI: Physical health and well-being	-0.007	0.999	2725
EDI: Social competence	-0.008	0.998	2728
EDI: Emotional maturity	-0.013	0.993	2731
EDI: Language and Cognitive Development	-0.014	0.994	2737
EDI: Communications and General Knowledge	0.004	1.001	2738
SDQ: Emotional problems	0.004	1.000	2740
SDQ: Conduct problems	0.010	0.998	2740
SDQ: Hyperactivity	0.007	1.000	2740
SDQ: Peer problems	0.003	1.002	2739
SDQ: Pro-social behavior (reversed)	0.001	0.998	2738
SDQ: Total problems	0.009	0.997	2739
<b>Child and Household Characteristics</b>			
Age (years)	4.846	0.394	3185
Household size	4.605	1.465	2744
Household Wealth	0.232	0.865	2848
Mother's education = 2. Did not finish elementary school	0.078	0.268	2926
Mother's education = 3. Elementary school / equivalent	0.377	0.485	2926
Mother's education = 4. Junior high school / equivalent	0.258	0.438	2926
Mother's education = 5. Senior high school / equivalent	0.200	0.400	2926
Mother's education = 6. 1/2/3 year diploma	0.029	0.169	2926
Mother's education = 7. 4 year diploma/Bachelor's degree	0.032	0.176	2926
Mother's education = 8. Master's/PhD	0.001	0.032	2926
Mother's education = 98. Don't know	0.001	0.037	2926
Child is a girl (1 = Yes)	0.449	0.497	3185
<b>Health status at baseline</b>			
Not stunted (1 = Yes)	0.734	0.442	2680
Moderately stunted (1 = Yes)	0.214	0.410	2680
Severely stunted (1 = Yes)	0.052	0.222	2680
Not wasted(1 = Yes)	0.664	0.472	2696
Moderately wasted(1 = Yes)	0.247	0.431	2696
Severely wasted (1 = Yes)	0.089	0.285	2696
Total good parenting score	0.177	1.005	3060

Note: All variables are values at endline except where indicated.

**Table 9: Instrumental variable regression results of project impact on playgroup and kindergarten enrolment rates: difference between Batch 1 and Batch 3. Dependent variable equals 1 if child ever enrolled in specified service.**

	Project playgroup		Non-project playgroup		Kindergarten, MoEC		Kindergarten, MoRA	
	Unadjusted (1)	Adjusted (2)	Unadjusted (3)	Adjusted (4)	Unadjusted (5)	Adjusted (6)	Unadjusted (7)	Adjusted (8)
Child's village is Batch 1 (1=Yes)	0.0302 (0.0418)	0.0253 (0.0422)	-0.0180 (0.0262)	-0.0256 (0.0286)	-0.0446 (0.0369)	-0.0256 (0.0366)	-0.0358 (0.0251)	-0.0365 (0.0261)
Constant	0.625*** (0.0678)	0.542** (0.191)	0.0750* (0.0365)	0.176 (0.124)	0.177*** (0.0449)	-0.158 (0.169)	0.0489* (0.0224)	-0.0513 (0.115)
Observations	1989	1717	1989	1717	1989	1717	1989	1717
R-squared	0.166	0.173	0.078	0.077	0.230	0.275	0.032	0.041
<b>Controls Included</b>								
Child Characteristics	N	Y	N	Y	N	Y	N	Y
Household Characteristics	N	Y	N	Y	N	Y	N	Y
Height and Weight Parenting practices at baseline	N	Y	N	Y	N	Y	N	Y
District dummies	Y	Y	Y	Y	Y	Y	Y	Y
First stage F- Statistic		97.630		97.630		97.630		97.630
First stage R- squared		0.775		0.775		0.775		0.775

*Note:* Robust standard errors clustered at the village level in parentheses. Child characteristics include: child's age and gender. Household characteristics include household size, household wealth and mother's education. Height and weight include stunting and wasting status at baseline. Parenting practices are self-reported by caregiver at baseline. District dummies are controlled for in both adjusted and unadjusted models.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 10: Instrumental variable regression results of project impact on duration of enrolment at playgroup and kindergarten services: difference between Batch 1 and Batch 3. Dependent variable is months of enrolment in specified service.**

	Project playgroup		Non-project playgroup		Kindergarten, MoEC		Kindergarten, MoRA	
	Unadjusted (1)	Adjusted (2)	Unadjusted (3)	Adjusted (4)	Unadjusted (5)	Adjusted (6)	Unadjusted (7)	Adjusted (8)
Child's village is Batch 1 (1=Yes)	1.016 (0.788)	0.967 (0.804)	-0.0368 (0.423)	-0.122 (0.460)	-0.555 (0.444)	-0.407 (0.438)	-0.264 (0.318)	-0.250 (0.308)
Constant	8.181*** (1.120)	2.232 (3.502)	0.752 (0.498)	3.053 (2.047)	1.596*** (0.422)	-5.303** (1.729)	0.414 (0.257)	-1.811 (1.271)
Observations	1989	1717	1989	1717	1989	1717	1989	1717
R-squared	0.142	0.141	0.086	0.088	0.160	0.203	0.027	0.046
<b>Controls Included</b>								
Child Characteristics	N	Y	N	Y	N	Y	N	Y
Household Characteristics	N	Y	N	Y	N	Y	N	Y
Height and Weight	N	Y	N	Y	N	Y	N	Y
Parenting practices at baseline	N	Y	N	Y	N	Y	N	Y
District dummies	Y	Y	Y	Y	Y	Y	Y	Y
First stage F-Statistic	97.630		97.630		97.630		97.630	
First stage R-squared	0.775		0.775		0.775		0.775	

*Note:* Robust standard errors clustered at the village level in parentheses. Child characteristics include: child's age and gender. Household characteristics include household size, household wealth and mother's education. Height and weight include stunting and wasting status at baseline. Parenting practices are self-reported by caregiver at baseline. District dummies are controlled for in both adjusted and unadjusted models.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 11: Instrumental variable regression results of project impact on child development: difference between Batch 1 and Batch 3. Dependent variable is standardized Early Development Instrument score reported by child’s caregiver.**

	Physical Health and Well-being		Social Competence		Emotional Maturity		Language and Cognitive Development		Communication and General Knowledge	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Child’s village is Batch 1 (1=Yes)	-0.0732 (0.0584)	-0.0669 (0.0601)	0.0188 (0.0618)	0.0285 (0.0573)	0.00938 (0.0606)	0.00193 (0.0582)	0.0397 (0.0683)	0.00847 (0.0595)	-0.0258 (0.0595)	-0.00267 (0.0580)
Constant	0.682*** (0.0979)	1.960*** (0.357)	-0.102 (0.0882)	-1.271*** (0.293)	-0.490*** (0.0932)	-1.550*** (0.315)	-0.535*** (0.0775)	-1.820*** (0.280)	-0.472*** (0.0718)	-1.440*** (0.298)
Observations	1909	1709	1911	1713	1913	1714	1917	1716	1918	1717
R-squared	0.108	0.126	0.121	0.169	0.138	0.173	0.252	0.357	0.245	0.284
<b>Controls Included</b>										
Child Characteristics	N	Y	N	Y	N	Y	N	Y	N	Y
Household Characteristics	N	Y	N	Y	N	Y	N	Y	N	Y
Height and Weight	N	Y	N	Y	N	Y	N	Y	N	Y
Parenting practices at baseline	N	Y	N	Y	N	Y	N	Y	N	Y
District dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
First stage F-Statistic	102.530		97.570		98.060		97.530		97.630	
First stage R-squared	0.777		0.776		0.776		0.775		0.775	

*Note:* Robust standard errors clustered at the village level in parentheses. Child characteristics include: child’s age and gender. Household characteristics include household size, household wealth and mother’s education. Height and weight include stunting and wasting status at baseline. Parenting practices are self-reported by caregiver at baseline. District dummies are controlled for in both adjusted and unadjusted models.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



**Table 12: Instrumental- variable regression results of project impact on child development (Dependent variable is standardized SDQ score)**

	SDQ Emotional Problem		SDQ Conduct Problems		SDQ Hyperactivity		SDQ Peer Problems		SDQ Pro-social Behavior		SDQ Total Problems	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Village is Batch 1 (1=Yes)	-0.0788 (0.0571)	-0.0684 (0.0603)	-0.115 (0.0610)	-0.107 (0.0642)	0.0180 (0.0621)	0.0122 (0.0652)	-0.0604 (0.0524)	-0.0864 (0.0563)	0.0306 (0.0591)	0.0223 (0.0572)	-0.0982 (0.0599)	-0.101 (0.0624)
Constant	0.553*** (0.103)	0.861* (0.346)	0.497*** (0.100)	1.403*** (0.383)	0.612*** (0.125)	1.393*** (0.357)	0.140* (0.0643)	0.630 (0.369)	-0.343*** (0.0552)	-0.112 (0.354)	0.688*** (0.0941)	1.603*** (0.365)
N	1919	1717	1919	1717	1919	1717	1918	1716	1918	1717	1918	1716
Adjusted R-squared	0.084	0.127	0.076	0.089	0.088	0.094	0.054	0.058	0.118	0.138	0.121	0.143
<b>Controls Included</b>												
Child Characteristics	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y
Household Characteristics	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y
Height and Weight	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y
Parenting practices at baseline	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y
District dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
First stage F-Statistic		97.630		97.630		97.630		97.480		97.630		97.480
First stage R-squared		0.775		0.775		0.775		0.775		0.775		0.775

*Note:* Robust standard errors clustered at the village level in parentheses. Child characteristics include: child's age and gender. Household characteristics include household size, household wealth and mother's education. Height and weight include stunting and wasting status at baseline. Parenting practices are self-reported by caregiver at baseline. District dummies are controlled for in both adjusted and unadjusted models.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 13: Project impact on enrollment rates for 1 year old cohort**

	Enrollment in:							
	Project playgroup		Non-project playgroup		Kindergarten, MoEC		Kindergarten, MoRA	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Child's village is Batch 1 ( $\beta_1$ )	0.575*** (0.031)	0.574*** (0.031)	-0.237*** (0.034)	-0.249*** (0.035)	-0.116*** (0.035)	-0.103*** (0.035)	0.005 (0.020)	0.006 (0.023)
Child's village is Batch 3 ( $\beta_2$ )	0.539*** (0.030)	0.540*** (0.030)	-0.219*** (0.034)	-0.219*** (0.037)	-0.082** (0.036)	-0.081** (0.036)	0.034 (0.022)	0.032 (0.023)
Constant	0.058 (0.041)	0.019 (0.132)	0.296*** (0.039)	0.339*** (0.116)	0.265*** (0.044)	-0.110 (0.147)	0.010 (0.016)	-0.147 (0.091)
Number of observations	2,842	2,457	2,842	2,457	2,842	2,457	2,842	2,457
Adjusted R2	0.328	0.332	0.172	0.179	0.234	0.277	0.033	0.042
Number of clusters	310	309	310	309	310	309	310	309
p-value of test of $H_0: \beta_1 = \beta_2$		0.355		0.259		0.498		0.251

**Controls Included**

Child Characteristics	N	Y	N	Y	N	Y	N	Y
Household Characteristics	N	Y	N	Y	N	Y	N	Y
Height and Weight	N	Y	N	Y	N	Y	N	Y
Parenting practices at baseline	N	Y	N	Y	N	Y	N	Y
District dummies	Y	Y	Y	Y	Y	Y	Y	Y

*Note:* Robust standard errors clustered at the village level. Child characteristics include: child's age and gender. Household characteristics include household size, household wealth and mother's education. Height and weight include stunting and wasting status at baseline. Parenting practices are self-reported by caregiver at baseline. District dummies are controlled for in both adjusted and unadjusted models.

**Table 14: Project impact on duration of enrollment for 1 year old cohort**

	Months enrolled in:							
	Project playgroup		Non-project playgroup		Kindergarten, MoEC		Kindergarten, MoRA	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Child's village is Batch 1 ( $\beta_1$ )	9.231*** (0.608)	9.209*** (0.613)	-3.118*** (0.569)	-3.318*** (0.590)	-0.828** (0.386)	-0.744* (0.381)	0.082 (0.254)	0.026 (0.276)
Child's village is Batch 3 ( $\beta_2$ )	8.019*** (0.520)	7.996*** (0.539)	-3.080*** (0.549)	-3.107*** (0.579)	-0.436 (0.389)	-0.471 (0.388)	0.341 (0.283)	0.263 (0.277)
Constant	0.037 (0.653)	-3.705 (2.413)	3.489*** (0.527)	4.615** (1.840)	2.115*** (0.440)	-5.770*** (1.508)	0.071 (0.184)	-2.519** (0.992)
Number of observations	2,842	2,457	2,842	2,457	2,842	2,457	2,842	2,457
Adjusted R2	0.250	0.249	0.174	0.186	0.163	0.211	0.028	0.044
Number of clusters	310	309	310	309	310	309	310	309
p-value of test of $H_0: \beta_1 = \beta_2$		0.082		0.620		0.470		0.398
<b>Controls Included</b>								
Child Characteristics	N	Y	N	Y	N	Y	N	Y
Household Characteristics	N	Y	N	Y	N	Y	N	Y
Height and Weight	N	Y	N	Y	N	Y	N	Y
Parenting practices at baseline	N	Y	N	Y	N	Y	N	Y
District dummies	Y	Y	Y	Y	Y	Y	Y	Y

*Note:* Robust standard errors clustered at the village level. Child characteristics include: child's age and gender. Household characteristics include household size, household wealth and mother's education. Height and weight include stunting and wasting status at baseline. Parenting practices are self-reported by caregiver at baseline. District dummies are controlled for in both adjusted and unadjusted models.

**Table 15: Project impact on child development for 1 year old cohort**

	Physical Health and Well-being		Social Competence		Emotional Maturity		Language and Cognitive Development		Communications and General Knowledge	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Village is Batch 1 ( $\beta_1$ )	0.120** (0.054)	0.108* (0.055)	0.097* (0.054)	0.081 (0.054)	0.009 (0.052)	-0.014 (0.053)	0.183*** (0.052)	0.151*** (0.049)	0.065 (0.049)	0.058 (0.049)
Village is Batch 3 ( $\beta_2$ )	0.220*** (0.049)	0.207*** (0.051)	0.054 (0.052)	0.020 (0.052)	-0.000 (0.048)	-0.035 (0.050)	0.115** (0.053)	0.099** (0.048)	0.104** (0.051)	0.078 (0.051)
Constant	-0.840*** (0.080)	-1.937*** (0.310)	-0.180*** (0.067)	-1.469*** (0.254)	-0.466*** (0.066)	-1.612*** (0.273)	-0.631*** (0.055)	-2.069*** (0.235)	-0.589*** (0.050)	-1.545*** (0.260)
Number of observations	2,725	2,445	2,728	2,450	2,731	2,452	2,737	2,456	2,738	2,457
Adjusted R2	0.102	0.118	0.117	0.167	0.137	0.171	0.250	0.360	0.262	0.298
Number of clusters	310	309	310	309	310	309	310	309	310	309
p-value of test of $H_0: \beta_1 = \beta_2$		0.056		0.225		0.687		0.291		0.694
<b>Controls Included</b>										
Child Characteristics	N	Y	N	Y	N	Y	N	Y	N	Y
Household Characteristics	N	Y	N	Y	N	Y	N	Y	N	Y
Height and Weight	N	Y	N	Y	N	Y	N	Y	N	Y
Parenting practices at baseline	N	Y	N	Y	N	Y	N	Y	N	Y
District dummies	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

*Note:* Robust standard errors clustered at the village level. Child characteristics include: child's age and gender. Household characteristics include household size, household wealth and mother's education. Height and weight include stunting and wasting status at baseline. Parenting practices are self-reported by caregiver at baseline. District dummies are controlled for in both adjusted and unadjusted models.

**Table 15.1 Impact on enrollment and child development outcomes by household wealth for 1 year old cohort**

	Impact on poor			
	Village is Batch 1		Village is Batch 3	
	Coefficient	Robust SE	Coefficient	Robust SE
<b>Enrollment in ECED Programs</b>				
Whether enrolled in project playgroups	0.607***	(0.043)	0.534***	(0.043)
Whether enrolled in non-project playgroups	-0.259***	(0.051)	-0.223***	(0.052)
Whether enrolled in RA programs	-0.090**	(0.045)	-0.079*	(0.047)
Whether enrolled in TK programs	-0.011	(0.029)	0.046	(0.032)
Total Number of Months of project playgroup	9.278***	(0.816)	7.203***	(0.724)
Total Number of Months of non-project playgroup	-3.176***	(0.710)	-2.918***	(0.696)
Total Number of Months of RA programs	-0.655	(0.447)	-0.200	(0.505)
Total Number of Months of TK programs	-0.030	(0.350)	0.330	(0.349)
<b>Standardized Child Development Outcomes</b>				
EDI: Physical Health & Well-Being	-0.086	(0.103)	0.043	(0.101)
EDI: Social Competence	0.107	(0.080)	0.035	(0.080)
EDI: Emotional Maturity	-0.043	(0.085)	-0.047	(0.084)
EDI: Language & Cognitive Development	0.109	(0.072)	0.069	(0.072)
EDI: Communication & General Knowledge	-0.079	(0.075)	-0.012	(0.075)
SDQ: Emotional Symptoms	-0.036	(0.085)	0.039	(0.084)
SDQ: Conduct Problems	-0.056	(0.088)	0.023	(0.088)
SDQ: Hyperactivity & Inattention	0.032	(0.091)	-0.021	(0.089)
SDQ: Peer Problems	-0.142	(0.092)	-0.059	(0.091)
SDQ: Pro-social Behavior	-0.085	(0.080)	-0.003	(0.085)
SDQ: Total Difficulties	-0.076	(0.086)	0.002	(0.088)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Batch 5 is used as the comparison group. All regressions reported here correspond to the adjusted specifications reported in Tables 10-12

**Table 15.2 Impact on enrollment and child development outcomes for 1 year old cohort by parenting score at the baseline**

	Impact on those whose parents report below-average parenting scores			
	Village is Batch 1		Village is Batch 3	
	Coefficient	Robust SE	Coefficient	Robust SE
<b>Enrollment in ECED Programs</b>				
Whether enrolled in project playgroups	0.555***	(0.041)	0.481***	(0.039)
Whether enrolled in non-project playgroups	-0.224***	(0.045)	-0.191***	(0.046)
Whether enrolled in RA programs	-0.136***	(0.047)	-0.128***	(0.042)
Whether enrolled in TK programs	0.029	(0.024)	0.067***	(0.026)
Total Number of Months of project playgroup	8.512***	(0.745)	7.156***	(0.667)
Total Number of Months of non-project playgroup	-3.290***	(0.713)	-2.872***	(0.705)
Total Number of Months of RA programs	-1.305**	(0.585)	-0.997*	(0.535)
Total Number of Months of TK programs	0.244	(0.278)	0.706**	(0.319)
<b>Standardized Child Development Outcomes</b>				
EDI: Physical Health & Well-Being	0.089	(0.090)	0.255***	(0.084)
EDI: Social Competence	0.067	(0.076)	0.016	(0.069)
EDI: Emotional Maturity	-0.007	(0.074)	-0.090	(0.074)
EDI: Language & Cognitive Development	0.083	(0.072)	0.074	(0.070)
EDI: Communication & General Knowledge	0.017	(0.072)	0.106	(0.071)
SDQ: Emotional Symptoms	-0.030	(0.070)	0.017	(0.071)
SDQ: Conduct Problems	-0.053	(0.087)	0.062	(0.087)
SDQ: Hyperactivity & Inattention	0.042	(0.073)	-0.036	(0.075)
SDQ: Peer Problems	-0.093	(0.082)	0.055	(0.080)
SDQ: Pro-social Behavior	-0.087	(0.073)	-0.039	(0.071)
SDQ: Total Difficulties	-0.054	(0.076)	0.041	(0.082)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Batch 5 is used as the comparison group. All regressions reported here correspond to the adjusted specifications reported in Tables 10-12

**Table 16. Child development production function for 4 year old cohort (early beneficiaries)**

	Total months of Enrolment between 2009 and 2013 in				
	Project playgroup	Non Project playgroup	Kindergarten	Religious playgroups	Primary school
<b>EDI</b>					
Physical Health and Well-being	0.011* (0.006)	0.011 (0.008)	0.004 (0.005)	0.005 (0.009)	0.009* (0.005)
Social Competence	0.006 (0.006)	0.011 (0.007)	0.001 (0.005)	-0.002 (0.013)	0.016*** (0.005)
Emotional Maturity	-0.000 (0.006)	0.006 (0.007)	-0.001 (0.005)	-0.016* (0.009)	0.011* (0.006)
Language and Cognitive Development	0.006** (0.003)	0.002 (0.004)	0.006** (0.002)	0.007** (0.003)	0.024*** (0.004)
Communication and General Knowledge	0.004 (0.007)	0.011 (0.010)	0.014** (0.006)	0.031*** (0.009)	0.022*** (0.006)
<b>SDQ</b>					
Total Difficulties	0.018*** (0.006)	0.003 (0.007)	0.008* (0.005)	0.010 (0.009)	-0.003 (0.006)
Emotional Problems	0.011 (0.007)	0.012 (0.008)	0.007 (0.005)	0.017** (0.008)	0.001 (0.006)
Social Conduct	0.015** (0.007)	-0.004 (0.007)	0.006 (0.005)	-0.001 (0.008)	0.001 (0.006)
Hyper activity	0.008 (0.006)	0.005 (0.008)	0.007 (0.005)	0.005 (0.009)	-0.003 (0.005)
Peer problems	0.008 (0.007)	-0.006 (0.007)	0.001 (0.005)	0.003 (0.008)	-0.009 (0.006)
Pro social behavior	-0.003 (0.006)	0.006 (0.008)	0.002 (0.005)	0.013* (0.008)	-0.001 (0.005)

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Robust standard errors are in the parentheses. Each row is the result of a separate regression. The dependent variables are child development outcomes as measured by the EDI and the SDQ. Key variables of interest are months of enrollment in each type of service. Each regression controls for child and household characteristics as specified in the text.

**Table 17. Child development production function for 1 year old cohort (later beneficiaries)**

	Total months of Enrolment between 2009 and 2013 in				Primary school
	Project playgroup	Non Project playgroup	Kindergarten	Religious playgroups	
<b>EDI</b>					
Physical Health and Well-being	0.012*** (0.002)	0.013*** (0.004)	0.014*** (0.004)	0.025*** (0.005)	Not applicable
Social Competence	0.019*** (0.003)	0.020*** (0.004)	0.027*** (0.004)	0.011 (0.007)	
Emotional Maturity	0.003 (0.003)	0.007** (0.003)	0.012*** (0.005)	0.016** (0.007)	
Language and Cognitive Development	0.033*** (0.003)	0.033*** (0.004)	0.057*** (0.004)	0.041*** (0.007)	
Communication and General Knowledge	0.024*** (0.003)	0.030*** (0.004)	0.031*** (0.005)	0.014** (0.007)	
<b>SDQ</b>					
Total Difficulties	-0.002 (0.003)	-0.001 (0.003)	-0.014*** (0.004)	-0.017** (0.007)	Not applicable
Emotional Problems	-0.001 (0.003)	-0.002 (0.003)	-0.006 (0.004)	-0.008 (0.007)	
Social Conduct	0.003 (0.003)	0.007** (0.003)	-0.006* (0.004)	-0.013** (0.006)	
Hyper activity	-0.005* (0.003)	-0.006* (0.003)	-0.012*** (0.004)	-0.010 (0.007)	
Peer problems	-0.004* (0.002)	-0.002 (0.003)	-0.015*** (0.004)	-0.015** (0.007)	
Pro social behavior	-0.013*** (0.003)	-0.007** (0.004)	-0.008** (0.004)	0.003 (0.007)	

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Robust standard errors are in the parentheses. Each row is the result of a separate regression. The dependent variables are child development outcomes as measured by the EDI and the SDQ. Key variables of interest are months of enrollment in each type of service. Each regression controls for child and household characteristics as specified in the text.



**Table 18: Comparison of Center and Teacher Characteristics by Villages**

	Playgroups					Kindergartens						
	Non-Project Village Playgroups		Project Village Playgroups		Diff. Between Project Villages & Non-Project Villages	Non-Project Village Kindergartens		Project Village Kindergartens		Diff. Between Project Villages & Non-Project Villages		
	Mean	S.D.	Mean	S.D.		Mean	S.D.	Mean	S.D.			
<b>Center Characteristics</b>												
<i>Center Quality (ECERS-R)</i>												
Space and Furnishing	2.565	1.071	3.168	1.257	0.603	**	3.004	1.230	2.777	1.155	-0.227	
Personal Care Routines	2.491	1.113	2.587	1.063	0.096		2.552	1.146	2.422	1.021	-0.130	
Language-Reasoning Activities	3.189	1.521	3.495	1.207	0.306		3.794	1.570	3.522	1.522	-0.272	
Interactions	2.122	0.950	2.700	0.907	0.578	***	2.403	1.012	2.293	0.907	-0.110	
Program Structure	3.755	1.667	4.151	1.422	0.396		4.062	1.557	4.040	1.522	-0.022	
Parents and Staff	2.565	1.537	2.842	1.305	0.277		2.686	1.425	2.610	1.436	-0.076	
Total (Mean) ECERS-R Score	2.515	1.096	2.457	0.878	-0.058		2.889	0.945	2.601	0.936	-0.288	*
	2.743	1.080	3.057	0.906	0.314	*	3.056	1.075	2.895	0.966	-0.161	
<i>Center Schedule</i>												
Days of operation/week	5.082	0.997	4.448	1.289	-0.634	**	5.981	0.138	5.988	0.154	0.007	
Hours of operation/day	2.214	0.470	2.195	0.395	-0.019		2.524	0.348	2.527	0.411	0.003	
<b>Teacher Characteristics</b>												
<i>Education</i>												
Elementary at most	0.009	0.096	0.007	0.086	-0.002		0.000	0.000	0.000	0.000	0.000	
Junior high	0.018	0.135	0.024	0.153	0.006		0.005	0.070	0.008	0.089	0.003	
Senior high	0.734	0.444	0.708	0.455	-0.026		0.420	0.495	0.373	0.484	-0.047	
Higher education	0.239	0.428	0.261	0.440	0.022		0.576	0.495	0.619	0.486	0.043	
<i>Type of ECED Training</i>												
None	0.142	0.350	0.140	0.347	-0.002		0.140	0.348	0.265	0.442	0.125	***
Some Project (100 hrs)	0.000	0.000	0.044	0.206	0.044	*	0.000	0.000	0.000	0.000	0.000	
Full Project (200 hrs)	0.000	0.000	0.246	0.431	0.246	***	0.000	0.000	0.000	0.000	0.000	
Some Project (100 hrs) & Other	0.000	0.000	0.034	0.181	0.034		0.000	0.000	0.000	0.000	0.000	
Full Project (200 hrs) & Other	0.000	0.000	0.186	0.390	0.186	***	0.000	0.000	0.003	0.051	0.003	
Other only	0.858	0.350	0.350	0.477	-0.508	***	0.860	0.348	0.733	0.443	-0.127	***
<i>Experience in ECED</i>												
ECED	0.377	0.487	0.245	0.431	-0.132	**	0.405	0.492	0.389	0.488	-0.016	
ECED & Cadre	0.113	0.318	0.140	0.348	0.027		0.135	0.343	0.138	0.345	0.003	
Cadre	0.160	0.369	0.298	0.458	0.138	**	0.125	0.332	0.185	0.389	0.060	
None	0.349	0.479	0.317	0.466	-0.032		0.335	0.473	0.288	0.454	-0.047	
<i>Years of teaching</i>	6.183	5.561	5.287	3.393	-0.896	*	9.376	7.115	9.076	7.017	-0.300	

Note: Sample consists of Playgroups (N=306) and Kindergartens (N=272) for which center quality measures were collected. \* p<0.05, \*\* p<0.01, \*\*\* p<0.001

**Table 19: Cost-benefit-analysis**

	4-year-old cohort		1-year-old cohort	
	Per beneficiary (\$)	Total (\$)	Per beneficiary (\$)	Total (\$)
Discounted stream of income per beneficiary	96	64,573,510	331	223,124,103
Discounted cost per beneficiary	76	51,469,388	76	51,469,388
B-C	19	13,104,122	255	171,654,715
Return for each USD invested	1.3	1.3	4.3	4.3

Assumptions: Number of beneficiaries = 673,162. Annual cost per beneficiary = USD 27. Additional years of schooling = 0.4. Benefits start at age 18 and continue for 40 years. Returns to education = 6.5%. Discount rate = 5%. Average annual earnings = 33% of 2012 GDP per capita in PPP terms.

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**Table A1. The first stage regression results for IV estimation**

		Original batch 2 (=1)		Original batch 3 (=1)		Control variables	F statistics of two IVs	R squared	Number of observations
		Coeff	SE	Coeff	SE				
All	Baseline	-0.373***	(0.122)	-0.832***	(0.043)	Yes	185.91	0.624	1,317
	Midline	-0.368***	(0.122)	-0.830***	(0.044)	Yes	181.52	0.625	1,317
	Endline	-0.363***	(0.120)	-0.829***	(0.044)	Yes	180.93	0.628	1,317
Poor children	Baseline	-0.328***	(0.121)	-0.822***	(0.049)	Yes	143.76	0.591	764
	Midline	-0.323***	(0.122)	-0.815***	(0.050)	Yes	135.12	0.595	764
	Endline	-0.317***	(0.120)	-0.812***	(0.050)	Yes	135.56	0.598	764
Nonpoor children	Baseline	-0.497***	(0.155)	-0.843***	(0.048)	Yes	154.32	0.678	553
	Midline	-0.488***	(0.159)	-0.843***	(0.047)	Yes	157.87	0.675	553
	Endline	-0.481***	(0.158)	-0.847***	(0.046)	Yes	169.24	0.678	553
Above average parenting score	Baseline	-0.370***	(0.131)	-0.818***	(0.049)	Yes	138.35	0.589	675
	Midline	-0.370***	(0.131)	-0.816***	(0.049)	Yes	137.54	0.590	675
	Endline	-0.368***	(0.129)	-0.815***	(0.049)	Yes	137.30	0.595	675
Below average parenting score	Baseline	-0.375***	(0.135)	-0.849***	(0.043)	Yes	194.14	0.673	641
	Midline	-0.363***	(0.137)	-0.845***	(0.044)	Yes	183.24	0.672	641
	Endline	-0.354***	(0.134)	-0.846***	(0.043)	Yes	191.05	0.677	641

Notes: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Child characteristics and household background variables included. These are child's age, gender, household size, household wealth and mother's education level. All standard errors are robust and clustered at the village level. Separate first stage results are reported because of variations in time-varying control variables.

**Table A2. Balance between Batches at Baseline**

	Batch 1 vs Batch 3			Batch 3 vs Batch 5		
	Batch 1	Batch 3	Diff	Batch 3	Batch 5	Diff
EDI: Physical Health & Well-Being				-0.307	-0.303	-0.004
EDI: Social Competence				-0.038	-0.003	-0.035
EDI: Emotional Maturity				-0.186	-0.210	0.024
EDI: Language & Cognitive Development				-1.362	-1.321	-0.042
EDI: Communication & General Knowledge		Intentionally blank		0.524	0.553	-0.029
SDQ: Emotional Symptoms				-0.006	-0.025	0.019
SDQ: Conduct Problems				0.150	0.079	0.071
SDQ: Hyperactivity & Inattention				0.301	0.421	-0.120**
SDQ: Peer Problems				0.174	0.158	0.016
SDQ: Pro-social Behavior				0.315	0.328	-0.013
SDQ: Total Difficulties				0.205	0.196	0.009
Age of child (in years)	4.355	4.358	-0.004	4.358	4.373	-0.014
Household size	4.637	4.701	-0.064	4.701	4.769	-0.068
Wealth Z-score	-0.279	-0.236	-0.043	-0.236	-0.181	-0.055
Parenting Skills Z-Score	0.064	-0.006	0.069	-0.006	0.046	-0.051
Mother's Education= 1 for Not yet/never go to school	0.036	0.034	0.002	0.034	0.027	0.007
Mother's Education = 1 for Did not finish primary school	0.082	0.090	-0.008	0.090	0.088	0.002
Mother's Education = 1 for Primary school	0.393	0.405	-0.012	0.405	0.424	-0.020
Mother's Education = 1 for Junior high school	0.235	0.238	-0.003	0.238	0.260	-0.022
Mother's Education = 1 for Senior high school	0.192	0.179	0.013	0.179	0.147	0.032
Mother's Education = 1 for 1/2/3 year diploma	0.024	0.022	0.002	0.022	0.015	0.006
Mother's Education = 1 for 4 year diploma/Bachelor degree	0.033	0.031	0.002	0.031	0.031	0.000
Mother's Education = 1 for Master's/PhD	0.001	0.000	0.001	0.000	0.004	-0.004
Mother's Education = 1 for Don't know	0.003	0.002	0.001	0.002	0.004	-0.002
Children's Gender: Male = 1	0.476	0.499	-0.023	0.499	0.511	-0.012

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard errors are clustered at the village level. Batch 1 and 3 comparison in outcomes are not shown as project is already active in Batch 1. However, control variables are shown since the intervention is not expected to have influenced these variables.